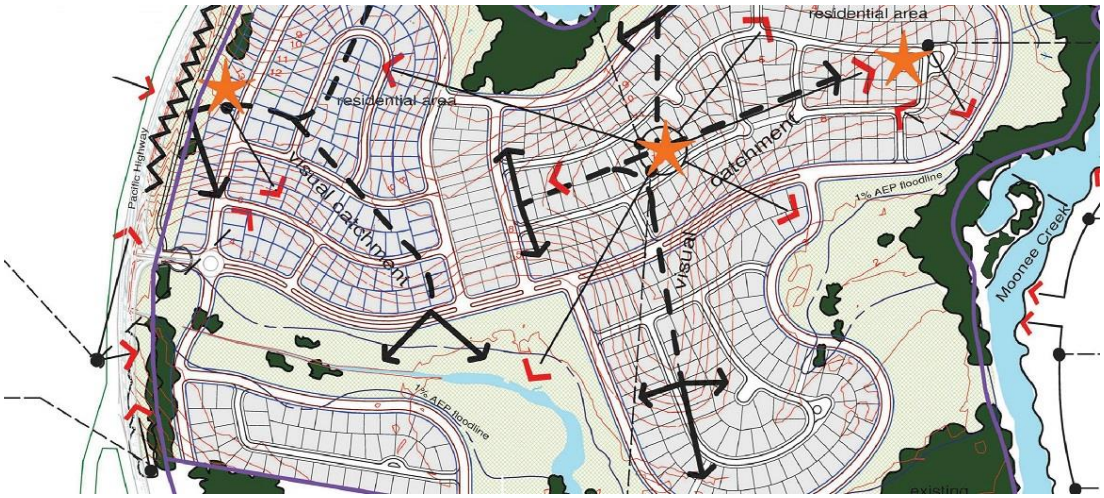
Project Approval 06_0143 MOD 4

NSW Planning and Environment

Lots 1 & 2 DP 725785

The Glades, Moonee Beach NSW



Prepared for: Rothwell Boys Pty Ltd
April 2019

Modification under Section 75W

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Contents

Executive Summary 1

1. Introduction 5

1.1 Background 6
1.2 Subject Land Details 7
1.3 Contact Details 8
1.4 Report Structure 8
1.5 Consent Authority 9

2. Site Context 10

2.1 Site Description 10
2.2 Local Context 12
2.3 Site Analysis 13
2.4 Planning Controls 17

3. Proposed Modification(s) 18

3.1 Modification to Preliminary Lot Layout 18
3.1.1 Proposed Residential Lots 18
3.1.2 Proposed Vegetation Removal 20
3.1.3 Proposed Engineering Servicing 20
3.2 Modification to Site Levels (Bulk Earthworks Cut/Fill) 22
3.3 Modification to Noise Attenuation 24
3.4 Modification to Landscaping and Open Space Management 25
3.5 Modification to Vegetation Management 26
3.6 Modification to Bushfire Management 26
3.7 Modification to Natural Areas 27
3.8 Modification to Approved Plans 27
3.9 Additional Plans 30

4. Specialist Assessments 32

4.1 Supporting Investigations 32
4.1.1 Flora and Fauna Assessment 32
4.1.2 Flooding 37
4.1.3 Engineering Infrastructure Assessment 38
4.1.4 Stormwater Quality Assessment 38
4.1.5 Soil and Water Management 39
4.1.6 Noise Assessment 39
4.1.7 Contaminated Lands 40
4.1.8 Acid Sulfate Soils 40
4.1.9 Traffic 40
4.1.10 Bushfire Risk Assessment 42
4.1.11 Safer by Design 43
4.1.12 Accessibility 44
4.1.13 Heritage 44

5.	**Consultation**	**45**
5.1	Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013)	45
5.1.1	Background	45
5.1.2	Public Consultation	45
5.1.3	DPE Assessment – Deferred Areas Planning Proposal	47
6.	**Statutory Assessment**	**48**
6.1	Development Assessment	48
6.2	State Environmental Planning Instruments	48
6.3	Regional Planning Policies	52
6.4	Local Planning Instruments and Policies	53
6.5	Development Control Plan	57
7.	**Environmental Effects**	**60**
7.1	Section 4.15 – Evaluation	60
8.	**Conclusion**	**66**

Figures

Figure 1:	Location Plan	10
Figure 2:	The Subject Land	11
Figure 3:	The Approved Moonee Beach Collector Road	11
Figure 4:	Zoning Plan under Coffs Harbour LEP 2013	12
Figure 5:	Site Elevation	13
Figure 6:	Acid Sulfate Soils	14
Figure 7:	Koala Habitat	15
Figure 8:	100 Year ARI Flood Extent	16
Figure 9:	Bushfire Prone Land	16
Figure 10:	Coastal Hazards	17
Figure 11:	Approved Preliminary Lot Layout – MP06_0143	18
Figure 12:	Proposed Preliminary Lot Layout MP06-0143 MOD 4	19
Figure 13:	Proposed Additional 31 Allotments	20
Figure 14:	Approved Bulk Earthworks MP06-0143	22
Figure 15:	PS01—K210 (1% AEP Catchment + 5% AEP Ocean + Climate Change)	23
Figure 16:	Proposed Bulk Earthworks MP06-0143 MOD 4	23
Figure 17:	Proposed Noise Attenuation MP06-0143 MOD 4	25
Figure 18:	Proposed Zoning (Exhibition zoning)	46
Figure 19:	Proposed Land Use Zones (Council recommended zoning)	46
Figure 20:	Adopted Land Use Zones (LEP 2013 as amended)	47

Tables

Table 1	The Glades, Moonee Beach, NSW	7
Table 2	Proposed Modifications	10
Table 3	Proposed Modifications	27
Table 4	Project Engineering Drawings Prepared by Resource Design & Management	30
Table 5	Project Drawings Prepared by James Warren & Associates Pty Ltd	31

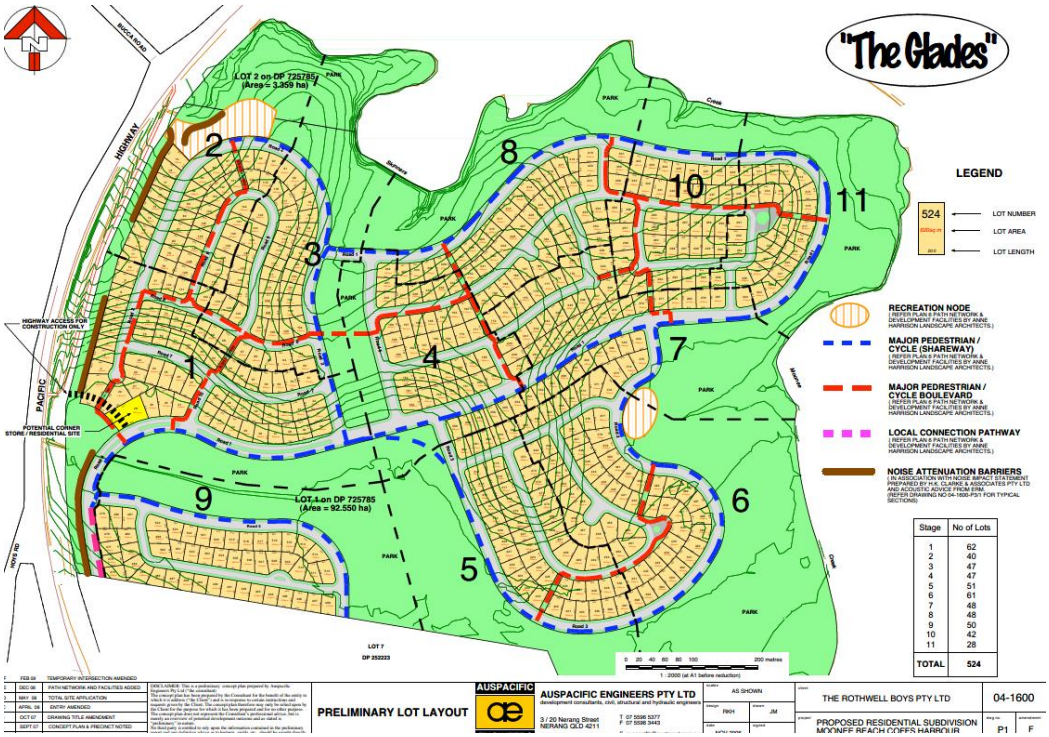
Annexures

Appendix A	Draft Suite of Project Plans	A
Appendix B	Revised Draft Conditions	B
Appendix C	Flora & Fauna Assessment	C
Appendix D	Engineering Infrastructure Report	D
Appendix E	Flood Assessment	E
Appendix F	Noise Assessment	F
Appendix G	Acid Sulfate Soils Assessment	G
Appendix H	Traffic Assessment	H
Appendix I	Bushfire Risk Assessment	I
Appendix J	Cultural Heritage Assessment	J
Appendix K	Correspondence from OEH	K
Appendix L	JWA Letter dated 29 October	L

Executive Summary

This environmental assessment report supports an application for the modification to Major Project Approval MP06_0143. This application is made under the provisions of Part 3A Major Projects (Transition Provisions) Section 75W of the *Environmental Planning and Assessment Act 1979.*

The subject land is located at Pacific Highway, Moonee Beach NSW and is currently vacant land used for cattle grazing. This land is subject to the existing major project approval MP06_0143. This approval provides for the creation of 524 residential allotments over eleven stages, site earthworks (cut and fill), provision of roads and other infrastructure, open space, active play areas and a pedestrian/cycleway network. A copy of the Approved Preliminary Lot Layout (MP06_0143) is included in Section 3, Figure 11.



Extract from Section 3, Figure 11: Approved Preliminary Lot Layout – MP06_0143

Project Approval, MP06_0143 has been commenced and has been subject to three subsequent modifications which are described in Section 1.1. Specifically, this fourth modification (Mod 4) seeks to:

1. Reconfigure the subdivision pattern to include an additional 31 lots (Lot 1 DP 725785) as shown in Section 3, Figure 12.
2. Modify site levels (bulk earthworks – cut and fill) (Lot 1 DP725785) as shown in Section 3.2, Figure 16.
3. Modify noise mitigation measures (sound barrier) (Lot 1 DP725785) as shown in Section 3.3, Figure 17.

Mod 4 – Item 1: Reconfiguration of Preliminary Lot Layout

The land use zones which apply to the subject land were endorsed by Council and the NSW Department of Planning by the making of Coffs Harbour Local Environmental Plan 2013 (Amendment No. 8) on the 23rd of July 2018.

In part, this proposal represents an infill of the approved subdivision pattern under MP06_0143 and is proposed on land which is zoned R2 Low Density Residential under the Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013).

An extract from the CHLEP 2013 – Land Use Map is shown in the figure below. This figure identifies the extent of the R2 zone, the extent of the approved subdivision lots under MP06_0143 and the location of the infill area (i.e. additional 31 residential lots) which forms part of this modification application (i.e. Mod 4).

The proposed modification will require vegetation removal, the extension to Council's water and sewer services, as well as stormwater (inter-allotment drainage) telecommunications and electricity infrastructure. Amelioration measures (additional revegetation and rehabilitation works) which are proposed to address the loss of the vegetation from this site are proposed within Lots 1 & 2 DP 725785.

Extract from Section 2.1, Figure 4 showing the Zoning Plan under Coffs Harbour LEP 2013.

This application is made having considered the requirements of the *Threatened Species Conservation Act 1995 (TSC Act), State Environmental Planning Policy No.44, Section 5A of the Environmental Planning & Assessment Act 1979 and the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*. This proposed development will not have a significant impact on any matter of national environmental significance, nor will it result in the extinction of any species listed under the TSC Act.

An assessment using the Bio Banking Assessment Methodology has also been completed to determine the impact of removing the central vegetated corridor from the subject land. In total approximately 1.37 hectares of relatively intact native vegetation will be removed to enable the development of the 31 additional allotments. These allotments are proposed in place of the central corridor which is identified as "Park" in the Approved Preliminary Lot Layout under MP06_0143.

The assessment has determined the ecosystems credits which would be lost as a result of the proposed development and the ecosystem credits which would be generated on-site through compensatory measures.

In determining the type of compensatory measures, the existing commitments to revegetation and rehabilitation under MP06_0143 have been acknowledged. It is concluded that ample opportunity exists within the Glades Estate to offset the loss of the central corridor of vegetation and that enhancement works: -

a) are over and above the vegetation management works required by the original approval;
b) will result in a fully structured and functioning ecosystem and significant improvement in the corridor values of the open space areas within the estate;
c) represents a more than adequate offset for the removal of an isolated patch of vegetation which has limited and reduced functionality as the development progresses.
d) will adequately bolster north-south habitat connectivity in the locality.

Mod 4 – Item 2: Modification to Site Levels (Bulk Earthworks Cut/Fill)

This modification also seeks a change regarding bulk earthworks and minimum site levels. Since the approval of MP06-0143, a further flood assessment has been completed and has been peer reviewed and approved by Council. The assessment concluded that all proposed dwellings are to have finished floor levels between 4.03m and 4.68m.

As a consequence of this further flood assessment, the site levels within the subject land (to the extent of the approved subdivision pattern under MP06_0143) have been adjusted according to the mapped flood extent. The adjusted site levels are represented on the Bulk Earthworks and Noise Attenuation Plan (dated 16 January 2018) included in Appendix A.

Mod 4 – Item 3: Modification to Noise Mitigation Measures

In addition to the abovementioned matters, this modification also seeks changes to the noise mitigation measures which were initially required under the Project Approval.

A revised assessment has been completed on account of the significant change to both the horizontal and vertical alignment of the Pacific Highway. The noise assessment confirms that noise levels may be mitigated by using improved architectural treatments. Accordingly, some residential allotments require the implementation of noise mitigation measures in lieu of the previously approved mounding and noise wall. The proposed

allotments which are impacted in this regard are identified on the Bulk Earthworks and Noise Attenuation Plan (dated 16 January 2018) included in Appendix A.

Conclusion

This report has evaluated the impacts of the proposed development. The proposed modifications are considered appropriate taking into consideration the environmental qualities of the land and the range of design and ameliorations measures which are intended to address and mitigate the anticipated impacts to same.

The proposed development contributes to achieving population growth within the Coffs Harbour Local Government Area. It will provide additional housing choice for existing residents in the area and those intending to relocate to this locale. Having considered the proposal in the context of applicable statutory and non-statutory development controls, we believe there are no material impediments to it being granted approval.

1. Introduction

Resource Design and Management Pty Ltd (RDM) on behalf of Rothwell Boys Pty Ltd (Rothwell), submit this updated Environmental Assessment Report which supports an application for modification under Section 75W of the EPA Act 1979.

The application and accompanying documentation was lodged with the NSW Department of Planning on the 24th of November 2017. The application was made having considered the requirements of Coffs Harbour City Local Environmental Plan 2000 (CHLEP 2000) and the draft Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013), as well as other legislative controls and supporting policies. At the time this application was made, the subject land (Lots 1 & 2 DP725785), along with other land parcels was deferred from CHLEP 2013. This was done to enable further investigations to be undertaken to support the proposed land use zones under CHLEP 2013.

On the 23rd of July 2018, Amendment No 8. to CHLEP 2013 was made. The effect of same resolved most of the deferred lands, including the subject land. Consequently, CHLEP 2013 has become the relevant local environmental planning instrument applying to the subject land.

This report has now been updated to address the provisions of CHLEP 2013.

The S75W application seeks to Modify Project Approval (MPA) 06-0143. The proposed modifications that are sought include:

1. Reconfiguration of the subdivision pattern to include 31 additional lots;
2. Modify site levels (bulk earthworks – cut and fill);
3. Modify noise mitigation measures (sound barrier);

As consequence of the proposed modifications, it is necessary to extend services infrastructure (i.e. water, sewer and stormwater) to the modified footprint (i.e. proposed 31 lots) and remove vegetation within the modified footprint. It is also necessary to revisit the stormwater treatment strategy in view of the changes to stormwater catchment areas arising from the modified footprint and the altered bulk earthworks surface.

This proposal represents an “infill” of the approved urban footprint which is the subject of the Major Project Approval issued by the Minister for Planning on 15 March 2009. It also includes changes to the landform (earthworks) and noise mitigation measures associated with the Project Approval based on further detailed investigation.

In view of the proposed modifications, a draft set of project plans have been prepared and are included in **Appendix A**. Revised draft conditions are also presented in **Appendix B**.

1.1 Background

This proposal follows the granting of a Project Approval 06_0143 for the Glades Estate (Lots 1 & 2 in DP725785) under Section 75J of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Project Approval 06_0143 was granted by the NSW Minister for Planning on the 15 March 2009. This Project Approval has been commenced and has been subject to three previous modifications as follows.

MOD 1:
On the 18th of November 2009 a Section 75W modification was lodged with the Department seeking:

a) to facilitate the issue of a Construction Certificate to permit bulk earthworks on-site in advance of providing the creation of any easements or instruments of title for the construction of the northern collector road;
b) permit the staging of the project to proceed in a manner generally consistent with the Preliminary Lot Layout Plan (04-1600 Drawing P1 Amendments F dated February 2009), but allowing flexibility regarding the sequencing of staging.
c) The provision of temporary construction fencing during the bulk earthwork's construction in a manner different to Plan 8 Landscape Staging Plan dated December 2008 referred to in Condition C10 of MP06_0143.

The proposed modification sought and obtained changes to Conditions A2, B1(2), & C10 as well as including new Condition B1A. This proposed modification was approved on the 1st of February 2010.

MOD 2:
On the 21st of June 2011 a Section 75W modification was lodged with the Department seeking to allow the issue of a construction certificate for the installation of a sewer rising main across the Pacific Highway in advance of any other approvals or certifications required for the development. The proposed modification sought changes to Conditions B1A and C10. This proposed modification was approved on the 15th of July 2011

MOD 3:
On the 27th of November 2014 a Section 75 W modification application was lodged with the Department seeking to amend Condition B1(3) and Condition E18 to delete references to the Moonee Developer Contributions Plan 2008 and the associated development contribution table and replace it with the contributions applicable under the recently adopted Moonee Release Area Development Contributions Plan. This proposed modification was approved by DPE on the 2nd of February 2015.

The subject land was previously excluded from the CHLEP 2013 at the time of making of this plan, being the 27th of September 2013. It is understood that the subject land was excluded from CHLEP 2013 due to unresolved matters concerning the transition of land use zones for open space and environmental protection from CHLEP 2000.

Following five (5) years of investigation, most of the deferred lands zoning matters (including the subject land) was resolved by the making of Amendment N$^{o.}$ 8 to CHLEP 2013 on the 23rd July 2018.

The proposed modification (i.e. additional residential allotments) is consistent with the intent for the land which was recently zoned from Residential 2A Low density to R2 Low Density Residential under the Deferred Areas Planning Proposal (Coffs Harbour Local Environmental Plan 2013), Amendment No 8. It is noted that the zoning of this land to R2 Low Density Residential was supported by both Coffs Harbour City Council and the NSW Department of Planning & Environment.

This application was lodged with New South Wales Department of Planning and Environment in November 2017 when the deferred matters applied to the subject land. The application addressed both CHLEP 2000 and CHLEP 2013. As CHLEP 2013 has now been made and solely applies to the subject land, this revised report has been prepared to address the provisions of CHLEP 2013.

The East Moonee area is captured in the Coffs Development Control Plan 2015 (CHDCP 2015) of CHLEP 2013. In the CHDCP 2015, component G6 provides a detailed masterplan for the development of the Moonee Release Area including guidelines for development and measures to protect the natural environment. This report also addresses the provisions of the CHDCP 2015 which are relevant to the proposed development.

1.2 Subject Land Details

Table 1 The Glades, Moonee Beach, NSW	
Legal Description and Property Address	
Address	Pacific Highway, Moonee Beach NSW
Lot(s) and Deposited Plan(s)	Lot 1 & 2 in DP 725785
Land zoning (*Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013*)	R2 Low Density Residential Zone (Part) RE2 Private Recreation (Part) E2 Environmental Conservation (Part)
Name of Land Owner	Rothwell Boys Pty Ltd
Local Government Area (LGA)	Coffs Harbour City Council, NSW

1.3 Contact Details

Contact: Mr Jim Punch
Email: jim@projectplan.biz

Mr Matt Cooper
Email: matt@resdesman.com.au
Ph. 6651 2688

Company: Rothwell Boys Pty Ltd
C/o Resource Design and Management Pty Ltd

Postal Address: PO Box 4430
Coffs Harbour Jetty, NSW 2450

Authority for the lodgement of this application under Section 75W of the EPA Act is given by the land owners Rothwell Boys Pty Ltd, a copy of the authority document is provided with the accompanying application form.

1.4 Report Structure

This report is divided into eight sections.

Section 2 examines the context of the subject land by describing its location, existing character and uses and the local context in which it is situated.

Section 3 describes the proposed modifications.

Section 4 provides a summary of the specialist assessments which have been prepared in relation to the proposed modifications.

Section 5 describes the consultation undertaken during the preparation of this proposal and that which occurred under MP 06_0143.

Section 6 reviews the proposed modifications having regard to the relevant statutory and non-statutory provisions arising from relevant environmental planning instruments and development controls.

Section 7 completes an assessment of the proposed development in accordance with Section 75W of the *Environmental Planning and Assessment Act*, 1979.

Section 8 concludes this environmental assessment.

1.5 Consent Authority

Under Section 75W of the *Environmental Planning and Assessment Act 1979,* inclusive of its supporting regulation *2000*; the Minister for Planning is the consent authority for this application.

2. Site Context

2.1 Site Description

Subject Land

The land subject to MP 06_0143 is outlined in red below. This land comprises Lots 1 & 2 in DP 725785 and has an area of approximately 95.9 hectares.

Location

The subject land is located approximately 1.4 kilometres north of the Moonee Beach Shopping Centre and is positioned on the eastern side of the highway between Moonee Beach Road and Skinners Creek. The subject land is identified in **Figure 1**.

Figure 1: Location Plan
Source: Google Maps

Land Subject to Modification

This modification affects the land (Lots 1 & 2 in DP 725785) identified in **Figure 2** below. Each component of the proposed modification is identified in the table below.

Table 2 Proposed Modifications

Type of Modification	Description of Modification
Noise Attenuation Barrier	Seeking Modification to remove
Additional 31 Lots	Seeking additional 31 lots
Bulk Earthworks Extent	Seeking alteration to minimum fill level (AHD)

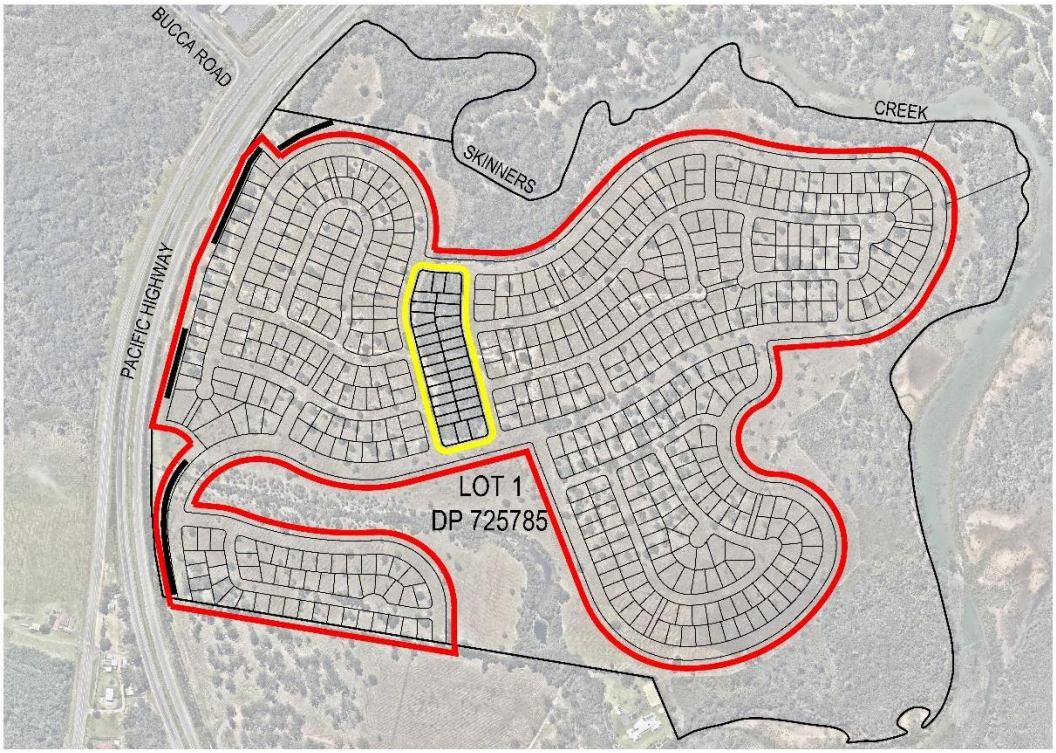


Figure 2: The Subject Land
Source: CHCC

Site Access

Permanent access is to be achieved via the construction of the Moonee Beach Collector Road, extending northwards of its current limit at Estuary Drive, Moonee Beach. Refer **Figure 3** which shows the location of the collector road through the adjoining lands.

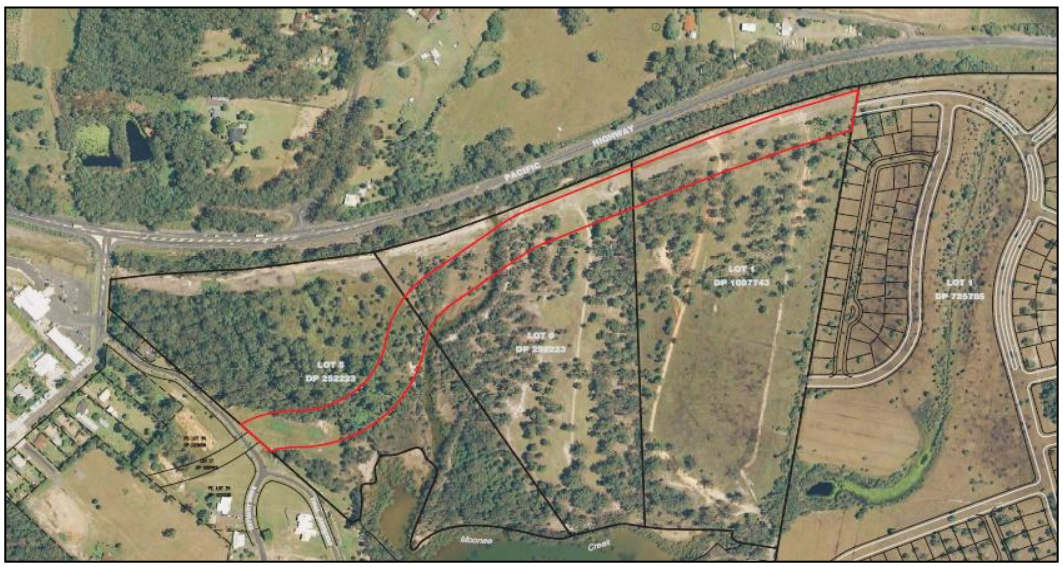


Figure 3: The Approved Moonee Beach Collector Road
Source: CHCC

Land Use - Zoning

The proposed modifications (i.e. noise mitigation, bulk earthworks & additional residential allotments) are limited to the R2 Low Density Residential zone under CHLEP 2013. The subject land also has land zoned RE2 Private Recreation & E2 Environmental Conservation. An extract of the CHLEP 2013 map is provided in **Figure 4** below.

Figure 4: Zoning Plan under Coffs Harbour LEP 2013
Source: CHCC

2.2 Local Context

The subject land is positioned approximately 1.4 kilometres from the Moonee Beach shopping precinct and less than fourteen (14) kilometres from Coffs Harbour's central business district.

The northern and eastern boundaries are formed by Skinners and Moonee Creek alignments, undeveloped residential zone land adjoins the southern boundary and the Pacific Highway borders the western property boundary.

2.3 Site Analysis

The subject land (Lots 1 & 2 DP 725785) has the following attributes:

Existing Development
The land parcel(s) remains undeveloped. Open areas of grassland and scattered trees occur throughout the site.

Surrounding Land Use
The eastern boundary adjoins Moonee Creek and the western boundary adjoins the Pacific Highway. Refer to **Figure 2**.

The southern boundary (of Lot 1 DP725785) adjoins other vacant parcels of land that will become residential development and will incorporate part of the approved collector road.

Topography: The general topography of the subject land varies in elevation between approximately 1m and 16m AHD. Refer **Figure 5,** below.

Figure 5: Site Elevation
Source: CHCC

Easements & Encumbrances:
The western portion is encumbered by an aboveground power line (Essential Energy) and underground service infrastructure owned by Coffs Harbour City Council and Telstra/NBN.

Other than the above, there are no other easements or encumbrances which would affect the development of the land as proposed.

Site Access: Access to the proposed subdivision will be gained via the approved collector road (*L&E Case Order Number 10571 of 2011*).

Soil Conditions (Acid Sulfate)

The subject land is identified on Council's Acid Sulfate Soils Map to be affected by Classes 3, 4 & 5 Acid Sulfate Soils (ASS) – refer **Figure 6**.

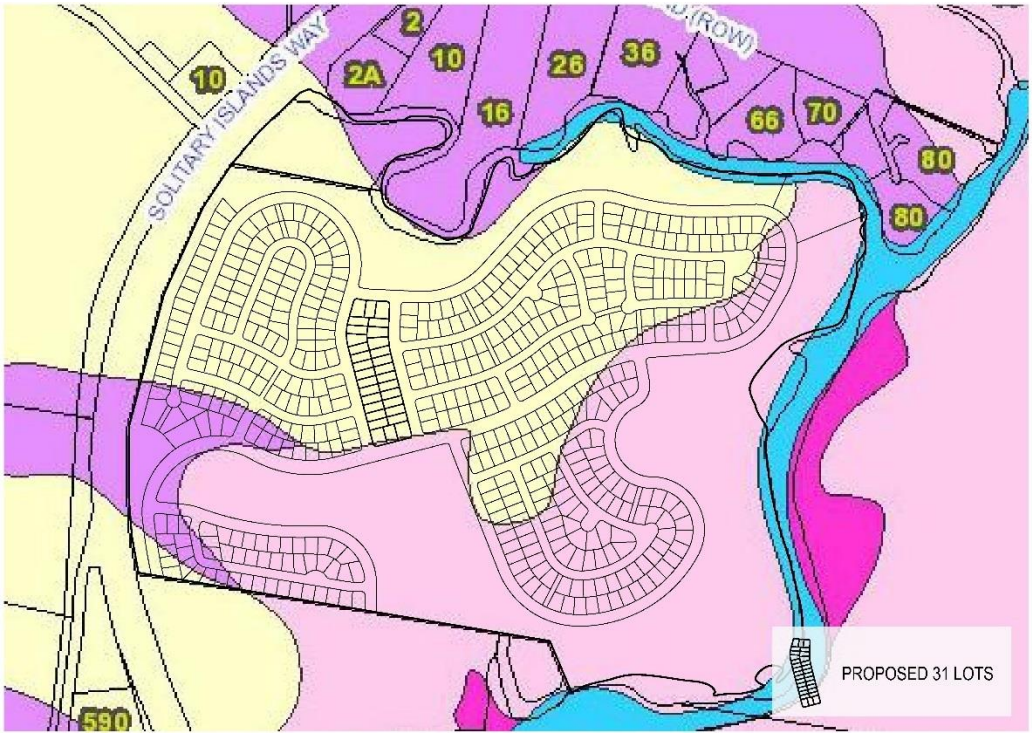


Figure 6: Acid Sulfate Soils
Source: CHCC

- Class 1
- Class 2
- Class 3
- Class 4
- Class 5

Soil Conditions (Contamination)

Coffs Harbour City Council's mapping system does not identify the land as being:

- former banana lands;
- potentially contaminated land; or
- an EPA notified site.

Drainage Systems:
The land parcel contains several natural overland flow paths that drain to Skinners Creek (which forms the northern boundary of the site) and Moonee Creek (which forms the eastern boundary of the site).

Services:
Electricity and telecommunication services are available and can be connected to the subject land. Similarly, connection to Council's reticulated water and sewerage supply networks will also be made as required.

Vegetation:
Open areas of grassland and scattered trees occur throughout the subject land. More dense areas of vegetation occur in the eastern portion of Lot 1 DP725785 and the northern portion of Lots 1 & 2 in DP725785.

Council's koala habitat mapping shows part of the subject land to contain secondary koala habitat. Refer to **Figure 7**.

Figure 7: Koala Habitat
Source: CHCC

Flooding:
Council's flood risk maps identify the Flood Hazard and 1% AEP flood extents concentrated around the Skinners Creek in the north and Moonee Creek in the east of the subject land. Refer to **Figure 8.**

Figure 8: 100 Year ARI Flood Extent
Source: CHCC

Bushfire:

Figure 9 is an extract from Coffs Harbour City Council's Bushfire Prone Land Map. The subject land is identified in part as bushfire prone land, with vegetation groups around the site's peripheries considered as Category 1 bushfire prone land.

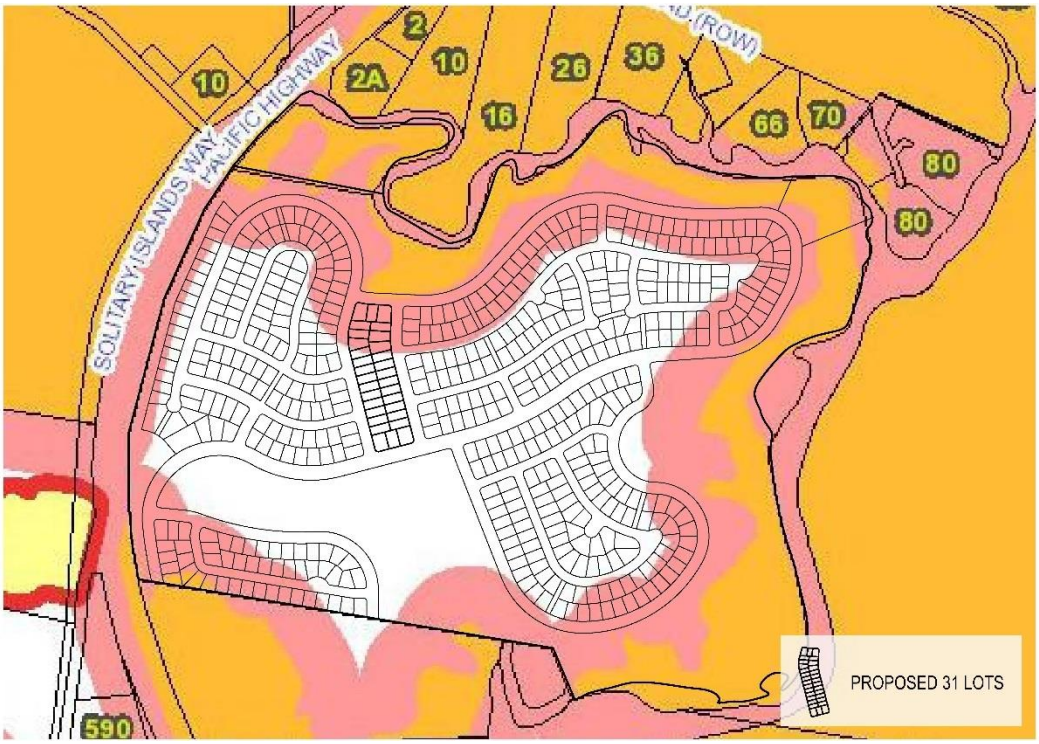


Figure 9: Bushfire Prone Land
Source: CHCC

Aboriginal Cultural Heritage:
Council's mapping does not identify any items of Cultural Heritage Significance.

Coastal Processes:
The subject land is located in the Coastal Zone, however it is not located in the area that is captured by the Coffs Harbour Coastal Zone Management Plan 2013.

Figure 10: Coastal Hazards
Source: CHCC

2.4 Planning Controls

The relevant planning controls that apply to the site include the provisions of:

- Environmental Planning and Assessment (EP&A) Act 1979;
- State Environmental Planning Policy No. 44 – Koala Habitat Protection;
- State Environmental Planning Policy No. 55 – Remediation of Land;
- State Environmental Planning (Coastal Management) 2018;
- State Environmental Planning Policy (Infrastructure) 2007;
- North Coast Regional Plan 2036;
- Coffs Harbour Local Environmental Plan 2013;
- Coffs Harbour Development Control Plan 2015;
- Moonee Creek Estuary Management Plan; and
- Moonee Release Area Development Contributions Plan 2017.

3. Proposed Modification(s)

This proposal seeks to modify the Part 3A Project Approval MP 06_0143 issued by the Minister for Planning on the 5th of March 2009. MP 06_0143 has been modified on three previous occasions in 2010, 2011 & 2014. Accordingly, this modification is referred as MP 06_0143 MOD 4.

The following sections identify the proposed changes to be considered under MP06_0143 MOD 4.

3.1 Modification to Preliminary Lot Layout

(Affecting Conditions A1, A2, A3, A6 B3 & E14, E18 & E19 - MP06_0143)

The Project Approval permits the subdivision of the land into 524 allotments, associated earthworks (cut and fill), the provisions of roads and associated infrastructure, open space, recreation facilities, playing fields and a pedestrian/cycleway network. The approved Preliminary Lot Layout is shown in **Figure 11** below.

Figure 11: Approved Preliminary Lot Layout – MP06_0143
Represents the extent of "Park"

3.1.1 Proposed Residential Lots

It is proposed to modify part of the approved subdivision layout contained within Lot 1 in DP 725785. This proposal seeks to develop the area identified as "*Park*" on the approved Preliminary Lot Layout positioned between Stages 1, 3 and 4. Refer to **Figure 11** above.

Following Coffs Harbour City Council and the Department of Planning & Environment support for the adopted land use zones (i.e. R2 – Low Density Residential, RE2 – Private Recreation & E2 – Environmental Conservation), the Rothwell Boys Pty Ltd progressed the preparation of this Section 75W application. Section 5.1.2 below outlines the consultation which occurred between Council and the Department in this regard.

The proposed modification (i.e. additional residential allotments) is consistent with the intent for the land which was recently zoned from Residential 2A Low density to R2 Low Density Residential under the Deferred Areas Planning Proposal (Coffs Harbour Local Environmental Plan 2013, Amendment No 8. It is noted that the zoning of this land to R2 Low Density Residential was supported by both Coffs Harbour City Council and the NSW Department of Planning & Environment.

The development of the land ("Park") into 31 residential lots, brings the total number of residential lots to 555. The revised subdivision pattern is shown in the amended Preliminary Lot Layout Plan identified as **Figure 12** below. A copy of same is also included in **Appendix A.**

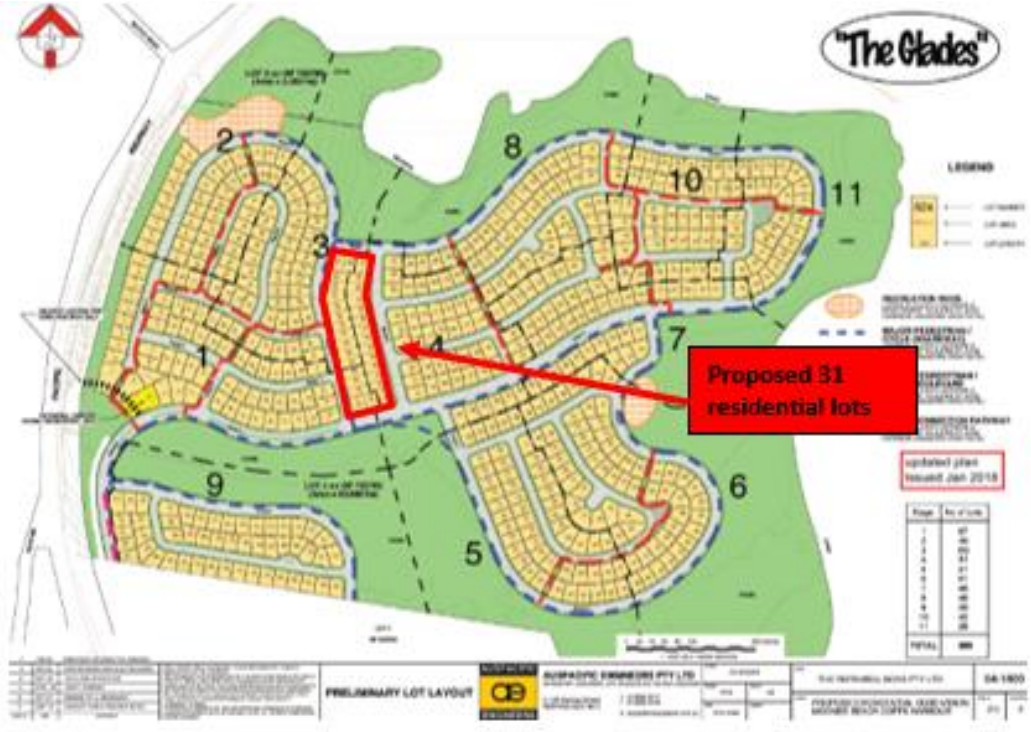


Figure 12: Proposed Preliminary Lot Layout MP06-0143 MOD 4

The additional 31 residential allotments range in area, between 516m^2 and 742m^2. These lots are of a consistent size and area with the approved project allotments which range in size from 516 m2 to 1186 m2. The additional 31 residential allotments are shown in **Figure 13** below.

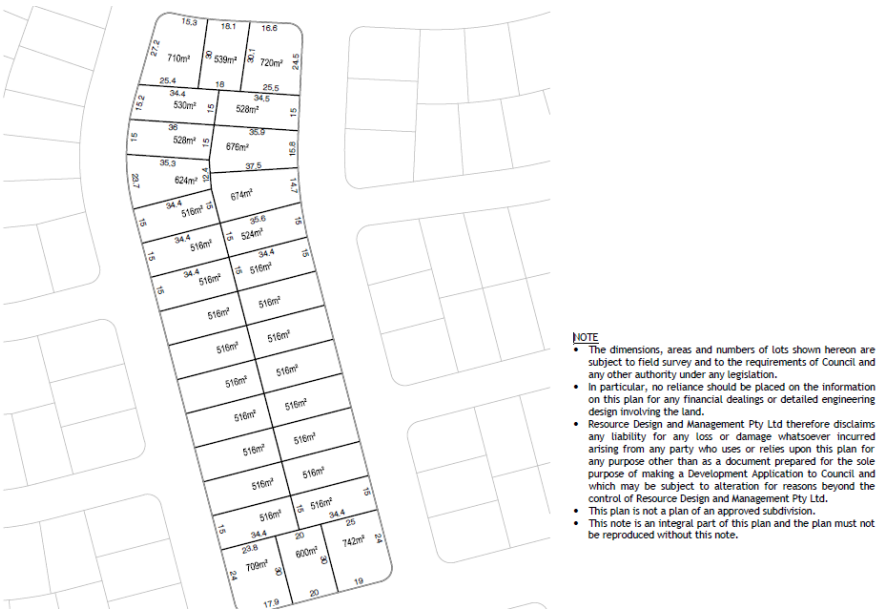


Figure 13: Proposed Additional 31 Allotments
Source: RDM

3.1.2 Proposed Vegetation Removal

The land occupied by the additional 31 allotments contains vegetation. To accommodate the additional allotments, approximately 1.7 hectares of vegetation (1.35ha of native vegetation) is proposed to be removed.

In view of the proposed vegetation removal, James Warren and Associates Pty Ltd (JWA) have completed a Flora and Fauna Assessment. JWA's report (RW7 22/02/18) is attached as **Appendix C**.

To ameliorate the loss of vegetation from the subject land additional habitat enhancement (i.e. rehabilitation & revegetation) works are proposed around the peripheries for the subject land over and above that required by the original development approval. These areas of additional habitat enhancement works are shown as 'proposed offset areas' in Figure 16 of JWA's Fauna & Flora Assessment.

JWA's impact assessment and proposed amelioration measures is discussed in Section 4 below.

3.1.3 Proposed Engineering Servicing

Conceptual engineering servicing plans have been prepared for the additional 31 lots. These are included in the Engineering Infrastructure Report located in **Appendix D**. A summary of each servicing strategy is provided below:

Wastewater Servicing:
The Glades Estate proposes a number of sewer pump stations situated throughout the site to receive sewer from the estate. The pump stations will operate collectively to transfer sewer to the Sewage Reclamation Plant in Bucca Road.

The detailed design of the sewer pump stations and associated sewer rising mains will provide for the additional 31ET load generated by the proposed development (i.e. the additional 31 residential lots).

Stormwater Drainage:
Stormwater drainage will be directed to two stormwater management facilities located to the north and south of the proposed 31 allotments. Detailed design of the proposed drainage network will include a detailed analysis of the existing drainage network to ensure that all council requirements with respect to urban drainage are met.

Water Reticulation:
The approved Glades Estate development has made provision for a 100mm DIA water main located within all the roads surrounding the site. The proposed development (i.e. the additional 31 residential lots) will modify these water mains to provide efficiency to the overall design. It is noted that the proposed modifications are minor and do not impact the functionality of the original design intent.

The proposed development will utilise these water mains for the provision of house services to each of the proposed 31 Lots.

The water main and water services will be constructed in accordance with Coffs Harbour City Council requirements. Fire hydrants are to be installed to comply with Council requirements.

3.2 Modification to Site Levels (Bulk Earthworks Cut/Fill)

(Affecting Conditions A3, D6, B3 & A3, E16 - MP06_0143)

Filling of part of the overall development site is required to ensure future allotments are above the design flood level and associated freeboard. A minimum fill level of 4.75m AHD has been set by Condition D6 of MP06-0143 and is identified on the approved Bulk Earthworks and Noise Attenuation Barriers Plan, Revision C dated December 2008. Refer to **Figure 14** below.

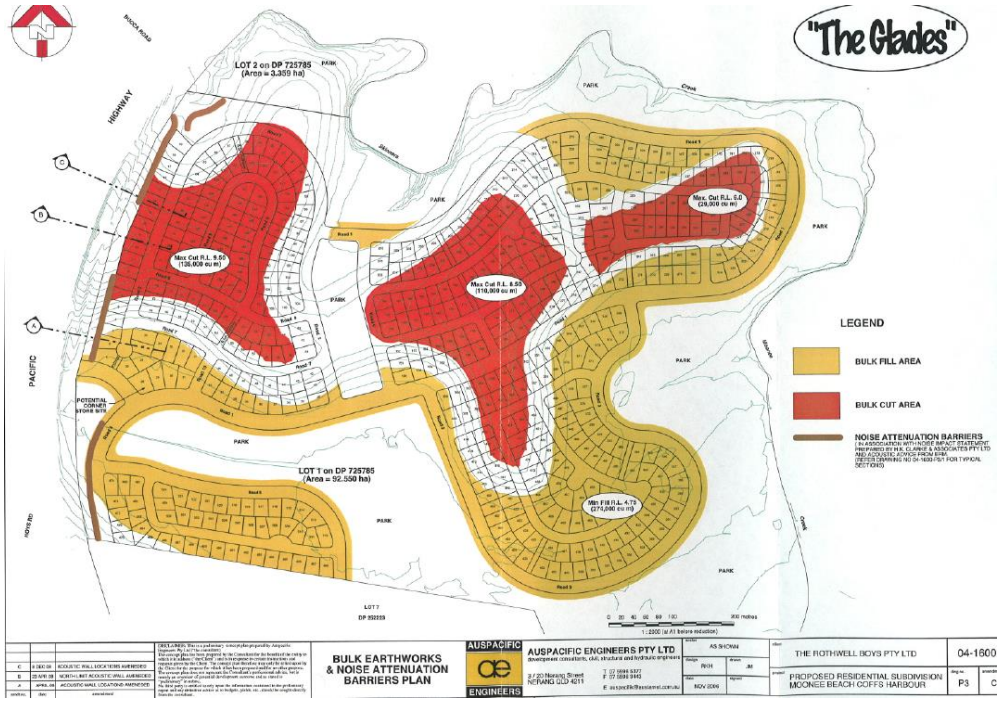


Figure 14: Approved Bulk Earthworks MP06-0143

Since the approval of MP06-0143, a further flood assessment was completed by Martens & Associates (in August 2015) on adjoining land described as Lot 1 in DP1097743. That assessment was peer reviewed and was approved by Coffs Harbour City Council. Given Martens more recent work, a flood assessment (inclusive of hydrologic and hydraulic modelling) was completed for the subject land in January 2018.

Having completed their assessment (for the subject land), Martens concluded that a all proposed dwellings are to have a finished floor level at 4.03 – 4.68 m AHD (0.5m higher than determined flood levels) in accordance with drawing PS01-K210 which is shown below. Refer to **Figure 15 below**.

A consequence of Martens assessment is the lowering of the fill level required for the development. This change permits a substantial reduction in the total earthworks volume that is required (for this development). **Figure 16** below represents the revised Bulk Earthworks and Noise Attenuation Plan.

Given the substantial change to the site levels, it is appropriate that Condition D6 be amended (as proposed) and the approved Bulk Earthworks and Noise Attenuation

Barriers Plan, Revision C dated December 2008 be replaced. In its place, Resource Design & Management's Bulk Earthworks and Noise Attenuation Plan dated the 16th of January 2018 is proposed. A copy of this plan is included in **Appendix A**.

Note: The cut & fill extents combined with the quantities that are shown on RDM's proposed plan provides flexibility in terms of delivering a functional design surface for subdivision development.

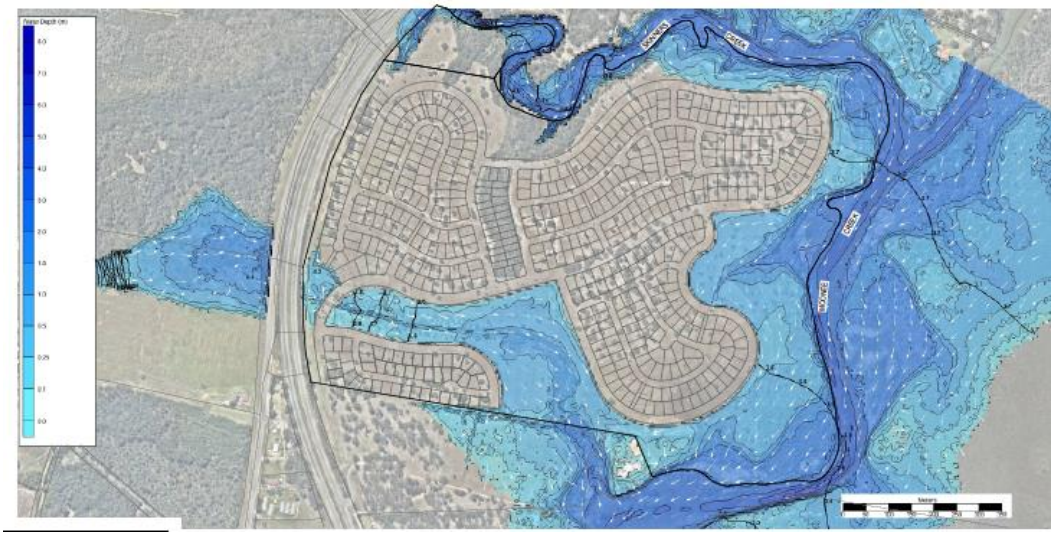


Figure 15: PS01—K210 (1% AEP Catchment + 5% AEP Ocean + Climate Change)
Source: Martens Jan 2018

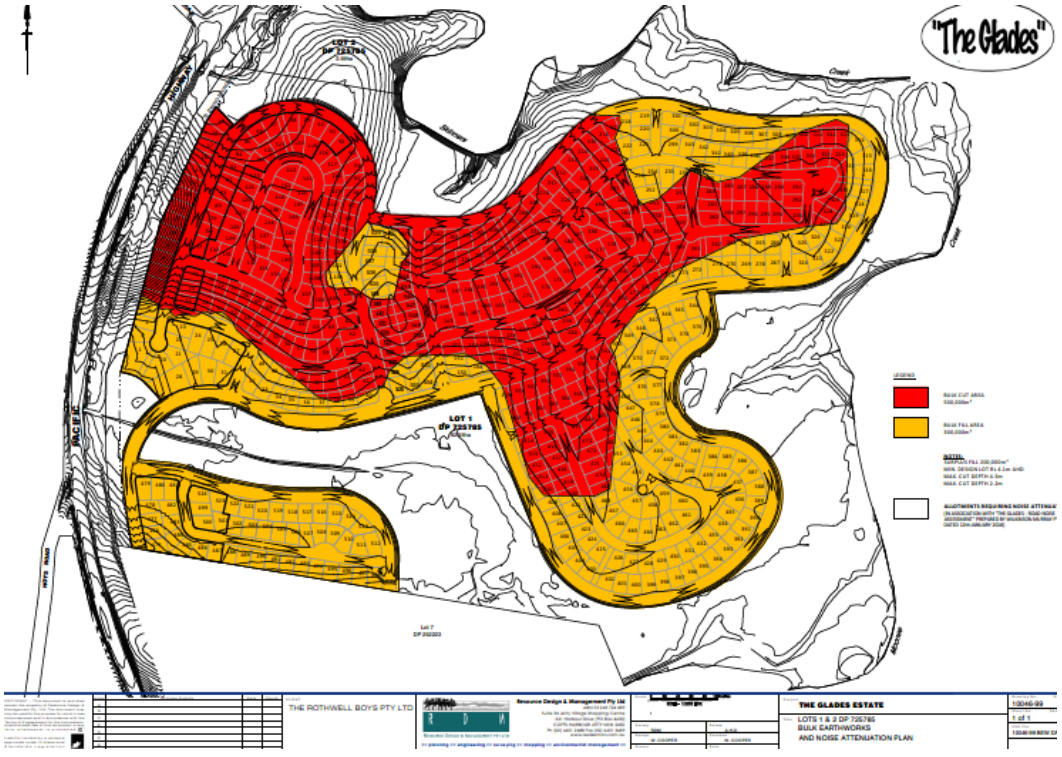


Figure 16: Proposed Bulk Earthworks MP06-0143 MOD 4

3.3 Modification to Noise Attenuation

(Affecting Conditions A3, B3 & B13, E4, E17- MP06_0143)

A noise impact assessment was completed in 2004 by H.K. Clarke & Associates to assess the impact of road traffic noise relative to the development which was approved as MP06_0143. At that time, noise barriers were proposed and were included in H.K. Clarks Assessment.

In concluding their assessment, H.K. Clarke confirmed the proposed noise barriers were appropriate and that a small number of residential allotments remained exposed to noise levels above acceptable limits. For those dwellings, recommendations included the adoption of alternative ventilation systems.

As a consequence of H.K. Clarkes assessment, Condition B3 was applied to MP06 _0143 and the proposed noise barriers were identified on the approved "Bulk Earthworks and Noise Attenuation Barriers" plan dated December 2008. This plan is listed in the approved drawings list under Condition A3. An additional plan, "Typical Noise Attenuation Barrier Sections" dated 17 April 2008 is also listed.

Condition B3 (1) (MP06_0143) requires an acoustic assessment prior to the issue of the construction certificate for Stages 1, 2 3 and 9 (Lots 1-20,84-96 and 474-479), demonstrating that the assigned external noise criteria could be achieved for these lots. Condition B3(2) permits a building covenant or section 88B instrument to apply to all lots which could not achieve the assigned external noise criteria.

Since 2008 the Pacific Highway has been upgraded from a two lane to a four-lane carriageway. The resulting upgrade has substantially altered the position of the road as well as road pavement levels for the full frontage of the site. It is noted that highway road levels in the northern and southern parts of the site have been elevated by more than 4m above the subject land. Consequently, the approved noise barriers in these locations would be ineffective.

Given the significance of the change to the highway, a noise assessment has been completed by Wilkinson Murray (WM) in accordance with State Environmental Planning Policy (Infrastructure) 2007. A summary of their report is provided in **Section 4.1.3**.

WM's assessment confirms that noise emanating from the upgraded highway can be mitigated by requiring improved architectural treatments. Residential allotments which are subject to noise mitigation measures (i.e. architectural treatments) are identified in Figure 4 of WM's assessment. WM's noise assessment report is included in Appendix F.

In view of the change to the highway alignment and WM's noise assessment, a restriction as to user under Section 88B of the Conveyancing Act 1919 is appropriate. Regarding Figure 4 of WM's noise assessment, Lots 1 to 31 inclusive, 74 to 92 inclusive, 119 to 123 inclusive, 475 to 487 inclusive, 499 to lot 501 inclusive, 523 and 524 will be impacted.

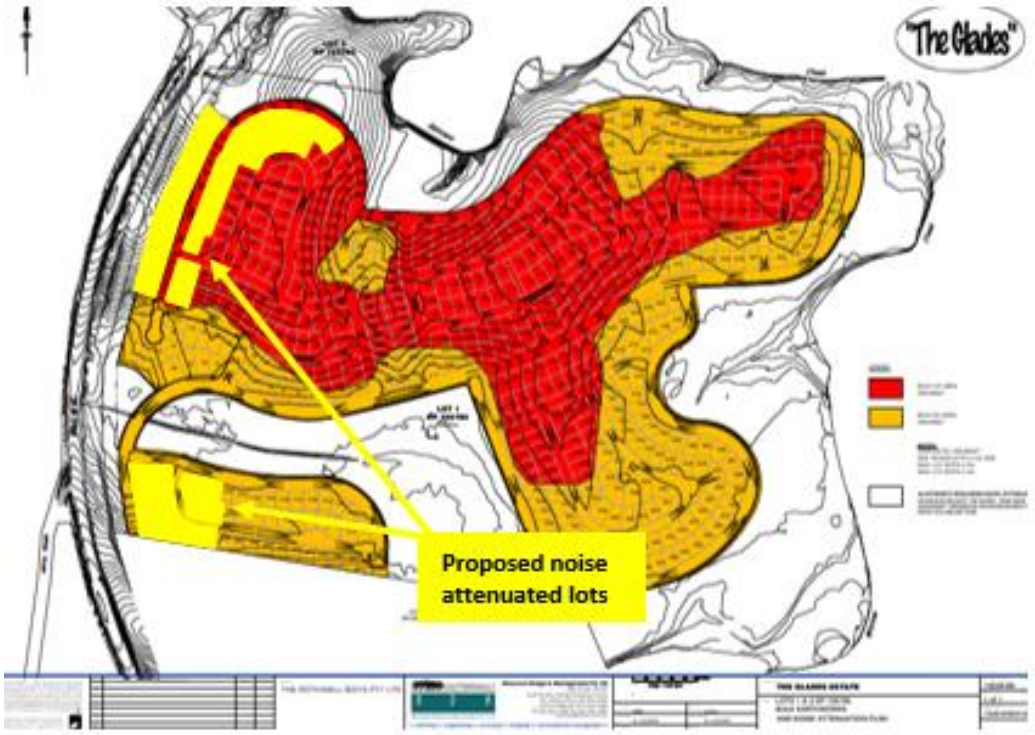


Figure 17: Proposed Noise Attenuation MP06-0143 MOD 4

Given the change to the highway alignment and the results of WM's assessment, it is appropriate that: -

a) Condition A3 (MP06_0143) be amended as proposed; i.e. referencing Resource Design & Management's "Bulk Earthworks and Noise Attenuation Plan" dated the 16th of January 2018.
b) Condition A3 (MP06_0143) be amended as proposed; i.e. deleting the plan reference "Typical Noise Attenuation Barrier Sections" plan dated 17 April 2008.
c) Condition B3 be amended as proposed.

3.4 Modification to Landscaping and Open Space Management

(Affecting Conditions A3 & B13, D3, E11, E14 – MP06_0143)

In recognition of the proposed modification to the subdivision layout discussion in Section 3.1, the approved Landscape Concept Plan dated December 2006, the Broadscale Open Space Types plan dated December 2008, and the Staging of Open Space Dedication to Council dated December 2008 have been amended to include the additional subdivision lots.

Similarly, considering the proposed modification to noise attenuation barriers (i.e. removal), the reference to the proposed noise attenuation barriers on the Landscape Concept Plan has also been removed.

Accordingly, it is proposed to amend Condition A3, B13, D3, E11 & E14. Please refer to the proposed Modification of Conditions which is included in **Appendix B**.

3.5 Modification to Vegetation Management
(Affecting Condition A3, B15 – MP06_0143)

It is noted that existing vegetation within the open space areas of the site was to be retained and a Vegetation Management Plan prepared (including general rehabilitation and revegetation works) in accordance with Condition B15 of the original development approval.

Condition B15 requires that the Vegetation Management Plan include weed control, creation and management of Wallum froglet habitat, riparian rehabilitation works and planting of replacement Koala food trees. In this regard, a Vegetation Management Plan (ERM, 2008) and Broad Scale Open Space Types Plan (ERM, 2008) are referred to in Condition A3 and Condition B15.

To offset the loss of 1.37 ha of native vegetation from the central corridor (requiring 74 credits as calculated by the BBAM) significant habitat enhancement works are proposed over and above that required by the MP06_0143 as approved. These areas of proposed habitat enhancement works are shown as 'proposed offset areas' in **Figure 16** of JWA's Fauna & Flora Assessment dated 22 February 2018.

In recognition of the additional habitat enhancement work, it is proposed to amend condition A3 and introduce a new condition - B15(A). Condition A3, is amended to include JWA's "Figure 16 - Proposed Offset Areas and Possible Fauna Movements After Development Plan". Condition B15(A) is introduced to define the rehabilitation works within the "Proposed Rehabilitation / Offset Areas (13.7Ha)" and the "Proposed Revegetation / Offset Areas (3.87ha) that are identified in Figure 16.

Please refer to the proposed Modification of Conditions which are included in **Appendix B**.

3.6 Modification to Bushfire Management
(Affecting Condition A3, B16 – MP06_0143)

In recognition of the proposed modification to the subdivision layout discussed in Section 3.1, an additional Bushfire Risk Assessment Plan dated 25th March 2019 has been prepared. This plan shows asset protections zones which are to be applied to individual lots that are exposed to a bushfire risk and require future dwelling houses to achieve a level of building construction standard in accordance with AS3959.

Accordingly, it is proposed to amend Conditions A3 and B16. Please refer to the proposed Modification of Conditions which is included in **Appendix B**.

3.7 Modification to Natural Areas

(Affecting Condition C10 – MP06_0143)

In recognition of the proposed modification to the subdivision layout discussion in Section 3.1, the Broadscale Open Space Types plan dated December 2008 has been amended to include the additional subdivision lots.

Accordingly, it is proposed to amend Condition A3 & C10. Please refer to the proposed Modification of Conditions which is included in **Appendix B**.

3.8 Modification to Approved Plans

In recognition of the proposed modification(s), a description of the proposed change(s) to each approved plan is provided as follows:

Table 3 Proposed Modifications

Approved Plan MP06_0143	Proposed Plan MP06-0143 MOD 4	Comments
Preliminary Lot Layout (Drawing No P1 Rev. F dated February 2009)	Preliminary Lot Layout (Drawing No P1 Rev. F – Updated Plan Issued Jan 2018)	Plan changes are limited to: ▪ the inclusion of the proposed 31 Lots in place of the same area identified as Park. ▪ The removal of noise attenuation barriers
Bulk Earthworks and Noise Attenuation Barriers (Drawing No. P3 Rev. C dated December 2008	Bulk Earthworks and Noise Attenuation Barriers (Drawing No. 10046-99 dated 16 January 2018	Plan changes are limited to: ▪ Adjusted bulk earthworks (cut & fill footprint & indicative volumes) ▪ The removal of noise attenuation barriers
Typical Noise Attenuation Barrier Sections (Drawing No. P3/1 Rev A dated 17 April 2008)	No Plan Provided	The proposed modification seeks to remove the noise attenuation barrier. Accordingly, the Approved Plan has been removed from the Table at Condition A3.
Roadworks Typical Sections (Drawing No. P4 Rev A, dated April 2008	No Plan Provided	Current Plan remains appropriate to this modification
Stormwater Drainage and Catchment Plan (Drawing	Stormwater Drainage and Catchment Plan (Drawing No	Plan changes are limited to:

Table 3 Proposed Modifications		
Approved Plan MP06_0143	Proposed Plan MP06-0143 MOD 4	Comments
No P4, Revision C, dated April 2008	P4, Revision C, Updated Jan 2018	▪ the inclusion of the proposed 31 Lots in place of the same area identified as Park.
Stormwater Outlets and Swale Sections Drawing No, P6, Rev B, dated Sept 2007	No Plan Provided	Current Plan remains appropriate to this modification
Conventional Sewage Reticulation Concept Plan Drawing No. P7 Rev A dated April 2008	Development Application Sewer Reticulation Plan Drawing Reference 16083-15 dated November 2017	Both plans are relevant to this modification. Drawing Reference 16083-15 has been added to the list of approved plans in Condition A3.
Water Reticulation Concept Plan Drawing No P9 dated Nov 2006	Development Application Sewer Reticulation Plan Drawing Reference 16083-15 dated November 2017	Both plans are relevant to this modification. Drawing Reference 16083-15 has been added to the list of approved plans in Condition A3.
Stormwater Management Plan Drawing No GJ0339.5.3a dated 30 July 2007	No Plan Provided	Current Plan remains appropriate to this modification
Typical Bioretention Swale Cross Section	No Plan Provided	Current Plan remains appropriate to this modification
Bushfire Risk Assessment Map – December 2008	Bushfire Risk Assessment Map dated Nov 2017	Plan changes are as follows: <u>Bushfire Risk Assessment Map - December 2008 (Updated Nov 2017)</u> Residential allotments to the east and west of the central corridor previously impacted with construction standards are no longer impacted by the bushfire fire prone central corridor. Instead, reference is made to the proposed residential allotments and Drawing Reference 16083-18 (Bushfire Risk Assessment Plan) dated 25th March 2019

Table 3 Proposed Modifications		
Approved Plan MP06_0143	Proposed Plan MP06-0143 MOD 4	Comments
Staging of Open Space dedication to Council dated December 2008	Staging of Open Space Dedication to Council dated Jan 2018	Plan changes are limited to: ▪ the inclusion of the proposed 31 Lots in place of the same area identified as Park. ▪ alteration to Staged Lot yields and construction table.
Active recreation node 1	No Plan Provided	Current Plan remains appropriate to this modification
Passive Recreation Node 2	No Plan Provided	Current Plan remains appropriate to this modification
Broad Scale Open Space Types dated December 2008.	Broad Scale Open Space Type dated Jan 2018	Plan changes are limited to the inclusion of the proposed 31 Lots.
Vegetation Management dated December 2008	Vegetation Management dated Jan 2018	Plan changes are limited to the inclusion of the proposed 31 Lots.
Streetscape (Street Tree Planting) dated December 2008	Streetscape (Street Tree Planting) dated Jan 2018	Plan changes are limited to the inclusion of the proposed 31 Lots.
Path Network and Development Facilities – dated December 20008	Path Network and Development Facilities dated Jan 2018	Plan changes are limited to the inclusion of the proposed 31 Lots.
Landscape Concept Plan dated December 2018	Landscape Concept Plan dated Jan 2018	Plan changes are limited to: ▪ the inclusion of the proposed 31 lots ▪ the removal of the reference to noise attenuation buffers
Landscape Staging Plan dated December 2008	Landscape Staging Plan dated Jan 2018	Plan changes are limited to the inclusion of the proposed 31 lots

Table 3 Proposed Modifications		
Approved Plan MP06_0143	Proposed Plan MP06-0143 MOD 4	Comments
Permanent Fence Option 1	No Plan Provided	Current Plan remains appropriate to this modification
Temporary / Permanent Fence Option 2 & 3	No Plan Provided	Current Plan remains appropriate to this modification
Additional Potential Wallum Froglet Habitat dated November 2008	No Plan Provided	Current Plan remains appropriate to this modification
Engineering Details (Typical Street/Road Sections) December 2008	No Plan Provided	Note: This plan was not available at the time of this submission
Preliminary Erosion and Sediment Control Plan (in Construction Environmental Management Plan, Preferred Project Report, September 2008)	No Plan Provided	Note: This plan was not available at the time of this submission

3.9 Additional Plans

In recognition of the proposed modification(s), a suite of additional plans have been prepared. A description of these additional plans is provided as follows:

Table 4 Project Engineering Drawings Prepared by Resource Design & Management			
Drawing No.	Revision	Name of Plan	Date
16083-10		Cover Sheet	January 2018
16083-11		Overall Site Plan	November 2017
16083-12		Layout Plan	November 2017
16083-13		Cut & Fill Plan – Depth	November 2017
16083-14		Road & Drainage AND Erosion & Sediment Control plan	November 2017
16083-15		Sewer Reticulation Plan	November 2017
16083-16		Water Reticulation Plan	November 2017

16083-18		Bushfire Risk Assessment Plan Lots 525-555, Drawing Reference 16083-18	25th March 2019

Table 5 Project Drawings Prepared by James Warren & Associates Pty Ltd			
Drawing No.	Revision	Name of Plan	Date
N02066_Fauna Mvt		Proposed Offset Areas & Possible Fauna Movements After Development	February 2018

4. Specialist Assessments

4.1 Supporting Investigations

Several specialist reports have been prepared having regard to the proposed development. These are attached as Appendices to this report. Provided below is a brief synopsis of each report and its relevance to this proposal.

4.1.1 Flora and Fauna Assessment

James Warren & Associates Pty Ltd (JWA) have undertaken a Flora and Fauna Assessment. A copy of their assessment, dated the 22nd of February 2018 is included in **Appendix C**.

The accompanying assessment is an amended and updated version of JWA's Flora and Fauna Assessment which was prepared in 2007 for the development approved as MP06_0143. The attached assessment includes additional field surveys and an impact assessment for the proposed 31 additional allotments.

In completing their assessment of the subject land, JWA undertook: -

- Mapping and ground truthing vegetation units and determining their conservation status;
- Searching for and recording threatened, ROTAP and regionally significant plant species;
- Determining the occurrence of endangered ecological communities;
- Determining the suite of threatened fauna in the locality and assessing their potential occurrence;
- An assessment of habitat in relation to adjacent habitat;
- An assessment of the corridor value;
- An assessment of statutory policy documents and associated legislation.

In completing their assessment, JWA concludes that: -

- 1.75 hectares of vegetation is proposed to be cleared, the majority (1.37ha) of which is relatively intact native vegetation;
- The proposed development (i.e. additional 31 residential lots) will result in the loss of foraging, sheltering and breeding habitat for native fauna occurring in the locality;
- The impact on threatened species is not considered to be significant;
- The site is not mapped as primary or secondary koala habitat under the Coffs Harbour City Koala Plan of Management, November 1999;
- The impact of the proposed development (i.e. additional 31 residential lots) would be unlikely to result in the local extinction of any of the listed threatened species and therefore a species impact statement is not required;

- The proposed development (i.e. additional 31 residential lots) will not have a significant impact on any matters of National Environmental Significance and therefore a Commonwealth assessment of the proposal is not required.

Assessment of Habitat Corridor Value

Section 4.1.5 of JWA's assessment discusses the impacts arising from the loss of the central corridor (identified as "Park") as a habitat corridor and the effectiveness of the land where it is retained as part of the development. A summary of JWA's observations are described below.

- The proposed development (i.e. additional 31 residential lots) will contribute towards a reduction in the efficacy of the subject land as a corridor due to habitat loss and fragmentation. However, the subject land (Lots 1 & 2 DP 725785) will retain movement habitat around the peripheries of the land to consolidate links between the Moonee Beach Nature Reserve and habitats on the southern side of Skinners Creek. These peripheral habitats have greater corridor value than the central corridor (identified as "Park") given that they do not encourage wildlife to enter roadways or residential areas where hazards exist.

- The ongoing value of the central corridor (Identified as "Park"), should it be retained (i.e. post development of the subject land), would be significantly reduced for the following reasons:

  a) The approved road crossings at the northern and southern ends of the corridor do not allow for any fauna diversion or exclusion infrastructure. Accordingly, native fauna species would be at risk of injury or death at these road crossing points;
  b) The approved road crossings may act as a disincentive for dispersal of some species due to a lack of cover;
  c) There is a distinct lack of cover to the south, caused by the inclusion of roads, recreational areas and stormwater treatment devices/basins. Fauna movement would therefore be restricted to highly mobile species only.
  d) The maintenance of bushfire asset protection zones within the eastern and western edges of the retained vegetation is likely to significantly reduce the habitat and corridor values of the central corridor for native fauna species, particularly forest interior species or those which are susceptible to edge effects.
  e) There is a lack of connectivity to significant habitat area. The subject land has limited connectivity to National Parks and nature reserves in this locale which is exacerbated by the Pacific Highway and residential development to the north and south.

Having completed their assessment of the central corridor as a "habitat corridor", JWA concluded that it would be likely restricted to "stepping stone habitat" for highly mobile species once the development was completed. The loss of this "stepping stone habitat" as a result of the proposed development (i.e. additional 31 residential lots) is considered unlikely to have any significant impacts on native fauna species utilising the land and

more common disturbance adapted species are likely to continue to use street and landscape trees to move across the subject land.

Amelioration Measures (Plant Communities)

Section 4.2.2 of JWA's assessment discusses an approach to ameliorate the loss of vegetation (1.37 ha) from the subject land.

Whilst JWA acknowledges Coffs Harbour City Council's own offset requirements, the determination of offsets based on NSW Bio Banking Assessment Methodology (BBAM) is considered by JWA to be the most up-to-date and equitable approach for determining ecological offset requirements in NSW.

In view of the proposed development's impact (i.e. additional 31 residential lots), the loss of intact vegetation is proposed to be offset. In this regard, surveys of the impact site and proposed offset sites have been completed by JWA utilising the BioBanking Assessment Methodology (BBAM).

JWA's assessment using BBAM concluded that 74 ecosystem credits would be required to offset the loss of the vegetation for the additional 31 allotments. Given the likely opportunity for offsetting within the Glades Estate, the BBAM was also used to calculate the number and type of credits that can be created through revegetation or rehabilitation of existing vegetation in addition to what is already required under MP06_0143.

JWA's results have indicated that additional rehabilitation work within 13.71 ha of existing vegetation to be retained on the subject land would create 112 ecosystem credits and the revegetation of an additional 3.87 hectares of currently cleared land on the Glades development site would potentially create a further 38 credits. JWA's recommends that an offset strategy/management plan be prepared which includes:

- Identification of offset location/s
- Justification for offset calculation methodology;
- Details of rehabilitation / revegetation strategy;
- Techniques for weed control/removal;
- Ongoing maintenance requirements and monitoring and reporting procedures.

Figure 16 in JWA's report identifies the location of proposed offset areas, being 13.71 ha (Proposed Rehabilitation) and 3.87 ha (Proposed Revegetation).

Amelioration Measures (Fauna)

Section 4.2.3 of JWA's assessment discusses amelioration measures for fauna and threatened fauna impacted by this proposal. Whilst some loss of habitat will occur as a result of the proposal, JWA note that neither fauna or threatened fauna will be significantly affected by the proposal as suitable habitat will be retained around the perimeter of the subject land (i.e. Lots 1 & 2 DP 725785).

JWA's amelioration measures for fauna and threatened fauna include:

- Landowners should control dogs on the subject land. All animals should reside within fenced enclosures and be on a leash when outside of the enclosure. Cats should be banned from the subject land under the Companion Animals Act (1998) to reduce likely impacts on local fauna.
- Appropriate disposal of rubbish and food scraps reduces opportunities for nonnative predators and disturbance adapted competitors.
- Landscape and landfill materials should be sourced from supplier where cane toads do not occur
- A qualified fauna handler should be on site when clearing occurs
- 40km/hr speed limit to be imposed on internal access roads
- Lighting and koala exclusion fencing is provided where appropriate on roadways adjacent to koala habitat.

Amelioration Measures (Threatened Fauna)

Section 4.2.4 of JWA's assessment discusses the additional amelioration measures for threatened fauna species. JWA recommends the following additional measures: -

- Koala habitat trees be included as part of the proposed revegetation and offset plantings within the subject land (i.e. Lots 1 & 2 DP 725785)
- Glossy black cockatoo food tree species be included as part of the proposed revegetation/offset plantings within the subject land. (i.e. Lots 1 & 2 in DP725785)

Note:
Additional measures were considered for the Koala, Squirrel Glider, Glossy Black Cockatoo and the Common Planigale. In some instances, these additional measures accord with those outlined in Section 4.2.3

Amelioration (Wildlife Corridors)

In reviewing the impact of the proposed development (i.e. additional 31 residential lots) on wildlife corridors, JWA considers the majority of fauna species will persist on the broader Glades Estate (i.e. Lots 1 & 2 DP 725785) through the retention of vegetation in the north, south and east of the site.

In view of the loss of some "stepping stone" features, JWA proposes the following amelioration measures: -

- Rehabilitation of currently cleared or degraded areas of vegetation in the east north and south of the Glades Estate (lots 1 & 2 in DP 725785) in accordance with Figure 16. (Refer to Figure 16 in JWA Report). This is expected to further enhance current movement opportunities in these areas both within the subject land and onto adjoining properties.
- Installation of exclusion fencing as appropriate to encourage fauna such as Koalas to utilise corridor habitat areas and avoid entering hazardous areas such as roadways.

Statutory Considerations

Section 5 of JWA's report includes an assessment of the impact of the proposed development (i.e. additional 31 residential lots) with regard to: -

- Section 5A of the Environment Planning & Assessment Act (1979), (Assessment of Significance)
- State environmental Planning Policy No 44 (SEPP 44) Koala Habitat Protection; and
- The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).

With regard to the above matters, a summary of JWA's assessment is provided below.

Assessment of Significance

Having assessed the impact of the proposed development against the relevant heads of consideration, JWA advise that a Species Impact Statement is not required.

Assessment of SEPP 44

The land occupied by the proposed development (i.e. additional 31 residential lots) is not mapped as primary or secondary koala habitat under the Coffs Harbour City Koala Plan of Management, 1999. Notwithstanding, JWA advises that the proposed development will result in the loss of tree species (Eucalyptus pilularis) which is listed as a primary koala habitat tree. In assessing the proposals impact to the koala under Section 4.1.4.5, JWA advises that there has been no koalas or evidence of their occurrence on the land in either of their surveys completed in 2004 and 2017. Accordingly, JWA concludes that the removal of vegetation (Eucalyptus pilularis) is not considered likely to destroy, damage or compromise the value of the land as koala habitat.

Assessment of EPBC Act 1999

Having assessed the impact of the proposed development (i.e. additional 31 residential lots) against the relevant heads of consideration, JWA advise that Commonwealth Assessment is not required for the proposed development.

Summary and Conclusion

Having completed their impact assessment in accordance with the relevant legislative controls, JWA advises that the proposed development, (seeking the removal of approximately 1.75 hectares of vegetation of which 1.37 is relatively intact native vegetation) will result in the minor loss of foraging, sheltering and breeding habitat for native fauna occurring in the locality and that the impact on threatened species recorded on the land is not considered to be significant.

In relation to the loss of vegetation and the impact of same with respect to fauna and flora corridor functioning, JWA consider that additional revegetation and rehabilitation works (i.e. in addition to the general rehabilitation and revegetation works required under MP06_0143) around peripheries of the site (i.e. east, north and south vegetated perimeter) is sufficient to offset the limited function of this site (i.e. stepping stone features), most especially once the land is fully developed.

In relation to the loss of vegetation and counter compensation (offset) measures, JWA have undertaken a survey of the subject site and propose offset sites within the subject land (Lots 1 & 2 DP 725785) using the BioBanking Assessment Methodology. JWA's results confirm that the loss of 1.37 hectares of intact native vegetation amounts to 74 ecosystem credits and that the additional rehabilitation of vegetation within the subject land and the revegetation of existing cleared land would provide a total of 140 ecosystem credits.

In their review of the subject land's (lot 1 & 2 DP725785) potential for rehabilitation and revegetation, JWA have considered the general rehabilitation and revegetation works in accordance with the approved Vegetation Management Plan (MP06-0143). In this regard, the offset areas have been identified by JWA for rehabilitation and revegetation are now proposed to be rehabilitated/revegetated to a much higher standard toward plan community type (PCT) benchmarks. In doing so, the additional rehabilitation and revegetation work in these offset areas (to higher PCT benchmarks) will generate additional credits which may be used to offset the impact of the proposed development (i.e. additional 31 residential lots). **Figure 16** in JWA's report identifies the location of the offset areas, being 13.71 ha (Proposed Rehabilitation) and 3.87 ha (Proposed Revegetation).

JWA's assessment of the relevant legislative requirements (Section 5A EPA Act 1979 & EPBC Act 1999) concludes that further environmental assessment is not required.

4.1.2 Flooding

An assessment of flood impact (affecting the subject land, Lots 1 & 2 DP 725785) was completed in support of the development now approved as MP06_0143.

On review of the approved development post completion of the Pacific Highway upgrade, a review of flood behaviour affecting the subject land has been completed by Martens Consulting Engineers Pty Ltd (Martens). A copy of their Flood Assessment report is included in **Appendix E**.

Martens assessment has been made having prepared a detailed hydrologic and hydraulic model which has been informed by additional site survey and proposed design elements (site grading and proposed box culvert design – The Glades Estate) in order to assess local flood characteristics.

Martens hydrologic and hydraulic models were used to determine the existing and proposed conditions in the 1% AEP envelope analysis, inclusive and exclusive of climate change effects.

Martens modelling concluded that:

- The development does not have any material offsite water level impacts;
- The approved development area is flood free in the critical 1% AEP flood event with climate change;
- Compliance with Council flood planning level requirements for future buildings and roads are achievable.

In concluding their assessment, Martens provide the following recommendations:

1. All proposed dwellings are to have finished floor levels at 4.03 – 4.68 m AHD (0.5m higher than determined flood levels), in accordance with drawing PS01-K210 produced in the Martens report.
2. Should the proposed development footprint change, or significant changes to the proposed design levels and/or culvert design occur (as shown on Martens Drawing PS01-A050), an updated flood model with detailed earthworks should be prepared at Construction Certificate stage.

Note: The Bulk Earthworks and Noise Attenuation Plan (prepared by Resource Design & Management (Refer to Appendix A) has been prepared having regard to the revised flood modelling and minimum floor levels established by Martens drawing PSO1-K210.

4.1.3 Engineering Infrastructure Assessment

Resource Design & Management Pty Ltd has prepared an Engineering Infrastructure Report regarding the proposed 31 additional residential allotments. The report is included in **Appendix D**.

The assessment has completed a review of engineering infrastructure and servicing matters including, traffic, road network, footpath & cycleways and earthworks, water supplies, sewer and water servicing, electricity and telecommunications.

Given that the proposed subdivision seeks to infill land that is surrounded by an approved network of roads and services infrastructure, there are no impediments to the servicing of this this land for a residential purpose.

In addition to the abovementioned services, the report has also considered pre and post stormwater flows. The assessment considers that the urbanisation of the site will result in an approximate increase of 25% to peak flow rates from this site. The report concludes that the detailed design of the stormwater drainage network will cater for urbanisation flows generated by the proposed development.

4.1.4 Stormwater Quality Assessment

Section 4.7 of the Engineering Infrastructure Report completes an assessment of stormwater quality. The assessment has been prepared to include the proposed development (additional 31 residential lots) and to assess the proposed earthworks modification and contributing catchment areas.

The stormwater quality target for this proposal has been adopted from Coffs Harbour City Councils Water Sensitive Urban Design Policy which requires post-development stormwater quality to be controlled to pre-development conditions by achieving a neutral or beneficial effect on the receiving environment.
To determine the treatment measures a MUSIC model was prepared and Council's MUSIC parameters were incorporated into the modelling. The assessment was undertaken having regard to each contributing catchment within the Glades Estate. Generally, each

sub-catchment has regard to pollution generation rates based on the intended land use i.e. roads, roof and grassed areas. Each catchment incorporates a bioswale as the end of line treatment. Typically, each bioswale will consist of a standard swale section which is underlain by a 0.5m bio-retention filter with a perforated PVC pipe laid at the base. Typical bioswale details and their locations are included in **Appendix A.**

The assessment concluded with the Coffs Harbour City Council's MUSIC-link Validation Report.

4.1.5 Soil and Water Management

Section 4.8 of the Engineering Infrastructure Report reports on the sediment and erosion control measures which are to be implemented during the construction phase. A concept Sediment and Erosion Control Plan has also been prepared and is included with this report.

4.1.6 Noise Assessment

The initial assessment of the proposal's exposure to highway noise was completed by H.K. Clarke & Associates. This assessment was carried out prior to the commencement and completion of the Sapphire to Woolgoolga Pacific Highway Upgrade. The assessment concluded that night and daytime noise criteria would not exceed acceptable levels at the site from the highway due to proposed noise attenuation measures.

While noise attenuation measures (i.e. barrier treatments) were initially required under the Project Approval, a more recent acoustic assessment has been completed by Wilkinson Murray (WM). This revised assessment has been completed on account of the significant change to both the horizontal and vertical alignment of the highway. It is noted that for part of the site (northern and southern sections) the highway is elevated more than four metres above the subject land.

Due to the change in the highway elevation, WM's assessment was completed without regard to the approved noise attenuation barriers. The assessment found that:

- Road traffic on the Pacific Highway will generate noise levels intruding into the proposed subdivision;
- Improved architectural treatments will be required for some lots to meet internal noise criteria presented in the SEPP;
- Alternative ventilation will be required in bedrooms and habitable rooms to allow windows to be shut to meet SEPP Infrastructure requirements.

WM's assessment confirms that noise levels emanating from the upgraded highway and may be mitigated by using improved architectural treatments. Residential allotments which are subject to noise mitigations measures (i.e. architectural treatments) are identified in Figure 4 of WM's assessment.

In view of the change to the highway alignment and the results obtained from WM's assessment, a restriction as to user under Section 88B of the Conveyancing Act 1919 is

appropriate and must be applied to Lots (1 to 31 inclusive, 74 to 92 inclusive, 119 to 123 inclusive, 475 to 487 inclusive, 499 to lot 501 inclusive, 523 and 524. To ensure the requirements apply, condition B3 of the project approval is to be amended.

A copy of the updated noise assessment by Wilkinson Murray is included in **Appendix F**. A copy of the modified conditions (i.e. proposed conditions) is included in **Appendix B**.

4.1.7 Contaminated Lands

A preliminary investigation was undertaken by Resource Design & Management Pty Ltd (RDM) as part of the Major Project application i.e. the subdivision of Lots 1 & 2 in DP725785. This assessment sought to identify any past or present potentially contaminating activities and provide a preliminary assessment of any site contamination.

The findings from this investigation concluded that the activities undertaken on the subject land have been primarily livestock grazing and therefore the potential for land contamination is not a significant matter for the land.

With regard to this previous assessment and the extent to which it considered the likelihood of contamination, further assessment is unnecessary.

4.1.8 Acid Sulfate Soils

A preliminary Acid Sulfate Soils Site Assessment has been completed by Coffey Geosciences Pty Ltd (Coffey). The assessment has been prepared having regard to the whole of the subject land (i.e. Lot 1 & 2 in DP725785).

The report divides the land into two separate areas, being Unit 1 and Unit 2. These areas are defined according to the Australian Height Datum, above and below 4.0m are shown on **Figure 1 of** Coffey's report.

Coffey's assessment confirms that the Unit 1 area (which incorporates the additional 31 Lots) is not within an area with known acid sulfate soils and concludes that the underlying soil does not have acid generating potential.

This report does not identify any significant issues that would materially affect the proposed development (i.e. additional 31 residential lots). A copy of the Coffey report is included in **Appendix G**.

4.1.9 Traffic

A Traffic Impact Assessment (dated January 2018) has been prepared by Mr George Stulle. A copy of this report is included in **Appendix H.** This report has been prepared to assess the likely traffic impacts on the internal and external road networks and make recommendations in relation to any modification to traffic and transport infrastructure required for the proposed development (i.e. additional 31 residential lots).

In assessing the proposed development, regard has been given to the connecting road network to Moonee Beach Road, the Moonee Beach/Estuary Drive roundabout and the Pacific Highway/Moonee Beach Road interchange. Further consideration is also given with respect to:-

a) Public Transport (bus routes and bus shelter infrastructure) and travel distances from the proposed development to planned bus service routes;
b) Footpath and cycleway connections through the planned road reserve and public reserve areas.

Having regard to their assessment in the context of the abovementioned matters, the Traffic Assessment concludes with the following:

1. The Pacific Highway Sapphire to Woolgoolga Upgrade project has provided a Motorway standard grade separated interchange connecting Moonee Beach Road to the Pacific Highway and to Solitary Islands Way. Solitary Islands Way provides a local access road parallel to the Pacific Highway connecting Moonee Beach and other Northern Beaches Coastal villages. As traffic generation resulting from 'The Glades' residential development has been taken into account in the design of the Pacific Highway Interchange the minor increase in traffic generation for the additional 31 Lots will have insignificant impact on the interchange levels of service.

2. Moonee Beach Road and the Northern Collector Road servicing 'The Glades' residential development have been designed in accordance with Coffs Harbour City Council's Development specifications and Moonee Release Area Development Contributions Plan 2017. Traffic generation from the approved residential development (i.e. 524 lots) has been considered in the planning and design of the road network infrastructure. The nominal increase in traffic generation as a result of the additional 31 Lots will have no impact on road safety, amenity or levels of service on the road network.

3. The location of the proposed additional 31 Lots provides adequate travel distance to the bus service bus route and will have no impact on bus service or infrastructure requirements and represents minimal variation to the approved plan.

4. The *Moonee Release Area Development Contributions Plan 2017* provides footpath and cycleway connections throughout the road reserve and public reserve areas. The location of the proposed additional 31 Lots provides good access to footpaths and cycleways and will have no impact on infrastructure requirements.

5. No additional intersection works on the existing or proposed local network are required to facilitate the proposed 31 allotment subdivision as the road network to be created will be of sufficient capacity to safely and functionally cater for the proposed development.

4.1.10 Bushfire Risk Assessment

A Bushfire Risk Assessment report has been prepared by RDM for the proposed additional 31 allotments in accordance with the requirements of *Planning for Bushfire Protection 2006 (PFBP)* and is included in **Appendix I**.

The bushfire safety recommendations detailed in the assessment will provide a reasonable and satisfactory level of bushfire protection to accommodate the further development of the land. The report recommends the following:

Asset Protection Zone and Grounds

The proposed development for 31 additional allotments is directly exposed to bushfire prone land on its northern and southern boundaries. With respect to the northern boundary it is recommended that an APZ of at least 33 metres applies to achieve a BAL rating of 29 in accordance with AS3959. The actual APZ is 36 metres comprising of the 6m building line, 20m wide road reserve and 10m wide stormwater management facility.

With respect to the southern boundary it is recommended that an APZ of at least 37m applies to achieve a BAL rating of 19 in accordance with AS3959. The actual APZ is 41 metres comprising of the 6m building line, 25m wide road reserve and 10m wide stormwater management facility.

Construction Requirements

The proposed development (i.e. additional 31 residential lots) does not seek approval for building construction. Accordingly, building construction standards which are to be applied to any future dwelling house within the proposed development should be considered at the Development Application stage.

Notwithstanding, due to the distances which separate the proposed lot from the bushfire prone land, each proposed lot will support a building constructed to a BAL of no greater than 29.

Road Construction

Each proposed allotment has direct access to the public road network.

Water:

Each proposed allotment will be connected to a reticulated water supply system. Accordingly, a supplementary water supply for firefighting purposes is not required.

Electricity

Each proposed allotment will be connected to an underground electricity supply.

An electricity network is required for the surrounding Glades Estate. Detail design of the electrical network will determine the effects of additional loads on the existing systems, and any potential upgrades of existing infrastructure to cater for the additional loads.

Gas

The proposed development does not seek approval for building construction. Accordingly, the gas supply and protection measures should be considered at the development application stage for same.

4.1.11 Safer by Design

To ensure that Design Principles are considered in the design of residential development. This is achieved through implementing the following:

Territorial Re-enforcement

Community ownership of public space sends positive signals to the community. Places that feel owned and cared for are likely to be used, enjoyed and revisited. People who have guardianship or ownership of areas are more likely to provide effective supervision and to intervene in crime than passing strangers and criminals rarely commit crime in areas where the risk of detection and challenge are high. Effective guardians are often ordinary people who are spatially 'connected' to a place and feel an association with, or responsibility for it.

Territorial re-enforcement uses actual and symbolic boundary markers, spatial legibility and environmental cues to 'connect' people with space, to encourage communal responsibility for public areas and facilities, and to communicate to people where they should/should not be and what activities are appropriate.

Surveillance

People feel safe in public areas when they can see and interact with others, particularly people connected with that space, such as adjoining residents. Criminals are often deterred from committing crime in places that are well supervised.

The proposed subdivision will utilise natural surveillance. This is achieved when normal space users can see and be seen by others. This highlights the importance of building layout, orientation and location; the strategic use of design; landscaping and lighting – it is a by-product of well-planned, well-designed and well-used space.

Space/Activity Management

Space/Activity Management strategies are an important way to develop and maintain natural community control. Space management involves the formal supervision, control and care of the development. All space, even well planned and well-designed areas need to be effectively used and maintained to maximise community safety. Places that are infrequently used are commonly abused. There is a high correlation between urban decay, fear of crime and avoidance behavior.

Access Management

Access control treatments restrict, channel and encourage people and vehicles into, out of and around the development. Way-finding, desire-lines and formal/informal routes are important crime prevention considerations. Effective access control can be achieved by using physical and symbolic barriers that channel and group pedestrians into areas, therefore increasing the time and effort required for criminals to commit crime.

Natural access control includes the tactical use of landforms and waterways features, design measures including building configuration; formal and informal pathways, landscaping, fencing and gardens.

4.1.12 Accessibility

Access to the proposed subdivision will be gained via the approved collector road network and the internal road network as part of the Project Approval. The proposed development (i.e. additional 31 residential lots) will become part of the existing approved stages of the overall development.

4.1.13 Heritage

An Aboriginal Cultural Heritage Assessment Report (ACHA) has been completed by ERM Australia Pty Ltd (ERM).

The ACHA report (dated 9 January 2019, included in Appendix J) has been prepared in accordance with the NSW Office of Environment & Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.*

The ACHA report assesses the potential impact to part of Lot 1 DP 725785, being the additional 31 Lots (comprising an area of approximately 1.8 Hectares), located within the central portion of the site. The report refers to this site as the "Project Area".

Having completed their site investigations and associated consultation, ERM conclude their assessment by confirming that:

- no Aboriginal cultural heritage objects were located within the Project Area;
- that the area itself is of low Aboriginal Heritage Significance due to ground disturbance from clearing as well as the construction and use of unsealed tracks; and
- no historic, scientific, or aesthetic values were identified.

Given that the resulting assessment did not identify any Aboriginal objects within the Project Area, ERM also conclude that there should be no additional constraints placed upon the proposed development (i.e. additional 31 residential lots) within the project area.

5. Consultation

5.1 Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013) (Amendment No. 8)

The following section summarises the planning consultation process which contributed to the current zoning of the subject land.

5.1.1 Background

On the 23rd of July 2018, Amendment No 8. to CHLEP 2013 was made. The purpose of this amendment was to transition all the deferred land to the provisions of the Coffs Harbour Local Environmental Plan 2013.

This planning process was instigated with the Gateway determination issued on the 24th of July 2015 with a requirement that the CHLEP be finalised within 12 months, expiring on the 31st of July 2016. On the 4th of July 2016, the Gateway determination was altered and then again on the 1st of March 2017 and the 17th of July 2017.

On the 23rd of March 2018, the Minister's delegate agreed to the making of the Coffs Harbour CHLEP 2013 (Amendment No.8). On the 23rd of July 2018, most of the deferred areas (including the subject land) came under the provisions of the CHLEP 2013. **Figure 16** below represents the adopted land use zoning.

5.1.2 Public Consultation

In accordance with the Gateway determination, community consultation was undertaken by Council from the 21st of October 2015 to 18 November 2015. A total of 222 community submissions were received. Notably, 197 of these submissions were made in relation to a single land parcel located in Emerald Beach. One submission was made in relation to the subject land during the exhibition period; this was made by the Rothwell Boys Pty Ltd.

The exhibited zoning reflected the Part 3A concept approval M06_0143 and included an R2 Low Density Residential Zone, E2 Environmental Conservation Zone and two small areas zoned RE1 Public Recreation. The exhibited zoning is shown in **Figure 16** below.

In response to the submission which was made by the Rothwell Boys Pty Ltd council amended the proposed zoning plan removing the proposed RE1 Public Recreation Zoning. The proposal plan which was submitted by Council to the Department for finalisation is shown in **Figure 17** below.

On the 11th of May 2017, the Department requested Council consider the RE2 Private Recreation Zone for the land in order to permit the recreational land uses on the site as was envisioned by the concept approval MP06_0143. Responding to the Department, Council updated the proposed zoning map as shown in **Figure 18** below. Because of the change, Council notified the landowner (Rothwell Boys Pty Ltd), who raised no objections to the updated zoning.

On the 29th of August 2017 the Department consulted Council on the terms of the Draft Planning Instrument. In response Council confirmed that they were happy with the draft and that the plan should be made.

Of significance to the preparation of this modification application (by the Rothwell Boys Pty Ltd) is the decision by Coffs Harbour City Council and the NSW Department of Planning to retain the central corridor, identified as "Park" in MP06_0143 in a residential zone. Refer to **Figure 20** below.

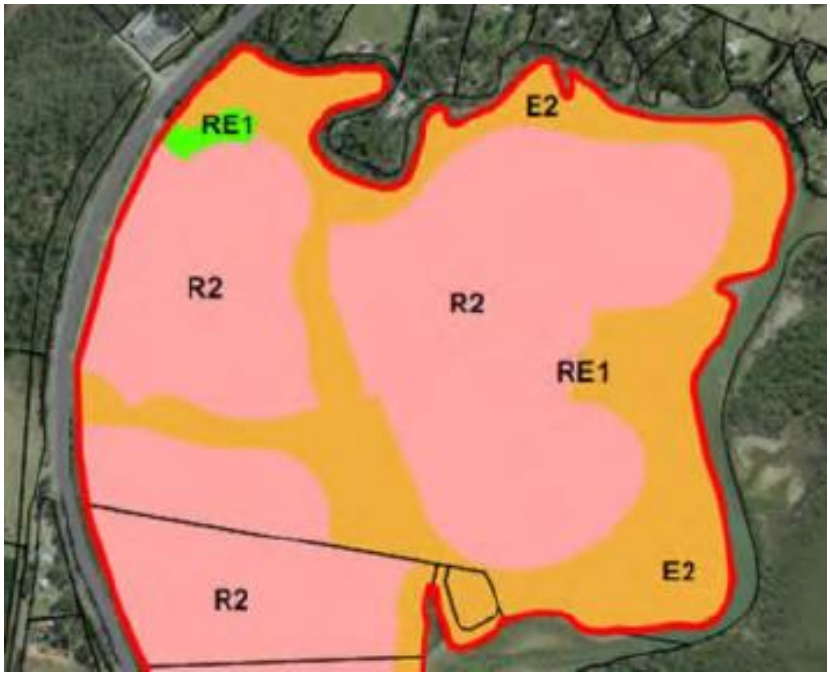


Figure 18: Proposed Zoning (Exhibition zoning)
(Source: Coffs Harbour City Council Planning Proposal – June 2015)

Figure 19: Proposed Land Use Zones (Council recommended zoning)
(Source: Coffs Harbour City Council Agenda of Ordinary Council Meeting – 9 March 2017)

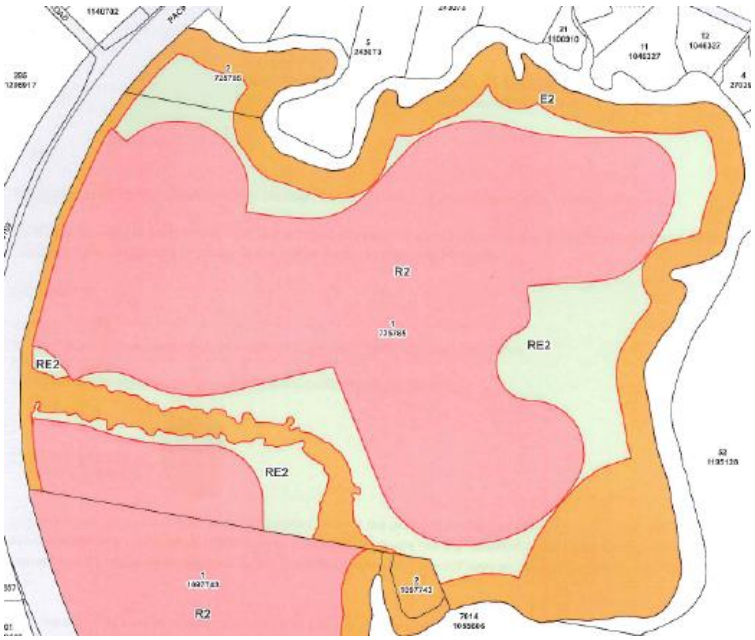


Figure 20: Adopted Land Use Zones (LEP 2013 as amended)
(Source: Coffs Harbour Local Environmental Plan 2013)

5.1.3 DPE Assessment – Deferred Areas Planning Proposal
Department of Planning & Environment – Plan Finalisation Report

After several years of ongoing investigation and amendments to the Deferred Areas (PP_2015_COFFS_004_00) the planning proposal concluded with the Departments Plan Finalisation Report which was completed on the 23rd of March 2018.

In concluding their report, the Department (p. 17) stated:-

"*Making of the draft LEP will provide certainty for future development applications and confer protections to land deemed to contain high conservation value*".

The Department further concluded that the draft LEP be made on the basis that most of the deferred land generally reflects residential approvals made under the former Part 3A of the Act while protecting land recognized for its environmental significance.

6. Statutory Assessment

6.1 Development Assessment

The NSW Minister for Planning is the consent authority with respect to the proposed modifications to the development approval MP06_0143.

Pursuant to the EP&A Act 1979, in assessing this modification application, the Department is expected to take into consideration the following matters.

6.2 State Environmental Planning Instruments

State Environmental Planning Policy No. 44 - Koala Habitat Protection

The effect of this policy prevents a consent authority from approving a development application without prior investigation of potential and core koala habitat occurring on the land. The provisions of this policy apply to the subject land as Coffs Harbour City Council is included in Schedule 1 of the policy and the subject land has an area of more than 1 Hectare.

Coffs Harbour City Council also has a Local Government area wide Koala Plan of Management that needs to be addressed in the assessment of the Section 75W modification process.

Comment

Assessment of the subject land has been completed to determine '*potential koala habitat*' of the land (see **Appendix C**).

The flora & fauna assessment in **Appendix C** found *"given the lack of recent koala activity detected, the disturbed dry open forest habitat on site is unlikely to represent an area of 'Core Koala Habitat', as defined in SEPP 44."*

Council's mapping shows that the subject land (limited to the additional 31 allotments does) not contain Secondary Koala Habitat (although it does apply to other parts of the Lot 1 DP 725785).

Having regard to the above, it is submitted that the Department's approval of the proposed development may be provided without further consideration of this policy.

All the trees on the subject land (limited to the additional 31 allotments) will be cleared to allow the formation of the subdivision, road network and asset protection zone. The proposed clearing will have little impact on fauna movement within the locality. A Flora and Fauna Assessment of the site was undertaken which identified no threatened or endangered species of flora or fauna will be impacted.

A 7-Part Test assessment under the Koala Plan of Management was completed as part of the Flora and Fauna Assessment. These assessments did not identify the need for a Species Impact Statement (SIS) (refer **Appendix C**).

State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) *2018* has been introduced to update and consolidate into one policy:

- SEPP 14 (Coastal Wetlands),
- SEPP 26 (Littoral Rainforests) and
- SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The Coastal Management SEPP 2018 gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

An integrated and coordinated approach to land use planning is promoted by the SEPP as it defines the four coastal management areas in the Act through detailed mapping and specifies assessment criteria that are tailored for each coastal management area.

The subject land does not contain:

- any previously identified SEPP 14 Coastal Wetlands, with the closest being located some 2 kilometres away. However, the maps associated with the SEPP Coastal Management 2018 show Coastal Wetlands and Coastal Wetland proximity areas along Skinners Creek and Moonee Creek that is within Lot 1. The development site of the proposed 31 allotments does not encroach on the identified wetlands or the wetlands proximity area.

- any previously identified SEPP 26 Littoral Rainforest, with the closest being located south of the site near White Bluff. The maps associated with the SEPP Coastal Management 2018 do not identify any Coastal Littoral Rainforest in proximity to the subject land.

- The northern part of the subject land is located within the Coastal Use Map associated with the SEPP. Consequently, this proposal is required to address the relevant provisions of the SEPP as set out below:

    (1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority:

        (a) has considered whether the proposed development is likely to cause an adverse impact on the following:

        (i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,

Comment
This proposal will not impact any public open space or access to and along the foreshore. The proposed 31 lot residential development will not impact opportunities to provide new public access to or along the coastal foreshore area.

Development associated with this 31 additional lots is remote from the creek foreshore. The development of this land will not impede or diminish to any extent the existing and physical land based right of access for the public.

(ii) overshadowing, wind funneling and the loss of views from public places to foreshores,

Comment:
This application will not impact these factors.

(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,

Comment:
This application will not impact these factors.

(iv) Aboriginal cultural heritage, practices and places,

Comment
The location of the proposed 31 additional lots is not in close proximity to any known aboriginal mythological sites or the any identified aboriginal cultural sites. Refer Aboriginal Cultural Heritage Assessment Report in **Appendix J.**

(v) cultural and built environment heritage, and

(b) is satisfied that:

(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or

(ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or

(iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and

Comment
The following Key Actions apply to development proposals:

- Development proposals will have to conform with specified design and planning standards to control height, setback and scale to ensure public access and to ensure that beaches and foreshore open spaces are not overshadowed;

- The use of good design principles to ensure more compact human scale towns are developed with their own character within the constraints of existing infrastructure;

- Identify and consider significant views and vistas within and from towns, including street patterns and layout and items of heritage significance;

- To promote compact and contained planned urban development in order to avoid ribbon development, unrelated cluster development and continuous urban areas on the coast;

- To provide for choice in housing and lifestyles;

- To increase public access to foreshores when feasible and environmentally sustainable options are available.

The key actions as outlined above have been considered in the proposed subdivision design, taking into account the natural constraints of the site including topography, flooding, vegetation and bushfire hazard.

The subdivision design aims to promote a variety of housing types within a compact environmental footprint.

State Environmental Planning Policy No. 52 – Farm Dams and other Works in Land and Water Management Plan Areas

Comment

This SEPP does not apply to the subject land.

State Environmental Planning Policy No. 55 – Remediation of Land

Comment

Given the generally natural state of the land and the absence of existing development and any indication of past or present contaminating activities, it is considered unlikely that soils within the vicinity of the proposed development are or have been contaminated. Coffs Harbour City Council's mapping system does not identify the land as being:

- former banana lands;
- potentially contaminated land; and
- EPA notified site.

State Environmental Planning Policy – (Infrastructure) 2007

Comment

The proposed development complies with the relevant provisions of this SEPP. The following is a summary of the relevant provisions of the SEPP:

- Division 1 – Consultation with Council on the provision of infrastructure is ongoing with this project.
- Division 5 –Subdivision 2 Cl 45 – proposed allotments will be located in a manner taking into account any existing and future distribution lines impacting the site.
- Division 6 – Bushfire Hazard Reduction – a site specific Bushfire Risk Assessment has been carried out for the site.
- Division 17 – Roads and Traffic Cl 102 – as the land parcel adjoins the Upgraded Pacific Highway and Service Road Network, noise and vibration has been addressed in the MP 06_0143 determination and appropriate mitigation measures have been applied as conditions of that consent. These do not affect the subject land.
- Division 18 – Sewerage Systems - the proposed development includes connection to Coffs Harbour City Council's reticulated system.
- Division 19 – Soil Conservation – the proposed subdivision integrates a sediment erosion control system.
- Division 20 – Stormwater – the proposal provides appropriate Stormwater Control facilities.
- Division 24 – Water - the proposal includes connection to Coffs Harbour City Council's reticulated system.

State Environmental Planning Policy – (Rural Lands) 2008

Comment

This SEPP does not apply to the subject land.

6.3 Regional Planning Policies

North Coast Regional Plan 2036

The North Coast Regional Plan (NCRP) 2036 is the NSW Government's blueprint for the future growth and development of the North Coast for the next 20 years.

The NCRP is not a land use zoning plan in the strict sense but rather it is concerned with stating specific Government key planning principles guiding growth on the North Coast. These Principles include directing growth to identified urban growth areas, managing the sensitive coastal area and providing great places to live and work within a unique environment.

The NCRP identifies Coffs Harbour as a Regional City. The region's cities are popular places to live and work with significant future population growth projected to occur in the Coffs Harbour local government area.

An action plan will be prepared for Coffs to coordinate the investment and infrastructure that will underpin the delivery of new homes and a significant number of new jobs.

The Department of Planning and Environment, council officers and representatives from relevant State agencies will oversee the delivery of these plans.

The action plans will identify opportunities, while protecting the unique character of these places. Providing greater housing choice in regional cities through more townhouses, villas and apartments will maximise the use of existing and new infrastructure and provide greater access to jobs, services and lifestyle opportunities.

Regional cities also have employment, health, education, residential and airport precincts that are capable of promoting employment growth for the entire North Coast.

The proposal is consistent with the contents of the NCRP.

6.4 Local Planning Instruments and Policies

Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013)

CHLEP 2013 generally applies to the whole of the Coffs Harbour LGA (except for the deferred lands) and has been prepared in accordance with the Standard Instrument Local Environmental Plan provisions of the State Government.

The zoning of the land where the 31 additional allotments are proposed is R2 Low Density Residential. The objectives of this zone are:

- To provide for the housing needs of the community within a low-density residential environment.

- To enable other land uses that provide facilities or services to meet the day to day needs of residents.

Comment

The proposal is consistent with these zone objectives. The subject land enjoys an existing consent for the development of 524 allotments. The proposed development (additional 31 residential lots) will provide additional housing for the community.

Part 4 Principle Development Standards

The provisions of the CHLEP 2013 which are relevant to the proposed development are:

4.1 Minimum subdivision lot size

Comment

The proposal is consistent with the minimum lot size requirements that applies under CHLEP 2013 – being 400m^2, as the smallest proposed lot is 516m^2.

4.1A Minimum subdivision lot size for community title schemes

Comment

No lots are proposed to be community title.

4.1A Minimum subdivision lot sizes for certain split zones

Comment

The proposal does not involve split zones and therefore the proposal is consistent with this requirement under CHLEP 2013.

4.1B Minimum lot size for dual occupancies in Zone R2

Comment

The proposal does not seek any dual occupancy development. Any future dual occupancy development would need to be consistent with the requirements that apply under CHLEP 2013.

4.2B Erection of dwelling houses on land in certain rural and environment protection zones

Comment

The proposal does not involve erection of dwellings on land in rural zones or environmental protection zones and therefore the proposal is consistent with this requirement under CHLEP 2013.

4.2C Minimum subdivision lot size for strata plan schemes in certain rural, residential and environment protection zones

Comment

The proposal does not include any strata subdivision and thus is consistent with this requirement under CHLEP 2013.

4.2D Boundary adjustments of land in certain rural, residential and environment protection zones

Comment

The proposal does not involve boundary adjustments and therefore this requirement is not triggered.

4.3 Height of buildings

Comment

The proposal involves subdivision and therefore this requirement under CHLEP 2013 is not triggered. Any future development of buildings would need to be consistent with this requirement.

4.4 Floor space ratio (FSR)

Comment

The proposal does not involve FSRs – generally under CHLEP 2013 FSRs do not apply to residential development.

4.5 Calculation of floor space ratio and site area

Comment

The proposal does not involve FSRs as under CHLEP 2013 FSRs do not apply to residential development.

4.6 Exceptions to development standards

Comment

The proposal does not seek to utilise this provision of CHLEP 2013 for the residential subdivision development sought.

Part 5 Miscellaneous Provisions

The provisions of the CHLEP 2013 which are also relevant to the proposed development are:

5.10 Heritage Conservation

1) Objectives The objectives of this clause are as follows:

(a) to conserve the environmental heritage of Coffs Harbour,
(b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,
(c) to conserve archaeological sites,
(d) to conserve Aboriginal objects and Aboriginal places of heritage significance.

Comment

An Aboriginal Cultural Heritage Assessment been prepared in accordance with the NSW Office of Environment & Heritage's (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. The assessment was completed covering the area occupied by the proposed 31 additional allotments (i.e. the project area).

The ACHA assessment concluded: -

- no Aboriginal cultural heritage objects were located within the project area;
- that the area itself is of low Aboriginal Heritage Significance due to ground disturbance from clearing as well as the construction and use of unsealed tracks; and
- no historic, scientific, or aesthetic values were identified.

Given that the resulting assessment did not identify any Aboriginal objects within the project area, this proposal remains consistent with Clause 5.10.

Part 7 Additional Local Provisions

The provisions of the CHLEP 2013 which are also relevant to the proposed development are:

7.1 Acid Sulfate Soils

Comment

Refer sections 2.3, 4.1 and **Appendix G** for details.

7.2 Earthworks

Comment

Refer Section 3.2 and **Appendix D** for details.

7.3 Flood Planning

Comment

Refer Section 2.3 for details and **Appendix E** for details.

7.4 Terrestrial Biodiversity

Comment

This is addressed in the Sections 4.1, 6.2 and 7.1 that provide details for flora and fauna. Refer also to **Appendix C**.

7.6 Riparian Land and Watercourses

Comment

This is addressed in the Sections 4.1, 6.5 and 7.1 that provide details for flora and fauna. Refer also to **Appendix C.**

7.8 Koala Habitat

Comment

This is addressed in the Sections 2.3, 6.2 and 7.1 that provide details for flora and fauna. Refer also to **Appendix C.**

7.11 Essential Services

Comment

This is addressed in the Sections 2.3, 3.1.3, 6.2, 6.4 and 7.1.

6.5 Development Control Plan

DCP 2015

Coffs Harbour Development Control Plan 2015 applies to all land within the local government area, except one small *"deferred matter"* at Sandy Beach. Section G6 of the DCP is relevant to the development of the East Moonee locality (east of the Pacific Highway). These are special locality provisions that prevail under the DCP applying to CHLEP 2013.

Part C1 – Subdivision Controls

Provision:
Lots are to be of regular shape and comprise a suitable frontage to depth ratio to enable future development that is responsive to the lands characteristics.

Comment
This provision has been integrated into the design of the proposed subdivision.

Provision:
Subdivisions are not to comprise an access handle where more than two access handles will directly adjoin.

Comment
There are no proposed access handle blocks included in the design of the proposed subdivision.

Provision:
Road networks, subject to topographic constraints, are to be based on a grid pattern to encourage pedestrian connectivity.

Comment
The design of the proposed subdivision is based on a grid pattern.

Provision:
Road hierarchy, layout and construction shall be designed in accordance with Council's Development Specifications.

Comment
The design of the road hierarchy and layout accords with Council's Development Specifications.

Provision:
Access points off major roads are to be rationalised where practical.

Comment

The design of access points off the collector road and connection to the subdivision is both practical and functional.

Provision:

Pathways are to be provided as an accessible integrated network of walking and cycling routes for safe and convenient travel.

Comment

The proposed 31 additional lots are linked to the approved accessible, safe and functional vehicle and pedestrian network - including the integrated pedestrian and cycle shareway.

Provision:

Subdivisions comprising steep land shown on the Steep and Highly Erodible Land Map are to be designed so that smaller lots are located on north facing slopes and larger lots are located on south facing slopes.

Comment

The 31 allotment subdivision is not identified on Council's Steep and Highly Erodible Land Map and therefore this provision does not apply.

Provision:

Subdivisions are to be designed to integrate with existing or proposed development on adjacent sites.

Comment

The proposed subdivision's design readily integrates with the approved development under Project Approval 06_0143. The proposed subdivision forms another stage of that development.

Provision:

Threshold and pavement treatments are to be designed to create an attractive streetscape.

Comment

*The proposed subdivision is designed to create an attractive streetscape with appropriate themed street tree planting, threshold and pa*vement treatments.

Provision:

The use of cul-de-sacs in the design of subdivisions should be minimised.

Comment

The proposed subdivision for 31 allotments does not include any cul-de-sacs.

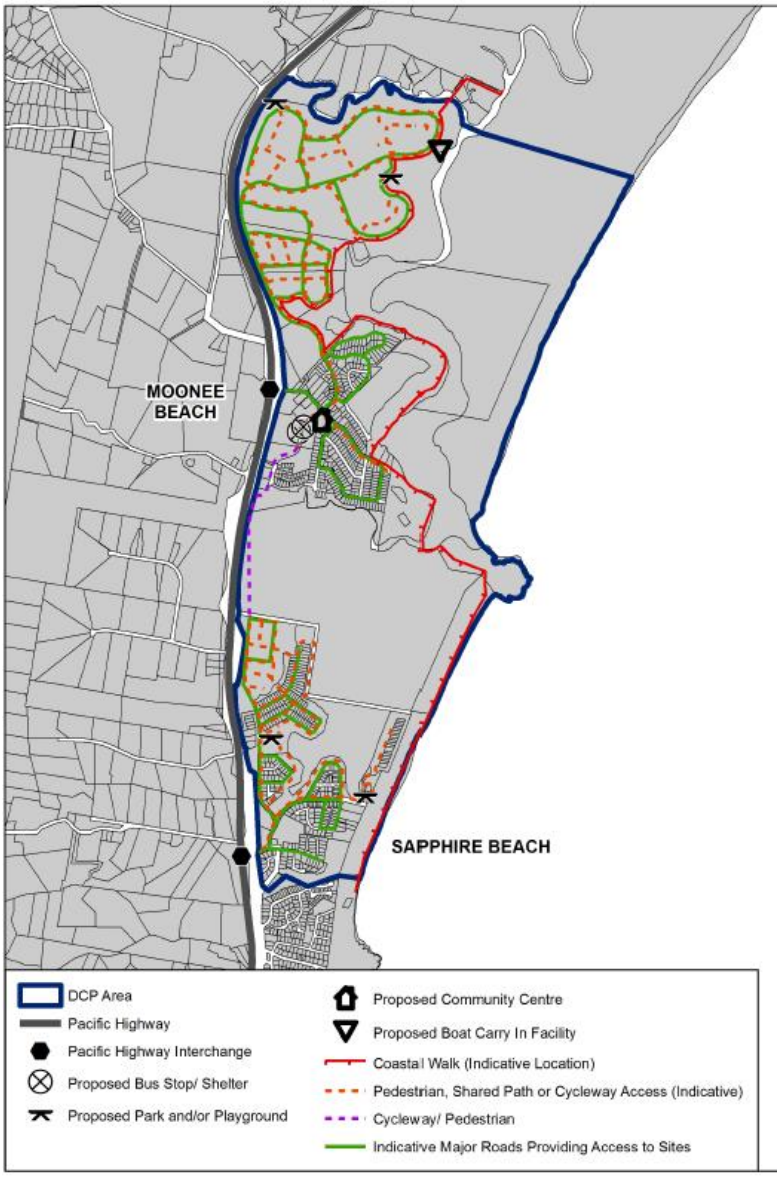
G6.1 Masterplan

This control applies to development and subdivision proposals on land within the East Moonee/Sapphire Beach urban release areas shown on the East Moonee/Sapphire Beach Masterplan. Development and subdivision proposals are to comply with the principles of the East Moonee/Sapphire Beach Masterplan. The masterplan is shown below.

Comment

The proposed subdivision for 31 allotments accords with the provisions of the East Moonee/Sapphire Beach Masterplan. Refer below copy of Masterplan.

Masterplan (East Moonee Beach/ Sapphire Beach)



7. Environmental Effects

7.1 Section 4.15 – Evaluation

Under the provisions of Section 4.15 of the EP&A Act, in determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application.

(a) the provisions of:

i. any environmental planning instrument, and

ii. any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Director-General has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and

iii. any development control plan and

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),

(v) (Repealed)

That apply to the land to which the development application relates:

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,

(c) the suitability of the site for the development,

(d) any submissions made in accordance with this Act or the regulations,

(e) the public interest.

Comment

a) (i)

Matter	Consideration
State Environmental Planning Policy No. 44 Koala Habitat Protection.	This planning policy is addressed in Section 6.2.
State Environmental Planning Policy No. 55 - Remediation of Land.	This planning policy is addressed in Section 6.2.
State Environmental Planning Policy (Coastal Management) 2018	This planning policy is addressed in Section 6.2.
Coffs Harbour Local Environmental Plan 2013	This planning instrument is addressed in Section 6.3.
State Environmental Planning Policy – (Infrastructure) 2007	This planning policy is addressed in Section 6.2.

a) (ii)

The land is not subject to any proposed instrument or deferred matters to Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013). The site was until the 23rd July 2018 included in the Deferred Matters component of CHLEP 2013.

a) (iii)

Primary Matter	Consideration
Coffs Harbour DCP 2015	This DCP is addressed in Section 6.4.

a) (iiia)

There are no planning agreements under Section 7.4 that apply to the proposed development.

a) (iv)

Comment

The are no matters listed under Section 92 that apply to the proposed development

b) The likely impacts of that development including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.

Comment

Primary Matter	Consideration
Context and Setting	The proposed development is appropriate and compatible within its current land use zoning and has been designed to respect the environmental constraints which are relevant to the land. The scale and form of the subdivision is consistent with the existing project approval and other residential lands in this locale.
Access, transport and traffic	The subject land is provided with collector road access, previously approved by the Land and Environment Court, which does not intersect with the Pacific Highway. A temporary construction access was approved under Major Project 06_0143, however during the construction of the Pacific Highway upgrade an access was constructed and this will facilitate construction.
Utilities	Existing utilities are available to the locality. New allotments will be augmented as required.
Cultural Heritage	An ACHA report has been prepared in accordance with the NSW Office of Environment & Heritage's (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. The resulting report concludes: ▪ no Aboriginal cultural heritage objects were located within the Project Area; ▪ that the area itself is of low Aboriginal Heritage Significance due to ground disturbance from clearing as well as the construction and use of unsealed tracks; and ▪ no historic, scientific, or aesthetic values were identified.

Primary Matter	Consideration
Flora and Fauna	The proposed development is for part of the subject land to be subdivided into thirty-one (31) residential allotments. The proposed development will result in the loss of 1.75 ha of vegetation of which 1.37 ha is relatively intact native vegetation. Areas within the subject land have been identified for additional rehabilitation and revegetation. The identified areas will achieve a much higher standard toward PCT benchmarks than what would be the case if the development were to proceed (without the embellishment of these areas) in accordance with the current conditions of development consent. In doing so, the impact of the proposed development (i.e. the additional 31 allotments) will be mitigated and environmental values (fauna & flora) will be improved at the peripheries of the subject land. Assessment of the relevant legislative requirements (Section 5A EPA Act 1979 & EPBC Act 1999) finds that further environmental assessment is not required
Noise	An assessment of the proposals exposure to highway noise has been completed and the recommended noise abatement measures will be implemented as part of the development in accordance with Project Approval 06_0143.
Safety, security and crime prevention	The orientation of allotments will ensure that dwelling houses overlook the street frontage and provide for increased passive surveillance. Street lighting will also be provided in accordance with Council's standards.
Social & Economic Impacts	The proposed development represents a positive social impact for this locale by providing a variety of residential allotments that is cognisant of the needs and requirements of the residential property market in this locale. The proposed development will generate a significant number of short-term employment opportunities during civil and housing construction whilst also generating demand for construction materials, transport and property services. Annual household expenditure will also provide ongoing and significant monetary contribution to the local economy.

Primary Matter	Consideration
Cumulative Impacts	This proposal has considered the potential impacts on the surrounding environment including traffic and water quality. Appropriate design measures have been proposed in each regard. The subject land is also exposed to several environmental constraints including bushfire, topography and vegetation. The proposed subdivision design is considerate of such, incorporating several design measures which aim to minimise any likely cumulative impacts. Housing within the subdivision will be designed and constructed to maximise water and energy efficiency through the application of the Building Sustainability Index: BASIX

c) The suitability of the site for the development.

Comment

The proposed development is considered appropriate for the site for the following reasons:

- The land is appropriately zoned and is compatible with surrounding development;
- The scale of the proposal is within the capacity of the land and can be appropriately serviced;
- The environmental constraints which affect the land can be appropriately managed;
- The environmental impacts of the development may be ameliorated by through design and management measures.

d) Any Submissions made in accordance with this Act or the Regulations.

Comment

Several Submissions have been made by the Office of Environment & Heritage in relation to the proposed development. A copy of same (letters from OEH) are included in Appendix K.

e) The public interest

Comment

The proposed modifications are assessed as being in the public's interest for the following reasons:

- they support the development of the land which will ultimately provide additional permanent housing for the Coffs Harbour local government area;

- It will provide increase housing opportunities for the Coffs Harbour Local Government Area;

- It will create additional employment opportunities during the construction phases and will increase the demand for local goods and services at Moonee Beach and Coffs Harbour;

- It is designed cognisant of environmental constraints and does not pose any environmental risk to the surrounding environment.

- The further development of the land is supported by the decision of Coffs Harbour City Council and the NSW Department of Planning & Environment to retain the land in a residential zone.

8. Conclusion

This Environmental Assessment Report has evaluated the impacts of the proposed development. This report describes the suitability of the site for the proposed development and, in particular, provides an assessment of the environmental impacts of the proposal.

The proposed development contributes to achieving population growth within the Coffs Harbour Local Government Area and in particular for Moonee Beach. It will provide additional housing choice for existing residents in the area and those intending to relocate to this locale.

Considerable consultation and environmental investigations have been completed prior to this submission under previous processes, especially during the early stages of the Major Project Approval for the estate and more recently with the progress of the Deferred Matters Planning Proposal. The proposed subdivision design has been prepared cognisant of this previous consultation and the environmental investigations which support this submission.

This proposed development is an appropriate utilisation of the land taking into consideration the current surrounding land uses and existing approvals. Consideration has been given to the environmental qualities of the land which are likely to be affected by this proposal. The proposal encompasses a range of design and ameliorations measures which are intended to address and mitigate the anticipated impacts of the development.

The proposed development is permissible within the existing land use zone prescribed under the provisions of Coffs Harbour Local Environmental Plan 2013. Consideration of the proposed development in the context of current Statutory and Non-Statutory development controls finds there are no material impediments to it being granted approval.

Having regard to the above and the considerations detailed in this report, the proposed development is considered appropriate for the land and therefore should be granted approval.

Appendix A – Draft Suite of Project Plans

"The Glades"

BUCCA ROAD

HIGHWAY

PACIFIC

HOYS RD

LOT 2 on DP 725785
(Area = 3.359 ha)

LOT 1 on DP 725785
(Area = 92.550 ha)

LOT 7
DP 252223

HIGHWAY ACCESS FOR CONSTRUCTION ONLY

POTENTIAL CORNER STORE / RESIDENTIAL SITE

Skinners Creek

Moonee Creek

PARK

Road 1 Road 2 Road 3 Road 4 Road 5 Road 6 Road 7 Road 8 Road 9 Road 10

Access Path Way

1 2 3 4 5 6 7 8 9 10 11

LEGEND

524 — LOT NUMBER
620sq m — LOT AREA
20.0 — LOT LENGTH

RECREATION NODE
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

MAJOR PEDESTRIAN / CYCLE (SHAREWAY)
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

MAJOR PEDESTRIAN / CYCLE BOULEVARD
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

LOCAL CONNECTION PATHWAY
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

updated plan
Issued Jan 2018

Stage	No of Lots
1	67
2	40
3	59
4	61
5	51
6	61
7	48
8	48
9	50
10	42
11	28
TOTAL	**555**

0 20 40 60 80 100 200 metres
1 : 2000 (at A1 before reduction)

amdt no.	date	amendment
F	FEB 09	TEMPORARY INTERSECTION AMENDED
E	DEC 08	PATH NETWORK AND FACILITIES ADDED
D	MAY 08	TOTAL SITE APPLICATION
C	APRIL 08	ENTRY AMENDED
B	OCT 07	DRAWING TITLE AMENDMENT
A	SEPT 07	CONCEPT PLAN & PRECINCT NOTED

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PRELIMINARY LOT LAYOUT

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scales	AS SHOWN
design	RKH
drawn	JM
date	NOV 2006
signed	

client: THE ROTHWELL BOYS PTY LTD

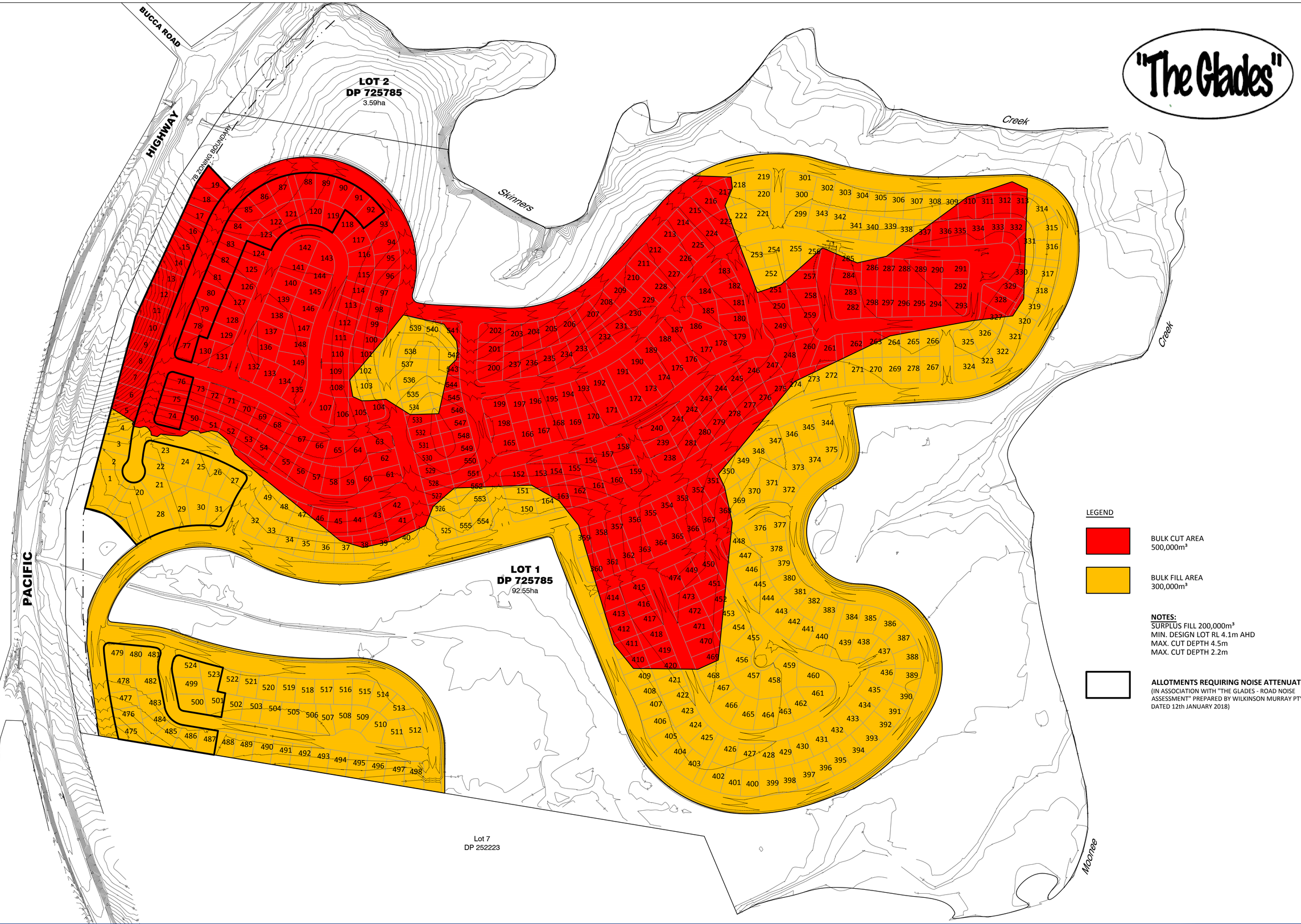
project: PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR

dwg no. P1

amendment F

04-1600

"The Glades"



LEGEND

- BULK CUT AREA 500,000m³
- BULK FILL AREA 300,000m³

NOTES:
SURPLUS FILL 200,000m³
MIN. DESIGN LOT RL 4.1m AHD
MAX. CUT DEPTH 4.5m
MAX. CUT DEPTH 2.2m

ALLOTMENTS REQUIRING NOISE ATTENUATION
(IN ASSOCIATION WITH "THE GLADES - ROAD NOISE ASSESSMENT" PREPARED BY WILKINSON MURRAY PTY LTD DATED 12th JANUARY 2018)

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Issue	Revision Details	Date	Check
H			
G			
F			
E			
D			
C			
B			
A			

CLIENT
THE ROTHWELL BOYS PTY LTD

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>> planning >> engineering >> surveying >> mapping >> environmental management >>

Scale 0 20 40 60 80 100metres
SCALE– 1:2000 HOR.

Survey	Datum
RDM	A.H.D.
Design	Checked
W. COOPER	W. COOPER
Drawn	Date
Iain Craig	16th January 2018

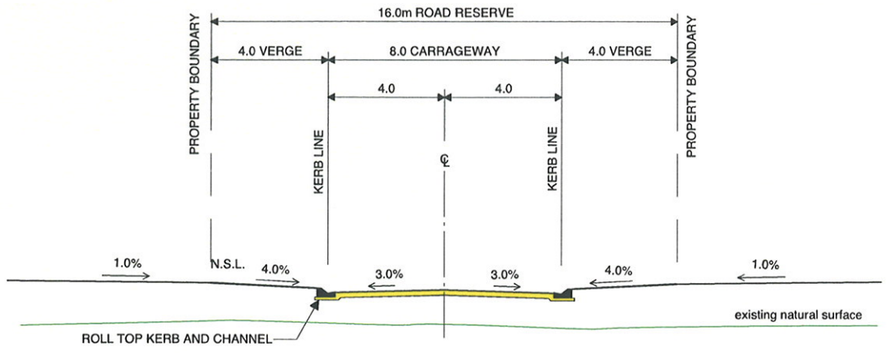
Project
THE GLADES ESTATE

Title
LOTS 1 & 2 DP 725785
BULK EARTHWORKS
AND NOISE ATTENUATION PLAN

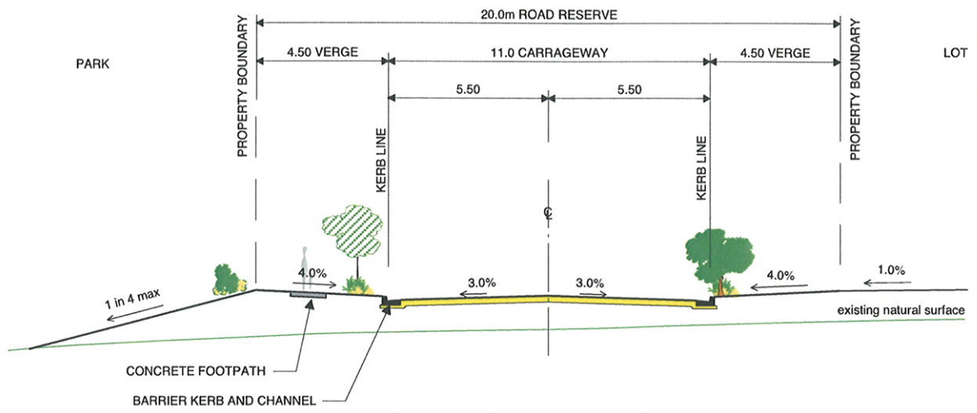
Drawing No.	Revision
10046-99	.
Sheet No.	Sheet Size
1 of 1	A1
CAD File	
10046-99 BEW DA	

PLOTTED: 16 January 2018 2:00:00 PM
J:\2010\Projects\10046 The Glades Bulk Earthworks\AutoCad\DRAWINGS 2018\10046-99 BEW DA.dwg

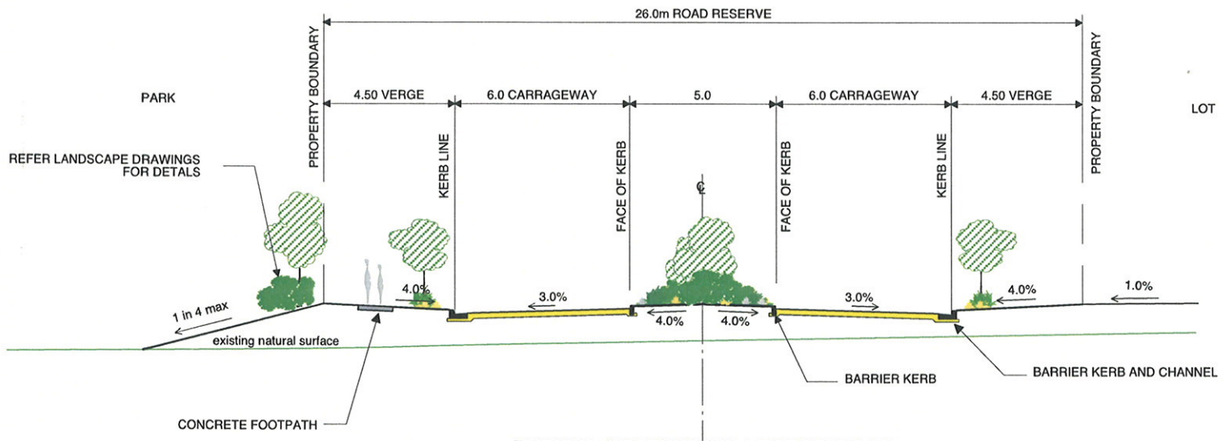
"The Glades"



TYPICAL SECTION LOCAL STREET
(Road 7 to Road 23)



TYPICAL SECTION COLLECTOR ROAD
(Part Road 1 to Road 6)



TYPICAL SECTION COLLECTOR ROAD
WITH CENTRE ISLAND
(Part Road 1 refer drawing 04-1600-P1)

0 1 2 3 4 5 10 metres

(1 : 100 @ A1)

amdt no.	date	amendment
A	APRIL 08	TYPICAL SECTIONS AMENEDED

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ROADWORKS TYPICAL SECTIONS

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scales		client	
AS SHOWN		THE ROTHWELL BOYS PTY LTD	04-1600
design: RKH	drawn: JM		
date: NOV 2006	signed:	project: PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR	dwg no.: P4 / amendment: A

"The Glades"

LEGEND

- UNDERGROUND STORMWATER DREAINAGE
- INTERALLOTTMENT DRAINAGE
- BIORETENTION ZONES
- STORMWATER DRAINAGE OUTLETS
- VEGETATION FILTER ZONE
- 3 / 0.52 ha — CATCHMENT NO / CATCHMENT AREA
- CATCHMENT BOUNDARY
- CREEK BUFFERS

updated plan Issued Jan 2018

NOTE:
TO BE READ IN CONJUNCTION WITH GILBERT & SUTHERALND STORMWATER ASSESSMENT & DRAWING No's 1600-P6 FOR STORMWATER OUTLETS AND STORMWATER TREATMENT DETAILS

0 20 40 60 80 100 200 metres

1 : 2000 (at A1 before reduction)

prepared in association with:-

GILBERT+SUTHERLAND
agricultural and environmental scientists

amdt no.	date	amendment
C	APRIL 08	ENTRY LAYOUT AMENEDED
B	SEPT 07	ASSETT LINE REMOVED
A	JULY 07	BUFFERS SHOWN / SWALES AMENDED

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STORMWATER DRAINAGE AND CATCHMENT PLAN

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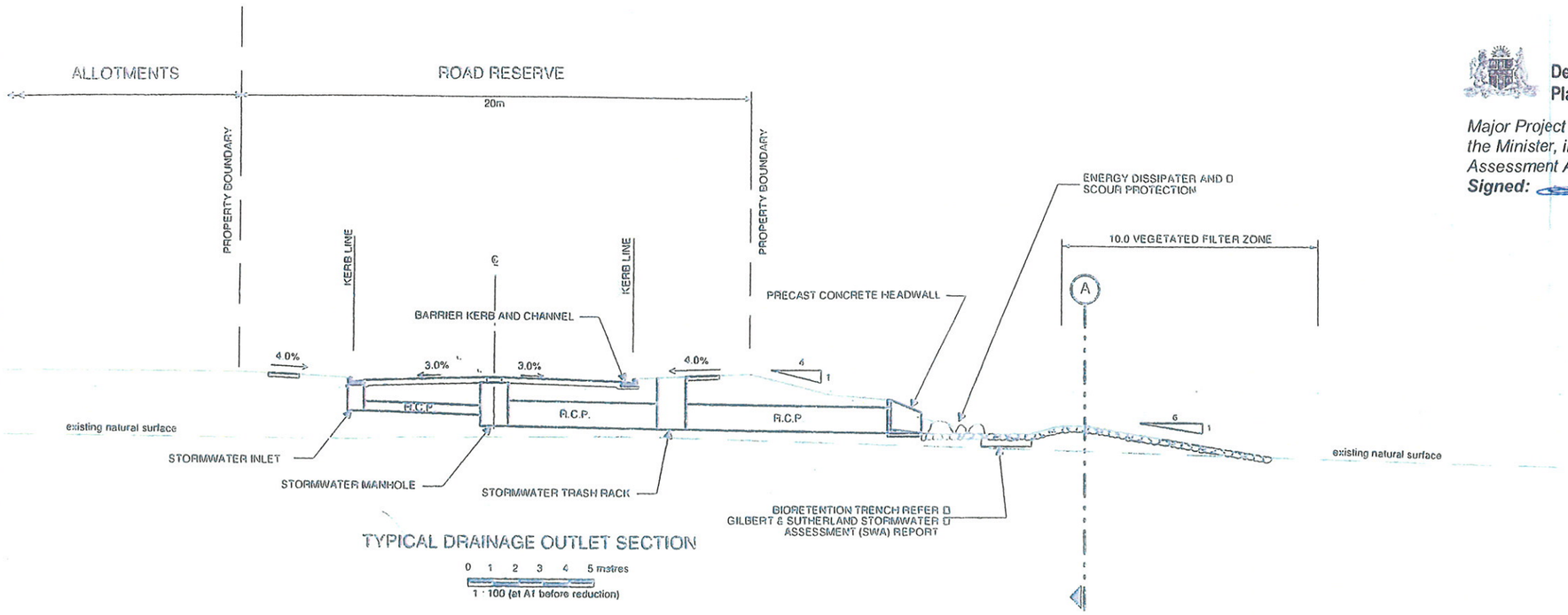
scales		client	
AS SHOWN		THE ROTHWELL BOYS PTY LTD	04-1600
design: RKH	drawn: JM	project: PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR	dwg no.: P5
date: NOV 2006	signed		amendment: C

"The Glades"

Department of Planning

*Major Project Number: **06_0143**, approved on **5 March 2009** by the Minister, in accordance with the Environmental Planning & Assessment Act 1979, subject to conditions of approval.*
Signed:



TYPICAL DRAINAGE OUTLET SECTION

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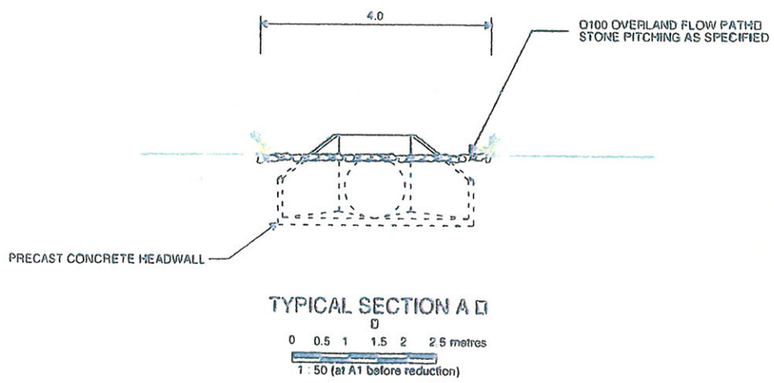
1 : 100 (at A1 before reduction)



TYPICAL SECTION A

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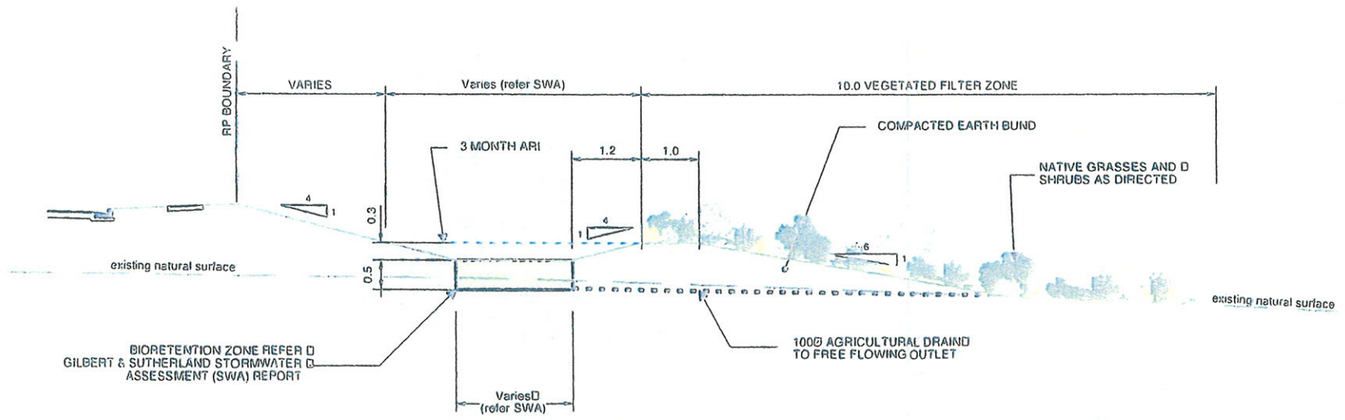
1 : 50 (at A1 before reduction)



TYPICAL STORMWATER TREATMENT SECTION

0 0.5 1 1.5 2 2.5 metres
1 50 (at A1 before reduction)

NOTE:
TO BE READ IN CONJUNCTION WITH GILBERT & SUTHERLAND STORMWATER ASSESSMENT & DRAWING No's 1600-P5 FOR STORMWATER DRAINAGE & CATCHMENT PLAN

prepared in association with
GILBERT+SUTHERLAND
agricultural and environmental scientists

amdt no.	date	amendment
B	SEPT 07	ASSETT ZONE REMOVED
A	JULY 07	BIORETENTION SECTION AMENDED

DISCLAIMER: This is a preliminary concept plan prepared by Auspacific Engineers Pty Ltd ("the consultant"). The concept plan has been prepared by the Consultant for the benefit of the entity to which it is address ("the Client") and is in response to certain instructions and requests given by the Client. The concept plan therefore may only be relied upon by the Client for the purpose for which it has been prepared and for no other purpose. The concept plan does not represent the Consultant's professional advice, but is merely an overview of potential development outcome and as stated is "preliminary" in nature. No third party is entitled to rely upon the information contained in the preliminary report and any definitive advice as to budgets, yields, etc., should be sought directly from the consultant.

STORMWATER OUTLETS AND SWALE SECTIONS

AUSPACIFIC ENGINEERS
AUSPACIFIC ENGINEERS PTY LTD
development consultants, civil, structural and hydraulic engineers
3 / 20 Nerang Street
NERANG QLD 4211
T 07 5596 5377
F 07 5596 3443
E auspacifit@austarnet.com.au

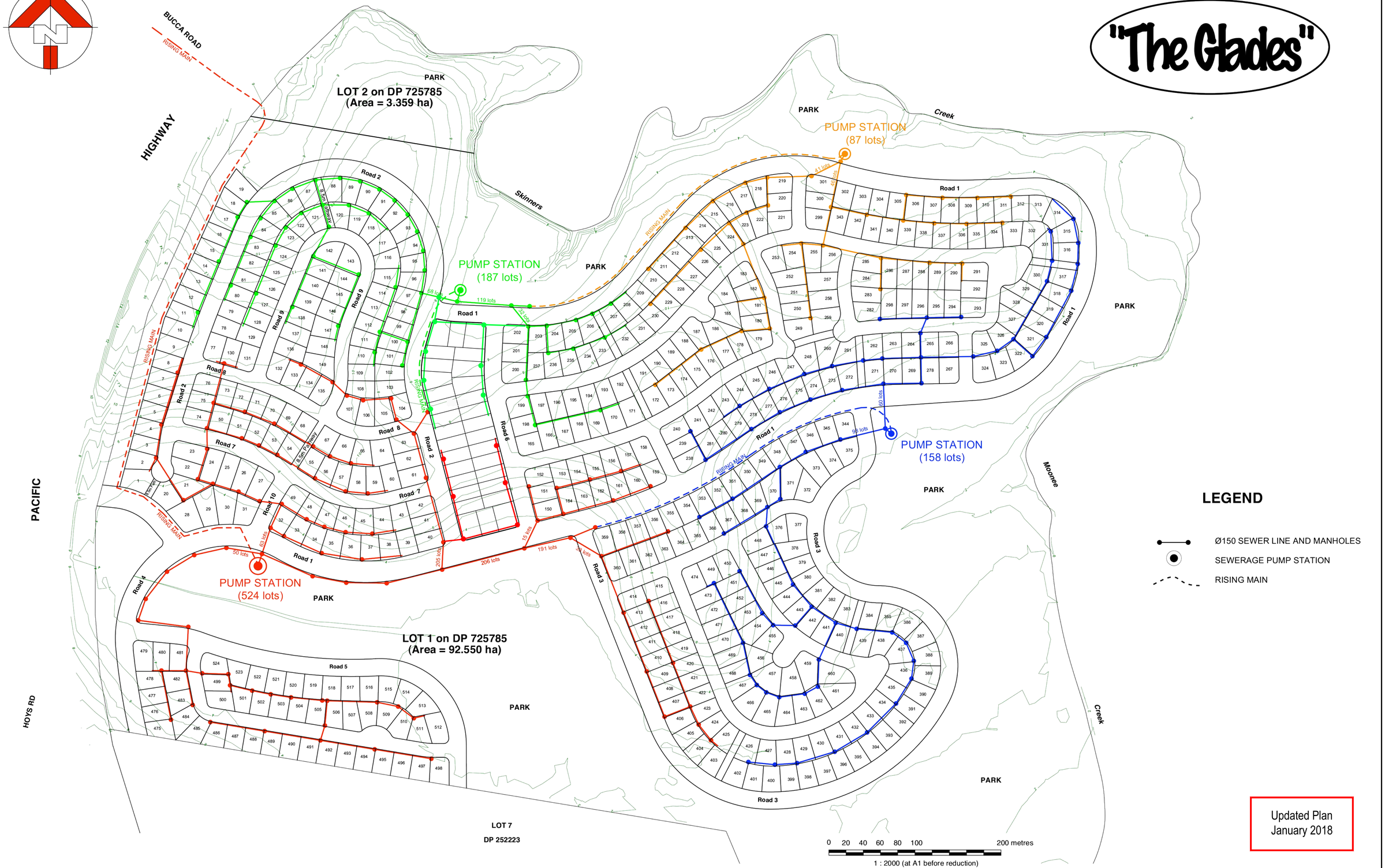
scales	AS SHOWN
design	RKH
drawn	JM
date	NOV 2006
signed	

client: THE ROTHWELL BOYS PTY LTD

project: PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR

dwg no.	amendment
04-1600	
P6	B

"The Glades"



LEGEND

- Ø150 SEWER LINE AND MANHOLES
- SEWERAGE PUMP STATION
- RISING MAIN

Updated Plan
January 2018

A	APRIL 08	LAYOUT AMENDED	
amdt no.	date	amendment	

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CONVENTIONAL SEWERAGE RETICULATION CONCEPT PLAN

AUSPACIFIC ENGINEERS

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E auspacifik@austarnet.com.au

scales	AS SHOWN		
design	RKH	drawn	JM
date	NOV 2006	signed	

client	THE ROTHWELL BOYS PTY LTD		04-1600
project	PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR	dwg no. P7	amendment A

"The Glades"

BUCCA ROAD

HIGHWAY

PACIFIC

HOYS RD

PARK

LOT 2 on DP 725785
(Area = 3.359 ha)

Skinners Creek

Moonee Creek

LOT 1 on DP 725785
(Area = 92.550 ha)

LOT 7
DP 252223

Road 1
Road 2
Road 3
Road 4
Road 5
Road 6
Road 7
Road 8
Road 9
Road 10

8.5m Parkway

150Ø
300Ø

FUTURE RETURN LINK LOOP TO
MOONEE BEACH ROAD WATER MAIN

300Ø TRUNK MAIN TO EXISTING MOONEE BEACH ROAD WATER MAIN
WITHIN EXISTING EFFLUENT RE-USE & WATERMAIN EASEMENT DP1062759

LEGEND

- 100Ø — WATERMAIN (UNLESS SHOWN OTHERWISE)
- CONDUIT CROSSINGS
- FIRE HYDRANTS
- SLUICE VALVES

0 20 40 60 80 100 200 metres

1 : 2000 (at A1 before reduction)

Updated Plan
January 2018

amdt no.	date	amendment
C	APRIL 08	ENTRY AMENDED & WATER NOTES ADDED

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WATER RETICULATION CONCEPT PLAN

AUSPACIFIC ENGINEERS

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scales		
AS SHOWN		
design	drawn	
RKH	JM	
date	signed	
NOV 2006		

client: THE ROTHWELL BOYS PTY LTD

project: PROPOSED RESIDENTIAL SUBDIVISION
MOONEE BEACH COFFS HARBOUR

dwg no.: P9

amendment: A

LEGEND:

- Bioretention system
- Vegetated buffer
- Stormwater outlet
- Stormwater drains
- Interallotment drains

Department of Planning

*Major Project Number: **06_0143**, approved on **5 March 2009** by the Minister, in accordance with the Environmental Planning & Assessment Act 1979, subject to conditions of approval.*

Signed:

GILBERT+SUTHERLAND
agricultural and environmental scientists

Suite 12, Riverwalk One
140 Robina Town Centre Drive, Robina, Qld 4226
Phone 55769944 Mobile 0418 760919 Fax 55769945

FIGURED DIMENSIONS TO BE READ IN PREFERENCE TO SCALING	APPROVED	
SCALE AS SHOWN	DRAWN A.G.G	DRAWING No
DATE 30/07/07	CHECKED	GJ0339.5.3a

PROJECT

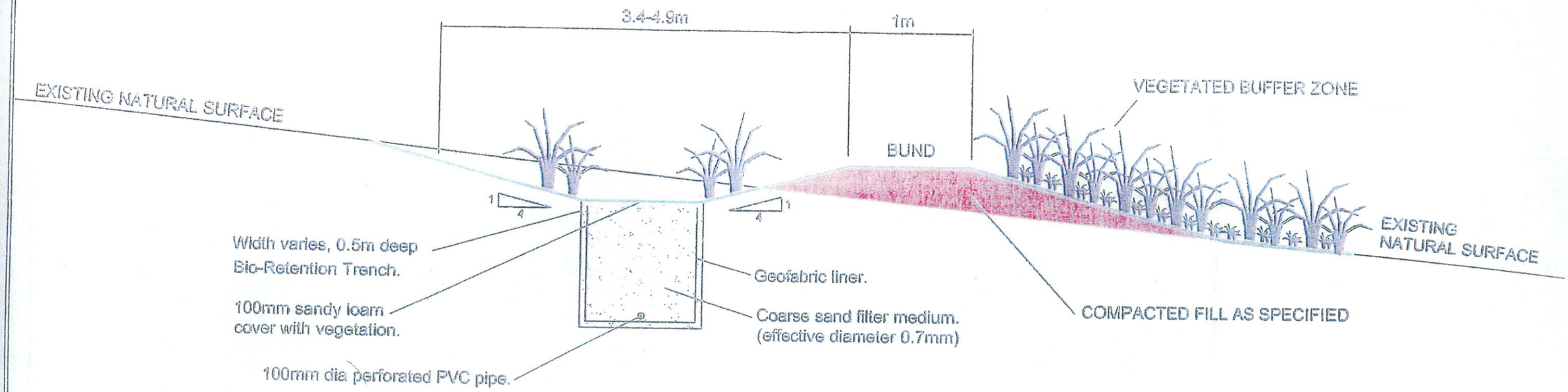
THE ROTHWELL BOYS PTY LTD

THE GLADES, MOONEE BEACH

STORMWATER MANAGEMENT PLAN

Department of Planning

*Major Project Number: **06_0143**, approved on **5 March 2009** by the Minister, in accordance with the Environmental Planning & Assessment Act 1979, subject to conditions of approval.*
Signed:



0 0.2 0.4 0.6 0.8 1 2 metres

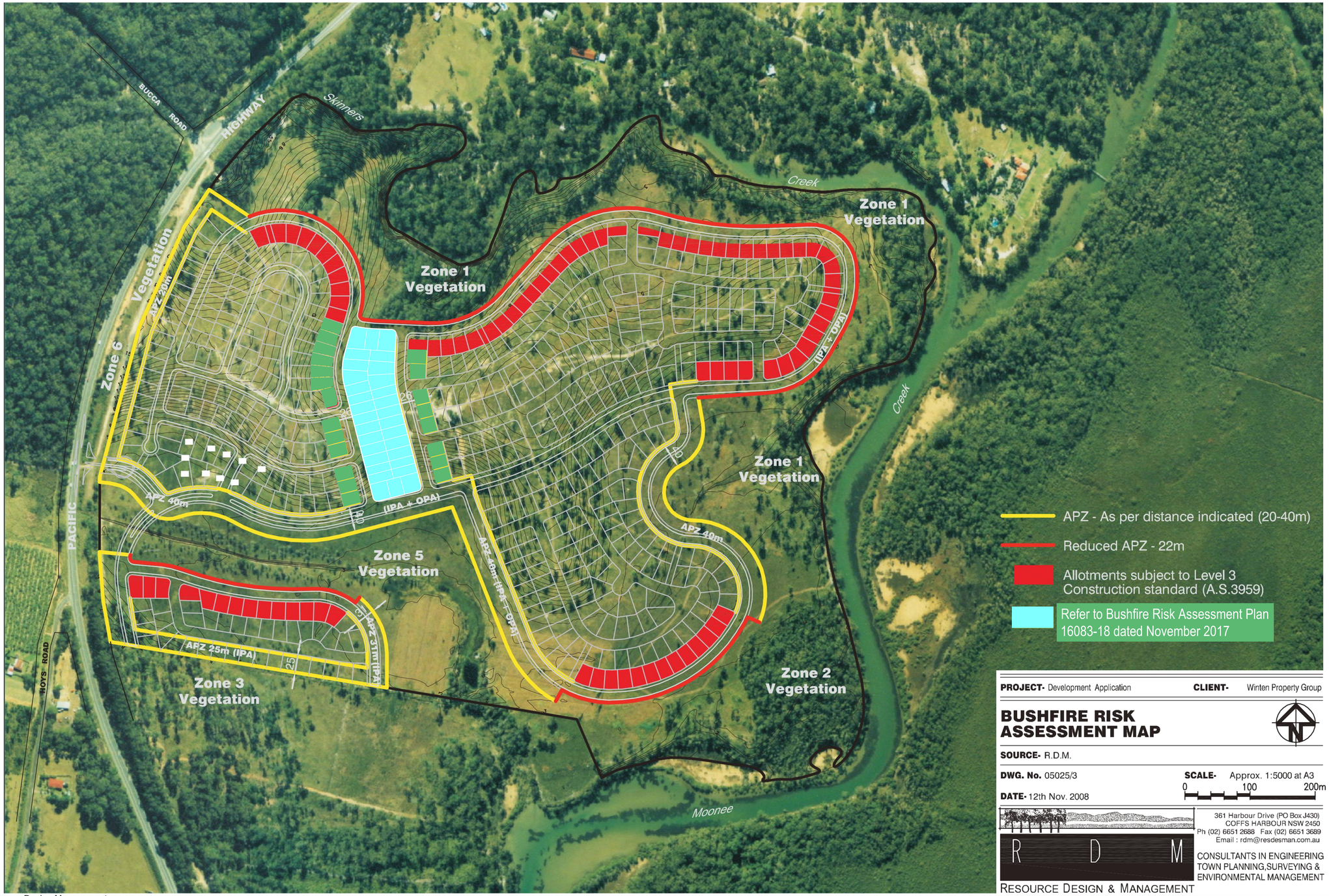
GILBERT+SUTHERLAND
agricultural and environmental scientists

Suite 12, Riverwalk One
140 Robina Town Centre Drive, Robina, Qld. 4226
Phone 55789944 Mobile 0418 760919 Fax 55789945

PROJECT
WINTEN PROPERTY GROUP
THE GLADES, MOONEE BEACH NORTH
TYPICAL BIORETENTION SWALE
CROSS SECTION

FIGURED DIMENSIONS TO BE READ IN PREFERENCE TO SCALING.	APPROVED	SCALE AS SHOWN	DRAWN A.J.F
		DATE 30/07/07	CHECKED

DRAWING No. GJ0339.5.4



PROJECT- Development Application **CLIENT-** Winten Property Group

BUSHFIRE RISK ASSESSMENT MAP

SOURCE- R.D.M.

DWG. No. 05025/3 **SCALE-** Approx. 1:5000 at A3

0 100 200m

DATE- 12th Nov. 2008

361 Harbour Drive (PO Box J430)
COFFS HARBOUR NSW 2450
Ph (02) 6651 2688 Fax (02) 6651 3689
Email : rdm@resdesman.com.au

R D M

CONSULTANTS IN ENGINEERING
TOWN PLANNING,SURVEYING &
ENVIRONMENTAL MANAGEMENT

RESOURCE DESIGN & MANAGEMENT

Source: Resource Design Management

ERM

0 200m

Approximate Only

Annex B **Bushfire Risk Assessment Map**
- Dated December 2008

RESOURCE DESIGN & MANAGEMENT PTY LTD

PROJECT: Development Application

DATE: 25th March 2019
DWG. No. 16083-18

SCALE 1:1250 at A3

0 25 50m

COVER OF EXCELLENCE®

Liability limited by a scheme approved under Professional Standards Legislation

BUSHFIRE RISK ASSESSMENT PLAN

LOTS 525 - 555

www.resdesman.com.au

Department of Planning

*Major Project Number: **06_0143**, approved on **5 March 2009** by the Minister, in accordance with the Environmental Planning & Assessment Act 1979, subject to conditions of approval.*

Signed:

BUCCA ROAD

LOT 2 on DP 725785
(Area = 3.359 ha)
PARK

PACIFIC HWY

HOYS RD

Skinners Creek

Moonee Creek

Road 1 Road 2 Road 3 Road 4 Road 5 Road 6 Road 7 Road 8 Road 9 Road 11 Road 12 Road 13 Road 14 Road 15 Road 22

1	67 lots
2	40 lots
3	59 lots
4	61 lots
5	51 lots
6	61 lots
7	48 lots
8	48 lots
9	50 lots
10	42 lots
11	28 lots

LOT 1 on DP 725785
(Area = 92.550 ha)

PARK

57

HIGHWAY ACCESS DELETED CONSTRUCTION ACCESS ONLY REFER TO CONDITIONS B1, B2

CONSTRUCTION

Stage	No. of Lots
1	67
2	40
3	59
4	61
5	51
6	61
7	48
8	48
9	50
10	42
11	28
TOTAL	555

Approximate Area of Land to be Dedicated:

Phase 1 - 19ha (To be dedicated after Stage 3 works completed)
Phase 2 - 18ha (To be dedicated after Stage 7 works completed)
Phase 3 - 8ha (To be dedicated after Stage 9 works completed)
Total - 45ha

Legend

Construction Stage

Open Space Areas to be Dedicated

- Stage 1 (Phase 1)
- Stage 2 (Phase 1)
- Stage 3 (Phase 1)
- Stage 4 (Phase 1)
- Stage 5 (Phase 2)
- Stage 6 (Phase 2)
- Stage 7 (Phase 2)
- Stage 8 (Phase 1)
- Stage 9 (Phase 3)
- Stage 10 (Phase 1)
- Stage 11 (Phase 1)

Source: AUSPACIFIC Engineers Pty Ltd 04-1600 November 2006

ERM

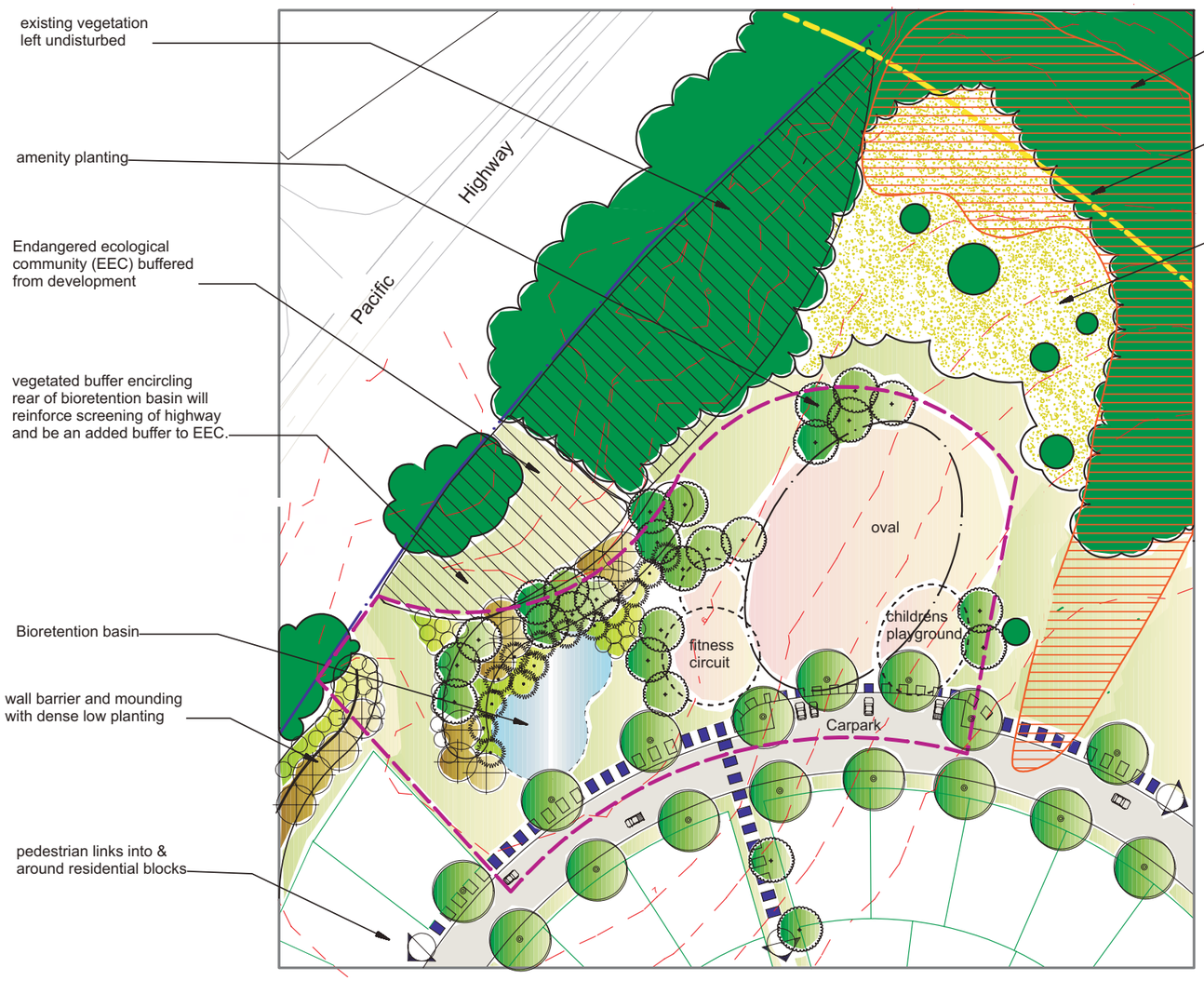
0 100m
Approximate Only

updated plan
Issued Jan 2018

Annex E

Staging of Open Space Dedication to Council - *Dated December 2008*

The Glades Estate, Coffs Harbour- Preferred Project Report Nov 08



Active Recreation Node 1

Recreation emphasis is on facilitating active use of open space. The node will cater to adults and older children. The recreation node is kept away from environmentally sensitive elements. It has direct pedestrian and vehicular links to the proposed residential development. Its construction and maintenance will not impinge into creek buffers or areas of cultural interest.

The recreation node may contain:

Mown oval (approx 75m x 50m) to allow for kick around games
Fitness track circuit
Play equipment for older children
BBQS
Seating and picnic tables
Carparking

Legend

- Mown Grasslands Containing Scattered Clumped Trees
- Area Managed to enable Natural Regeneration of Species
- Potential Archeological Deposit
- Endangered Ecological Community
- Existing Canopied Vegetation
- Recreation Node
- Property Boundary
- Skinners Creek 50m Buffer
- Pedestrian Route

Source: Anne Harrison Landscape Architect Plan 1 - Active Recreation Node 1

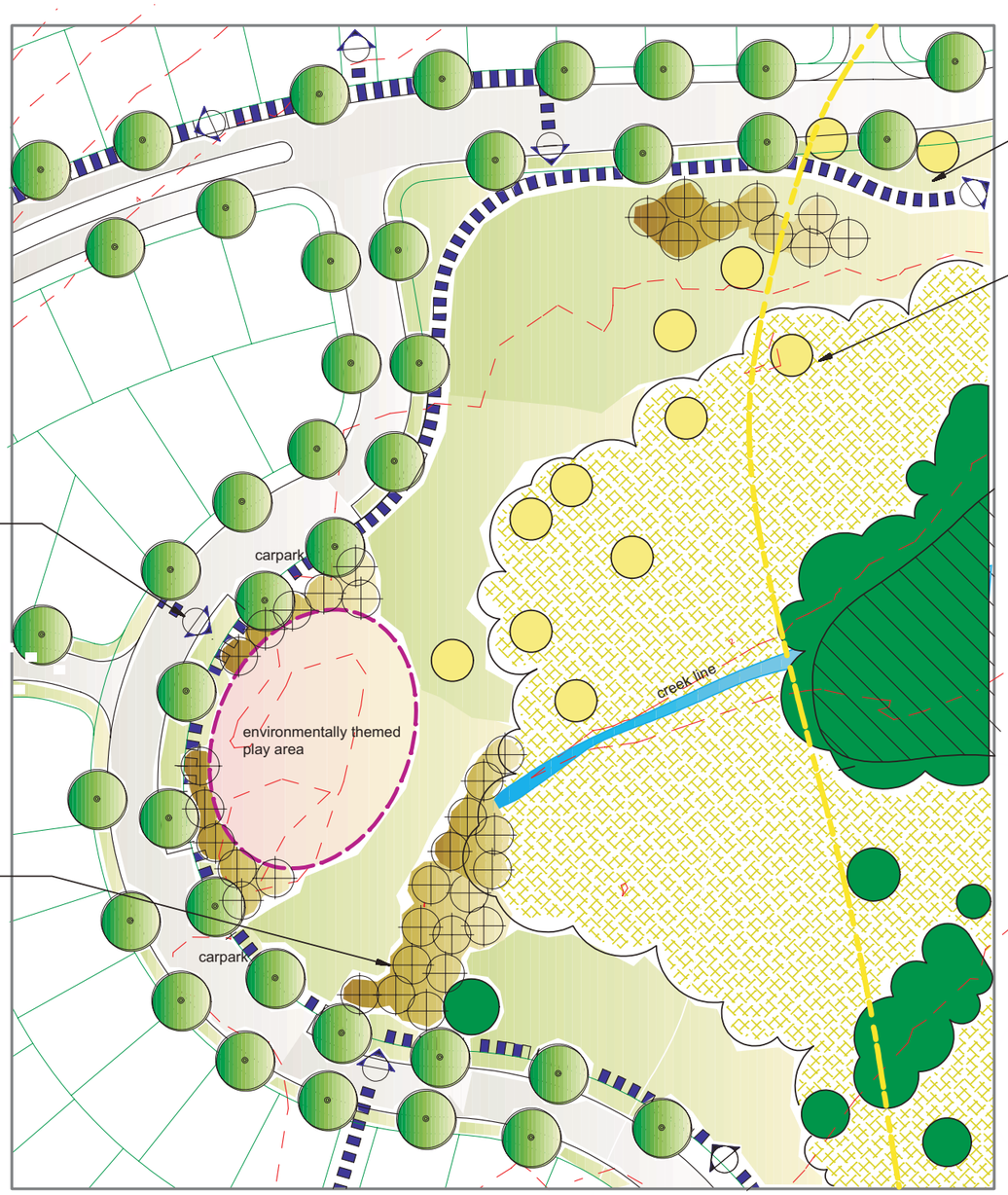
ERM

0 50m

Approximate Only

Annex H - Plan 1

Active Recreation Node 1
- Dated December 2008



Passive Recreation Node 2

Recreation emphasis is on explaining and incorporating environmental and cultural elements into recreation use Recreation will be more passive in nature and cater more to younger children. The node will be managed to facilitate informal family gatherings

The recreation node is kept away from ecologically and culturally sensitive regions of the site. It is readily accessible from multiple points within the proposed residential blocks.

Its theme will help promote positive custodial ownership of the surrounding Moonee Creek environs.

The recreation node may contain:

play equipment for young children
Seating and picnic tables
Interpretive material
planting for shade and amenity
BBQs
carparking

Legend

- Existing *Melaleuca sieberi*
- Mown Grasslands Containing Scattered Clumped Trees
- Area Managed to enable Natural Regeneration of Species
- Endangered Ecological Community
- Existing Canopied Vegetation
- Recreation Node
- Moonee Creek 100m Buffer
- Pedestrian Route

Source: Anne Harrison Landscape Architect Plan 2 - Passive Recreation Node 2

ERM

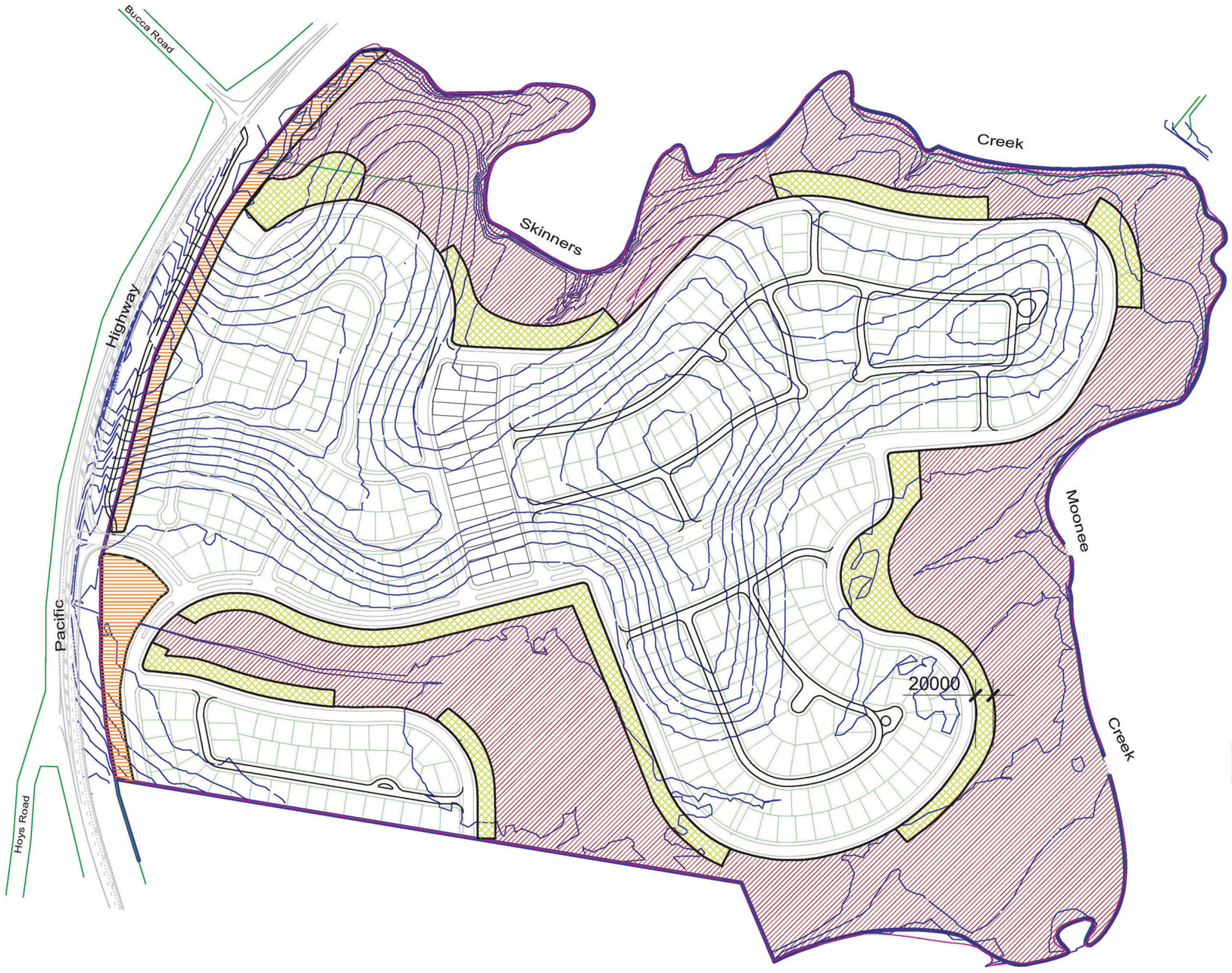
0 50m

Approximate Only

Annex H - Plan 2

Passive Recreation Node 2

- Dated December 2008



Legend

Open Space - Category 1 Natural Areas

Development and management of open space is directed at environmental protection, vegetation rehabilitation and improving habitat ecology

Open Space - Category 2 Residential and Recreation Areas

Development and management of open space is focussed on providing appropriate recreation facilities, asset protection and enhancing existing vegetation

Open Space - Category 3 Environmental Scenic Highway Buffer

Emphasis of development and management of open space is on screening, noise abatement and providing a connecting pedestrain / cycle route to access areas north and south of the site

Note: Open Space makes up over 40% of the total site area

updated plan
Issued Jan 2018

Source: Anne Harrison Landscape Architect Plan 3 - Broadscale Open Space Type

ERM

0 100m
Approximate Only

Annex H - Plan 3

Broad Scale Open Space Type
- Dated December 2008

In sensitive areas buffers to Skinners creek are increased from the minimum 50 metres

Recreation Node 1

20 metre highway buffer revegetated as thickly as APZ and service constraints will allow

Modification of existing vegetation will occur within highway buffer zone New roadside planting will accompany the construction of the entry road

Thinning of trees and understorey to reduce fire hazard

Recreation Node 2

Site Boundary

Landscape Features

Open space comprises over 40% of the total development parcel. The natural landscape and its enhancement will play a key role in defining the over all natural coastal character of this subdivision.

Built areas are logically placed to cause minimal disturbance to vegetation and be well away from sensitive low lying areas.

Native species are to be used in all areas to be maintained for natural vegetation. Biodiversity of the site should increase as remnant vegetation is strengthened.

All green open space areas are multi purpose;
filtering stormwater, recreation, visual amenity and sustaining the environmental integrity of the site

All work outlined on this plan will commence following consent of the plan. The strengthening of vegetation within buffer zones will be a priority so that plants are established prior to occupancy

Legend

Existing forest, swamp and mangrove communities protected and enhanced. Grazing removed and recreation contained to structured path ways These areas will be fenced to allow rehabilitation to occur

Rehabilitation of indigenous forest communities. Natural buffer enhanced. Revegetation utilises existing seed source and fencing to aid re-establishment

Rehabilitation of existing wetland, sedgeland, swamp sclerophyll and heath communities. Revegetation utilises existing seed source and fencing to aid re-establishment

Revegetation of indigenous heath community. Slashing is to cease to allow natural recovery of plant species. The majority of this area will also be fenced to aid re-establishment

Intensive landscape management within this zone. Recreation facilities are contained within areas of grassed open space with feature planting and interconnected via pathways. Area will be regularly mown and monitored to ensure quality of all landscape and recreation features

Proposed grouped indigenous tree planting (no understorey)

Connecting laneway or median strip, will be intensively managed and contain pathway, trees and grass

* Any area shown white internal to the site will be mown and operate with dual primary purposes of storm water filtration and secondly as open space suitable for a variety of recreation uses

Asset Protection Zone (APZ)

This zone has been identified for bushfire protection and complies with requirements recommended by the NSW Rural Fire Service. This zone also acts as an effective buffer between urban dwellings and natural vegetation. The APZ is part of the open space network and is characterised or may contain:

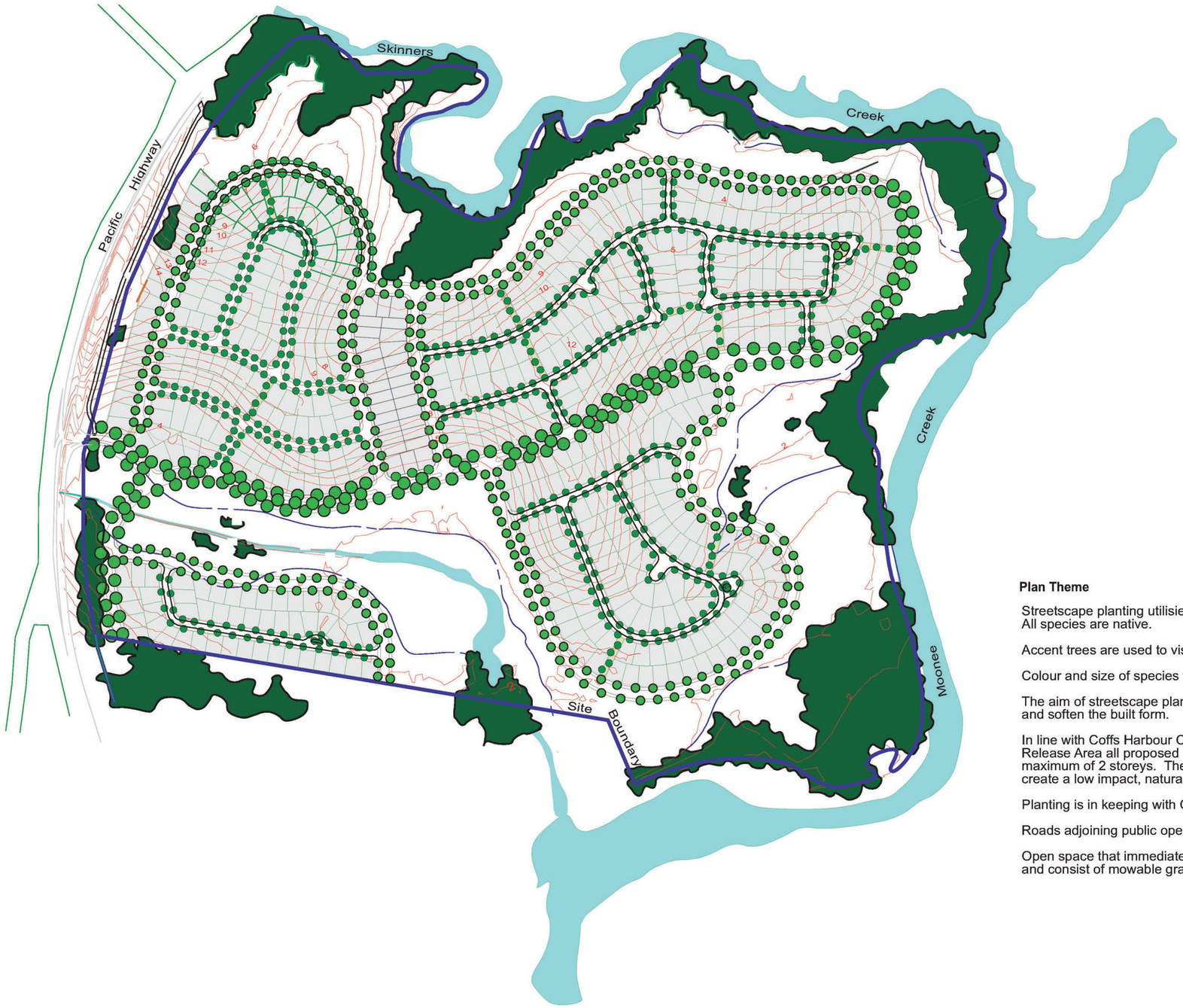
recreation nodes
perimeter roads
block setbacks
walking / cycle tracks
playground / picnic facilities
trees with no understorey
will be slashed or mown regularily
will operate as storm water filtering areas

updated plan
Issued Jan 2018

Source: Anne Harrison Landscape Architect Plan 4 - Vegetation Management

ERM

0 100m
Approximate Only



Legend

Existing Vegetation - comprising

Dry sclerophyll forest/woodland communities
swamp sclerophyll communities and
Intertidal communities

Boulevard Trees - Indicative species
(refer appendix 2 for full species list)

Lophostemon confertus (Brush Box)
Backhousia citriodora (Lemon Scented Myrtle)
Flindersia australis (Native Teak)

Avenue Trees - Indicative species

Melaleuca quinquenervia (Broad Leaved Paper Bark)
Buckinghamiana celsissima (Ivory Curl)
Eucalyptus robusta (Swamp Mahogany)
Eucalyptus microcorys (Tallow Wood)
Acmena smithii (Lilly-pilly)
Lophostemon confertus (Brush Box)

Street and Connecting Pathway Trees

Melaleuca sieberi (Sieber's Paper Bark)
Melaleuca leucadendra (Weeping Paper Bark)
Lophostemon suaveolens (Swamp Turpentine)
Cupaniopsis anarcardiodes (Tuckeroo)
Syzgium australe (Brush Cherry)
Tristaniopsis laurina (Kanuka)
Syzygium luehmannii (Riberry)
Callistemon salignus (White Bottlebrush)
Callistemon "Dawson River Weeper"

Plan Theme

Streetscape planting utilisies species found on site or found within the local area.
All species are native.

Accent trees are used to visually highlight thoroughfares.

Colour and size of species will vary according to the scale of the street to be landscaped.

The aim of streetscape planting is to provide shade and colour to the development and soften the built form.

In line with Coffs Harbour City Council's Development Control Plan for the Moonee Release Area all proposed buildings are low density, semi detached and restricted to a maximum of 2 storeys. These building controls combined with streetscape planting will create a low impact, natural coastal living environment.

Planting is in keeping with Coffs Harbour City Council's Street Tree Masterplan

Roads adjoining public open space will utilise planting and bollards to control access

Open space that immediately adjoins roadways will be utilised for stormwater run off and consist of mowable grassed swales

updated plan
Issued Jan 2018

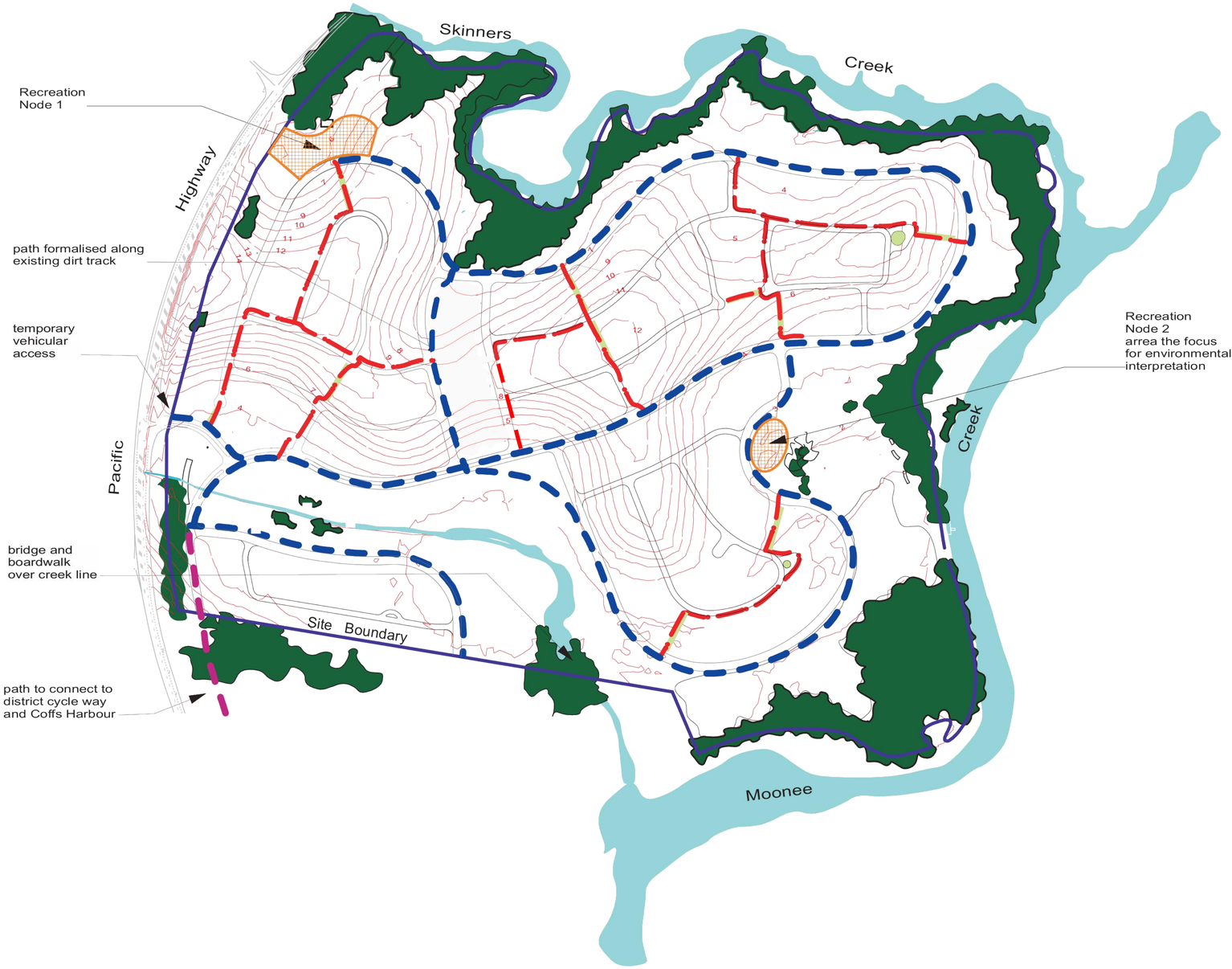
Source: Anne Harrison Landscape Architect Plan 5 - Streetscape

ERM

0 100m
Approximate Only

Annex H - Plan 5

Streetscape
- Dated December 2008



Legend

- Major pedestrian / cycle (shareway) routes may entail being; part of a grassed road easement or concrete footpath
- Main pedestrian / cycle boulevarde (shareway) This path will be part of a network which ultimately aims to link the northern beaches to Coffs Harbour
- Local connecting pathways will be concrete paved or elevated decks
- Focus of recreation activities and facilities. May comprise;
  picnic shelters
  BBQS
  open space for ball games
  playground

Plan Theme

The circulation plan for the site compliments the Coffs Harbour City Council's Development Control Plan "open space and circulation network"

The path network wraps around the entire site Internally pathways connect to give logical links through suburban areas allowing easy pedestrain access from one side of the site to the other

Pathway construction will vary in character depending on use and location. Pathways will be comprised of a combination of:

concrete
oxide coloured concrete
charcoal coloured conc pavers
timber (suitable for exposure to coastal climate)
"Safegrate"or "Safetread" - "X - treme" conditions
material used in and over marine / wetland locations

Updated Plan
January 2018

Source: Anne Harrison Landscape Architect Plan 6 - Path Network and Development Facilities

ERM

0 200m
Approximate Only

Annex H - Plan 6

Path Network and Development Facilities
- Dated December 2008

Recreation Node 1 - Active older childrens playground, space for ball games, picnic facilities and fitness circuit

20m Environmental Scenic Buffer / service easement will contain a vegetated buffer cycle / pedestrian path

Central vegetation and habitat corridor protected by permanent farm style fencing

pedestrian / green space link

main entry boulevard road

existing wetland and sedgeland communities strenthened protecting wallum froglet

pedestrian / cycle links to Moonee and Coffs Harbour

Skinners Creek

Pacific Highway

wildlife corridor

wildlife

corridor

osprey nest 100m

Moonee Creek

Moonee

Recreation Node 2 - Passive focus of recreation is on environmental interpretation of the Moonee Creek ecosystem. Area will contain small childs playground, carparking, picnic facilities and boardwalks

vegetation structure strengthened within 100m buffer protecting Moonee Creek environment

Legend

- Existing forest, sedgeland, swamp or mangrove communities
- Rehabilitated forest communities
- Rehabilitated swamp, sedgeland, heathland and wetland communities
- Rehabilitated Heathland
- Grasslands - mown regularly
- Proposed indigenous tree planting
- Boulevard Trees
- Avenue Trees
- Street and Connecting Pathway Trees
- Major recreation node area contains: picninc facilities, carparking and elements for outdoor play
- Low density housing

updated plan
Issued Jan 2018

Plan Theme

The Glades will be a high quality built environment, surrounded by open space, reflecting in character its beautiful natural coastal setting. The development where possible will enhance the sites many natural assets and create opportunities for people to enjoy them.

The Glades

Source: Anne Harrison Landscape Architect Plan 7 - Landscape Concept Plan

ERM

0 200m
Approximate Only

Annex H - Plan 7

Landscape Concept Plan
- Dated December 2008

Legend

Permanent farm style timber post and wire fence pedestrian access through fence gaps and bollards will be installed to control pedestrian movement where desired. Vehicular access gained through padlocked gates for maintenance purposes.

Temporary timber and star picket combination fence with 3- 4 strand wire. Gates to be installed to correspond where access is required for maintenance. Fencing will be progressively removed as each civil construction stage ceases

Rehabilitation and strengthening of existing native vegetation areas

- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5

updated plan
Issued Jan 2018

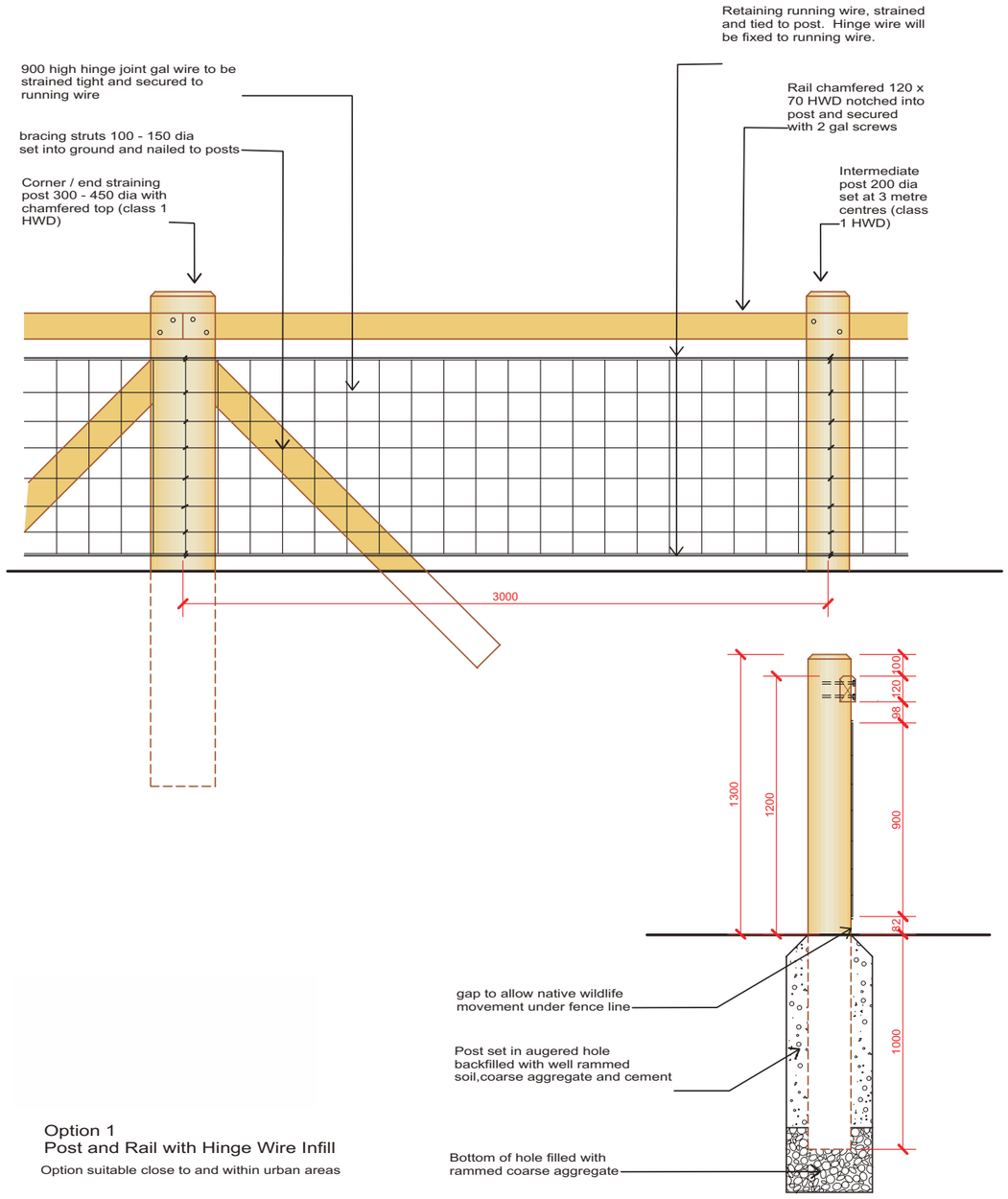
Source: Anne Harrison Landscape Architect Plan 8 - Landscape Staging

ERM

0 200m
Approximate Only

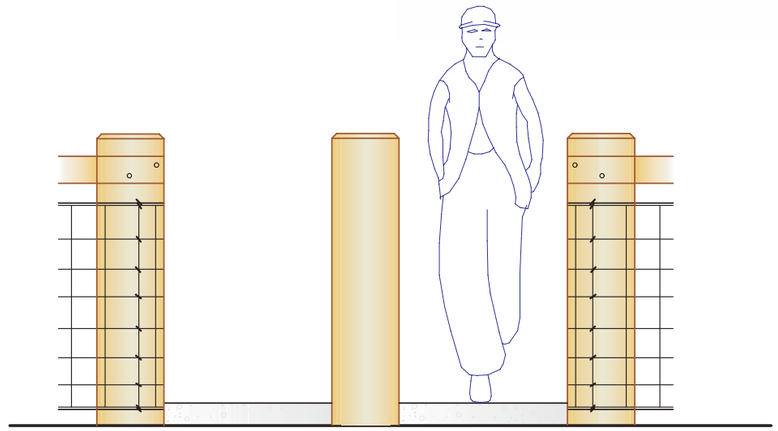
Annex H- Plan 8

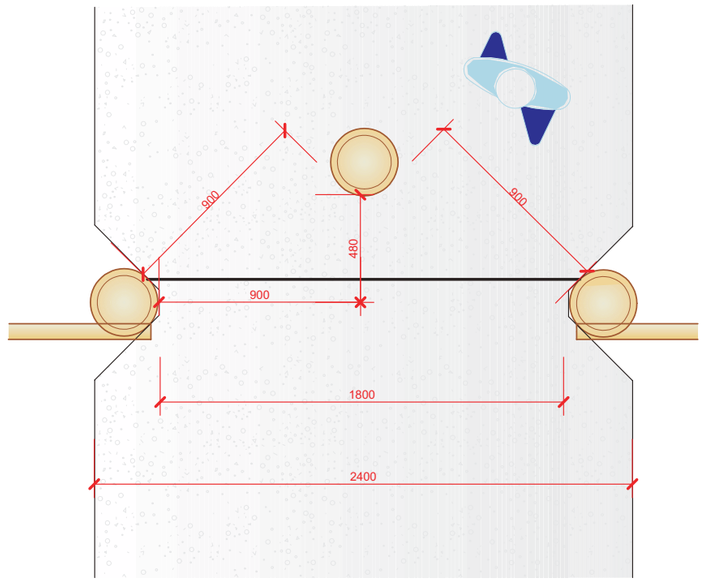
Landscape Staging Plan
- Dated December 2008



Option 1
Post and Rail with Hinge Wire Infill

Option suitable close to and within urban areas



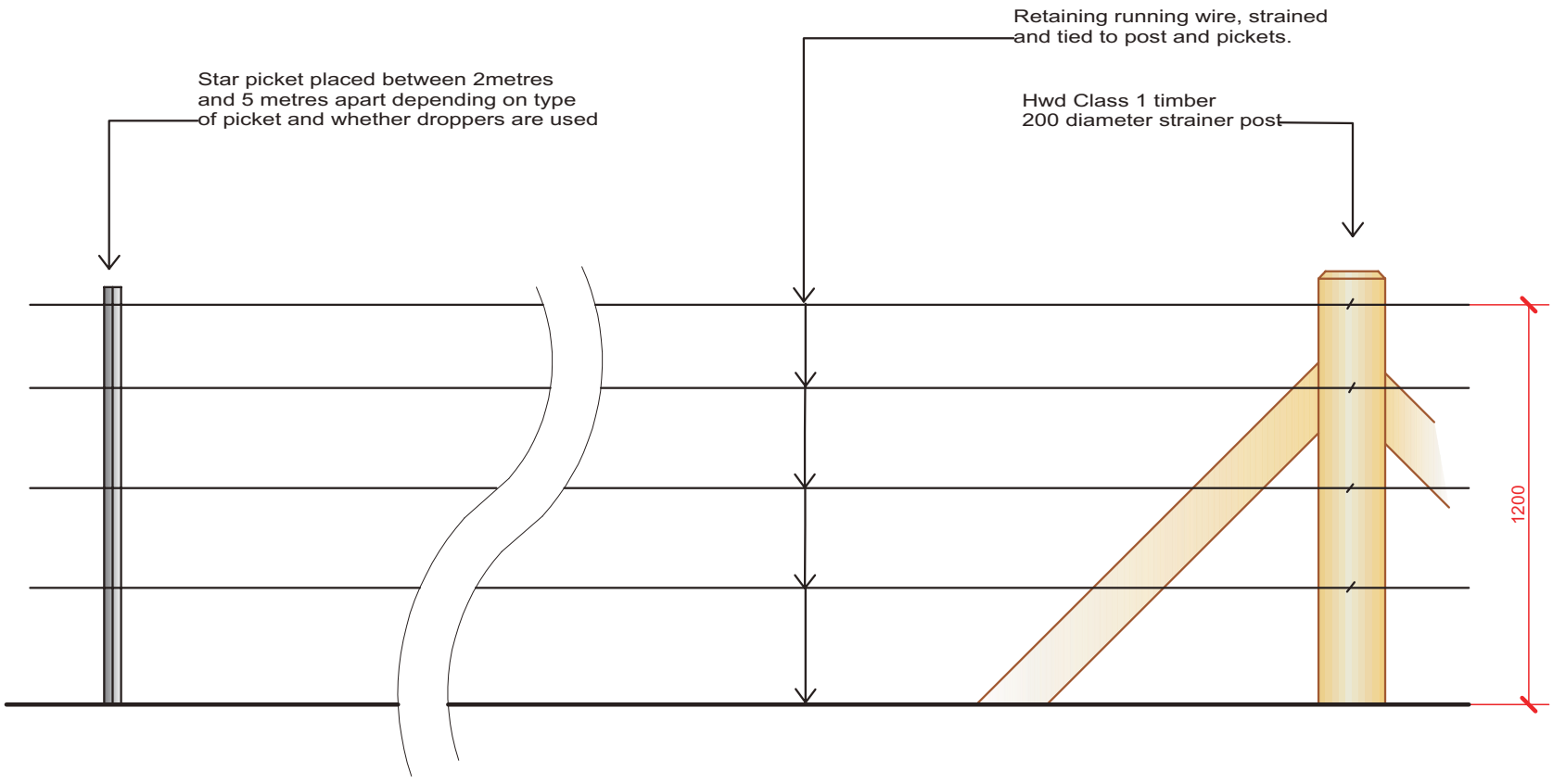


PEDESTRIAN ACCESS POINT

Source: Anne Harrison Landscape Architect Plan Option 1 Permanent Fence

ERM

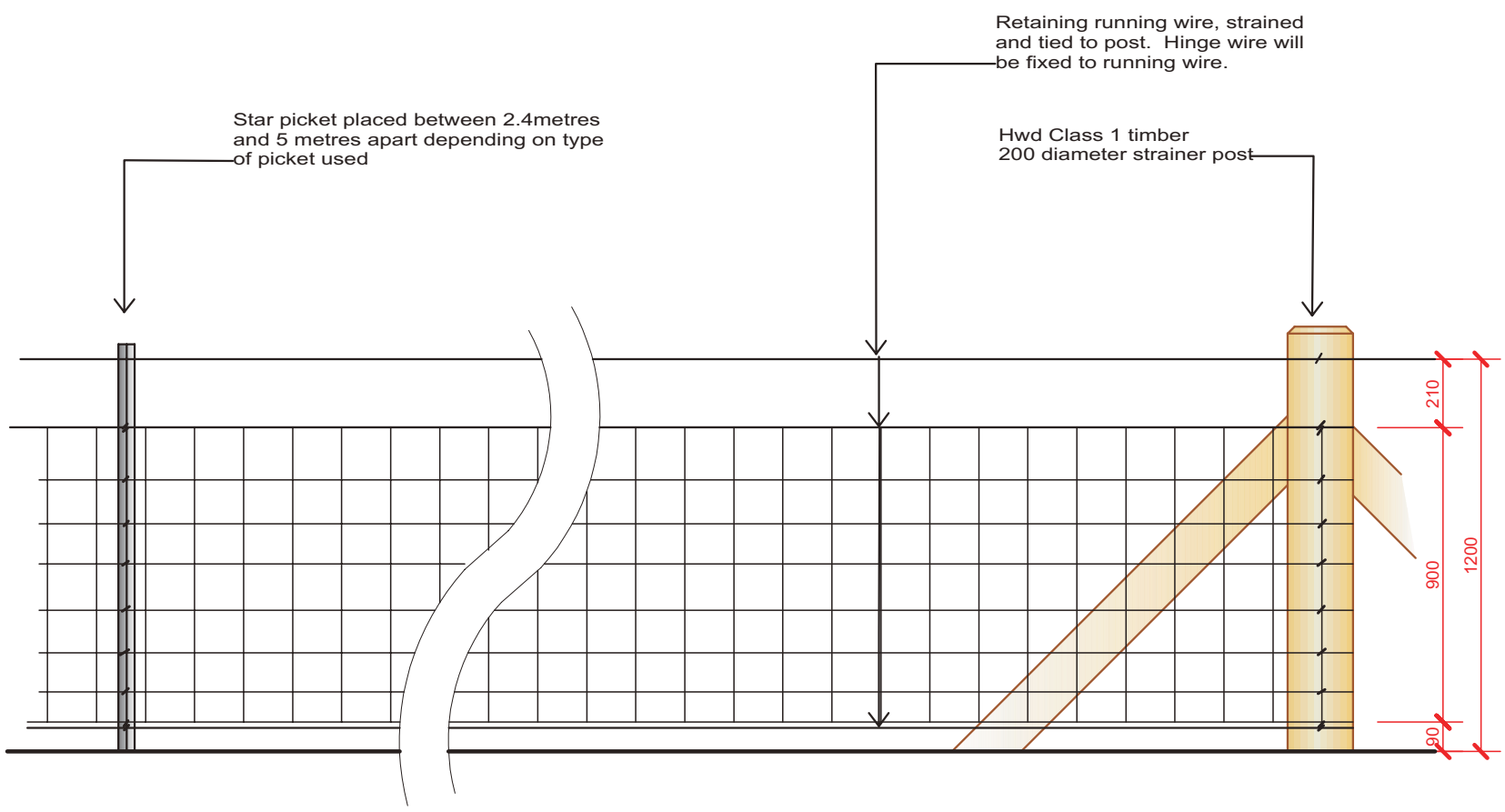
0 500m
Approximate Only



TEMPORARY / PERMANENT FENCE

Option 2
Post - Picket and Strained Wire

Option suitable for temporarily fenced areas and permanently fenced remote locations where emphasis is on natural regenration



PERMANENT FENCE

Option 3
Post - Picket and Hinge Wire

Option suitable for areas requiring restricted pedestrain access but not located within highly trafficed urban locations

Source: Anne Harrison Landscape Architect Plan Temporary/Permanent Fence Option 2 & 3

Annex H - Plan 11

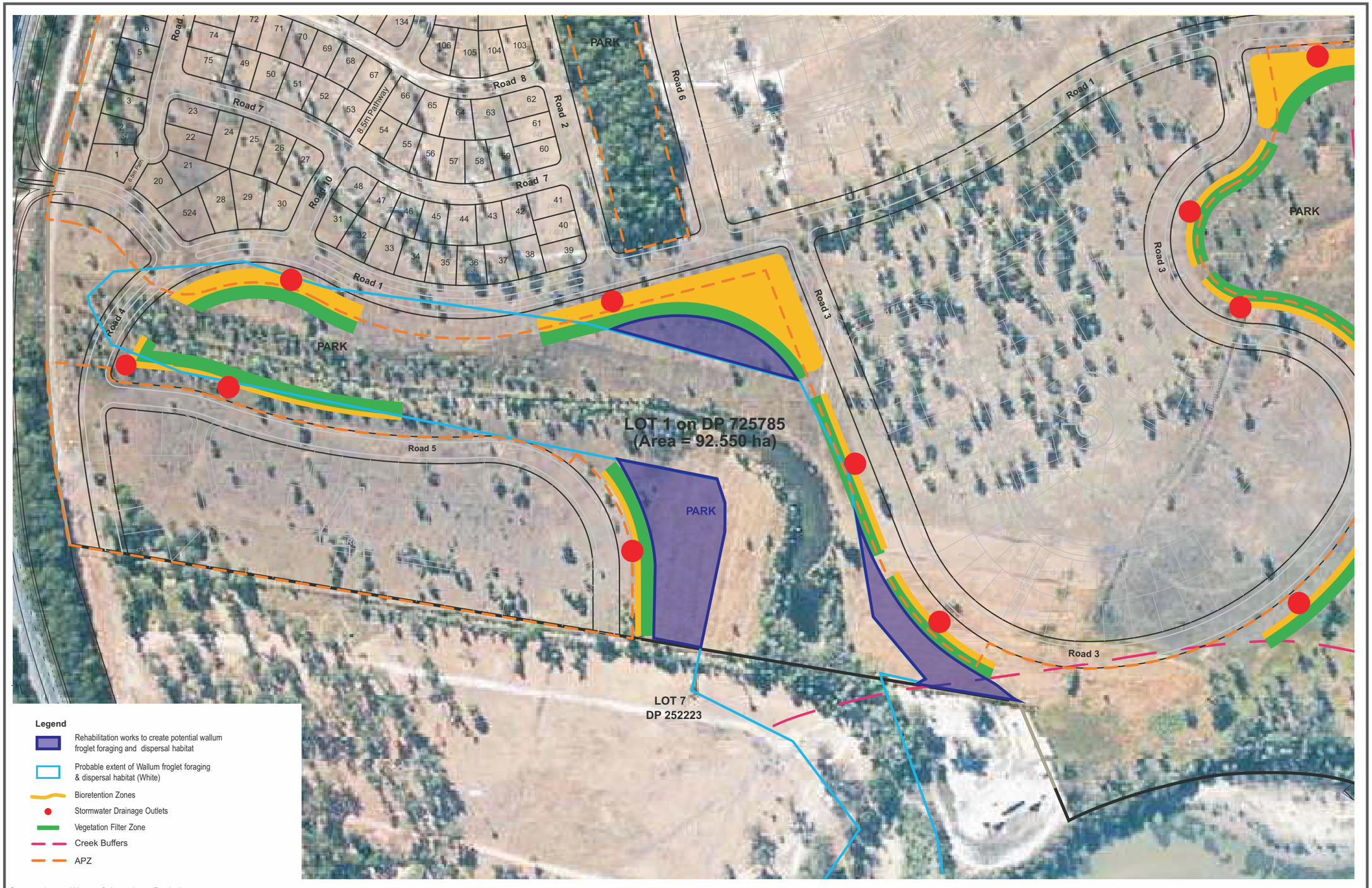
Temporary/Permanent Fence Option 2 & 3
- Dated December 2008

The Glades Estate, Coffs Harbour- Preferred Project Report Nov 08

ERM

0 500m
Approx Only

Jobs/2005/0037659/EA/AnnexH/Preferred Project Report - Temporary/Permanent Fence Option 2 & 3.cdr 27 11 2008 JD Environmental Resources Management Australia Pty Ltd



Source: James Warren & Associates Pty Ltd

ERM

0 100m

Approximate Only

Annex K

Additional Potential Wallum Froglet Habitat
- Dated November 2008

Legend

- Silt Fence
- Sediment Basin
- Cut Off Swales
- Catchment Boundary
- Direction of Construction Flows
- Creek Buffers

NOTE:

ALL WORKS TO BE WHOLLY CONTAINED WITHIN THE BOUNDS OF THE ASSET PROTECTION ZONE

TO BE READ IN CONJUNCTION WITH GILBERT & SUTHERALND STORMWATER ASSESSMENT & DRAWING No's 1600-P6 FOR STORMWATER OUTLETS AND STORMWATER TREATMENT DETAILS

NOTES

SILT AND SEDIMENT CONTROL

1 EROSION AND SEDIMENT CONTROL DEVICES SHALL BE INSTALLED ON SITE IN ACCORDANCE WITH THE REQUIREMENTS OF THE COFFS HARBOUR CITY COUNCIL AND THE EPA'S 'MANAGING URBAN STORMWATER'.

2 THE CONTRACTOR IS TO INSPECT ALL SEDIMENT AND EROSION CONTROL DEVICES IMMEDIATELY AFTER AND IF NECESSARY DURING RAINFALL EVENTS.

3 TOPSOIL AND STOCKPILED SOIL SHALL BE STORED/BUNDED IN A MANNER TO PREVENT SOIL BEING WASHED OFFSITE. ALL SOIL PROCESSING AREAS WILL DRAIN INTO SEDIMENTATION BASINS NO NET LOSS OF SEDIMENT SHOULD OCCUR FROM THE WORK SITE. THIS WILL NECESSITATE THE USE OF APPROPRIATE EROSION AND SEDIMENT CONTROLS. THESE SHOULD BE IMPLEMENTED AT THE SITE ESTABLISHMENT PHASE AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
CARE SHOULD BE TAKEN TO PREVENT SEDIMENT FROM ENTERING THE STORMWATER SYSTEM. THIS MAY INVOLVE PLACING ADDITIONAL SEDIMENT CONTROLS AROUND STOCKPILES AND/OR SILT TRAPS IN GULLIES, TABLE DRAINS AND INLET STRUCTURES AS DIRECTED.

4 THE CONTRACTOR SHALL AT ALL TIMES WITHIN ALLOTMENTS AND PARK LANDS MINIMISE THE DISTURBANCE OF THE EXISTING VEGETATION INCLUDING GRASS COVER, AND IF REQUESTED SHALL ROPE OFF OR SIMILARLY PROTECT ANY AREAS DIRECTED BY THE SUPERINTENDENT.

5 OUTSIDE THE CONSTRUCTION AREA EXISTING SURFACE STORMWATER RUNOFF IS TO BE MAINTAINED WHEREVER POSSIBLE.

6 THE CONTRACTOR IS TO ENSURE STORMWATER CONTROL IS ACHIEVED BY THE MAINTENANCE OF NEGATIVE GRADE BACK TO THE CONSTRUCTED SEDIMENTATION BASINS WHEREVER POSSIBLE.

7 STORMWATER DISCHARGE FROM THE SITE SHALL CONFORM TO THE FOLLOWING QUALITY CRITERIA - pH 6.5 to 8.5, SUSPENDED SOLIDS <50mg/l.

8 SHAKE DOWN AREA - THE CONTRACTOR SHALL PROVIDE A SHAKE DOWN AREA FOR CONSTRUCTION, SERVICE AND STAFF VEHICLES ENTERING AND LEAVING THE PUBLIC ROADS. THE CONTRACTOR SHALL LOCATE THE SHAKE DOWN AREAS TO SUITE SITE ACTIVITIES. THE SHAKE DOWN AREA SHALL COMPRISE 150mm THICK LAYER OF COURSE RIVER GRAVEL AVERAGE SIZE 75mm. OVER MI. A34 GEOFABRIC FOR AN AREA OF 15 m x 5m.

DUST CONTROL

1 THE CONTRACTOR SHALL PROVIDE AN ON SITE WATER CART AT ALL TIMES DURING CONSTRUCTION.

2 CLEARING OF LAND AND MAJOR EARTHWORKS WILL BE RESTRICTED IN SITUATIONS OF HIGH WIND.

3 STOCKPILES ONSITE WILL BE MINIMISED WHERE POSSIBLE AND LOCATED AWAY FROM THE EFFECTS OF PREVAILING WINDS ON EXISTING DWELLINGS.

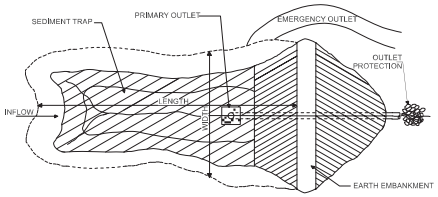
4 ALL PERMANENT BUNDS, BATTER AND DISTURBED AREAS ARE TO BE REVEGETATED AS QUICKLY AS POSSIBLE.

ON SITE EQUIPMENT

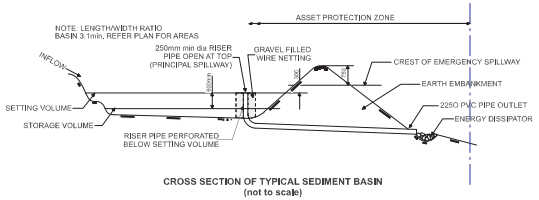
1 THE CONTRACTOR SHALL MINIMUMISE THE ON SITE MAINTENANCE OF MACHINERY WHEREVER POSSIBLE.

2 ALL STORAGE, PREPARATION AND DISPOSAL OF FUELS AND OILS IS TO TAKE PLACE UNDER THE SUPERVISION OF THE EARTHMOVING CONTRACTOR WHO WILL BE RESPONSIBLE FOR ANY SITE DECONTAMINATION.

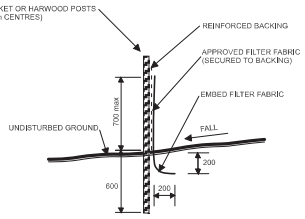
3 THE CONTRACTOR IS TO ENSURE THAT A SUITABLE PRODUCT DESIGNED TO CONTAIN AND ABSORB FUEL AND OIL SPILLS ON WATER IS AVAILABLE ONSITE.



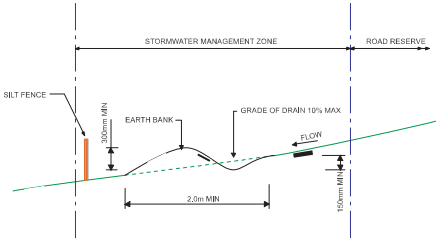
PLAN VIEW OF TYPICAL SEDIMENT BASIN
(not to scale)



CROSS SECTION OF TYPICAL SEDIMENT BASIN
(not to scale)



FILTER FABRIC SILT FENCE
(not to scale)



TEMPORARY DIVERSION CHANNEL
(not to scale)

Source:AUSPACIFIC Engineers Pty Ltd 04-1600 P10 A Nov 2006

ERM

0 100m
Approximate Only

Figure 3.1 **Preliminary Erosion and Sediment Control Plan**

The Glades Estate, Coffs Harbour - CEMP

Appendix B – Revised Draft Conditions

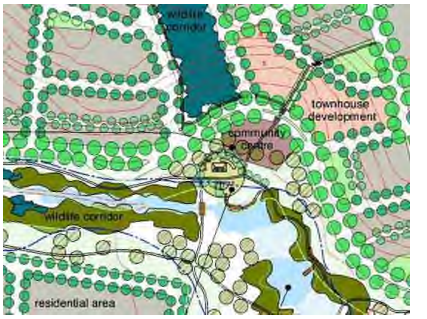
Project Approval 06_0143 MOD 4

NSW Planning and Environment

Rothwell Boys Pty Ltd

Lot 1 & 2 DP 725785

The Glades, Moonee Beach NSW



April 2019

Modification of Conditions

Resource Design & Management Pty Ltd
361 Harbour Drive
PO Box 4430
COFFS HARBOUR JETTY NSW 2450
www.resdesman.com.au
02 6651 2688

Executive Summary

This report supports an Application for the subdivision of land described as Lot 1 & 2 in DP 725785 Parish of Moonee, County of Fitzroy.

This application is made under the provisions of Part 3A Major Projects (Transition Provisions) Section 75W of the *Environmental Planning and Assessment Act 1979.*

The proposed modification involves the subdivision of part of the land into 31 residential allotments ranging in area, between 516m^2 and 742m^2.

The proposal comprises earthworks modification, vegetation removal and the extension to Council's water, sewer and reuse mains as well the provision of roads, walkways and open space.

The following are the proposed Modification of Conditions sought. In Condition A1 through to E17, the conditions have been redacted highlighted in red and new text is highlighted in green.

In regard to conditions A2, A3, A4, B15, B16 and E11 it is also proposed to add new sections to these Conditions.

In regard to Conditions E18 (1) and 19 it is proposed to delete these Conditions in their entirety and replace them with new Conditions.

SCHEDULE 1

Project Approval:	MP 06_0143 granted by the Minister for Planning on 05 March 2009.
For the following:	A residential subdivision of land into 553 lots, site earthworks (cut and fill), the provision of roads and associated infrastructure, open space, recreation facilities and playing fields, and a pedestrian/ cycleway network.
On land comprising:	Lots 1 and 2 DP725785, Pacific Highway, Moonee Beach
Modification:	MP 06_0143 MOD 4: • Modify Consent to include an extra Stage of Development for an additional 31 allotments. • Modify Conditions: o A1 (1) o A1 (3) o A1 (7) – delete sub condition (7) o A1 (11) o A2– delete sub-condition 1)iii) o A3 – insert into table new & revised drawings and dates o A4– insert new sub-condition (5) o A6 o B3 o B8 o B13 o B13 (v) & B13 (x) – delete reference to noise attenuation barriers or acoustic mounds o B15(A) – insert new condition regarding offsets and enhancement measures o B16 insert reference to new Bushfire Risk Assessment Report and Plan o C10 o D3 (2) o D6 (1) – delete condition and replace with reference to new Flood Assessment o D6 (2) - delete condition and replace o E2 (5) o E7 (4) (iv) o E11 (1) o E11 (3)

- E14 (1)
- E16
- E17 delete condition
- E18 (1)
- E18 (6)
- E19 (1)
- E19 (2)

SCHEDULE 2

RECOMMENDED CONDITIONS OF APPROVAL

MAJOR PROJECT NO. 06_0143

PART A—ADMINISTRATIVE CONDITIONS

A1 Project Description

Project approval is granted only to carrying out the project described in detail below:

1) Construction of a staged residential subdivision to create a total of ~~524~~ 555 lots within eleven (11~~)~~ stages;
   Construction of an internal network of roads, pedestrian paths and cycle ways;

2) In Schedule 2, Condition A1 the following:

A1 Project Description

Project approval is granted only to carrying out the project described in detail below:

1) Construction of a staged residential subdivision to create a total of ~~524~~ 555 lots within eleven (11~~)~~ stages;
2) Construction of an internal network of roads, pedestrian paths and cycle ways;
3) Provision of approximately ~~45~~ 43 hectares of open space / habitat conservation areas, including construction of two formal recreation nodes providing a range of facilities including barbeques, picnic shelters, informal playing fields, children's playgrounds and associated car parking;
4) Bulk earthworks (cut and fill);
5) Construction of associated infrastructure including water supply mains, sewerage mains, stormwater drainage structures, water quality and detention structures;
6) Construction of associated Asset Protection Zones;

~~7) Construction of noise attenuation measures, adjacent to the Pacific Highway;~~

8) Construction of the main pedestrian / cycleway linking the site to the south along the collector road;

9) Provision of fencing to riparian, environmental buffer zones and corridors,

10) Associated landscaping, street planting and rehabilitation / strengthening of existing native vegetation areas to be retained, and

11) Construction of temporary construction access to the Pacific Highway. Notes:

i) Release of construction certificates requires finalisation of arrangements for the construction of the northern collector at Moonee Beach including agreements being signed by respective landowners of neighbouring lots to the south of the site. Refer to condition **B1.**

ii) Release of subdivision certificates requires the construction and completion of the northern collector road at Moonee Beach and the removal of temporary construction access to the Pacific Highway. Refer to conditions **B1, B2 & E3.**

~~iii) Release of subdivision certificates for lots beyond the 149th lot is subject to either the completion of the planned Moonee Beach interchange (as set out in the RTA highway upgrade project) or a traffic study being undertaken for the intersection and implementation of any required improvements as approved by the RTA. Refer to conditions E3 and **E4**.~~

A2 Staging

The project is to be constructed in eleven (11~~)~~ stages; generally as follows:

1) Stage 1

i) ~~62~~ 67residential lots

ii) 1 lot for a potential corner store.

~~iii) Construction of noise mitigation measures for road traffic noise.~~

2) Stage 2

i) 40 residential lots

ii) Construction of Recreation Node No.1.

3) Stage 3

i) ~~47~~ 59 residential lots

ii) Dedication to Council of Phase 1 Open Space, ~~19~~17 ha.

4) Stage 4

i) ~~47~~ 61residential lots

5) Stage 5

i) 51 residential lots

6) Stage 6

i) 61 residential lots

ii) Construction of Recreation Node No.2.

7) Stage 7

i) 48 residential lots

ii) Dedication to Council of Phase 2 Open Space, 18ha.

8) Stage 8

i) 48 residential lots

9) Stage 9

i) 50 residential lots

ii) Dedication to Council of Phase 3 Open Space, 8ha.

iii) Construction of pedestrian / cycleway linking site to the south along the collector road.

10)Stage 10

i) 42 residential lots

11)Stage 11

i) 28 residential lots

Essential infrastructure, including roads, shall be constructed as specified in the staging listed above.

A3 Project in Accordance with Plans

The project shall be undertaken generally in accordance with the following drawings:

Project and Engineering Drawings prepared by Auspacific Engineers			
Drawing No.	Revision	Name of Plan	Date
P1	F	Preliminary Lot Layout ~~–~~ updated plan – Issued Jan 2018.	~~February 2009~~Jan 2018
P3	C	Bulk Earthworks and Noise Attenuation Barriers ~~–~~ updated plan – Issued Jan 2018.	~~December 2008~~Jan 2018
P3/1	A	Typical Noise Attenuation Barrier Sections ~~–~~ updated plan – Issued Jan 2018.	~~17 April 2008~~ Jan 2018
P4	A	Roadworks Typical Sections	April 2008

P5	C	Stormwater Drainage and Catchment Plan	~~April 2008~~ Jan 2018
P6	B	Stormwater Outlets and Swale Sections	September 2007
P7	A	Conventional Sewerage Reticulation Concept Plan	~~April 2008~~ Jan 2018
P9	C	Water Reticulation Concept Plan	~~April 2008~~ Jan 2018
Engineering Drawings prepared by Gilbert & Sutherland			
Drawing No.	Revision	Name of Plan	Date
GJ0339.5.3a		Stormwater Management Plan	30 July 2007
GJ0339.5.4		Typical Bioretention Swale Cross Section	30 July 2007
Project and Landscape Drawings prepared by ERM			
Drawing No.	Revision	Name of Plan	Date
Annex B (05025/3)		Bushfire Risk Assessment Map (Resource Design & Management)	~~December 2008 (12 Nov 2008)~~Nov 2017
Annex E		Staging of Open Space Dedication to Council	~~December 2008~~ Jan 2018
Annex H — Plan 1		Active Recreation Node 1	December 2008
Annex H — Plan 2		Passive Recreation Node 2	December 2008
Annex H — Plan 3		Broad Scale Open Space Types – updated plan – Issued Jan 2018.	~~December 2008~~ Jan 2018
Annex H — Plan 4		Vegetation Management – updated plan – Issued Jan 2018.	~~December 2008~~ Jan 2018
Annex H — Plan 5		Streetscape (Street Tree Planting) – updated plan – Issued Jan 2018	~~December 2008~~ January 2018
Annex H — Plan 6		Path Network and Development Facilities – updated plan – Issued Jan 2018.	~~December 2008~~Jan 2018
Annex H — Plan 7		Landscape Concept Plan – updated plan – Issued Jan 2018.	~~December 2008~~Jan 2018
Annex H — Plan 8		Landscape Staging Plan (fencing details) – updated plan – Issued Jan 2018.	~~December 2008~~Jan 2018

Annex H — Plan 10		Permanent Fence Option 1	December 2008
Annex H — Plan 11		Temporary/Permanent Fence Options 2 & 3	December 2008
Annex K		Additional Potential Wallum Froglet Habitat	November 2008
Annex L		Engineering Details (Typical Street/Road Sections	December 2008
Figure 3.2		Preliminary Erosion and Sediment Control Plan (in Construction Environmental Management Plan, Preferred Project Report, September 2008)	November 2006
Project and Engineering Drawings prepared by Resource Design & Management			
Drawing No.	Revision	Name of Plan	Date
16083-10		Cover Sheet	January 2018
16083-11		Overall Site Plan	November 2017
16083-12		Layout Plan	November 2017
16083-13		Cut & Fill Plan – Depth Contours	November 2017
16083-14		Road & Drainage and Erosion & Sediment Control plan	November 2017
16083-15		Sewer Reticulation Plan	November 2017
16083-16		Water Reticulation Plan	November 2017
16083-18		Bushfire Risk Assessment Plan	March 2019
Project Vegetation Rehabilitation/Revegetation Offset Drawing prepared by James Warren & Associates			
Drawing No	Revision	Name of Plan	Date
N02066_Fauna Mvt		Figure 16 – Proposed Offset Areas & Possible Fauna Movements After Development	22 February 2018

A4 Project in Accordance with Documents

The project shall be undertaken generally in accordance with the following documents:

1) *Environmental Assessment Report* prepared by ERM on behalf of Rothwell Boys Pty Ltd, dated November 2007; and,

2) *Preferred Project Report* prepared by ERM on behalf of Rothwell Boys Pty Ltd, dated September 2008.

3) *Post Preferred Project Submission* prepared by ERM on behalf of Rothwell Boys Pty Ltd, dated December 2008.

4) Section 75W modification application and supporting documents from Environmental Resources Management Australia, dated 2 June 2011.

5) Section 75W modification application and supporting documents from Resource Design and Management Pty Ltd, dated February 2018.

A5 Inconsistency between documents

In the event of any inconsistency between:

1) The conditions of this approval and the Statement of Commitments in Schedule 3, the conditions of this approval prevail.

2) The conditions of this approval and the drawings/documents referred to in conditions A3 and A4, the conditions of this approval prevail; and

3) Any drawing/document listed in conditions A3 and A4 and any other drawing/document listed in conditions A3 and A4, the most recent document shall prevail to the extent of the inconsistency.

A6 Certification & Staging

1) Staging of the Development

The staging of the project is to occur generally in numerical order, commencing with Stage 1. It is noted that staging may vary in timing according to market forces.

2) Construction Certificate

Prior to the commencement of subdivision works the proponent must obtain a Construction Certificate from either the Council or an accredited certifier for each stage of the subdivision before any subdivision work can commence for each stage.

3) Subdivision Certificate

Prior to registration of a plan of subdivision under Division 3 of Part 23 of the *Conveyancing Act 1919* for any allotments in any stage within the subdivision a Subdivision Certificate pursuant to Sections 109C(1)(d) and 109D of the Act must be obtained from the Council or an accredited certifier for each stage of the subdivision.

This approval relates to the subdivision of ~~524~~555 allotments and is not bound by the sequence of staging shown in the approved plans, however any changes to the sequence of staging in the approved plans must be agreed in writing by Coffs Harbour City Council.

A7 Lapsing of Approval

This project approval shall lapse (5) years after the date the project approval is endorsed by the Minister, unless works the subject of the 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.

PART B—PRIOR TO ISSUE OF CONSTRUCTION CERTIFICATE

Provision of Access to the site

B1 Access via Northern Collector Road

1) Access to the site shall be provided via the northern collector road (generally as identified in Moonee Development Control Plan 2004 or as otherwise agreed to by the Department) from its existing northern limit (near Tidal Crescent) to the southern boundary of the site, over Lot 5 DP 252223, Lot 6 DP 252223, and Lot 1 DP 1097743.

2) Prior to the issue of any Construction Certificate for the project the proponent shall provide to the satisfaction of Council and the Certifying Authority evidence of appropriate legal agreements being signed with landowners of Lot 5 DP 252223, Lot 6 DP 252223, and Lot 1 DP 1097743, for the construction of the northern collector road and associated project infrastructure works, over the respective lots.

   The proponent shall also provide to the satisfaction of Council and the Certifying Authority evidence of any relevant assessments and approvals required under the Act and the *Roads Act* 1993 being in place to enable commencement of the construction of the northern collector road (generally as identified in Moonee Development Control Plan 2004 or as otherwise agreed to by the Department).

3) The funding of the road is subject to agreements with the landowners of Lot 5 DP 252223, Lot 6 DP 252223, and Lot 1 DP 1097743 and also subject to the provisions of Moonee Developer Contributions Plan ~~2008~~2017 and any agreed credits for 'works-in-kind', refer to condition E18.

B1A Construction Certificate for Bulk Earthworks

Notwithstanding any other conditions in this approval, a construction certificate to undertake bulk earthworks (cut and fill) across the site and the installation of sewer rising main can be issued at any time provided that satisfactory arrangements have been made to deal with all relevant impacts

associated with these bulk earthworks and sewer rising main works, including but not limited to matters set out in conditions B2, B4, B5(7), B8, B9, B10, B11 and B12.

NOTE: In this instance the requirements of conditions B2, B4, B5(7), B8, B9, B10, B11 and B12 as listed above relate only to what is required to be completed prior to the issue of a construction certificate for bulk earthworks. All conditions listed in PART B of this approval are relevant for the issue of construction certificates for each stage of the Glades Estate development in its entirety.

B2 Construction Access from Pacific Highway

1) Temporary access to the site for construction of the project may be gained directly from the Pacific Highway. The design of the temporary access shall be to the satisfaction of the RTA. Evidence of the RTA's satisfaction shall be provided to the Certifying Authority prior to the issue of any Construction Certificate.

2) The temporary access shall only be used for construction purposes in relation to the approved project and not for general access to the site, to future lots and dwellings.

3) Upon completion of the northern collector road (refer to conditions **B1** and E3) this temporary access shall be removed and the area rehabilitated to the satisfaction of Council, and within the road reserve to the satisfaction of the RTA.

4) The proponent is responsible for all costs associated with the approval, design and construction of the temporary access, any required traffic management measures, and the removal of the temporary access and landscaping and rehabilitation of this area.

Road Traffic Noise

B3 Road Traffic Noise — Revised Acoustic Assessment

1) A revised acoustic assessment prepared by an appropriately qualified acoustic consultant must be submitted to the Certifying Authority for approval prior to the issue of a Construction Certificate for the western and northern perimeter lots of stages 1, 2, 3 and 9 (lots 1-20, 84-96, and 474-479) of the project. This shall demonstrate that the following noise criteria can be achieved at the most affected boundaries of the nominated allotments and specify noise mitigation measures to be implemented for inclusion with the first construction certificate for construction with the initial stage/s of the project:

   i) Day (7am —10pm): $L_{Aeq(15hr)}$55dB(A).

   ii) Night (10pm — 7am): $L_{Aeq(9hr)}$50dB(A).

2) Where the above external noise criteria would not feasibly or reasonably be met, the following internal noise criteria should be applied on affected lots for all habitable rooms under ventilated conditions complying with the requirements of the Building Code of Australia:

i) All habitable room other than sleeping rooms:

– Day (7am -10pm)- $L_{Aeq(15hr)}$45dB(A),

– Night (10pm — 7am) $L_{Aeq(9hr)}$40dB(A).

ii) Sleeping rooms: $L_{Aeq(9hr)}$35dB(A).

Notes:

i) The revised acoustic assessment is required in order to take into account the deletion of access to the Pacific Highway (refer to condition **B1)** and alternative treatment required for this area, as well as road traffic noise and mitigation measures arising from the RTA Pacific Highway upgrade project.

ii) 'Feasible or reasonable' is defined in Schedule 1, Part C.

iii) Internal noise criteria may be applied by means of building covenants or section 88B instruments, which will be required as part of the subdivision certificates for the affected lots.

Note:

The revised noise attenuation report identifies that a building covenant Section 88B instrument be applied to the following lots as shown on the Bulk earthworks and noise attenuation plan – Lots 1 to 31 inclusive; lots 74 to 92 inclusive; lots 119 to 123 inclusive; lots 475 to 487 inclusive; lots 499 to lot 501 inclusive; lot 523 and lot 524.

Traffic Management

B4 Traffic & Pedestrian Management Plan

1) Prior to the issue of a Construction Certificate for each stage of the project, a Traffic and Pedestrian Management Plan (as it relates to that stage) shall be prepared by an RTA accredited person in accordance with AS1742 and RTA publication 'Traffic Control at Works Sites' Version 2, and shall be submitted to and approved by the Certifying Authority. Safe public access shall be provided at all times. The Plan shall address, but not be limited to, the following matters:

   i) evidence of agreement from the RTA for any temporary construction access to and from the Pacific Highway, and compliance with their requirement for this access,

   ii) ingress and egress of vehicles to the site,

   iii) loading and unloading, including construction zones,

   iv) predicted traffic volumes, types and routes, and

   v) pedestrian and traffic management methods.

2) The Proponent shall submit a copy of each of the approved plans to Council.

   Note: Refer to Condition **B2** in respect to provision of temporary construction access to and from the Pacific Highway.

Road Design

B5 Roads, causeways, culverts and bridges

1) Kerb and gutter, stormwater drainage, interallotment drainage, full road width pavement including traffic facilities (roundabouts, median islands etc.), and paved footpaths shall be constructed along the full length of roads within the site.

2) All roads shall be in accordance with the relevant design requirements of Council. Final road design plans shall be prepared by a qualified practising Civil Engineer and submitted to the Certifying Authority prior to the issue of a Construction Certificate for each stage of the subdivision.

3) The centre traffic islands along Road 1 shall be deleted to ensure that there are no restrictions on vehicular access and manoeuvring for adjacent lots, or as otherwise agreed with Council.

4) All roads shall be designed to provide for adequate manoeuvring areas for service vehicles, including garbage trucks.

5) Staging of the project and road construction shall provide for interim turning and manoeuvring areas for all vehicles, including service vehicles.

6) Traffic calming measures shall be provided through the site.

7) The design of causeways, culverts and bridges shall have regard to terrestrial and aquatic fauna movement, and may include as relevant wet and dry sides, fauna furniture, fish passage, sediment and erosion controls, turbidity, stream flow and impact on stream bed or banks.

B6 Public Car Parking

Detailed construction plans shall be prepared to the satisfaction of Council for the car parks to be provided adjacent to the Recreation Areas/Nodes 1 and 2 prior to the issue of construction certificates for the relevant stages. The carparks shall be constructed as part of road works for areas adjacent to these recreation areas.

Public Transport

B7 Bus Stops

In order to ensure that pedestrians have adequate access to public transport, bus stops are to be constructed at appropriate locations through the site, subject to prior consultation with the relevant bus operators. The details of the type, location and operation of the structures are to be submitted to Council prior to the issue of the first Construction Certificate.

Acid Sulfate Soils

B8 Acid Sulfate Soil Testing

Prior to the issue of any Construction Certificates for Stages 4 to 11 inclusive, all soils in Stages 4 to 11 which are to be excavated below the current surface level in Zone 2 areas for Acid Sulfate Soils on the site (as identified in the Environmental Assessment and in *Acid Sulfate Soil and Groundwater Management Plan, Moonee Glades Residential Development, Moonee Beach,* prepared by Gilbert & Sutherland, August 2008) shall be tested for the presence of Acid Sulfate Soils.

B9 Acid Sulfate Soil Management Plan

A detailed Acid Sulfate Soil Management Plan for each stage of the project where Acid Sulfate Soils or Potential Acid Sulfate Soils have been identified, shall be prepared by a suitably qualified person in accordance with the *Acid Sulfate Soil Assessment Guidelines* (Acid Sulfate Soil Management Advisory Committee, 1998). The Management Plan shall be submitted to the satisfaction of the Certifying Authority prior to the issue of a Construction Certificate for that stage of the project.

Subdivision ***Works***

B10 Stormwater and Drainage Works Design

Final design plans of the stormwater drainage systems within the project, prepared by a qualified practicing Civil Engineer and in accordance with the requirements of Council shall be submitted to and approved by the Certifying Authority prior to issue of a Construction Certificate for each stage of the project. The hydrology and hydraulic calculations shall be based on models described in the current edition of *Australian Rainfall and Runoff.*

The final design plans shall be generally in accordance with the stormwater drainage concept plans prepared by Auspacific Engineers, refer to condition A3.

Monitoring

B11 Stormwater Monitoring Plan

In order to demonstrate that the stormwater management system satisfactorily complies with the intended design, prior to the issue of the Construction Certificate for the first stage of the project, a Stormwater Monitoring Plan (generally in accordance with the *Stormwater Infrastructure Maintenance Management Plan* prepared by Gilbert and Sutherland, May 2008) shall be approved by the Certifying Authority and shall be submitted to Council with any application under section 68 of the *Local Government Act 1993* to carry out stormwater drainage works.

Construction Management

B12 Construction Management Plan

1) Prior to the issue of a Construction Certificate for each stage of the project, a Construction Management Plan (as it relates to that stage) shall be submitted to and approved by the Certifying Authority. A copy of the approved plan shall be submitted to Council. The Plan shall address, but not be limited to, the following matters where relevant:

   i) hours of work;

   ii) contact details of site manager;

   iii) traffic and pedestrian management;

   iv) noise and vibration management;

   v) construction waste management;

   vi) dust management;

   vii) erosion and sediment control;

   viii) flora and fauna management, and

2) All cut and fill areas are to be topsoiled and seeded immediately after completion to protect the exposed areas from water and wind erosion. The earthwork staging details are to be shown on the Construction Certificate.

3) Erosion and sediment controls and management strategies shall be certified by a qualified Environmental or Engineering consultant in accordance with the Landcom publication "Managing Stormwater, Soils and Construction" 2004 (the 'Blue Book').

Landscaping and Open Space Management

B13 Detailed Landscape Plans

Prior to the issue of Construction Certificates for each stage, detailed landscape plans are to be submitted to the satisfaction of the Certifying Authority and a copy provided to Council, for those areas of the site associated with that stage which are to be dedicated as open space and are identified as Open Space Category 2 'Residential and Recreation Areas' and Open Space Category 3 'Environmental Scenic Highway Buffer' (as identified in the approved plan prepared by ERM 'Broad Scale Open Space Types' dated ~~December 2008~~ Jan 2018). The plans shall include, but not be limited to the following:

i) Existing features, including north point, access roads and location of trees to be retained or removed on site, to scale and identified by botanical and common names.

ii) Existing and proposed ground levels (shown as spot heights and/or contours over the site and direction and degree of slope) indicating the site boundaries, and the base of the trees proposed to be planted or that are to be retained (if applicable).

iii) Proposed and existing site services, including but not limited to water, gas, electricity, sewer, and stormwater and any easements on or adjacent to the site.

iv) Details of pedestrian access, circulation areas, and facilities within and around the project, including seating within recreation areas and along major pedestrian paths/routes.

v) Details of fences, gates, decorative features, retaining walls ~~or noise walls/acoustic fences,~~ and fencing (type and height) for the rear or western boundaries of Lots 1 to 19, adjacent to the Pacific Highway frontage.

~~Note: Any noise walls or acoustic fences are to be constructed in low maintenance materials such as concrete or 'Heber panels (not timber) and be in a suitable colour to blend with the landscaping.~~

vi) Landscape treatment for the site frontage to the Pacific Highway.

vii) Construction details of paving, edging, fencing, screening, panels and other hard landscape components.

viii) Details of installation of bollards to protect open space areas from unauthorised vehicle access. Maintenance vehicle access shall be provided.

ix) Details of stabilisation measures including topsoiling, seeding and planting for disturbed areas resulting from site earthworks, cutting and filling.

x) Details of landscaped planting associated with the areas zoned Environmental Protection 7B 'Scenic Buffer Zone' ~~and including any noise attenuation barriers or acoustic mounds~~, which shall be planted with endemic species.

ix) A detailed plant schedule and plans at an appropriate scale (1:100 to 1:250 for detailed plans and up to 1:500 for whole of site plans) indicating the location of all proposed planting and any existing vegetation to be retained on the site. The plant schedule shall include;

a) species listed by botanical and common names, with the majority of plants constituting local native species;
b) specific location, planting densities and quantities of each species; pot sizes; the estimated sizes of the plants at maturity, and proposed staking methods, if applicable.
c) maintenance methods including the use of drip irrigation and mulching or groundcovers to reduce bare soils areas and including a maintenance schedule for a minimum period of one year after completion of landscaping on site.

B14 Street Tree Plan

Prior to the issue of a Construction Certificate for each stage, a Street Tree Planting Plan shall be prepared by a qualified landscape architect or professional landscape consultant to the

satisfaction of the Certifying Authority and in accordance with the requirements of Council and Council's *"Street Tree Master Plan" and* a copy provided to Council.

B15 Vegetation Management Plan

1) Vegetation Management Plans (VMPs) are to prepared to the satisfaction of the Certifying Authority for those areas of the site to be dedicated as open space identified as Open Space Category 1 'Natural Areas' (as identified in the approved plan prepared by ERM 'Broad Scale Open Space Types' dated ~~December 2008~~ Jan 2018). VMPs may be prepared for those areas on a stage by stage basis or as one Plan and are to be submitted to Council prior to the issue of any Construction Certificate for the particular stage. Where a number of VMPs are to be prepared such VMPs must be prepared to a standard template.

2) The VMP shall be prepared by persons with professional qualifications and/or knowledge and experience in bush regeneration/stream rehabilitation practices and who are members of the Australian Association of Bush Regenerators (AABR). The VMP is to be in accordance with the guideline: "How to Prepare a Vegetation Management Plan — Version 4' (former Department of Natural Resources, undated).

3) The VMP shall also include but not be limited to the following matters:

   i. A locality plan identifying the property, a colour aerial photo of the property, a site plan showing proposed subdivision, contours, creeks, proposed APZ's on land to be dedicated to Council.
   ii. Identification and mapping of all native vegetation, including abundance codes and outline the methodology for ongoing management of all native vegetation, detailing the Initial and Follow Up Maintenance works required.
   iii. Identification and mapping of all noxious and environmental weeds as listed on Council's web site, including abundance codes and outline the methodology of removal and ongoing management of all such listed weeds, detailing the Initial and Follow Up Maintenance works required.
   iv. Detail of revegetation and compensation (koala feed trees, riparian and wetland species) treatment including cross sections, use local provenance plant species, densities, quantities, and protection of retained vegetation.
   v. Rehabilitation works and longer term habitat management and maintenance measures to create and manage Wallum froglet habitat areas including additional potential Wallum froglet foraging and dispersal habitat (as shown in plan prepared by ERM 'Additional Potential Wallum Froglet Habitat' December 2008).
   vi. Riparian and stream rehabilitation requirements of the Department of Water & Energy.
   vii. Identification and detail of fire and drought refuge areas along the creeks; retention and rehabilitation of wildlife corridors; wildlife crossings; and related traffic calming and speed control devices. Detail of exclusion fencing arrangements to provide barriers (where required) to koala movement, as well as detail of koala warning signage and

street lighting arrangements for early detection of koalas in movement corridors/roadways.

viii. Compensatory koala habitat revegetation is to be provided on site for secondary koala habitat to be removed from the site, in accordance with Council's Koala Plan of Management and at a ratio no less than 1:5 for Secondary Koala Habitat, and/or 1:10 for Secondary Koala Habitat and Endangered Ecological Communities.

ix. Maintenance, monitoring and reporting schedule.

x. Information regarding the timing of the works.

B15(A) Offsets and Habitat Enhancement Plan

1) An Offsets and Habitat Enhancement Plan (OEHP) is to be prepared to the satisfaction of the Certifying Authority for those areas of the site identified as "Proposed Rehabilitation / Offset Areas (13.7Ha)" and the "Proposed Revegetation / Offset Areas (3.87ha) that are identified in "Figure 16 - Proposed Offset Areas and Possible Fauna Movements After Development Plan" prepared by James Warren & Associates dated 22 February 2018.

2) The OEHP is to be prepared coincident with the VMP (Condition B15) and may be prepared on a stage by stage basis coincident with the VMP for that stage or as one Plan and is to be submitted to Council prior to the issue of any Construction Certificate for the particular stage. Where a number of OEHP are to be prepared such OEHP must be prepared to a standard template.

3) The OHEP shall be prepared by persons with professional qualifications and/or knowledge and experience in bush regeneration/stream rehabilitation practices and who are members of the Australian Association of Bush Regenerators (AABR).

4) The OHEP is to outline the offset and enhancement work and shall as a minimum:

i. Describe the works required to assist natural regeneration and/or planting of native shrubs and groundcovers (where necessary) in addition to Koala Food trees;

ii. Describe the measures to suitably monitor and control weeds and pest animals;

iii. Identify locations where nest boxes are to be placed. Note: a variety of nest boxes are to be placed on a proportional basis to offset the loss of particular hollow resources.

iv. Require the salvage of habitat features such as bush rock, hollow logs and woody debris (from the development site) for re-use / relocation as ground habitat within rehabilitation areas;

v. Consider the installation of fauna exclusion fencing (where appropriate) to prevent native fauna species from accessing the development footprint, and to prevent cattle from accessing retained and rehabilitated vegetation areas in the short to medium term.

vi. Identify measures to minimise light spill from the development into habitat corridors;

vii. Implement targeted PCT benchmarks for monitoring and maintenance prior to the handover of open spaced areas to Council.

Bushfire Management

B16 Asset Protection Zones

Asset Protection Zones (APZs) are to be provided in accordance with the Bushfire Risk Assessment Map (Drawing No.05025/3) by Resource Design and Management, ~~dated 12 November 2008~~ as amended November 2017, and in accordance with the Bushfire Risk Assessment Plan (16083-18) by Resource Design and Management, dated March 2019. Details of the APZs (as it relates to each stage of the project) are to be provided to the satisfaction of the Certifying Authority prior to the release of the Construction Certificate for each stage of the project.

PART C—PRIOR TO COMMENCEMENT OF WORKS

C1 Surrender of Existing Consent

In order for the development of land to proceed in a coordinated and orderly manner and to avoid potential conflicts with this approval, the proponent shall surrender development consent 257/1993 (issued by Council on 22 June 1994 for a community title subdivision), subject to and in accordance with the Regulation, prior to the commencement of works. A copy of the notice of surrender shall be sent to the Department.

Notification Requirements

C2 Notice to be Given Prior to Commencement/Excavation

1) The Principal Certifying Authority shall give the Department and Council written notice at least 48 hours prior to the commencement of excavation, and subdivision works on the site for each stage of the project.

2) The Principal Certifying Authority shall give a minimum of 48 hours notice to the Proponent of any critical stage inspection or any other inspection nominated by the Principal Certifying Authority via the notice under Sections 75S and 81A of the Act.

C3 Source of Material for Filling of the Site

Once the Construction Certificate has been issued for each stage of the subdivision, any change in the source of fill (that is fill not sourced from the site) must be notified to the Certifying Authority and approval obtained to the new source prior to the import of any of the material. A report from a practicing geotechnical engineer certifying that the new source material is suitable for the intended purpose must be provided. The report must include any conditions on the use of the material and a report from a registered NATA laboratory on the soil properties of the fill material.

Pollution Control

C4 Erosion and Sediment Control

Prior to commencement of work on the site for each stage of the project, all erosion and sedimentation control measures relevant to that stage are to be installed and operational including the provision of a "shake down" area where required to the satisfaction of the Principal Certifying Authority.

Services

C5 Existing Services

The proponent shall locate and identify any existing sewer main, stormwater line or other underground infrastructure within or adjacent to the site and the Principal Certifying Authority advised of its location and depth prior to commencing works for each stage of the project. Prior to the start of any works the Principal Certifying Authority shall ensure there shall be no conflict between the project and existing infrastructure.

Contact Details

C6 Contact Telephone Number

Prior to the commencement of the works for each stage of the project, the Proponent shall forward to the Department and Council a 24 hour telephone number to be operated for the duration of the construction works.

Waste Material

C7 Movement of Trucks Transporting Waste Material

The proponent shall notify the RTA's Traffic Management Centre of the truck route(s) to be followed by trucks transporting any waste material from the site, prior to the commencement of the removal of any waste material from the site for each stage of the project.

Heritage

C8 Aboriginal Cultural Heritage - Artefact Sites

1) A semi-permanent high visibility fence shall be built at least 10 metres from the known boundary of Site 2 (areas of remnant vegetation which are not to be disturbed), Site 3, Site 4, Site 6 and Site 7 (as identified in Table 3.2 of the Aboriginal Cultural Heritage Assessment by ERM dated October 2007) prior to commencement of any work on the site, in order to protect these sites from any inadvertent harm by workers developing the site. The fence shall be built under the supervision of a qualified archaeologist and representatives of the local Aboriginal community (Including representative/s of the Local Aboriginal Land Council/s). The fence is to be kept in place for the duration of the construction period.

2) Employees and contractors undertaking earthworks on the site must be instructed that they are working close to a culturally sensitive area. It is possible that their works may uncover cultural material. Employees and contractors must be instructed to exercise caution when working on the site and must be instructed how to identify this cultural material and that, in the event that they do find any, they are to stop work immediately and follow the procedures set out in Condition **D14** of this approval.

Notes:

i) Any modifications to the project that may be required arising from findings of any additional archaeological ground surveys may require further approval of the Minister.

ii) iii) Under section 75U of the Act authorisations being a permit under section 87 or consent under section 90 of the *National Parks and Wildlife Act 1974,* related to additional archaeological surveys, are not required for an approved project.

Vegetation and Tree Clearing

C9 Procedures prior to Vegetation and Tree Clearing

1) Prior to commencement of tree removal, a search for the presence of Koalas, and chance occurrence of any other native faunal species is required prior to any clearing of vegetation. This search should include upper canopy, midstorey and or understorey resources. Pre-clearing searches and subsequent clearing shall include the following procedures:

   i) All hollows should be searched, preferably by spotlighting in the evening prior to commencement.

   ii) All checks shall be to a minimum distance of 50m immediately adjacent to the proposed clearing area.

   iii) Surveys for Koalas are required within a three metre radius from the base of any listed food trees/resources.

   iv) If any animal is located, the tree and any within a 50m radius must not be removed until the animal has moved on under its own accord or an arrangement has been made with the Department of Environment & Climate Change to relocate the fauna in question.

   v) All unplanned or accidental injuries shall be reported to WIRES immediately. Koalas should be secured by covering with a towel or blanket and then secured in a bin or box with existing air holes.

2) A qualified Ecological consultant is to be present on site during any identified vegetation clearance. Their role is to monitor works in sensitive areas, offer advice during the clearance process and be present to supervise recovery procedures in case of accidental harm to wildlife.

Riparian Buffers

C10 Fencing of riparian buffer zones, habitat areas and corridors.

Prior to commencement of any works on the site (except for bulk earthworks and sewer rising main installation where only temporary construction fencing is required to be erected) permanent and temporary fencing shall be erected to the perimeters of the riparian buffer zones, habitat areas and corridors for that relevant stage (in particular Open Space Category 1 'Natural Areas' as identified in the approved plan prepared by ERM 'Broad Scale Open Space Types' dated ~~December 2008~~ Jan 2018), generally as provided for in the Landscape Staging Plan Annex H Plan 8 prepared by ERM, dated December 2008.

PART D—DURING CONSTRUCTION

Construction Management

D1 Approved Plans to be On-site

A copy of the approved and certified plans, specifications and documents incorporating conditions of approval and certification shall be kept on the site at all times and shall be readily available for perusal by any officer of the Department, Council or the Principal Certifying Authority.

D2 Site Notice

A site notice(s) shall be prominently displayed at the Pacific Highway boundary of the site for the purposes of informing the public of project details including, but not limited to:

1. Details of the Contractor, Principal Certifying Authority and Site Superintendent, or equivalent, for all stages of the project.

2. The approved hours of work;

3. the name of the site/project manager, the responsible managing company (if any), its address and 24 hour contact phone number for any inquiries, including for construction/noise complaints are to be displayed on the site notice; and

4. To state that unauthorised entry to the site is not permitted.

D3 Protection of Trees and Vegetation — On Site

1) All trees on the site that are not approved for removal are to be suitably protected by way of tree guards, barriers or other measures as necessary, during construction of any stage of the subdivision.

2) Removal of noxious, environmental and significant weeds within vegetation regeneration areas (Open Space Category 1 'Natural Areas' as identified in the approved plan prepared by ERM 'Broad Scale Open Space Types' dated ~~December 2008~~ Jan 2018) is to have no impact on retained significant native vegetation.

3) Retained trees and vegetation are to be protected from collateral damage during the clearing process through directional felling of trees and restriction of heavy machinery access within the critical root zones.

4) Where vegetative reproducing exotic species are present, any debris falling into stream/creek as a result of subsequent clearing practices should be removed immediately without impact on stream bank or adjacent vegetation.

D4 Dust Control Measures

The project shall be carried out in a manner that minimises or prevents the emission of dust from the site, including wind blown and traffic generated dust. This shall include all

vehicles carrying soil, spoil or rubble, entering and leaving the site, being covered at all times except during loading and unloading.

Site Maintenance

D5 Erosion and Sediment Control

All erosion and sediment control measures, as designed in accordance with the approved plans are to be effectively implemented, managed and maintained at or above design capacity for the duration of the construction works for each stage of the project, and until such time as all ground disturbed by the works has been stabilised and rehabilitated so that it no longer acts as a source of sediment.

No clearing or stripping works shall be undertaken on the site until the erosion and sediment control measures are implemented.

A qualified Environmental or Engineering Consultant shall ensure that the erosion and sedimentation controls are appropriate for the site and current stage of construction.

D6 Filling of the Site

~~1) All residential allotments shall be filled to a minimum of the design flood level plus minimum 600mm freeboard, with minimum fill levels of RL 4.75mAHD in accordance with the approved plans.~~

1.) All proposed dwellings are to have a finished floor levels at 4.03 – 4.68 mAHD (0.5m higher than determined flood levels), in accordance with drawing PS01-K210 produced in the Martens Consulting Engineers Flood Assessment report dated January 2018.

~~2) Fill platforms must be set at a minimum of 2 metres above the 1 in 100 year flood level or the water table (whichever is the higher) in the southern open space areas that contain stormwater infrastructure, in accordance with AusPacific Engineers advice dated 4 April 2008. Finished levels must be to the satisfaction of Council.~~

2) Should the proposed development footprint change, or significant changes to the proposed design levels and/or culvert design occur (as shown on Drawing PS01-A050), an updated flood model with detailed earthworks should be prepared at Construction Certificate stage.

3) Proposed earthworks shall be carried out in accordance with AS 3798, "Guidelines on Earthworks for Commercial and Residential Developments". The earthworks shall be monitored by a Registered Geotechnical Testing Consultant to a level 1 standard in accordance with AS 3798. A certificate from a registered Geotechnical Engineer certifying that the filling operations comply with AS3798 shall be submitted to the Principal Certifying Authority upon completion.

4) During filling operations,

i) No fill is to be placed hydraulically within twenty metres (20m) of any boundary that adjoins private land that is separately owned. Fill adjacent to these boundaries is to be placed mechanically.

ii) All fill and cut batters shall be contained wholly within the site.

iii) All topsoil to be re-spread and the site to be grassed and landscaped, including battered areas.

Monitoring

D7 Monitoring of Stormwater Management System

The stormwater drainage system shall be monitored in accordance with the approved Stormwater Monitoring Plan throughout construction of each stage of the subdivision to demonstrate that it satisfactorily complies with the intended design.

1) Amendments to the system may be required to ensure compliance.

2) Monitoring shall continue post-construction for each stage of one year or until dedication occurs whichever is the later.

Noise and Vibration

D8 Hours of Work

The hours of construction for all stages of the project, including the delivery of materials to and from the site, shall be restricted as follows:

1) between 7:00 am and 6:00 pm, Mondays to Fridays inclusive;

2) between 8:00 am and 1:00 pm, Saturdays;

3) no work on Sundays and public holidays.

Works may be undertaken outside these hours where:

4) the delivery of materials is required outside these hours by the Police or other authorities;

5) it is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm;

6) the work is approved through the Construction Management Plan; and

7) residents likely to be affected by the works are notified of the timing and duration of these works at least 48 hours prior to the commencement of the works.

D9 Construction Noise Objective

1) The construction noise objective for all stages of the project is to manage noise from construction activities (as measured by a $L_{A10(15minute)}$ descriptor) so it does not exceed the background L_{A90} noise level by more than 5dB(A).

2) Background noise levels are those identified in the Environmental Assessment or otherwise identified in the approved Construction Management Plan. The Proponent shall implement all feasible noise mitigation and management measures with the aim of achieving the construction noise objective.

3) Any activities that have the potential for noise emissions that exceed the objective must be identified and managed in accordance with the approved Construction Management Plan.

4) If the noise from a construction activity is substantially tonal or impulsive in nature (as described in Chapter 4 of the NSW Industrial Noise Policy), 5dB(A) must be added to the measured construction noise level when comparing the measured noise with the construction noise objective.

D10 Vibration Criteria

For all stages of the project, vibration resulting from construction of all stages of the subdivision must not exceed the evaluation criteria presented in the *Environmental Noise Management — Assessing Vibration: A Technical Guide (DEC, 2006).*

D11 Use of Crushing Plant Machinery

The use of crushing plant machinery, mechanical screening or mechanical blending of materials is not permitted on the site without separate further approvals being obtained under the Act.

Heritage

D12 Impact of Below Ground (Sub-surface) Works - Non-Aboriginal Objects

If any archaeological relics are uncovered during the course of the work in any stage of the project, then all works shall cease immediately in that area and the NSW Heritage Office contacted. Depending on the possible significance of the relics, an archaeological assessment may be required before further works can continue in that area.

D13 Impact of Below Ground (Sub-surface) Works — Aboriginal Objects

1) In the event that future works during any stage of the project disturb Aboriginal artefacts or relics, works at or adjacent to the material must stop immediately. Temporary fencing must be erected around the site and the material must be identified by an independent and appropriately qualified archaeological consultant. The Department of Environment and Climate Change, Coffs Harbour, the Coffs Harbour Local Aboriginal Land Council (LALC), the Yarrawarra Aboriginal Corporation and

the Garby Elders must be informed. These groups will advise on the most appropriate course of action to follow. Works must not resume at the location without the prior written consent of the Department of Environment and Climate Change.

2) A surface collection of artefacts must be undertaken by representatives of the Aboriginal community and an archaeologist in Site 1, the portion of Site 2 to be disturbed and Site 5 (as identified in Table 3.2 of the Aboriginal Cultural Heritage Assessment by ERM dated October 2007).

PART E—PRIOR TO ISSUE OF SUBDIVISION CERTIFICATE

E1 Subdivision Certificate

Prior to the registration of final subdivision plan in the Office of the Registrar-General, a subdivision certificate shall be obtained for each stage of the project.

E2 Civil and Infrastructure Works

1) All civil works approved with the Construction Certificate are to be completed to the satisfaction of Certifying Authority prior to issue of a Subdivision Certificate for each stage of the project.

2) All service infrastructure works to service each stage of the project are to be completed to the satisfaction of relevant authorities.

3) All roads, water and sewerage mains shall be fully constructed to the boundary of the adjoining land (Lot 1 DP 1097743) in accordance with Council's Development Design and Construction Specifications.

4) Any damage caused to public infrastructure (roads, footpaths, water and sewer mains, power and telephone services etc.) during construction of the project shall be repaired to the satisfaction of Council prior to the issue of a Subdivision Certificate for each stage of the subdivision.

5) The site shall be stabilised to Council's ~~satisfaction~~ specifications including as a minimum at least 50% grass cover or application of mulch or hydro seeding to all disturbed areas.

Collector Road & Moonee Beach Road

E3 Collector Road

Prior to the issue of a subdivision certificate for any of the lots in the project, the northern collector road from its existing northern limit (near Tidal Crescent) to the southern boundary of the site, over Lot 5 DP 252223, Lot 6 DP 252223, and Lot 1 DP 1097743, shall be constructed and completed to the satisfaction of Council and shall be dedicated as a

public road for its full alignment from the southern boundary of the site to its connection with Moonee Beach Road, refer to conditions B1, B2(3) and B2(4).

E4 Limitations on the release of lots

Should the Moonee Beach Road grade separated interchange with the Pacific Highway not be operational immediately prior to the release of the first 149 lots (or a different number of lots as otherwise agreed with or directed by the Department in consultation with the RTA), no further subdivision certificates for additional lots shall be released until a further traffic study of the intersection of Moonee Beach Road and Pacific Highway is undertaken to determine whether capacity is available to accommodate the additional traffic and whether any improvements are required to increase that capacity. Any required improvements are to be designed, approved and implemented to the satisfaction of the RTA.

Bush fire Management

E5 Asset Protection Zones

1) The Asset Protection Zones are to be inspected and certified for compliance by an appropriately qualified bushfire planning consultant prior to the release of the Subdivision Certificate for each relevant stage of the subdivision; the certificate is to accompany the application for the Subdivision Certificate for each relevant stage.

E 6 A c c e s s

Public road access shall comply with Section 4.1.3 (1) of Planning for Bushfire Protection (2006). In this regard the following design standards for public roads are to be incorporated into the project:

i) Roads shall be two-wheel drive, all weather roads; and,

ii) Urban perimeter roads are two-way with a carriageway of 8 metres minimum kerb to kerb.

E7 Registration of Easements / Restrictions to use / Right of carriageway

1) The creation of easements for services, rights of carriageway and restrictions as to user are applicable under Section 88B of the *Conveyancing Act 1919,* including (but not limited to) the following:

   a. Easements for sewer, water supply and drainage over all public services/infrastructure on private property.

   b. Drainage Easements are to be placed over all subsurface drains and interallotment drainage, benefiting and burdening the property owners. Maintenance of the subsurface drains is to be included in the 88B instrument.

2) Any Section 88B Instrument creating restrictions as to user, rights of carriageway or easements which benefit Council shall contain a provision enabling such restrictions,

easements or rights of way to be revoked, varied or modified only with the consent of Council.

3) Privately owned infrastructure on community land may be subject to the creation of statutory restrictions, easements etc. in accordance with the *Community Land Development Act 1989, Strata Schemes Management Act 1996, Conveyancing Act 1919,* or other applicable legislation.

4) In addition to the above certification, the following is to be included in the Section 88B Instrument to accompany the final plan of subdivision.

   i) A Restriction as to User within Lots 475 and 484-498 in Stage 9 of the subdivision, adjoining the Zone 3 vegetation to the south west of the site, allowing for the creation of a 10 metre wide Asset Protection Zone, measured from the southern boundary of these lots. This area shall be maintained as an inner protection area in accordance with *Planning for Bushfire Protection 2006* and the RFS's *Standards for Asset Protection Zones.* No dwellings are to be constructed in this area. The Restriction as to User shall advise the landowner of the need to maintain this area as an Asset Protection Zone.

   ii) A Restriction as to User allowing for the creation and maintenance of a Bushfire Asset Protection Zone (APZ) on all affected lots (including roads and open space areas to be dedicated to Council), as shown on Drawing No.05025/3 Bushfire Risk Assessment Map, prepared by RDM, 12 November 2008. This area shall be maintained as an inner protection area in accordance with *Planning for Bushfire Protection 2006* and the RFS's *Standards for Asset Protection Zones.* No dwellings are to be constructed in this area. The Restriction as to User shall advise the landowner of the need to maintain this area as an Asset Protection Zone.

   iii) A Restriction as to User on all allotments marked in yellow (Level 2 construction) or red (Level 3 construction) on Drawing No.05025/3 Bushfire Risk Assessment Map, prepared by RDM, 12 November 2008 requiring the construction of dwellings houses on the specified allotments to be Level 2 or Level 3 Construction Standard (AS3959).

   iv) A Restriction as to User on any allotments identified as a result of the revised acoustic assessment (refer to conditions B3 ~~and E17~~) requiring the imposition of the specified internal noise criteria.

   v) A Restriction as to User that no cats shall be permitted to be kept within the site.

   vi) A Restriction as to User to enforce adopted design guidelines for the site, generally as set out in the Draft Design Guidelines, Annexure S of the Environmental Assessment.

5) The restrictions are to be clearly marked on the plan/s of subdivision and Council is to be nominated as the sole party to vary, modify and/or extinguish the restriction.

Services

E8 Utilities -Telephone and Electricity Services

1) Prior to issue of the Subdivision Certificate for each stage of the project, the relevant stage is to be connected to all available services (water, electricity and telephone) Such connections, and any extension of services required to the project, are to be carried out at full cost to the proponent.

2) The production of written evidence from the local telecommunications supply authority certifying that satisfactory arrangements have been made for the provision of underground telephone supply must be submitted prior to issue of a Subdivision Certificate for each stage of the subdivision.

3) The production of written evidence from the local electricity supply authority certifying that reticulation of underground electricity has been completed prior to issue of a Subdivision Certificate for each stage of the subdivision.

4) The reticulation to include the provision of fully installed electric street lights to the relevant Australian standard and requirements of Country Energy.

5) The submission to the Certifying Authority and subsequent registration of the required right of carriageway/easement for services/restrictions-as-to-users is required.

E9 Water Supply and Sewer

1) Prior to issue of a Subdivision Certificate for each stage of the project reticulated water and sewerage shall be provided to all lots within that stage.

2) Trunk water mains are to be extended to the development from Council's existing trunk water main located on the collector road to the south of the site (not from the western side of the Highway).

3) Sewer shall be pumped direct to the Bucca Sewerage Treatment Plant.

E10 Work As Executed Plans

Works as executed plans are to be submitted to Council for each stage prior to the issue of a subdivision certificate for that stage, which shall be endorsed by a Registered Surveyor or a Consulting Engineer certifying that:

i) all drainage lines, sewer lines, services and structures are wholly contained within the relevant easement created by the project;

ii) the plans accurately reflect the Work as Executed.

Note: Where works are carried out by Council on behalf of the proponent it is the responsibility of the proponent to prepare and submit works-as-executed plans.

Open Space / Landscaping

E11 Embellishment and Maintenance of Open Space Areas

1) Prior to the release of relevant Subdivision Certificate for the project, open space (as it relates to each of those stages) is to be embellished and recreation areas and facilities established and constructed consistent with the approved landscape plans and in accordance with the plan titled Staging of Open Space Dedication to Council, December 2008, Annexure E of the 'Post Preferred Project Submission', December 2008, subject to the deletion of the open space area which is to become part of the 11 Stage development.

2) The works prescribed in the approved Vegetation Management Plan (VMP) for that relevant stage, must be completed in accordance with the VMP and certified in writing by the consultant who prepared the VMP, prior to the issue of the relevant Subdivision Certificates.

3) All landscaped and open space areas (Open Space Categories 1, 2 and 3 as identified in the approved plan prepared by ERM 'Broad Scale Open Space Types' dated ~~December 2008~~Jan 2018) to be dedicated to Council including open space areas along road reserves are to be managed and maintained for a minimum 5 years from release of relevant construction certificates, subject to the deletion of the open space area which is to part of the 11 Stage development.

E12 Street Trees

1) Street tree planting shall be carried out to Council's satisfaction in each stage of the project, prior to the issue of the Subdivision Certificate for each stage.

2) The plantings are to be maintained for twelve months in accordance with Council's Street Tree Master Plan to ensure successful establishment and development. A $370 bond per tree is to be paid to Council prior to the issue of the relevant Subdivision Certificate. The bond will be returned at the end of the twelve months maintenance period provided plantings have established successfully. At the end of the maintenance period Council will replace plantings that have failed at a cost per tree taken from the bond.

3) Works-as-executed plans shall be provided to Council in Digital CAD or Arcview format prior to issue of the relevant Subdivision Certificate.

E13 Public Reserve Signage

Interpretive or educational signage of the environmental and cultural values of the public reserves, in particular the areas of Wallum Froglet habitat, shall be provided prior to release of the final Subdivision Certificate, to the satisfaction of the Certifying Authority.

Dedication of Land

E14 Dedication of Open Space

1) The proponent shall make necessary arrangements for the dedication of the open space areas to Council prior to release of the relevant Subdivision Certificate in accordance with the plan titled Staging of Open Space Dedication to Council, December 2008, Annexure E of the 'Post Preferred Project Submission', December 2008, subject to the deletion of the open space area which is to become part of the 11 Stage development.
2) Prior to the issue of the first Subdivision Certificate for the project, relevant approvals or agreements are to be entered into with Council to allow the proponent to carry out management and maintenance works, as required under condition **E11,** on the open space areas in each stage of the project, during five years following release of construction certificates of each stage.
3) All open space and public reserve areas shall be dedicated at no cost to Council, other than any land that may be subject to the acquisition provisions of clause 20 *Coffs Harbour Local Environmental Plan 2000.*

   Note: Clause 20 *Coifs Harbour Local Environmental Plan 2000* applies to land zoned "Open Space 6A Public Recreation Zone" on the site.

E15 Dedication of Internal Roads

All internal roads shall be constructed by the proponent in accordance with the staging of the project and dedicated to Council as public roads.

Siteworks

E16 Fill Contour Plan

Prior to the release of a Subdivision Certificate for the first stage of the project to be released a final contour plan shall be submitted to Council showing the location, depth and type of fill located on the site. ~~This shall include fill platforms of minimum of 2 metres above the 1 in 100 year flood level or the water table (whichever is the higher) in the southern open space areas that contain stormwater infrastructure, in accordance with AusPacific Engineers advice dated 4 April 2008.~~

~~*Road Traffic Noise*~~

~~*E17 Verification of noise mitigation measures*~~

~~Prior to the release of the relevant Subdivision Certificate a report prepared by an appropriately qualified acoustic consultant shall be submitted to verify and certify that implemented noise mitigation measures have been constructed in accordance with the recommendations of the revised acoustic report, condition **B3.**~~

Monetary Contributions

In Schedule 2, delete Condition E18 in its entirety and replace it with new Condition E18 as follows:

E18 Section 94 Monetary Contributions

1) Prior to the endorsement of a Subdivision Certificate for each stage of the subdivision, the proponent must pay, in proportion to the additional lots created by that stage, a contribution to Council pursuant to Section 94 of the Act and Council's *Moonee Release Area Developer Contributions Plan 2014*, being as follows:

Moonee Developer Contributions Plan 2017			
MP 06_014- 3 D/A 631/08	**Contributions as at 22 November 2017**		
Facility	**No of Lots**	**$ per Lot**	**Sub-Total**
Community Facilities	553	1,062.82	587,739.46
Open Space (Neighbourhood: Moonee) subject to 'works in kind', refer point 3 below	553	2,207.86	1,220,946.58
Moonee Transport and Traffic, subject to 'works in kind', refer point 4 below	553	1,919.23	1,061,334.19
Urban Planning	553	13.46	7,443.38
Moonee local roads, subject to 'works in kind', refer point 4 below	553	6,767.94	3,742,670.82
Coffs Harbour Open Space Developer Contributions Plan 2014			
Facility	**No of Lots**	**$ per Lot**	**Sub-Total**
District Open Space	553	3,885.91	2,148,908.23
Surf Rescue Equipment Developer Contributions Plan 2013			
Facility	**No of Lots**	**$ per Lots**	**Sub-Total**
Surf Rescue Facilities	553	74.08	40,966.24
Coffs Harbour Road Network Developer Contributions Plan 2014			
Facility	**No of Lots**	**$ per Lot**	**Sub-Total**
Coffs Harbour Road			

Network	553	547.6	302,822.80
Coffs Harbour Administration Levy Developer Contributions Plan 2014			
Facility	**No of Lots**	**$ per Lot**	**Sub-Total**
Co-ordination and Administration	553	540.25	298,758.25
TOTAL CONTRIBUTIONS PAYABLE			**$9,411,589.95**
Stage 1 - 65 Lots (67 Lots proposed but 2 lot credit exists)			1,106,244.75
Stage 2 - 40 Lots			680,766.00
Stage 3 - 59 Lots			1,004,129.85
Stage 4 - 61 Lots			1,038,168.15
Stage 5 - 51 Lots			867,976.65
Stage 6 - 61 Lots			1,038,168.15
Stage 7 - 48 Lots			816,919.20
Stage 8 - 48 Lots			816,919.20
Stage 9 - 50 Lots			850,957.50
Stage 10 - 42 Lots			714,804.30
Stage 11 - 28 Lots			476,536.20
			527,593.64
TOTAL CONTRIBUTIONS PAYABLE			**$9,411,589.95**

2) The contribution shall be paid in the form of cash or bank cheque, made out to Coffs Harbour City Council, except as agreed with Council in relation to any credits for 'works in kind', as specified below. For accounting purposes, the contribution may require separate payment for each of the categories specified in the Contributions Plan and you are advised to check with Council.

   Evidence of the payment to Council shall be submitted to the Certifying Authority prior to the issue of the Subdivision Certificate for each stage of the project.

3) Contributions for Neighbourhood Open Space can comprise in part 'works-in- kind' for the construction of two recreation nodes within the site, refer to conditions **A2** and **B13**. Recreation Node No 1 is to be constructed prior to the release of the Subdivision Certificate for Stage 3. Recreation Node No. 2 is to be constructed prior to the release of the Subdivision Certificate for Stage 7. The value of works to be undertaken and the balance of monetary contributions shall be at least equal to the Neighbourhood Open Space contributions assessed, and adjusted, in accordance with the plan.

4) Contributions for the Transport and Traffic and Moonee Local Roads components of the Contributions Plan shall be paid to a total combined rate of $13,941.51 per lot, combined total amount of $7,277,468.22 for the estate, as adjusted in accordance with the procedures set out in Council's Section 94 Contributions Plans. These

contributions can comprise in part 'works-in-kind' for the construction of the collector road (refer to condition **B1**) and in part a monetary contribution for the balance of the total contributions owing, following 'works-in-kind'. The value of 'works-in-kind' to be undertaken plus the monetary contributions shall be at least equal to the Transport and Traffic and the Moonee Local Roads contributions as assessed, and adjusted, in accordance with the plan.

Note: The collector road is to be completed to the satisfaction of Council prior to the issue of any Subdivision Certificates, in accordance with condition **E3**.

5) The contribution rates will be adjusted in accordance with the procedures set out in Council's Section 94 Contributions Plans. The proponent is advised to confirm the contribution rate applicable at the time of payment as rates are revised at least annually.

6) Contribution calculations recognise the two existing lots and have therefore only been imposed on the additional ~~522~~ 553 lots. The existing lot entitlements have been recognised in Stage 1 of the development.

7) The Contribution Plans may be inspected at the Council Administration Offices, 2 Castle Street, Coffs Harbour or on Council's web site, www.coffsharbour.nsw.gov.au.

E19 Section 64 Monetary Contributions

In Schedule 2, delete Condition E19 in its entirety and replace it with new subsections to Condition E18 as follows:

1) Contributions Plans relevant to the project include:

- Wastewater Treatment and Carrier System Development Servicing Plan 2008 Interim - 24 April 2008.
- Water Supply Development Servicing Plan 2008 - Interim - 24 April 2008.

2) Prior to endorsement of a Subdivision Certificate for each stage of the project, the proponent must pay, in proportion to the additional lots created by that stage, the following contributions to Council pursuant to Section 64 of the *Local Government Act* 1993.

Facility	No of Lots	$ per Lot	Sub-Total
Water	553	10,436.94	5,771,627.82
Wastewater	553	9,980.67	5,519,310.51
Total			**$11,290,938.33**

3) The contributions are reviewed from time to time and are also subject to quarterly adjustment in accordance with the Consumer Price Index for Sydney (All Groups).

4) The Contribution Plans may be inspected at the Council Administration Offices, 2 Castle Street, Coffs Harbour or on Council's web site, www.coffsharbour.nsw.gov.au.

Appendix C – Flora & Fauna Assessment

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

FLORA AND FAUNA ASSESSMENT

'The Glades'
(Lots 1 & 2 DP 725785)
Pacific Highway, Moonee

A Report Prepared for
Rothwell Boys Pty Ltd

FEBRUARY 2018

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TABLE OF CONTENTS

1 INTRODUCTION 4
1.1 Background 4
1.2 Locality 5
1.3 Soils and Geology 6
1.4 The Proposed Development 6
1.5 Literature Review 6
2 FLORA ASSESSMENT 7
2.1 Introduction 7
2.2 Methods 7
2.3 Results 11
2.4 Coffs Harbour City Council Vegetation Mapping 17
3 FAUNA ASSESSMENT 19
3.1 Introduction 19
3.2 Methods 19
3.3 Results and Discussion 27
4 IMPACTS AND AMELIORATION 52
4.1 Impacts of the Proposed Development 52
4.2 Amelioration 59
5 STATUTORY CONSIDERATIONS 64
5.1 Introduction 64
5.2 Assessment of Significance (Seven Part Test) 64
5.3 Koala Habitat Assessment 66
5.4 Commonwealth Environment Protection and Biodiversity Conservation Act (1999) 66
6 SUMMARY AND CONCLUSIONS 71
REFERENCES 73
APPENDIX 1 - PLANT SPECIES LIST 78
APPENDIX 2 – FAUNA SPECIES LIST 83
APPENDIX 3 – HABITAT SUITABILITY ASSESSMENT 87
APPENDIX 4 – BBAM ASSESSMENT (IMPACTS) 105
APPENDIX 5 – BBAM ASSESSMENT (OFFSETS) 106
APPENDIX 6 - ASSESSMENT OF SIGNIFICANCE (7 PART TEST) 107
APPENDIX 7 - FAUNA DISTRIBUTION TABLES 135

1 INTRODUCTION

1.1 Background

JWA Pty Ltd have been engaged by Rothwell Boys Pty Ltd (Rothwell Boys) to complete a Flora and Fauna Assessment for part of 'The Glades' development site (Lots 1 & 2 DP 725785) at Moonee. The Subject site is a 1.75 ha of land within the central portion of The Glades development.

A Flora and Fauna Assessment was completed for The Glades site in 2007 (JWA 2007) to accompany a Development Application.

It is understood that Rothwell Boys propose to lodge an application (75W modification application) seeking to modify Project Approval 06-0143 issued by the Minister for Planning on 5th March 2009, to include additional residential subdivision over 1.75 ha of land within the central portion of The Glades development (i.e. the Subject site). The current report is an amended and updated version of the Flora and Fauna Assessment prepared by JWA in 2007 and includes additional field surveys and an impact assessment for the proposed additional allotment layout.

This assessment has involved the following:

- Mapping and ground truthing vegetation units and determining their conservation status with reference to the Comprehensive Regional Assessment completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999), and with reference to the vegetation of the Coffs Harbour City Council LGA (Fisher, Body and Gill 1996) and the Coffs Harbour Vegetation Management Strategy (Ecograph 2002);
- Searching for and recording Threatened (*TSC Act 1995*), ROTAP (Briggs & Leigh 1996) and regionally significant plant species (Sheringham & Westaway 1995), and assessing the occurrence of Endangered Ecological Communities (EECs);
- Determining the suite of Threatened fauna (*TSC Act 1995*) that occurs in the locality and assessing their potential occurrence on the Subject site;
- Completion of a detailed fauna survey program;
- Assessing habitat provided by the Subject site in relation to adjacent habitat and making an assessment of the corridor value of the Subject site; and
- Addressing statutory requirements including *State Environmental Planning Policy No. 44 (SEPP 44 – Koala Habitat Protection)*, Section 5A of the *Environmental Planning & Assessment Act (1979)* and the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Locality

1.2.1 Introduction

The Locality is defined as the area within a 10km radius of the Subject site. The Locality therefore extends from Coffs Harbour in the south to Woolgoolga in the north and from Mt Coramba in the west to the coastline in the east (**FIGURE 1**).

Prominent features in the locality include the towns of Coffs Harbour, Woolgoolga and Moonee Beach, the coastline, Moonee Creek and its tributaries and Moonee Beach Nature Reserve.

Dominant habitat types are eucalypt forest, swamp sclerophyll forest and intertidal communities. Land uses within the locality include forestry, tourism, grazing, conservation and agriculture.

There are four (4) dedicated conservation reserves in the locality:

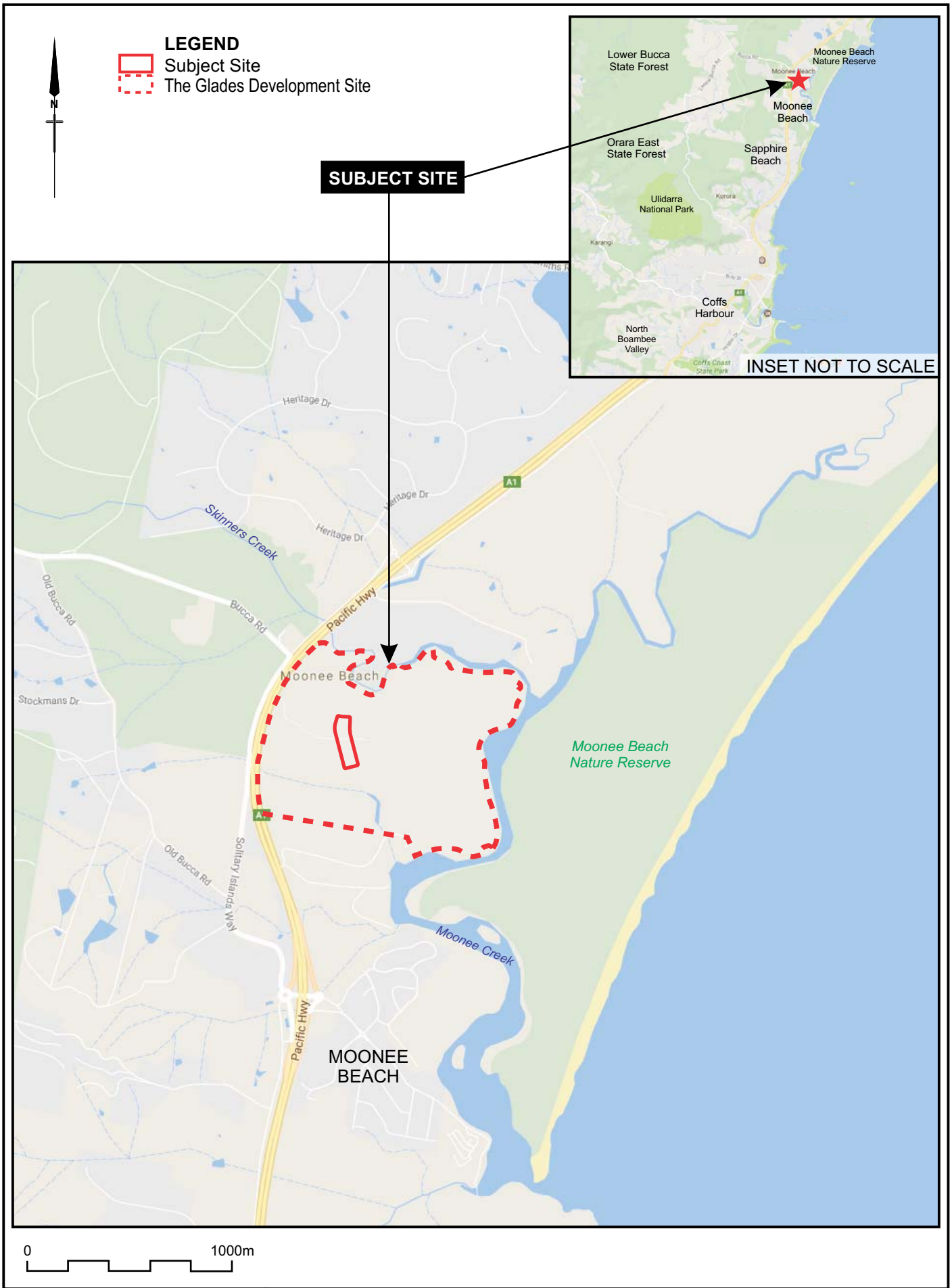
- Moonee Beach Nature Reserve, an area of 336 hectares immediately east of the Subject site;
- Ulidarra National Park, an area of 680 hectares to the south-west of the Subject site;
- Bruxner Park Flora Reserve, an area of 407 hectares adjoining Ulidarra National Park; and
- Kororo Nature Reserve, an area of 11 hectares south of the Subject site.

State Environmental Planning Policy (SEPP) 14 wetland number 318 occurs to the north of the Subject site, while SEPP 14 wetland number 319 is located about 2km to the south-east of the Subject site, to the south of the Moonee Creek estuary (**FIGURE 2)**.

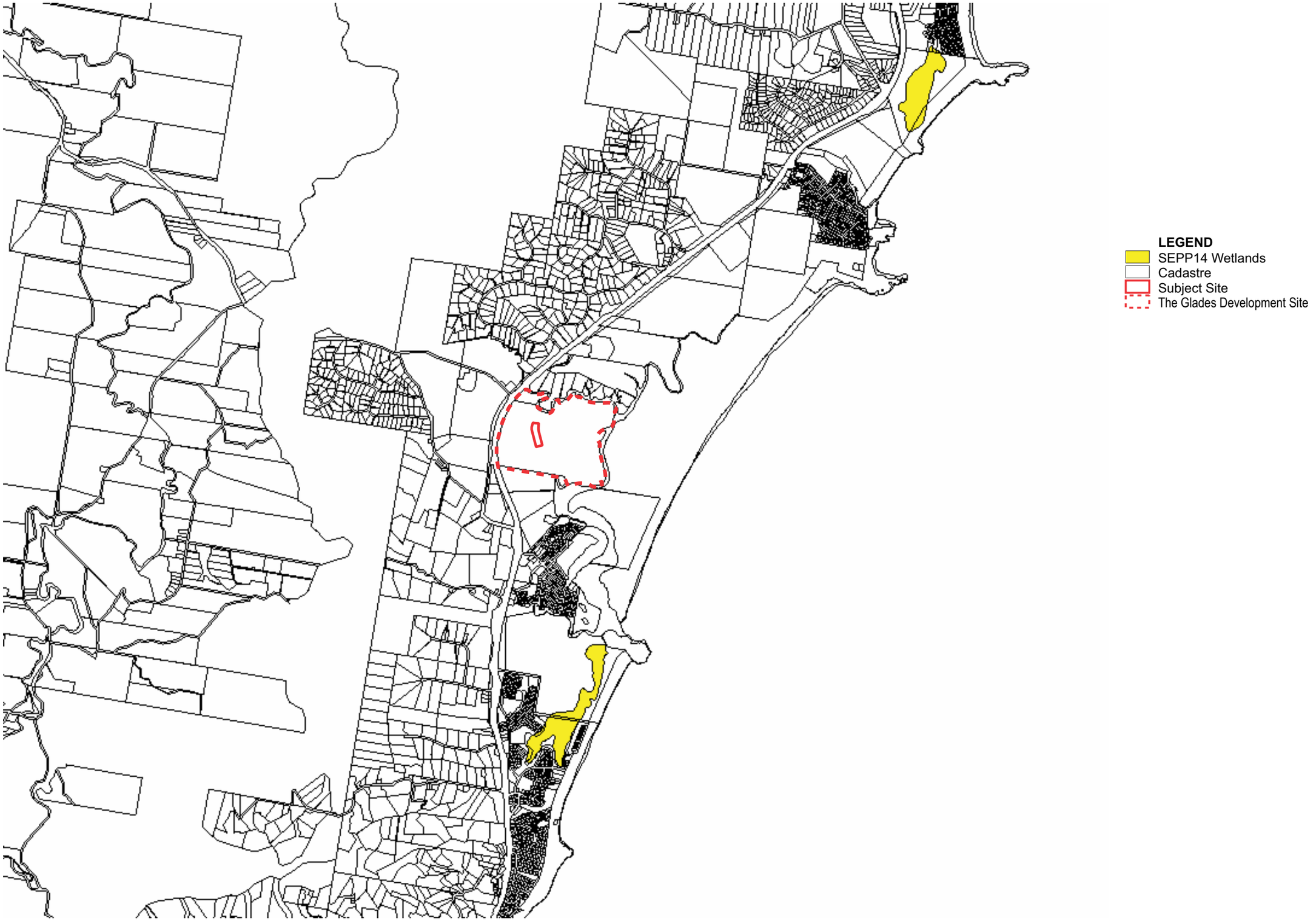
A small area of SEPP (State Environmental Planning Policy) 26 Littoral Rainforest occurs to the south of the Subject site between Digger's Head and White Bluff as SEPP 26 number 68B (**FIGURE 3**).

1.2.2 The Subject Site

The Subject site consists of part of Lots 1 & 2 in DP 725785 Pacific Highway, Moonee. The Subject site, in accordance with the definition provided in the Threatened Biodiversity Survey Assessment (TBSA) Guidelines (DECC 2004a), represents areas that are directly affected by the proposed development. The Subject site therefore covers an area of approximately 1.75 hectares, much of which is comprised of advanced native regrowth vegetation (**FIGURE 4**). The subject site occurs as a narrow finger of vegetation that extends along the ridgeline in the central part of The Glades development. The Subject site was originally apart of the approved The Glades development as a retained open space area.



SOURCE: Google Maps SCALE: 1 : 25 000 @ A4 JWA PTY LTD Ecological Consultants	CLIENT Rothwell Boys Pty Ltd PROJECT Flora & Fauna Assessment Lots 1 & 2 DP725785 Pacific Highway, Moonee NSW Coffs Harbour City Council LGA	**FIGURE 1** PREPARED: BW DATE: 16 October 2017 FILE: N02066_Locality.cdr	TITLE **LOCALITY PLAN**



SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 40 000 @ A3

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Ecological Consultants

CLIENT
Rothwell Boys Pty Ltd

PROJECT
Flora & Fauna Assessment
Lots 1 & 2 DP725785
Pacific Highway, Moonee NSW
Coffs Harbour City Council LGA

FIGURE 2

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_SEPP14.cdr

TITLE

SEPP 14 WETLANDS

SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 40 000 @ A3

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Flora & Fauna Assessment
Lots 1 & 2 DP725785
Pacific Highway, Moonee NSW
Coffs Harbour City Council LGA

FIGURE 3

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_SEPP26.cdr

TITLE

SEPP 26 LITTORAL RAINFOREST

LEGEND
Subject Site
The Glades Development Site

0 150m
1 : 5000

SOURCE: Google Earth June 2016 Aerial Photo

SCALE: 1 : 5000 @ A3

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Lots 1 & 2 DP725785
Pacific Highway, Moonee NSW
Coffs Harbour City Council LGA

FIGURE 4

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_Aerial.cdr

TITLE

AERIAL PHOTOGRAPH

The Subject site and the adjoining approved development is bordered by Moonee Creek to the east and the Pacific Highway to the west. Land to the north of the Subject site is generally cleared but includes isolated trees and vegetation. Land to the south is characterised by open eucalypt forest with a largely cleared midstorey. The Subject site is shown in **FIGURE 4**.

1.3 Soils and Geology

Soils on the Subject site are part of the Newports Creek type, characterised by low, level to gently undulating coastal back barrier floodplains on Pleistocene estuarine sediments. Soils are deep, poorly drained Yellow Podzolics and Humic Gleys (DLWC 1999).

1.4 The Proposed Development

The approved development (Project Approval 06-0143) issued by the Minister for Planning on 5th March 2009 (**FIGURE 5**) consists of a fifteen (15) stage residential development with a total of 524 lots. Rothwell Boys now propose to lodge an application to modify the Project Approval to remove an open space area located between residential precincts 1 and 2 (**FIGURE 5**) (i.e. the Subject site), which covers a total of 1.747 ha, in order to create an additional thirty-one (31) residential allotments (**FIGURE 5**).

1.5 Literature Review

A number of Flora and Fauna Reports and other sources of information were reviewed in the course of this assessment. These include:

- Anne Harrison (2005) Landscape Concept & Open Space Management Plan for Lot 1 & 2 DP725785 Pacific Highway Moonee.
- Clancy, G.P. & V.A. (1998) Flora and Fauna Assessment Moonee Release Area. A report prepared for Coffs Harbour City Council.
- DLWC (1999) Soil landscape series sheet 9537 Coffs Harbour.
- JWA (2000) Flora and Fauna Assessment. Heritage Park, Moonee.
- JWA (2003a) Preliminary study. Lots 1 & 2 DP 725785, Pacific Highway, Moonee.
- JWA (2003b) Flora and Fauna Assessment. Lot 122 DP 1052566 Moonee Beach Road, Moonee.
- JWA (2004a) Wallum Froglet Assessment. Lots 1 & 2 DP 725785, Pacific Highway, Moonee.
- JWA (2004b) Flora and Fauna Assessment. Lots 6 & 7 DP 252223, Pacific Highway, Moonee.
- Moonee Development Control Plan (2004) Coffs Harbour City Council.
- NPWS Atlas of NSW Wildlife records. Moonee Beach Nature Reserve.
- NPWS Atlas of NSW Wildlife records. Coffs Harbour Local Government Area.
- WBM Oceanics (2005) Moonee Creek Estuary Processes Study.

15.3
18.1
16.6
27.2
710m²
30
539m²
30.1
720m²
24.5
25.4
18
25.5
34.4
15.2
530m²
15
34.5
528m²
15
36
15
528m²
15
35.9
20.7
676m²
15.8
35.3
38.7
23.7
624m²
674m²
14.7
21.9
34.4
516m²
15
35.6
524m²
34.4
516m²
34.4
516m²
516m²
516m²

2 FLORA ASSESSMENT

2.1 Introduction

This section discusses the methods used in the vegetation assessment and presents the results of the assessment.

2.2 Methods

2.2.1 Desktop Review

The following databases were reviewed as part of the desktop assessment to find records of State and Commonwealth Threatened species[1] within 10km of the Subject Site:

- the Commonwealth *Environment Protection Biodiversity and Conservation (EPBC) Act* (*1999*) Protected Matters Search Tool (PMST) (Dept. Environment 2013); and
- Atlas of NSW Wildlife (OEH 2016) database.

2.2.2 Site Surveys

2.2.2.1 Introduction

This section describes the methodology used during the site surveys, including identification of vegetation communities, assessing weed status and conservation value of vegetation communities and mapping of threatened flora species and Endangered Ecological Communities (EECs).

The Glades development, including the Subject site, was originally inspected between the 10th and 14th of May 2004 when it was comprehensively surveyed and a general plant species list was compiled. An additional survey was completed on the 23rd and 24th of September 2004 to target Threatened orchid species considered possible occurrences on The Glades development site.

The previously mapped vegetation communities (JWA 2007) were ground-truthed on the 29th March 2017, and 14th and 15th November 2017, and the mapping updated to reflect the current vegetation composition and status.

An assessment of the impact site and potential revegetation/offset sites utilising the BioBanking Assessment Methodology (BBAM) was completed at the Subject site between the 14th and 15th November 2017.

2.2.2.2 Rationale

The Department of Environment and Conservation (NSW) (now OEH) prepared a Working Draft of the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities in 2004 (Draft Guidelines). The Draft Guidelines provide suggested survey

[1] As listed within schedules of the *TSC Act (1995)* and *EPBC Act (1999).*

methods and effort when undertaking flora and fauna surveys in NSW. In relation to vegetation surveys the Draft Guidelines note that:

> *"To survey the vegetation of a study area[2] several different techniques can be employed – which techniques are employed may depend on the size and characteristics of the study area."*

These techniques may include:

- Transects - Transects (or traverses) are valuable for obtaining an understanding of the vegetation communities in the area, identifying community boundaries and recording species (Forest Animal Surveys *et al*. 1997). A variation on the transect type survey is the random meander method (discussed below); and
- Plot-based (or Quadrat) Surveys - The typical dimensions of a plot are 20 metres by 20 metres, however where vegetation occupies a linear space, the plot shape can be changed to fit within the vegetation type as long as the total area remains the same.

The DRAFT Guidelines also state that:

> *"Defining a minimum level of survey effort is complicated by factors such as individual characteristics of the area or vegetation communities, and the time and budget of studies".*

In relation to Threatened flora species, the DRAFT Guidelines note that:

> *"In conducting a vegetation survey, threatened biodiversity may be identified during transect or plot surveys or by opportunistic observations such as walking or driving between sampling sites. Depending on the aims of the study, targeted surveys may be conducted for threatened biodiversity considered likely to occur in the locality. If this is the case, targeted searches should be carried out in areas of preferred habitat for these species".*

2.2.2.3 Vegetation Community Mapping

A survey plan showing the distribution of the vegetation communities was produced by surveying the drip line of all vegetation occurring on The Glades development site, with the assistance of aerial photography, during the 2004 surveys. The plan was then ground truthed by JWA during the 2017 surveys, with a particular focus on the Subject site. The vegetation communities were identified and described with reference to the Walker & Hopkins (1990) vegetation classification system. All vegetation was assessed, with particular attention given to areas of high diversity and structural complexity (i.e. rainforest and swamp sclerophyll communities). Rare and threatened flora, known to occur in the area were targeted and mapped during the site assessments. The vegetation community number/description for The Glades development were retained for the Subject site for consistency.

[2] The "study area" for this assessment included the entire Subject site.

2.2.2.4 Identification of Endangered Ecological Communities (EECs)

Endangered Ecological Communities (EECs) were identified by JWA with reference to the EEC listings for the North Coast Bio-region and the final determinations from the scientific committee (OEH 2016).

2.2.2.5 Weed Status

The status of weed infestation, within each vegetation community, was assessed during the 2004 and 2017 surveys. The condition was based on the percentage cover of exotic species to total cover, in the canopy, mid-storey and ground cover. Weed status was categorised as follows:

- 0-30% cover of exotics - weed status was categorised as low;
- 30-50% cover of exotic species - weed status was categorised as medium; and
- exotic species exceeding 50% cover - weed status was categorised as high.

2.2.2.6 Assessment of Conservation Value

The conservation value of plant communities on the Subject site was determined with reference to:

- Regional Forestry Agreement (RFA). A Comprehensive Regional Assessment completed of NSW Forest and Non-forest ecosystems (CRA Unit 1999). The RFA establishes the framework for the management of the forests of upper northeast and lower northeast regions. The RFA document sets out percentage reservation status of forest and non-forest ecosystems in the CRA Reserve System based on vegetation modelling to establish the pre-1750 extent of forest ecosystems in the region; and
- Threatened Species Conservation Act (TSC 1995). This act provides protection for the listed Endangered Ecological Communities and threatened flora.

Conservation value categories and the criteria used to determine these categories are summarised in **TABLE 1**.

TABLE 1
CONSERVATION VALUE CATEGORIES AND CRITERIA

Conservation value	Criteria
Low	Generally pasture grassland, highly disturbed/exotic vegetation, crops
Low - Medium	Scattered native trees within grassland, disturbed/exotic vegetation
Medium	Disturbed/fragmented native vegetation with a Medium presence of Camphor laurel

Conservation value	Criteria
Medium - High	Native vegetation with a lower occurrence of Camphor laurel, tending to be larger and less disturbed, containing ROTAP or threatened flora species. Potential to be categorised as an Endangered Ecological Community.
High	Larger areas of native vegetation with little Camphor laurel, containing threatened species and/or containing characteristics indicative of an Endangered Ecological Community (EECs).

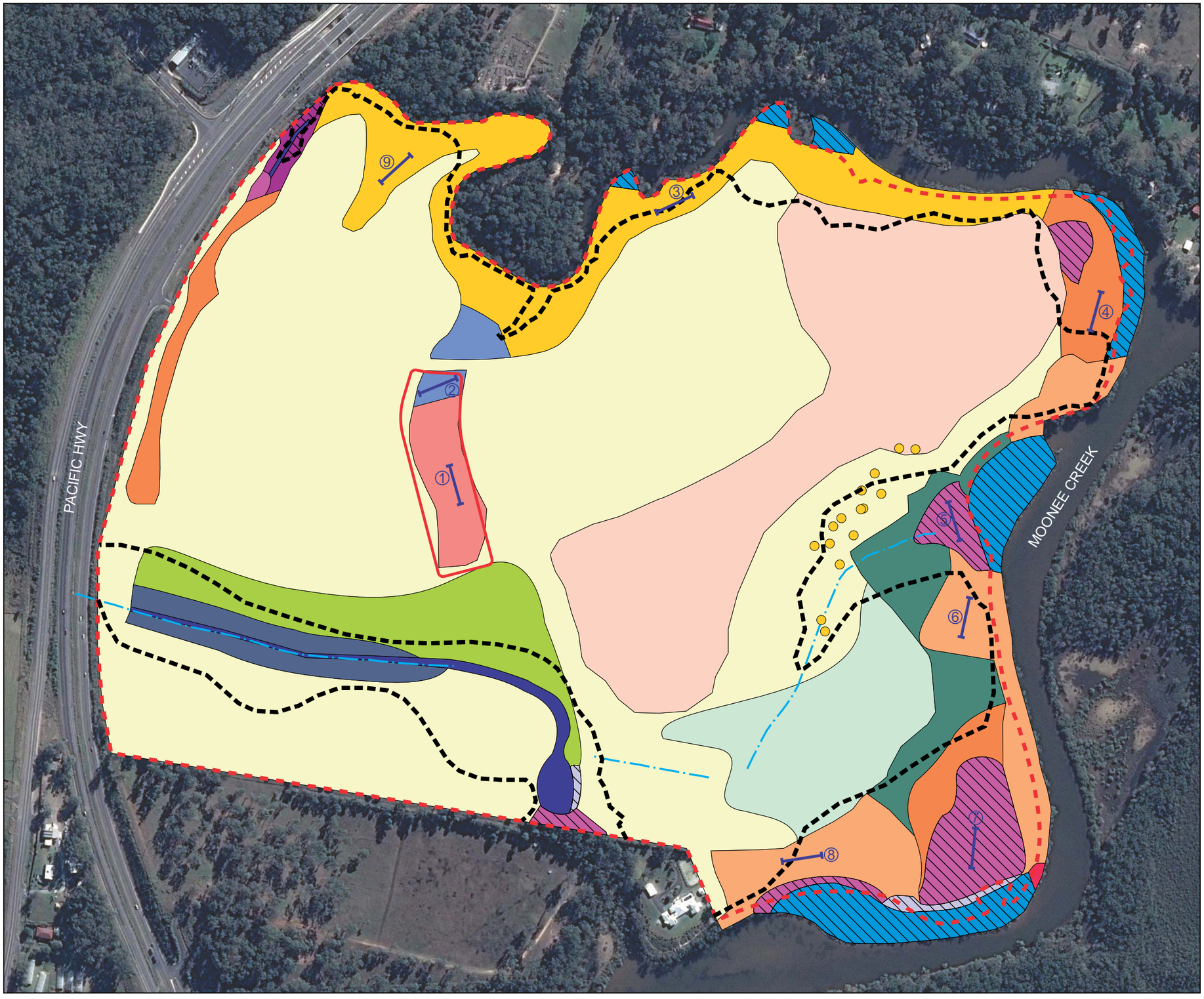
2.2.2.7 Quadrat (plot-based) Surveys

During the November 2017 site surveys, plot-based surveys were undertaken at nine (9) locations over The Glades development site in accordance with the BioBanking Assessment Methodology (BBAM) (OEH 2014) (**FIGURE 6**). The BBAM is used to assess the biodiversity values of a development site for the purpose of obtaining a biobanking statement, or a biobank site for the purpose of entering into a biobanking agreement.

Surveys in accordance with the BBAM focussed on impact areas and potential revegetation/offset sites. Vegetation occurring in the study area were stratified by identifying the distribution of Plant Community Types (PCTs) according to the NSW PCT classification as described in the VIS Classification Database, and then mapping the area of each PCT into a vegetation zone. A vegetation zone is defined in the BBAM an area of native vegetation on a development site or biobank site that is the same PCT and has a similar broad condition state (i.e. low condition or moderate to good condition). In identifying areas that are in a similar broad condition state, consideration is given to areas of the PCT that have a similar over-storey cover, mid-storey cover, ground cover, weediness, or combinations of these.

The following attributes were assessed at each survey site:

a) Native plant species richness;
b) Native overstorey cover;
c) Native midstorey cover;
d) Native ground cover (grasses);
e) Native ground cover (shrubs);
f) Native ground cover (other);
g) Exotic plant cover (calculated as percentage of total ground and midstorey cover);
h) Number of trees with hollows;
i) Proportion of overstorey species occurring as regeneration; and
j) Total length of fallen logs.



LEGEND

- Subject Site
- The Glades Development Site
- BBAM Transect (50m)
- Individual *Melaleuca sieberi*
- Endangered Ecological Community
- Drainage line
- Q100 Flood Line (Auspacific Engineers)

Dry Sclerophyll Forest/Woodland Communities

- Community 1a - Tall open/closed forest (*Eucalyptus pilularis* +/- mixed species)
- Community 1b - Tall mid-dense forest (*Eucalyptus planchoniana*, *Syncarpia glomulifera*, *Corymbia intermedia*)
- Community 1d - Tall mid-dense forest (*Eucalyptus planchoniana*, *Eucalyptus tindaliae, Eucalyptus pilularis, Syncarpia glommulifera)*
- Community 1e - Tall open forest (*Eucalyptus siderophloia*)
- Community 1f - Tall closed forest (*Eucalyptus planchoniana*, *Syncarpia glomulifera*, *Eucalyptus pilularis*)
- Community 1g - Tall open woodland (*Eucalyptus pilularis*, *Eucalyptus planchoniana*, *Syncarpia glomulifera* +/- *Angophora costata*)

Swamp Sclerophyll Communities

- Community 2a - Mid-high swamp sclerophyll forest (*Melaleuca quinquenervia*)
- Community 2b - Mid-high swamp sclerophyll forest (*Melaleuca sieberi*)
- Community 2c - Mid-high swamp sclerophyll woodland (*Melaleuca quinquenervia*, *Melaleuca linariifolia*)
- Community 2d - Mid-high Swamp she-oak woodland (Casuarina glauca)
- Community 2e - Tall mid-dense forest (*Lophostemon suaveolens, Callistemon salignus*, *Syncarpia glomulifera* +/- *Melaleuca quinquenervia*)

Heathland Communities

- Community 3a - Mid-high to tall closed heath *(Ochrosperma leneare, Leptospermum polygalifolium*, *Leucopogon parviflorus)*
- Community 3b - Slashed heath (Mixed species)

Grassland Communities

- Community 4a - Low closed grassland (*Andropogon virginicus*, *Themeda triandra)* with scattered trees
- Community 4b - Low closed grassland (*Themeda triandra*, *Juncus* sp.*)*

Intertidal Communities

- Community 5a - Low open mangrove forest/ Saltmarsh (*Aegicerus corniculatum*, *Juncus kraussii, Sporobolus virginicus)*

Wetland Communities

- Community 6a - Wetland *(Nymphaea* sp., *Eleocharis* sp., *Philydrum lanuginosum)*

N

0 150m

1 : 5000

SOURCE: JWA Site Investigations 2004 & 2017; Auspacific Engineers (04-1600-P1-C.pdf & 04-1600 -P5C.pdf) Google Earth June 2016 Aerial Photo
SCALE: 1 : 5000 @ A3

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FIGURE 6

PREPARED: BW
DATE: 23 November 2017
FILE: N02066_Veg.cdr

TITLE

VEGETATION COMMUNITIES

The plot-based full floristic survey was based on a 20 m × 20 m quadrat (or 400 m^2 equivalent for linear areas). Line transects were also used to assess site attributes that can be measured by percent foliage cover. Native plant species richness was assessed within a 20 m × 20 m plot. The number of trees with hollows and the total length of fallen logs was assessed within a 50 m × 20 m plot. The floristic data in **TABLE 2** below was collected within a 20 m × 20 m plot. The number of trees with hollows was estimated by counting the number of trees with hollows visible from the ground in a 50 m × 20 m plot. The total length of fallen logs was the total length of woody material greater than 10 cm in diameter that was observed on the ground in the 50 m × 20 m plot. Regeneration was measured as the proportion of over-storey species that were observed to be regenerating and was assessed across the entire vegetation zone.

TABLE 2
FLORISTIC SURVEY DATA COLLECTED

Attribute	Survey Requirement (OEH 2014)
Stratum (& layer)	Stratum and layer in which each species occurs
Growth form	Growth form for each recorded species
Species name	Scientific name and common name
Cover	A measure or estimate of the appropriate cover measure for each recorded species; recorded from 1–5% and then to the nearest 5%. If the cover of a species is less than 1% and the species is considered important, then the estimated cover should be entered (e.g. 0.4)
Abundance rating	A relative measure of the number of individuals or shoots of a species within the plot.

2.3 Results

2.3.1 Database Search

OEH database searches revealed ten (10) Threatened Flora species that may occur within 10km of the subject site. The Commonwealth PMST identified twenty-five (25) threatened flora species that may occur within 10km of the subject site based on the availability of suitable habitat within the locality.

Threatened flora species detected in the database searches are listed in **TABLE 3**. The conservation status of each species listed in **TABLE 3** is shown in accordance with the Commonwealth *EPBC Act* (*1999*) and *TSC Act (1995)*.

TABLE 3
DATABASE RECORDS OF THE THREATENED FLORA SPECIES WITHIN 10KM OF THE SITE

Botanical name	Common name	TSC Act*	EPBC Act#
Acronychia littoralis	Scented acronychia	(E)	E
Allocasuarina defungens	Dwarf heath casuarina	(E)	E
Allocasuarina thalassoscopica		-	E
Arthraxon hispidus	Hairy-joint grass	(V)	V
Boronia umbellata	Orara boronia	(V)	V
Chamaesyce psammogeton	Sand spurge	E1	-
Cryptostulis hunteriana	Leafless tongue orchid	(V)	V
Cynanchum elegans	White-flowered wax plant	(E)	E
Diospyros mabacea	Red-fruited ebony	(E)	E
Diploglottis campbellii	Small-leaved tamarind	(E)	E
Endiandra floydii	Floyd's walnut	(E)	E
Endiandra hayesii	Rusty rose walnut	(V)	V
Haloragis exalata subsp. velutina	Tall velvet sea-berry	(V)	V
Hicksbeachia pinnatifolia	Red boppel nut	V	V
Lindsaea incisa	Slender screw fern	E1	-
Macadamia integrifolia	Macadamia nut	-	V
Macadamia tetraphylla	Rough-shelled bush nut	(V)	V
Marsdenia longiloba	Slender marsdenia	E1	V
Myrsine richmondensis	Purple-leaf muttonwood	(E)	E
Niemeyera whitei	Rusty plum	V	-
Phaius australis	Lesser swamp-orchid	(E)	E
Pultenaea maritima	Coast Headland pea	V	-
Quassia sp. 'Moonee Creek'	Moonee Quassia	E1	(E)
Samadera sp. Moonee Creek		(E)	E
Sarcochilus fitzgeraldii	Ravine orchid	(V)	V
Sarcochilus hartmannii	Waxy sarchochilus	(V)	V
Sophora tomentosa	Silverbush	E1	-
Thesium australe	Australian toadflax	V	V
Tylophora woollsii			E
Zieria prostrata	Headland zieria	E1	E

* NSW Threatened Species Conservation Act 1995 (TSC Act)
# Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
E1 – Endangered (state), E2 – Endangered Population, E4 – Critically Endangered (state), E – Endangered (national), V – Vulnerable, CE – Critically Endangered (national)

2.3.2 Threatened Flora Known from the Locality

The Clancy report (1998) on the Moonee Release Area recorded Rusty plum (*Amorphospermum whitei*) to the south of the Subject site, and notes that *Quassia* sp. B (Moonee Creek) is also known from the area. A JWA survey to the south of Moonee village (2004) also recorded Quassia sp. 'Moonee Creek'.

There has also been an unverified record of the Threatened species Dwarf heath casuarina (*Allocasuarina defungens*) on the Subject site (Mark Graham *pers comm*. 2004).

2.3.3 Site Surveys

One hundred and sixty-eight (168) flora species were recorded over The Glades development site (JWA 2007). None of these are Threatened or ROTAP (Briggs & Leigh 1995) species. A full list of flora species recorded at the Subject site is included as **APPENDIX 1**. Weed species are indicated by the use of an asterisk*.

Two (2) regionally significant (Sheringham & Westaway 1995) flora species were recorded within The Glades development site: White stringybark (*Eucalyptus globoidea*) and Christmas bells (*Blandfordia grandiflora*). Both these species were also recorded by Clancy (1998) within The Glades development site.

Three (3) broad vegetation types, consisting of distinct vegetation communities were identified on the Subject site during the 2004 surveys (JWA 2007). The boundaries and vegetation community descriptions were slightly modified in 2017 to reflect the current condition of these communities. These updated communities are described in **SECTION 2.3.4** and are shown in **FIGURE 6**.

No Endangered Ecological Communities (EECs) occur on the Subject site (**FIGURE 6)**:

2.3.4 Vegetation Community Descriptions

Three (3) vegetation communities were recorded within the Subject site (**FIGURE 6**). The vegetation communities are shown in **TABLE 4**. The numbering of these vegetation communities follows that utilised during previous vegetation mapping over the site (JWA 2007).

The conservation status of these communities are discussed with reference to the Comprehensive Regional Assessment completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999).

Vegetation communities are also described at a local level with reference to the following documents:

- Fisher, Body and Gill (1996) The vegetation of the Coffs Harbour City Council LGA
- Ecograph (2002) Coffs Harbour Vegetation Management Strategy

- NSW Office of Environment and Heritage (OEH 2012) Vegetation community profiles of the Coffs Harbour, LGA.

TABLE 4
VEGETATION COMMUNITIES PRESENT ON THE SUBJECT SITE

Community		Short Description
1	**Dry Sclerophyll forest/woodland communities**	
	1f	Tall closed forest (*Eucalyptus planchoniana*, *Syncarpia glomulifera*, *Eucalyptus pilularis*)
2	**Swamp sclerophyll communities**	
	2b	Mid-high swamp sclerophyll forest (*Melaleuca sieberi* +/- *Melaleuca quinquenervia*)
4	**Grassland/sedgeland communities**	
	4a	Low closed grassland (**Andropogon virginicus* (Whiskey grass), *Themeda triandra* (Kangaroo grass)) with scattered trees.

*Introduced species

2.3.4.1 Community 1(f) – Tall closed forest (*Eucalyptus planchoniana, Syncarpia glomulifera, Eucalyptus pilularis*)

Location and area
This community occurs over the majority of the Subject site.

Description
This community has a mixed composition with numerous species present in the canopy, and appears to be relatively mature regrowth. Needlebark stringybark (*Eucalyptus planchoniana*) is the dominant canopy species, along with secondary occurrences of Turpentine (*Syncarpia glomulifera*), Blackbutt (*Eucalyptus pilularis*), and Tindale's stringybark (*Eucalyptus tindaliae*). Other species present include the occasional Tallowwood (*Eucalyptus microcorys*) and Rusty gum (*Angophora costata*).

The midstorey in this community is relatively dense in areas with immature Turpentine, along with Hopbush (*Dodonaea triquetra*), Mock olive (*Notelaea ovata*) and some Black she-oak (*Allocasuarina littoralis*). The ground layer is generally sparse, consisting of scattered occurrences of Blady grass (*Imperata cylindrica*), *Juncus* sp., Flax lilly (*Dianella caerulea*) and Gahnia (*Gahnia sp.*), along with regenerating Mock olive and Turpentine. Some occasional Egg and bacon peas (*Pultenaea villosa*) also occur, while some Hairpin banksia (*Banksia spinulosa*) occurs in the more open northern portion of the community.

Conservation status
The most relevant Forest Ecosystem type considered in the CRA report (1999) is Forest Ecosystem 20 (Clarence Lowland Needlebark Stringybark) (CRA Unit 1999). The Regional Forestry Agreement document provides the following data on this ecosystem:

- Pre 1750 there was 12496 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 10817 hectares (86.6%) remains.
- The ecosystem is not considered to be Vulnerable, Rare, or Endangered.

- 55.4% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 26.6% in dedicated reserves and 21.9% in informal reserves. A further 6.9% is protected by tabulated prescriptions.

The closest description of this community under the Fisher, Body & Gill (1996) classification system for vegetation in the Coffs Harbour LGA is Map Unit N42a – Needlebark stringybark (*Eucalyptus planchoniana*, *Corymbia intermedia*), which is considered Locally Significant.

The Coffs Harbour Vegetation Management Strategy (CHVMS) (Ecograph 2002) notes that there is 15 hectares of Map Unit N42a within the Coffs Harbour LGA, comprising 0.06% of mapped bushland within the Coffs Harbour LGA.

Under the Vegetation Mapping of the Coffs Harbour LGA (VMCH – OEH 2012) the vegetation aligns closest with the vegetation of CH_D0F02: Sandstone bloodwood – Needlebark stringybark heathy forest.

It should be noted that the mixed composition of this community is not adequately represented by Forest Ecosystem 20. Conservation value is considered to be moderate.

2.3.4.2 Community 2(b) - Paperbark (*Melaleuca sieberi +/- Melaleuca quinquenervia*)

Location and area
This community occurs as a small area in the north of the Subject site.

Description
This community occurs in moist, low-lying areas of the site, and consists of Broad-leaved paperbark, mostly to the exclusion of other species. Some emergent Swamp mahogany (*Eucalyptus robusta*) occurs sporadically throughout. Some Broad-leaved paperbark (*Melaleuca quinquenervia*) also occurs along with an understorey of Saw sedge (*Ghania spp.*) and sedges (*Cypress spp.*).

Conservation status
This community is best described by *Forest Ecosystem 112 (Paperbark)* (CRA Unit 1999). The Regional Forestry Agreement document provides the following data on this ecosystem:

- 28577 hectares of this ecosystem type remains within the upper north east section of the NSW North Coast Bioregion. The original extent (ie. Pre 1750) has not been calculated.
- The ecosystem is considered to be **Vulnerable**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) reserve system has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.

- Paperbark communities have been identified as a priority for conservation on private land.

The closest description of this community under the Fisher, Body & Gill (1996) classification system for vegetation in the Coffs Harbour LGA is Map Unit N50 – Paperbark (*Melaleuca* sp., *Casuarina glauca*, *Eucalyptus robusta*), which is considered Ecologically Significant (comprising tree species utilised by Koalas).

The Coffs Harbour Vegetation Management Strategy (CHVMS) (Ecograph 2002) notes that there is 475 hectares of Map Unit N50 within the Coffs Harbour LGA, comprising 2.03% of mapped bushland within the Coffs Harbour LGA.

Under the Vegetation Mapping of the Coffs Harbour LGA (VMCH – OEH 2012) the vegetation aligns closest with the vegetation of CH_FrW04: Coastal paperbark – Sedgeland dominated forest.

Portions of this community that occur below the 1 in 100 flood line are considered to be representative of the Endangered Ecological Community (EEC) Swamp sclerophyll forest on coastal floodplains, and has a high conservation value. However, the Subject site occurs above the 1 in 100 flood line, therefore areas of this community within the Subject site is not considered to be representative of the EEC and the conservation value of this vegetation is considered to be moderate.

2.3.4.3 Community 4(a) - Low open grassland (*Andropogon virginicus*, *Themeda triandra*) with scattered trees

Location and area
This community occurs along the boundaries of the Subject site.

Description
Grassland on the Subject site is comprised mostly of Whisky grass (*Andropogon virginicus*) and Kangaroo grass (*Themeda triandra*), along with Blady grass (*Imperata cylindrica*) and some Parramatta grass (*Sporobolus indicus var indicus**). Other species such as Spiny-headed mat rush (*Lomandra longifolia*), Native violet (*Viola hederacea subsp. hederaceae*), Bracken (*Pteridium esculentum*) and Pennywort (*Centella asiatica*) occur patchily throughout the community. Some small patches of sedgeland (*Juncus planifolius*, *Juncus usitatus*) also occur, within low-lying areas.

Conservation status
There is no appropriate CRA classification for this community. The community does not qualify as natural (native) grassland, due to the overall dominance of Whisky grass. The conservation status is therefore considered to be relatively low.

Grasslands are not adequately described under the Fisher, Body & Gill (1996) classification system for vegetation in the Coffs Harbour LGA.

The highly modified nature of the grassland community from a combination of slashing and grazing has resulted in a simplified grassland community without any structural characteristics which qualify as a forest community. The conservation value of this vegetation is considered to be low.

2.4 Coffs Harbour City Council Vegetation Mapping

2.4.1 Introduction

Vegetation mapping was originally assessed in 2007 under the Coffs Harbour City Council Draft Vegetation Management Plan (JWA 2008). A new Local Environment Plans (LEP) for most of the Coffs Harbour local government area (LGA) came into effect in September 2013 (LEP 2013). However, Council resolved to defer changing the zoning of several areas, including lands identified on Map 2 (Moonee), therefore LEP 2013 does not apply to this land and LEP 2000 continues to apply to the deferred lands of Moonee. The following sections discuss the vegetation mapping for the Subject site in terms of the Coffs Harbour Draft Vegetation Management Plan in the original report (JWA 2008) and the Coffs Harbour LEP 2000.

Furthermore, fine-scale vegetation mapping was completed across the Coffs Harbour LGA (OEH 2012a and b). The purpose of this fine-scale vegetation map was to enable more informed decision making with respect to the sustainable management of native vegetation within the LGA. Fine-scale vegetation mapping for the Subject site is also discussed in the following sections.

2.4.2 Coffs Harbour City Council Draft Vegetation Management Plan

The 2009 report (JWA 2009) referred to mapping of The Glades under the Coffs Harbour City Council Draft Vegetation Management Plan. Mapping of the Subject site under this plan has not identified any areas in the Subject site as being of "ecological value" (**FIGURE 7**). Under the Coffs Harbour Vegetation Management Study, ecosystem types that have met between 0-33% of their reservation target are considered of "very high ecological value". Areas of ecological value under the CHVMS in The Glades development site are shown in **FIGURE 7**.

2.4.3 Coffs Harbour LEP 2000

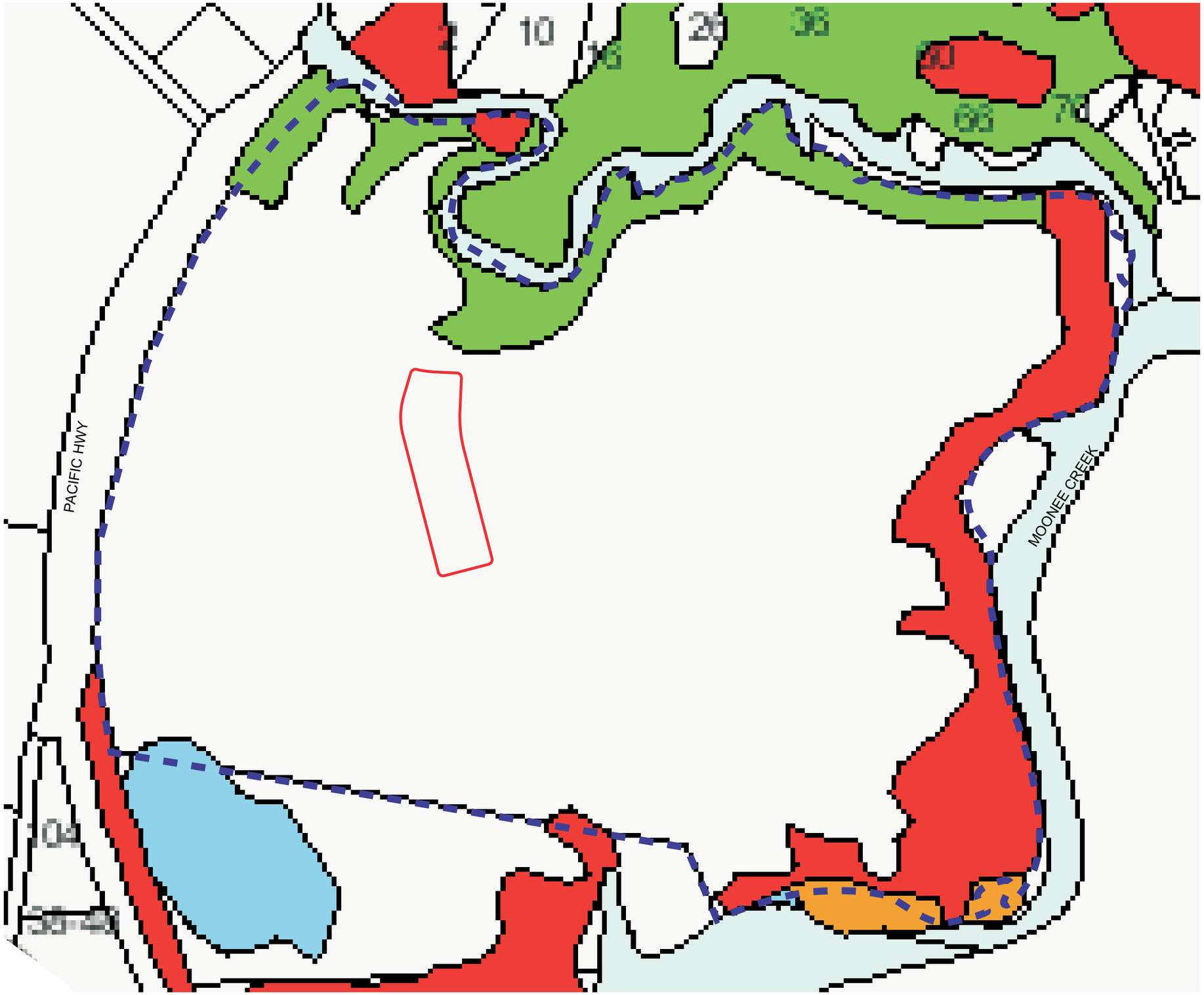
The subject site is mapped as Residential 2A – low density residential (**FIGURE 8**).

2.4.4 Coffs Harbour LGA Fine-scale Vegetation Mapping

The Coffs Harbour Fine-scale Vegetation mapping identifies the following vegetation types across the Subject site (**FIGURE 9**):

- Dry sclerophyll forests.

The fine-scale mapping does not map any Endangered Ecological Communities within the Subject site (**FIGURE 10**).



SOURCE: Coffs Harbour City Council Website (Accessed 14 July 2006)

SCALE: 1 : 5000 @ A3

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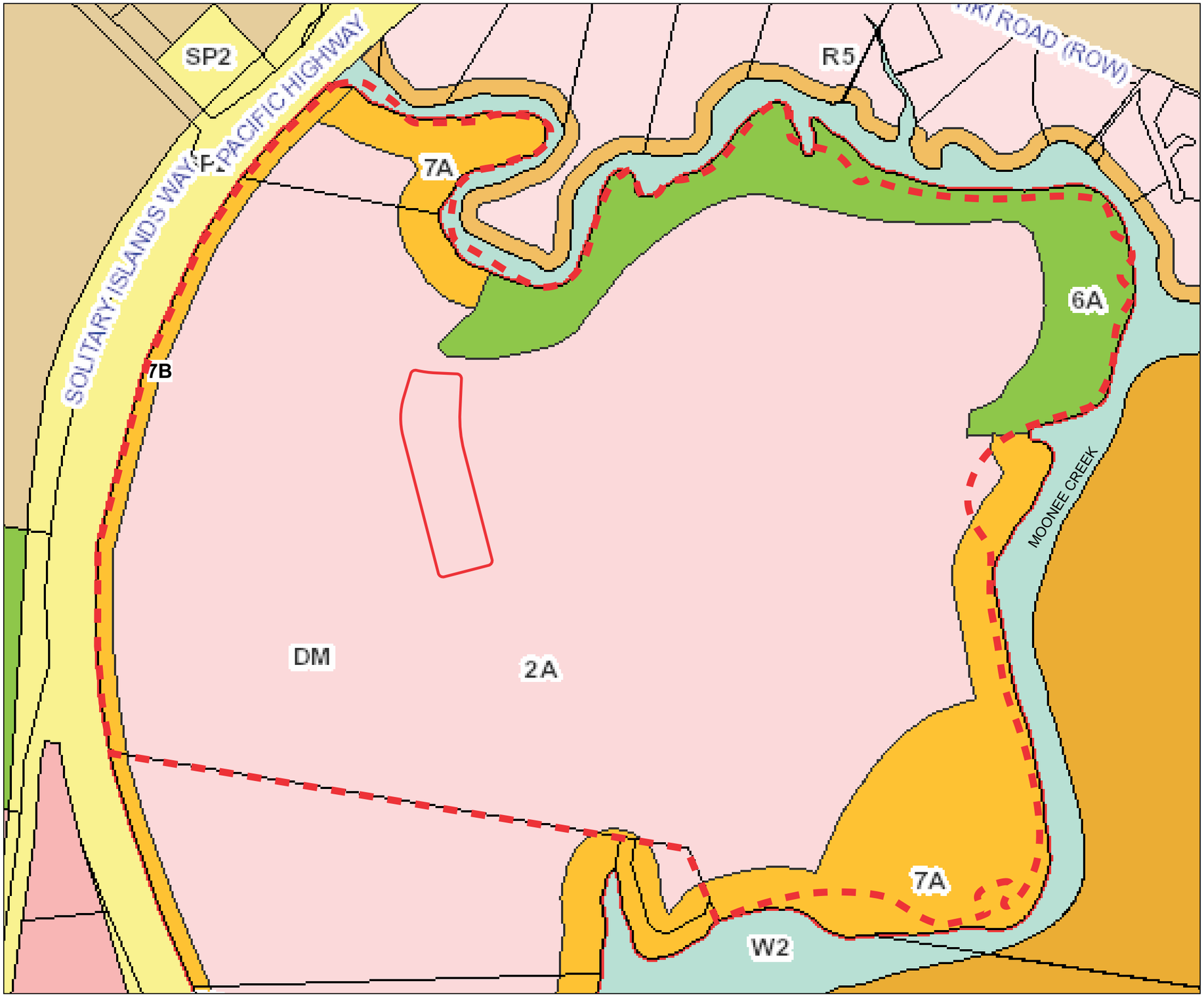
FIGURE 7

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_CHC Veg Value.cdr

TITLE

COFFS HARBOUR CITY COUNCIL VEGETATION VALUE



LEGEND

- Subject Site
- The Glades Development Site
- Cadastre

Coffs Harbour City LEP 2013

- R2 - Low Density Residential
- R5 - Large Lot Residential
- RU2 - Rural Landscape
- RU3 - Forestry
- RE1 - Public Recreation
- E1 - National Parks & Nature Reserves
- SP2 - Infrastructure
- W2 - Recreational Waterways
- DM - Deferred Matter

Coffs Harbour City LEP 2000 Deferred Areas

- Residential 2A - Low Density Residential
- Open Space 6A - Public Recreation
- Environmental Protection 7A - Habitat & Catchment Zone
- Environmental Protection 7B - Scenic Buffer Zone

0 150m

1 : 5000

SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 5000 @ A3

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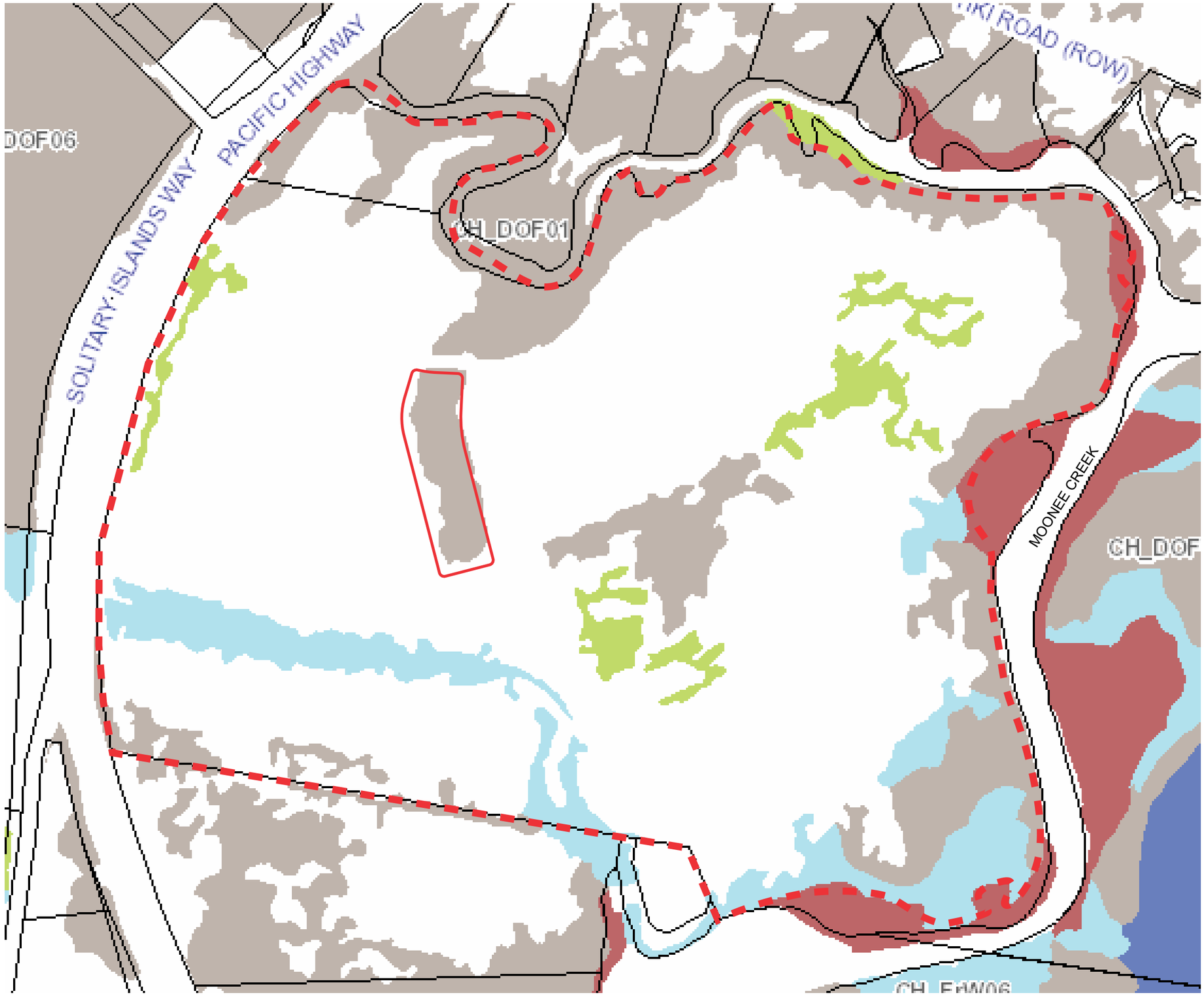
FIGURE 8

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_Zoning.cdr

TITLE

ZONING PLAN



SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 5000 @ A3

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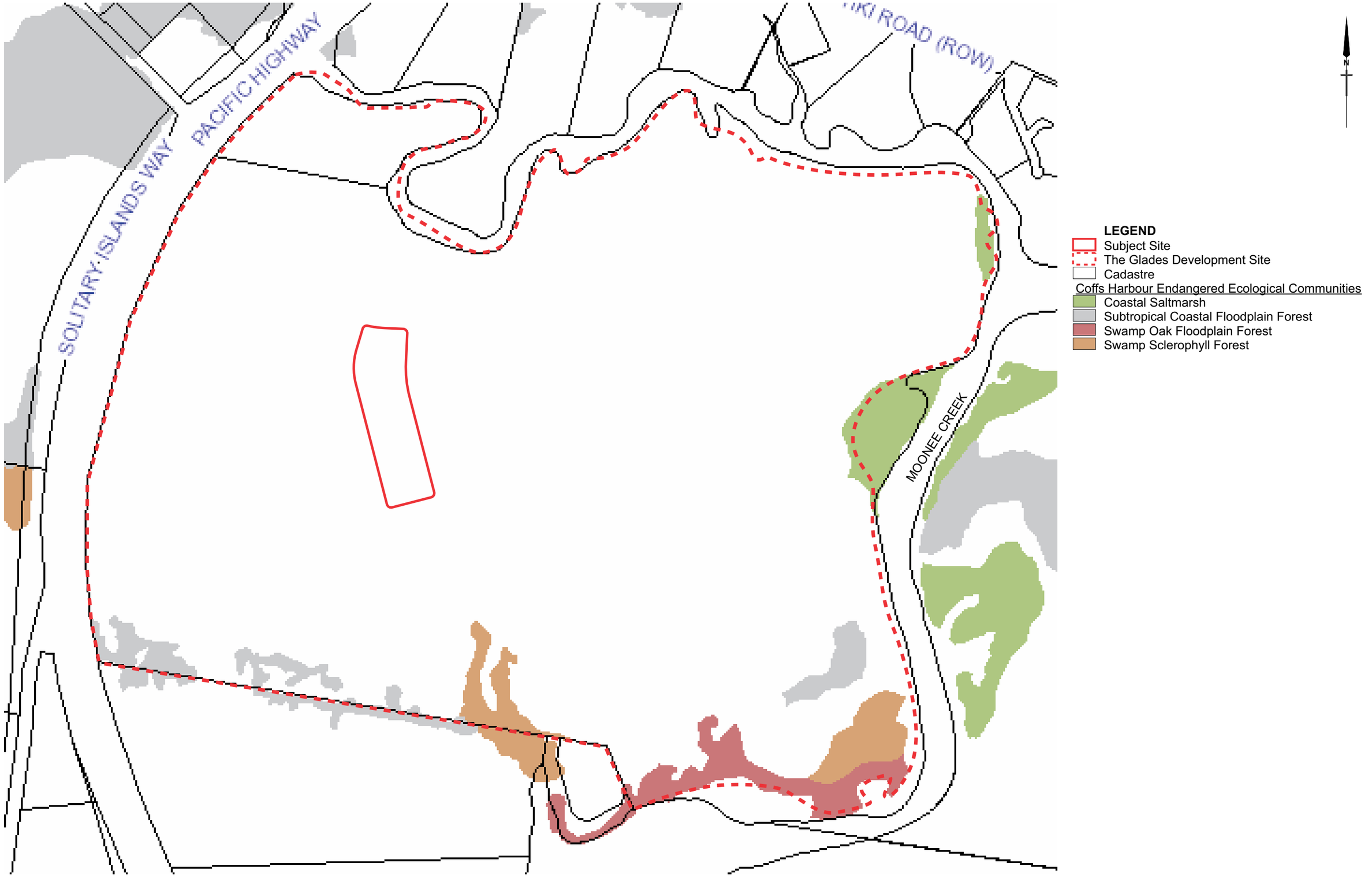
FIGURE 9

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_CHC Veg.cdr

TITLE
COFFS HARBOUR CITY COUNCIL FINE SCALE VEGETATION MAPPING



SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 5000 @ A3

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FIGURE 10

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_CHC EEC.cdr

TITLE
COFFS HARBOUR CITY COUNCIL EEC'S

There are also no Over Cleared Vegetation types mapped on the Subject site (**FIGURE 11**).

SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 5000 @ A3

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FIGURE 11

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_CHC over cleared.cdr

TITLE
COFFS HARBOUR CITY COUNCIL OVER CLEARED VEGETATION TYPES

3 FAUNA ASSESSMENT

3.1 Introduction

This section includes a description of the methods used in determining which fauna species use, or are likely to use, the Subject site and a discussion of the results of the Fauna assessment. The fauna assessment involved a full fauna survey (i.e. specialised bird, bat and amphibian survey, spotlighting, hair sampling and trapping) and was completed across the entire The Glades development site.

3.2 Methods

3.2.1 Desktop Review

The following databases were reviewed as part of the desktop assessment to find records of State and Commonwealth Threatened species[3] within 10km of the Subject Site and within Moonee Nature Reserve which is adjacent to the site:

- the Commonwealth *EPBC Act* (*1999*) PMST (Dept. Environment 2013); and
- Atlas of NSW Wildlife (OEH 2016) database.

3.2.2 Literature Review

A comprehensive literature review was completed by JWA (2003b) as part of a Flora and Fauna Assessment for a nearby site in the locality. This review used a number of sources to identify records of Threatened species in the locality.

The Flora and Fauna Assessment of the Moonee Release Area (Clancy 1998) was also consulted.

3.2.3 Habitat Assessment

Site habitats were assessed to determine their value for native fauna species. This assessment was completed in conjunction with the flora survey. The assessment focused on identifying habitat features associated with Threatened species as well as other native fauna groups. Particular attention was paid to habitat features such as:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places.
- The presence of Koala food trees.
- The presence of preferred Glossy black cockatoo feed trees (Forest oak and/or Black she-oak).
- The presence of Yellow-bellied glider feeding scars.

[3] As listed within schedules of the *TSC Act (1995)* and *EPBC Act (1999).*

- Condition, flow and water quality of drainage lines and bodies of water.
- Areas of dense vegetation.
- Presence of hollow logs/debris and areas of dense leaf litter.
- Presence of fruiting flora species.
- Presence of blossoming flora species, particularly winter-flowering species.
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation.
- Presence of caves and man-made structures suitable as microchiropteran bat roost sites.

3.2.4 Corridor Analysis

3.2.4.1 Background

Maintaining habitat connectivity at the landscape scale is required to maintain the viability of species populations in the long term (Beier and Noss, 1998). In fragmented landscapes, corridors of native vegetation (or fauna corridors) that connect larger habitat areas can enhance landscape connectivity by:

- providing habitat for fauna and flora species; and
- facilitating the movement and dispersal of fauna and flora species between larger and/or more suitable habitat areas in the landscape.

Importantly, even where corridors physically connect two habitat areas, it is crucial that the habitat requirements and movement capacities of the species for which proposed corridors are intended is considered in the design (e.g. width, length, vegetation type and vegetation structure) of fauna corridors in order for the corridors to provide functional connectivity in the landscape (Tischendorf and Fahrig, 2000; Hess and Fischer, 2001).

The existing Project Approval included an open space area located between residential precincts 1 and 2 (**FIGURE 5**). This proposed open space area covers a total of 1.747 ha and contains native vegetation that was proposed to be retained. The Section 75W modification application to modify the Project Approval proposes to remove this open space area and clear this vegetation in order to create additional residential allotments.

In order to determine the habitat and connectivity values of this vegetation, JWA completed desktop and site-based assessments. The corridor assessment methodology utilised is outlined in the following sections.

3.2.4.2 Desktop Assessment

Prior to conducting the field survey, aerial photography over the subject site, adjacent waterway corridors and wider locality was reviewed. The basic premise of aerial photographic interpretation in this case was to identify areas of potential flora and fauna

habitat and corridor values within the locality and determine the level of connectivity between these areas and the subject vegetation.

3.2.4.3 Site Assessment

Subsequent to the above desktop review, one (1) ecologist from JWA completed an inspection of the Subject site on the 14th and 15th of February 2017 to assess biodiversity and corridor values. The inspection included ground-truthing previous vegetation mapping, searches for threatened flora and fauna species, and one (1) night of spotlighting.

A habitat assessment, including searches for evidence of Threatened fauna species previously recorded from the broader The Glades development site, and an assessment of the likely impacts on fauna movement opportunities resulting from the removal of vegetation were also completed.

To further assess whether vegetation would be an effective movement corridor for native fauna, values considered included corridor width, length, shape, habitat type and quality, structural complexity, edge effects, general movement patterns of target fauna groups, and any fauna diversion or exclusion requirements (e.g. culverts, rope bridges, fences).

3.2.5 Fauna Surveys

3.2.5.1 Background

A number of detailed fauna surveys have been completed by JWA over The Glades development site:

- A detailed fauna survey over five (5) days by two (2) ecologists between the 10th and the 14th of May 2004. The weather was generally fine and warm during the survey period, although nights were notably cool to cold.
- A targeted survey was completed over three (3) nights by two (2) ecologists between the 22nd and the 24th of September 2004 targeting the Grass owl. The weather during this period was mild and windy with some light rain in the evenings of the 23rd and 24th.
- A targeted survey for the Wallum froglet was completed by two (2) ecologists on the nights of the 6th and 7th September 2005.
- A night of spotlighting was completed by one (1) ecologist over the subject site on the 14th February 2017 as part of the corridor analysis;
- A detailed fauna survey was completed by two (2) ecologists over four (4) days between the 27th and the 30th of March 2017. The weather was generally fine and warm for the survey period, with rain falling on the 30th. Minimum and maximum temperatures throughout this survey were 19°C and 30°C respectively (BOM 2017). This survey was originally planned to occur over five (5) days, however due to severe weather experienced as a result of ex-tropical cyclone Debbie, including flash flooding and strong winds, the survey was terminated early. The closest

weather station at Coffs Harbour (approx. 13km south of the site) recorded 104.8 mm of rain and winds up to 69km/hr on the 31st March (BOM 2017).

- A brief fauna survey was completed by two (2) ecologists in conjunction with the recent BBAM assessment on the 14th and 15th November 2017 and included active searches and incidental observations.

3.2.5.2 Survey Techniques

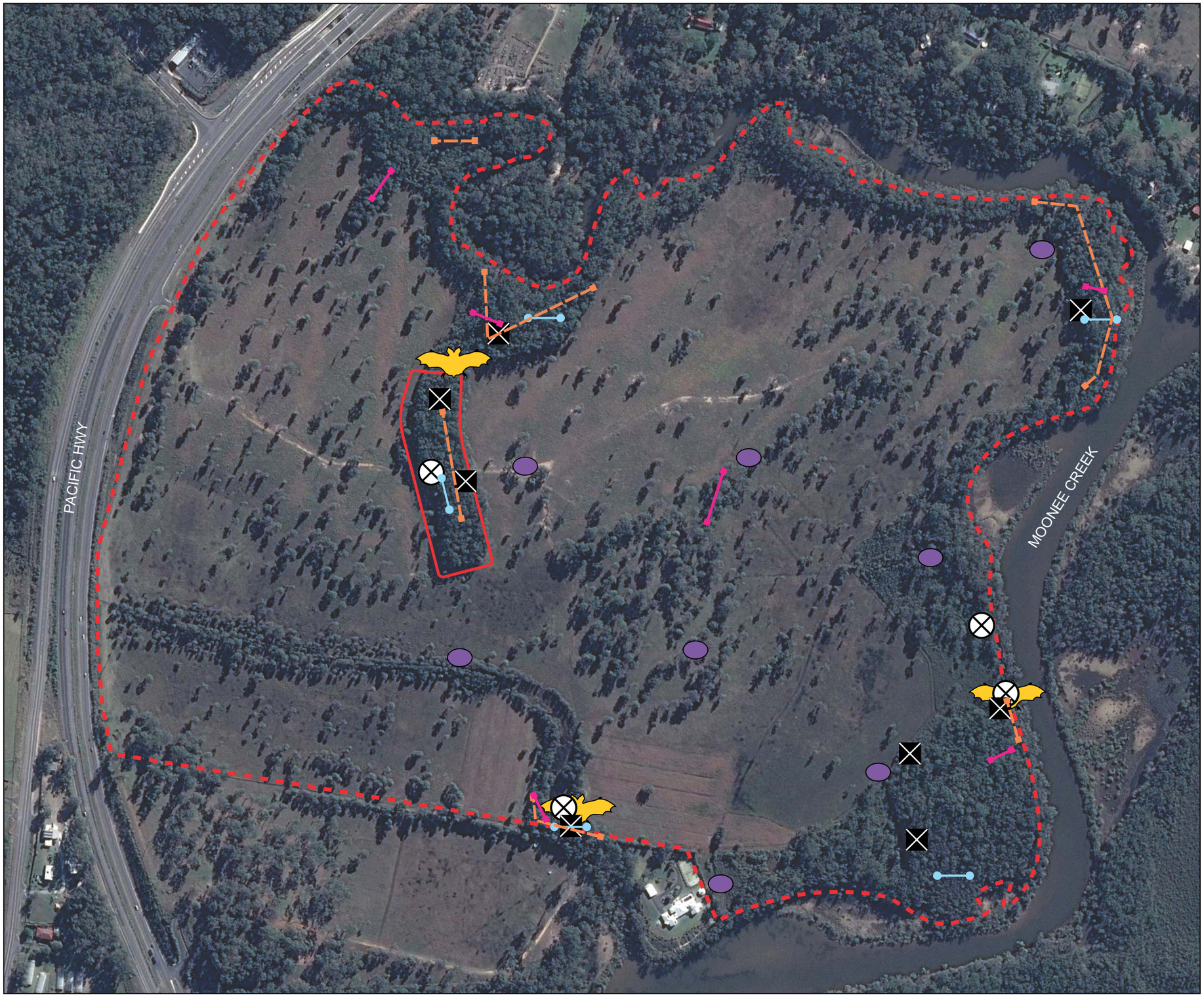
The 2004 and 2017 detailed fauna surveys were completed in accordance with the methodology set out in the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al*. 2012) and the DRAFT Threatened Species Survey and Assessment Guidelines (NSW Department of Environment and Climate Change 2009).

Fauna species were detected using a combination of trapping techniques, opportunistic sightings and active searches during daylight and at night. All traps were routinely checked as soon as practicably possible after first light to minimise the capture stress to any trapped animals and to prevent captured animals from overheating during warm daylight hours. Captured animals were handled for a minimum amount of time to reduce stress associated with handling. Care was taken to ensure that captured animals were released into areas where they could find immediate and safe shelter and predators could not intercept them.

The detailed fauna surveys were designed to target identified threatened species. Techniques utilised during the fauna surveys are described below. Unless otherwise indicated, the following survey techniques were utilised in both the 2004 and 2017 site assessments. **FIGURES 12** and **13** shows the location of trap and survey sites for the 2004 and 2017 surveys, respectively. A summary of the 2004 and 2017 survey effort for the site assessments are shown in **TABLE 5.** It should be noted that the 2017 survey was cut short due to inclement weather resulting in localised flash-flooding.

TABLE 5
SUMMARY OF TRAPPING EFFORT

Trap/survey type	Survey effort 2004	Survey effort 2017
Elliott trapping	293 trap nights	198 trap nights
Arboreal Elliott trapping	33 trap nights	16 trap nights
Total Elliott trapping	326 trap nights	214 trap nights
Cage traps	32 trap nights	36 trap nights
Pitfall traps	75 trap nights	108 trap nights
Harp traps	6 trap nights	NA
Hair tubes	420 trap nights	NA
Anabat/SongMeter (bat calls)	3 nights	2 nights
Spotlighting	14 hours	18 hours
Call playback	4 nights + 3 nights targeted survey for Grass owls	3 nights



N

LEGEND

Subject Site

The Glades Development Site

2004 Trapping Locations

Hair Tubes

Elliott Lines

Pitfall Lines

Call Playback Locations

Harp Traps

Cage Traps

Anabat Locations

0 150m

1 : 5000

SOURCE: JWA Site Investigations 2004; Google Earth June 2016 Aerial Photo

SCALE: 1 : 5000 @ A3

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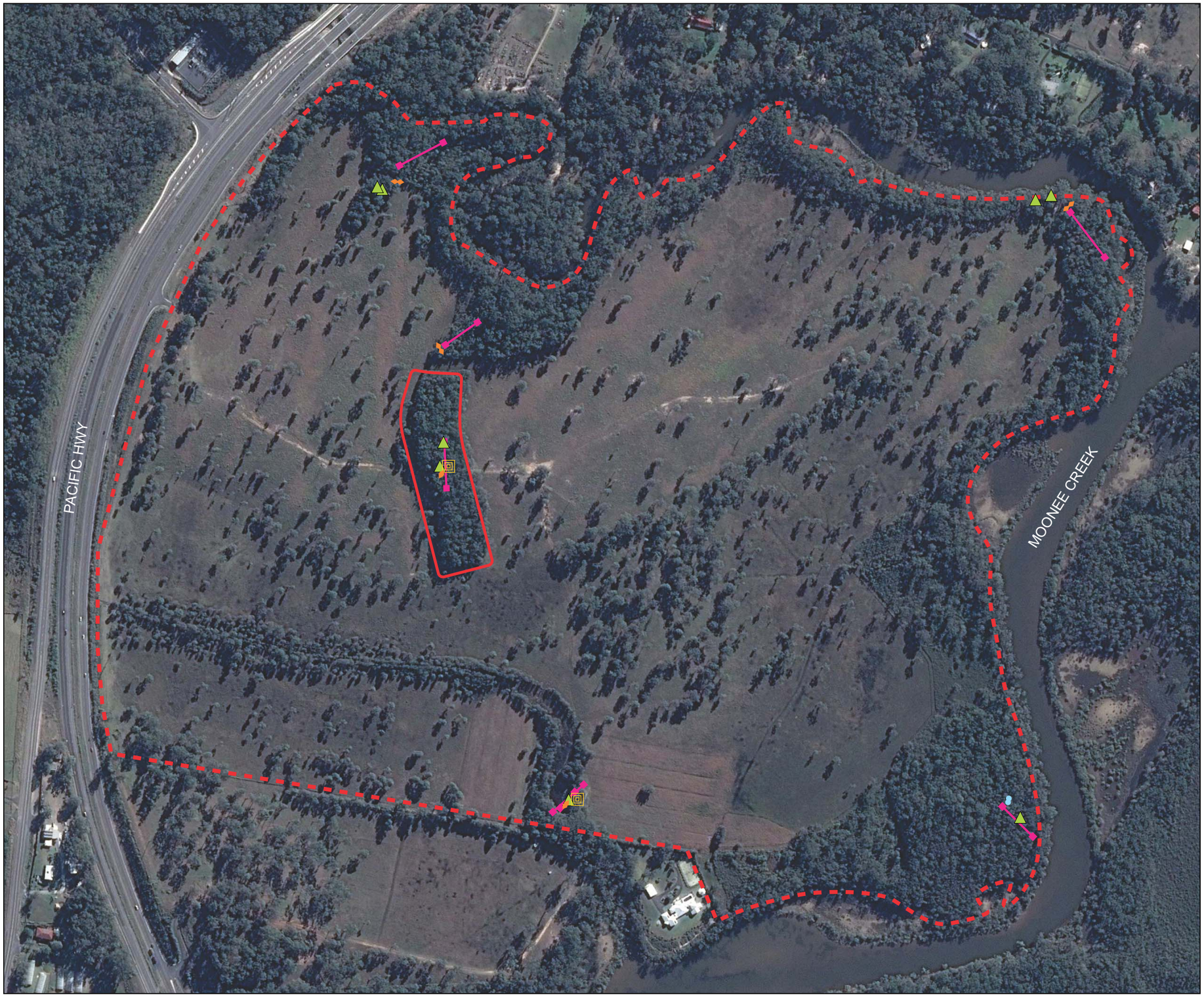
FIGURE 12

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_Trapping 2004.cdr

TITLE

TRAPPING LOCATIONS 2004



N

LEGEND

Subject Site

The Glades Development Site

2017 Trapping Locations

Trapping Lines

Funnel Lines

Pitfall Lines

Song Meter

Camera Traps

0 150m

1 : 5000

SOURCE: JWA Site Investigations 2017; Google Earth June 2016 Aerial Photo

SCALE: 1 : 5000 @ A3

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FIGURE 13

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_Trapping 2017.cdr

TITLE

TRAPPING LOCATIONS 2017

Trap/survey type	Survey effort 2004	Survey effort 2017
Bird survey	Diurnal dusk/dawn survey – 8 hrs, 5 days opportunistic records	4 days opportunistic records
Amphibian survey	2 hours targeted survey, call playback, 3 nights opportunistic records	2 nights of opportunistic records and call playback
Reptile survey	1 hour targeted survey, 5 days, 4 nights opportunistic records	4 days/nights opportunistic records
Camera traps	NA	24 trap nights

Active Searching
Logs, sheets of tin, cardboard, bark and leaves were overturned in search of reptiles and amphibians while incidentally traversing the Subject site. Diggings were searched for signs of droppings. The Subject site was actively searched for scats and bones. Active observation of bird activity was undertaken during all site visits.

Chewed Cone Survey
Target species – Glossy black cockatoo

A ground search was undertaken where the feed tree species *Allocasurina littoralis* and/or *A. torulosa* occur to look for the presence of chewed cones, a sign of feeding activity of the Glossy black cockatoo.

Tree Hollow Survey
A systematic survey was undertaken of scattered trees within grasslands on the Subject site, which are likely to be removed for the proposed development. Any trees containing hollows, spouts, fissures etc were marked by GPS and mapped.

Stag Watching
Target species – arboreal mammals and nocturnal bird species

Each of the trees identified with hollows within the development area were observed for emerging fauna from before dusk for a period of one hour for one (1) night only in 2004. Hollow bearing trees were also observed for one (1) night in 2017. Observers positioned themselves so that the silhouette of any fauna dispersing from the tree could be clearly seen, and also utilised a 50W spotlight powered by 12V batteries to make periodic checks of the hollow.

Type 'A' and 'B' Elliott Box Traps and Cage Traps
Target species – ground-dwelling and arboreal mammals.

This methodology provides an insight into the size and density of populations of ground fauna which may form a component of the diet of raptors such as the Eastern grass owl and the Masked owl. It also indicates the extent of invasion by exotic species such as the

Black rat and the House mouse which allows an assessment of the 'naturalness' of the area to be made.

Eighty-four (84) type 'A' Elliott traps and eight (8) cage traps were deployed over a period of four (4) nights in 2004. Trapping effort totalled three-hundred and sixty-eight (368) trap nights for the 2004 survey. Trap locations are shown in **FIGURE 12.** Each Elliott trap was baited with rolled oats, honey, peanut butter and vanilla essence, while cage traps were baited with either a combination of banana and apple or chicken necks.

Sixty (60) type 'A' Elliott traps, six (6) type 'B' Elliot traps, and twelve (12) cage traps were deployed over a period of three (3) nights in 2017. Traps were deployed along six (6) trapping lines, spread out across The Glades development site to ensure each vegetation type was adequately surveyed. Trapping effort totalled two-hundred and thirty-four (234) trap nights for the 2017 survey. Trap locations are shown in **FIGURE 13.** Each Elliott trap was baited with a mixture of rolled oats, honey, and peanut butter. While cage traps were baited with either a combination of banana and apple, a mixture of peanut butter, honey and oats, or sardines.

Arboreal Traps
Eight type 'B' arboreal Elliott traps were set for a period of 2 nights in 2017 for a total of sixteen (16) trap nights. Elliott traps were set on arboreal platforms attached to the side of potential habitat trees at approximately 3-4m above the ground. Arboreal Elliott trap locations were situated along the Elliot and cage trapping lines shown in **FIGURE 13**. Arboreal Elliott traps were baited with a mixture of peanut butter, honey and oats. Honey water was also sprayed on the trunk of trees above the arboreal traps.

Pitfall Traps/Funnel Traps
Target species – Common planigale, reptiles, amphibians.

In 2004, five (5) pitfall lines of five (5) buckets (10 litre) spaced five (5) metres apart (incorporating drift fencing) were set for a period of three (3) nights. A total of 75 bucket nights were achieved during this component of the Study. Pitfall trap locations are shown in **FIGURE 12.**

In 2017, pitfalls were set along a series of line transects throughout The Glades development site (the use of pitfall traps was dependant on ground conditions). Where ground conditions were not suitable for installing pitfall traps (i.e. hard, rocky ground) funnel traps were utilised instead. Six (6) pitfall/funnel trap transect lines, each with six (6) pitfall/funnel traps, were set for a period of three (3) nights for a total of one hundred and eight (108) trap nights. Pitfall/Funnel trap locations are shown in **FIGURE 13**.

Hair Tubes
Target species – ground-dwelling mammals.

In 2004, six (6) lines of five (5) hair tubes each were laid on the Subject site. Each Hair Tube was baited with rolled oats, honey, peanut butter and vanilla essence and then set for a period of fourteen (14) nights. Samples were identified by Barbara Triggs.

No hair tube traps were deployed during the 2017 surveys as this labour-intensive technique did not reveal any additional fauna species that were not otherwise recorded by alternative survey techniques (i.e. Elliott traps, cage traps, pitfall traps) during the 2004 surveys.

Call Playback Techniques
Target species - Powerful owl, Masked owl, Koala, Grass owl, Yellow-bellied glider, Squirrel glider and Wallum froglet.

In both 2004 and 2017, call playback was carried out over four (4) and three (3) nights, respectively, at various locations throughout The Glades site for a period of one (1) hour. Target species included: Powerful owl, Masked owl, Koala, Grass owl, Yellow-bellied glider, Squirrel glider and Wallum froglet. Calls were broadcast, and then followed by a five (5) minute listening period. Call playback locations are shown in **FIGURE 12** and **13.**

A targeted Grass owl call playback was undertaken at seven (7) selected sites for three consecutive nights on the 23rd, 24th, & 25th of September 2004. Grass owl calls were broadcast and a ten minute listening period followed. Spotlighting was undertaken for 10 minutes at each of the sites following call broadcast to determine whether owls had flown in to the broadcast site.

Specialist Avian Survey
Target species - All diurnal avian species

In 2004, a survey was carried out to sample diurnal bird species. A dawn and dusk census was completed by one (1) person walking through bushland along Skinners and Moonee Creeks for a total of two (2) hours over four (4) days. Incidental observations were recorded by both ecologists in 2004 while checking traps and mapping vegetation.

Incidental bird observation were recorded by two (2) ecologists in 2017 while checking traps and conducting other site assessments.

Harp Netting
Target species - All microchiropteran bats

In 2004, two (2) Harp traps were set in potential flyways over three (3) nights. Flyways were chosen on the basis of adequate cover on both sides of the trap, and screening was incorporated to enhance capture success. One of the harp traps was left in position for the three nights due to lack of other suitable positions. The other harp trap was moved each night in order to adequately survey The Glades site. A total of six (6) trap nights was achieved in this component of the study.

No harp traps were deployed during the 2017 surveys as this labour-intensive technique did not reveal any additional microchiropteran bat species that were not otherwise recorded by alternative survey techniques (i.e. Anabat) during the 2004 surveys.

Anabat Recording/Song Meter
Target species - All microchiropteran bats

In 2004 a Anabat II sonar detector (Titley Electronics, Ballina) was used to download the ultrasonic calls of Microchiropteran bats. Recording was undertaken for ten (10) hours per night over two (2) nights, and for four (4) hours on the third night. A total of twenty-four (24) hours of recording was undertaken. Recording times commenced from slightly before dusk. Recording was undertaken by positioning the Anabat II sonar detector facing across possible bat flyways (**FIGURE 12**). Anabat records were identified by Dr. Greg Richards.

In 2017, a SongMeter SM2Bat+ ultrasonic bat detector unit was used to record microbat calls from The Glades development site. The Songmeter was placed at two (2) locations over two (2) nights (one night per location) between the hours of dusk (1800h) and dawn (0600h). The data from these recordings were analysed by an expert in echolocation call identification. SongMeter locations are shown in **FIGURE 13**.

Spotlighting
Target species - Powerful owl, Masked owl, Eastern grass owl, Brush-tailed phascogale, Yellow-bellied glider, Squirrel glider, Koala, Grey-headed flying fox and all nocturnal bird species.

Spotlighting was undertaken by four (4) investigators for one and a half (1.5) hours each on the night of the 11th of May 2004 for a total of six (6) hours spotlighting. Additional spotlighting was carried out on the nights of the 12th and 13th of May 2004 by two (2) investigators for totals of four (4) hours and three (3) hours respectively. The weather for the spotlighting survey was fine and warm.

Spotlighting was undertaken by two (2) investigators for three hours each night between the 27th and 29th March 2017 for a total of eighteen (18) person hours spotlighting. The weather for the spotlighting surveys was warm and dry.

Sections of the site that could be accessed were driven in a four-wheel drive vehicle. The speed of the vehicle was kept under 5km/hour. A large spotlight was used to detect 'eye-shine' from nocturnal fauna. If fauna could not be identified from the vehicle, it was necessary to approach them on foot with a handheld spotlight and to identify them with binoculars.

Spotlighting was also conducted on foot in order to access heavily vegetated areas on the subject site. The observer walked at approximately 1km/h, allowing intensive listening as an adjunct to visual detection.

Koala Scat Searches
A search for Koala scats (approximately 2 minutes per tree) was undertaken under primary Koala feed trees known to be extensively utilised within Coffs harbour LGA, primarily Tallowwood (*Eucalyptus microcorys*) and Swamp mahogany (*E. robusta*).

Infrared Motion Detector Cameras
Eight (8) infrared motion detector cameras were positioned throughout the Subject site for a period of three (3) nights during the 2017 survey for a total of twenty-four (24) trap nights. Camera locations are shown in **FIGURE 13**. Bait included a mixture of peanut butter, honey and oats, and sardines, which was positioned to draw animals into the range of the camera.

3.3 Results and Discussion

3.3.1 Database Search

OEH database searches revealed forty-nine (49) threatened fauna species that may occur within 10km of the subject site. The Commonwealth PMST identified twenty-three (23) threatened fauna species that may occur within 10km of the subject site based on the availability of suitable habitat within the locality. Threatened fauna species detected in the database searches are listed in **TABLE 6**. The conservation status of each species listed in **TABLE 6** is shown in accordance with the Commonwealth *EPBC Act* (*1999*) and *TSC Act (1995)*. Species that will clearly not occur on the site i.e. whales, sharks, marine turtles and marine birds have been omitted.

Database searches using the Commonwealth PMST also revealed that twenty-five (25) migratory species may occur within 10km of the site based on the availability of suitable habitat. Migratory species identified in database searches are listed in **TABLE 7**.

TABLE 6
NPWS DATABASE RECORDS OF THREATENED FAUNA SPECIES WITHIN 10 KM OF THE SUBJECT SITE

Scientific name	Common name	TSC Act*	EPBC Act#
Aepyprymnus refescens	Rufous bettong	V	-
Anthochaera phrygia	Regent honeyeater	E4A	CE
Argynnis hyperbius inconstans	Australian fritillary	(E)	CE
Artamus cyanopterus cyanopterus	Dusky woodswallow	V	-
Botaurus poiciloptilus	Australasian bittern	(E)	E
Calidris canutus	Red knot	-	E
Calidris ferruginea	Curlew sandpiper	(E)	CE
Callocephalon fimbriatum	Gang-gang cockatoo	V	-
Calyptorhynchus lathami	Glossy black-cockatoo	V	-
Chalinolobus dwyeri	Large-eared pied bat	(V)	V
Climacteris picumnus	Brown treecreeper	V	-
Coracina lineata	Barred cuckoo-shrike	V	-
Crinia tinnula	Wallum froglet	V	-
Daphoenositta chrysoptera	Varied sittella	V	-
Dasyomis brachypterus	Eastern bristlebird	(E)	E
Dasyurus maculatus	Spotted-tailed quoll	V	E
Ephippiorhynchus asiaticus	Black-necked stork	E1	-

Scientific name	Common name	TSC Act*	EPBC Act#
Erythrotriorchis radiatus	Red goshawk	(CE)	V
Esacus magnirostris	Beach stone-curlew	E4A	-
Glossopsitta pusilla	Little lorikeet	V	-
Grus rubicundus	Brolga	V	-
Haematopus fuliginosus	Sooty oystercatcher	V	-
Haematopus longirostris	Pied oystercatcher	E1	-
Haliaeetus leucogaster	White-bellied sea-eagle	V	-
Hieraaetus morphnoides	Little eagle	V	-
Hoplocephalus stephensii	Stephens' banded snake	V	-
Irediparra gallinacea	Comb-crested jacana	V	-
Ixobrychus flavicollis	Black bittern	V	-
Kerivoula papuensis	Golden-tipped bat	V	-
Litoria brevipalmata	Green-thighed frog	V	-
Litoria olonburensis	Wallum sedge frog	V	V
Lathamus discolor	Swift parrot	E1	CE
Lophoictinia isura	Square-tailed kite	V	-
Miniopterus australis	Little bentwing-bat	V	-
Miniopterus schreibersii oceanensis	Eastern bent-wing Bat	V	-
Mixophyes balbus	Stuttering frog	(E)	V
Mixophyes iteratus	Giant barred frog	E1	E
Mormopterus norfolkensis	Eastern freetail-bat	V	-
Myotis macropus	Large-footed myotis/ Southern myotis	V	-
Ninox strenua	Powerful owl	V	-
Numenius madagascariensis	Eastern curlew	-	CE
Pandion cristatus	Eatern osprey	V	-
Petauroides volans	Greater glider	-	V
Petaurus australis	Yellow-bellied glider	V	-
Petaurus norfolcensis	Squirrel glider	V	-
Petrogale penicillata	Brush-tailed rock-wallaby	(E)	V
Petroica boodang	Scarlet robin	V	-
Phascogale tapoatafa	Brush-tailed phascogale	V	-
Phascolarctos cinereus	Koala	V	V
Phyllodes imperiallis smithersi	Pink underwing month	(E)	E
Planigale maculata	Common planigale	V	-
Pomatostomus temporalis temporalis	Grey-crowned babbler (eastern subspecies)	V	-
Potorous tridactylus tridactylus	Long-nosed potoroo	(V)	V
Pseudomys novaehollandiae	New Holland mouse	(-)	V
Pteropus poliocephalus	Grey-headed flying-fox	V	V
Ptilinopus magnificus	Wompoo fruit-dove	V	-

Scientific name	Common name	TSC Act*	EPBC Act#
Ptilinopus regina	Rose-crowned fruit-dove	V	-
Rostratula australis	Australian painted snipe	(E)	E
Saccolaimus flaviventris	Yellow-bellied sheathtail-bat	V	-
Syconycteris australis	Common blossom-bat	V	-
Turnix melanogaster	Black-breasted button-quail	(CE)	V
Tyto longimembris	Eastern grass owl	V	-
Tyto novaehollandiae	Masked owl	V	-
Tyto tenebricosa	Sooty owl	V	-

* NSW Threatened Species Conservation Act 1995 (TSC Act)

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

E1 – Endangered (state), E2 – Endangered Population, E4 – Critically Endangered (state), E – Endangered (national), V – Vulnerable, CE – Critically Endangered (national)

TABLE 7
DATABASE RECORDS OF COMMONWEALTH LISTED MIGRATORY SPECIES WITHIN 10KM OF THE SITE

Scientific Name	Common Name	Status#
Actitis hypoleucos	Common sandpiper	M
Apus pacificus	Fork-tailed swift	M
Ardea alba	Great egret	M
Ardea ibis	Cattle egret	M
Calidris acuminata	Sharp-tailed sandpiper	M
Calidris canutus	Red knot	E
Calidris ferruginea	Curlew sandpiper	CE
Calidris melanotos	Pectoral sandpiper	M
Cuculus optatus	Oriental cuckoo	M
Cuculus saturates	Oriental cuckoo	M
Gallinago hardwickii	Latham's snipe	M
Gallinago megala	Swinhoe's snipe	M
Gallinago sternura	Pin-tailed snipe	M
Haliaeetus leucogaster	White-bellied sea-eagle	M
Hirundapus caudacutus	White-throated needletail	M
Lathamus discolour	Swift parrot	CE
Merops ornatus	Rainbow bee-eater	M
Monarch melanopsis	Black-faced monarch	M
Monarch trivirgatus	Spectacled monarch	M
Myiagra cyanoleuca	Satin flycatcher	M
Numenius madagascariensis	Eastern curlew	CE
Pandion haliaetus	Osprey	M
Rhipidura ruffrons	Rufous fantail	M
Rostratula benghalensis	Painted snipe	E
Tringa nebularia	Common greenshank	M

CCE - Critically Endangered, CE - Endangered, CV - Vulnerable & M – Migratory as listed within schedules of the Commonwealth *EPBCA (1999)*

A database search was also completed for records of Threatened fauna within Moonee Beach Nature Reserve which occurs adjacent the Subject site. Seventeen (17) Threatened species have been recorded from the Reserve and include:

- Glossy black-cockatoo (*Calyptorhynchus lathami*);
- Pied oystercatcher (*Haematopus longirostris*);
- Eastern Osprey (*Pandion haliaetus*);
- Black-necked stork (*Ephippiorhynchus asiaticus*);
- Brown treecreeper (*Climacteris picumnus*);
- Sooty oystercatcher (*Haematopus fuliginosus*);
- Comb-crested jacana (*Irediparra gallinacea*);
- Squirrel glider (*Petaurus norfolcensis*);
- Koala (*Phascolarctos cinereus*);
- Grey-headed flying fox (*Pteropus policephalus*);
- Common blossom bat (*Syconcteris australis*);
- Little bent-wing bat (*Miniopterus australis*);
- White-bellied sea-eagle (*Haliaeetus leucogaster*);
- Square-tailed kite (*Lophoictinia isura*);
- Little tern (*Sternula albifrons*);
- Little lorikeet (*Glossopsitta pusilla*); and
- Eastern bent-wing bat (*Miniopterus schreibersii oceanensis*).

3.3.2 Literature Review

A full fauna survey was completed for Lot 122 DP 1053566, Moonee Beach Road, Moonee by JWA in 2003. This site occurs approximately 1 km south-east of the site. Six (6) Threatened species were recorded:

- Pied oystercatcher (*Haematopus longirostris*);
- Osprey (*Pandion haliaetus*);
- Glossy black cockatoo (*Calyptorhynchus lathami*);
- Little bent-wing bat (*Miniopterus australis*);
- Large-footed myotis (*Myotis macropus*); and
- Grey-headed flying-fox (*Pteropus policephalus*).

The Clancy Flora and Fauna Assessment of the Moonee Release Area (1998) recorded eight (8) Threatened fauna species:

- Little bent-wing bat (*Miniopterus australis*);
- Common bent-wing bat (*Miniopterus schreibersii*);
- Large-footed myotis (*Myotis macropus*);
- Osprey (*Pandion haliaetus*);
- Pied oystercatcher (*Haematopus longirostris*);
- Sooty oystercatcher (*Haematopus fuliginosus*); and

- Glossy black cockatoo (*Calyptorhynchus lathami*).

Clancy (1998) recorded three (3) Threatened species from The Glades site:

- Yellow bellied glider (*Petaurus autralis*) – in the north-west corner of the site
- Common bent-wing bat (*Miniopterus schreibersii*) – in the eastern part of the Subject site
- Osprey (*Pandion haliaetus*) - from nest in the south-east of the Subject site.

Clancy (1998) also notes that Koalas have been recorded in the north-west of The Glades site along Skinners Creek.

3.3.3 Coffs Harbour LGA Fine-scale Vegetation Mapping

The Coffs Harbour Fine-scale Vegetation mapping has not identified any areas of High Value Arboreal Habitat on the Subject site (**FIGURE 14).**

3.3.4 Koala Habitat

The Coffs Harbour City Council has not mapped Koala habitat within the Subject site (**FIGURE 15**). However, secondary Koala habitat has been mapped north of the Subject site along the northern and eastern boundaries of The Glades site, as well as a few small patches mapped along the southern boundary of The Glades (**FIGURE 15**).

3.3.5 Habitat Assessment

3.3.5.1 Amphibians

Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction, with the exception of two highland genera (*Assa darlingtoni* and *Philoria* spp.). The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter.

The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. These species include the Red-eyed tree frog (*Litoria chloris*), Leseuer's frog (*Litoria leseueri*), Fletchers frog (*Lechriodus fletcheri*) and the Barred frogs of the *Mixophyes* genus.

The Subject site is likely to provide good quality habitat for a range of frogs. The Subject site provides areas of moderately deep leaf litter for shelter. Surrounding vegetation within The Glades also offer a variety of good quality habitat for a range of frogs, including the dam in the south-east, the paperbark forest adjacent to the dam, and

SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

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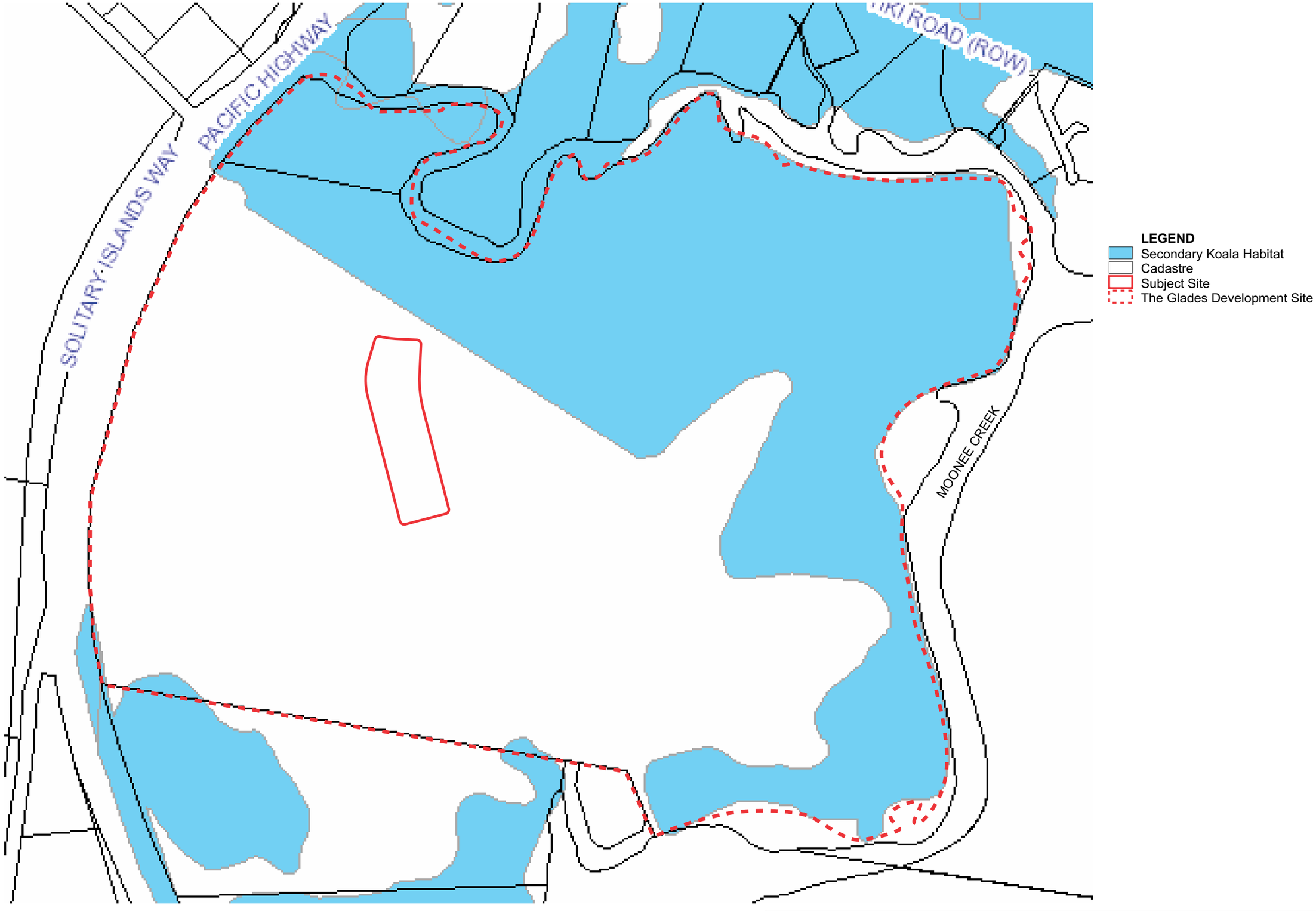
FIGURE 14

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_CHC Arboreal Hab.cdr

TITLE
COFFS HARBOUR CITY COUNCIL HIGH VALUE ARBOREAL HABITAT



SOURCE: Coffs Harbour City Council Online Mapping Tool accessed 05/04/17

SCALE: 1 : 5000 @ A3

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FIGURE 15

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_Koala.cdr

TITLE

COFFS HARBOUR CITY COUNCIL KOALA HABITAT

sedgeland communities. The drainage line in the north-western corner of The Glades site is another area of good quality habitat, with areas of dense Lomandra providing good shelter opportunities.

Grasslands provide suitable habitat for a range of Amphibian species, particularly along drainage depressions and soaks. Species commonly encountered in grassland communities include the Common eastern froglet, Eastern sign bearing froglet, Striped marsh frog, Spotted grass frog, Eastern dwarf tree frog, Rocket frog, Whistling tree frog and Cane toad. Sedgeland communities in low lying grassland areas may provide suitable habitat for these species.

Species typically encountered in or adjacent to Closed Forests include the Eastern dwarf tree frog, Red-eyed tree frog, Striped marsh frog, Cane toad and Dainty green tree frog. Relatively few species occur in conjunction with Closed Forest types when permanent water is absent. Species which typically occur in low elevation Rainforest and permanent streams such as the Giant barred frog (*Mixophyes iteratus*) are unlikely to occur at the Subject site.

3.3.5.2 Reptiles

As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate and other factors affecting thermoregulation such as shade and availability of shelter and basking sites (Smith *et al* 1994).

In a survey of the moist forest herpetofauna of North-eastern NSW, Smith *et al* (1989) found that few species discriminated between rainforest and wet sclerophyll forest, however, most species exhibited a response to differences in elevation and the availability of microhabitat components and other substrates.

The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction.

Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. This contrasts markedly with the distribution patterns of birds, and most mammals.

The single limiting factor in terms of species diversity in coastal vegetation is the lack of shelter sites (eg. logs, tree hollows and decorticating bark). Such habitat components characterise eucalypt forests and woodlands, where species diversity may be much higher, depending on disturbance factors.

The Subject site is considered to provide good quality habitat for reptiles due to the presence of: the combination of shelter and basking sites; fallen logs for shelter; forested areas with good canopy and leaf litter development; and reliable sources of prey.

3.3.5.3 Birds

The significance of near coastal environments of the N.S.W. Far North Coast and South-East Queensland as over-wintering habitat for migratory birds has been established by many observers and bird banders including Keast (1968), Robertson (1973), Gravatt (1974), Porter (1982) and Robertson and Woodall (1983). These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia (Fitzpatrick and Nix 1973; Edwards 1979; Nix 1982; Specht *et al* 1981).

Many insectivorous birds from higher latitudes and elevation over-winter in the locality. These include species such as the Fantail cuckoo, Sacred kingfisher, Rainbow bee-eater, Noisy pitta, Tree martin, Black-faced cuckoo-shrike, Cicada bird, Golden whistler, Rufous whistler, Rose robin, Grey fantail, White-throated gerygone, Silvereye, Olive-backed oriole and Spangled drongo.

Birds such as honeyeaters and lorikeets are Blossom nomads (*ibid.*). These birds move locally in response to variation in the availability of nectar and or pollen, important components in their diet. Porter (1982) highlights the importance of Forest red gum, Broad-leaved paperbark and Coast banksia for Scaly-breasted and Rainbow lorikeets as these species flower during the lorikeet's winter breeding period. A sequence of important nectar bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon provide a continuity of food for nectarivorous birds.

Studies of bird usage in rainforest remnants by Holmes (1987), Connelly and Specht (1988) and Lott & Duigan (1993) indicate that the diversity and abundance of birds is related to the size of the Rainforest patches and their degree of isolation from major areas of native forest. Lott & Duigan (1993) and Howe *et al* (1981) also note that sites with a higher diversity of vegetation and those which are closer to water generally support a greater diversity of birds. Locally nomadic and migratory rainforest species such as the Wompoo, Rose-crowned and Superb fruit-doves, Common koel and Black-faced cuckoo-shrike are known to use scattered areas of habitat as "stepping-stones" between more intact areas of forest (Date *et al* 1992; Lott & Duigan 1993).

The variety of habitats present on and adjacent to the Subject site is likely to result in a high diversity of resident and nomadic birds occurring on the Subject site over the year. Habitat which occur on or adjacent to the Subject site include open woodland, grassland, sclerophyll forest, wetland, and tidal communities such as mangrove and saltmarsh.

The Subject site provides foraging resources for nectarivorous birds due to the occurrence of Eucalypt, Melaleuca and Banksia species. The Subject site provides a relatively low diversity and abundance of fruiting species. The Subject site and adjacent areas of vegetation represent moderate quality habitat for frugivorous birds.

No trees with hollows necessary for hollow-nesting birds were recorded on the Subject site. However, a moderate number of trees with hollows were recorded in the surrounding The Glades development site. The Subject site may represent important forage habitat for hollow-dependent avifauna breeding in forests in the locality.

3.3.5.4 Mammals

Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense understorey layer, which provides shelter from predators and provides nesting opportunities, is particularly important.

In general, medium-large terrestrial mammals such as macropods select habitats which provide a dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats.

All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Smith & Lindenmeyer (1988) consider that shortage of nest hollows is likely to limit arboreal mammal populations where density of hollow bearing trees is less than 2 to 8 trees per hectare.

Arboreal folivores (*e.g.* Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate.

Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as Banksia and Acacia sp. These species also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivore/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate producing trees (Sap feed trees) and shrubs (*e.g.* Acacia sp.). Arboreal nectarivores and insectivores are generally hollow dependent species.

No trees with hollows necessary for hollow-dependent mammals were recorded on the Subject site. However, a moderate number of trees with hollows were recorded in the surrounding The Glades site. However, as with the birds, the vegetation on and adjacent to the Subject site may represent important forage habitat for hollow-dependent mammals resident in forests in the locality. Trees known to be used by Koalas in the Coffs Harbour LGA occur on the Subject site and include Broad-leaved paperbark, Blackbutt and Pink bloodwood.

The structural complexity and habitat diversity of the Subject site is likely to support a moderate diversity and abundance of ground dwelling mammals. Expected species include: Black rat, Swamp rat, House mouse, *Antechinus* sp., *Melomys* sp., and the Northern brown bandicoot.

Insectivorous bats, like insectivorous birds, overlap considerably in diet and broad vegetation preferences (Hall 1981), but specialise in foraging in specific layers or substrates within the forest (Crome and Richards 1988). Vegetation on and adjacent to the Subject site is likely to provide forage habitat for a relatively high diversity and abundance of insectivorous bats, due to the combination of open, forested and denser areas of vegetation. The nectarivorous Common blossom bat may forage on Broad-leaved paperbark and Hairpin Banksia throughout the Subject site.

Several old-growth trees suitable for hollow-dependant bats occur along Skinners and Moonee Creeks. Areas of more mature forest along the northern edge of The Glades site represent suitable roost habitat for the Threatened Black flying-fox and Grey-headed flying fox. Suitable roost habitat for the Common blossom bat (*ie.* Littoral rainforest) does not occur on the Subject site.

3.3.5.5 Tree Hollows Within the Development Area

All of the trees within the development area of the Subject site were inspected for the presence of hollows, fissures or spouts. No trees with hollows were recorded within the Subject site impact area during the 2017 survey.

The majority of mature trees with well-developed hollows occur outside the development area, within the north-east and eastern portions of The Glades development site in vegetation communities flanking Skinners and Moonee Creeks.

3.3.6 Corridor Analysis

An assessment of the existing (pre-development) habitat values of the 1.747 ha of additional vegetation proposed to be removed from the subject site for native fauna groups and threatened fauna species previously recorded from the broader Glades development site was completed (**TABLE 8**). The assessment also includes a summary of the likely impacts of removing the vegetation within this area.

An assessment was also completed on the likely post-development corridor values of the vegetation for native fauna groups and threatened fauna species previously recorded from the broader development site (**TABLE 9**). The assessment also includes a summary of the likely impacts on fauna movement opportunities of removing the vegetation within this area. To assess whether this vegetation would be an effective movement corridor for native fauna, values considered included corridor width, length, shape, habitat type and quality, structural complexity, edge effects, general movement patterns of target fauna groups, and any fauna diversion or exclusion requirements (e.g. culverts, rope bridges, fences).

TABLE 8
ASSESSMENT OF EXISTING HABITAT VALUES OF ADDITIONAL VEGETATION TO BE REMOVED

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
Amphibians	Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction. The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter. The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. A small area (0.100ha) of Swamp sclerophyll forest occur within the northern portion of the vegetation proposed for removal and may provide suitable habitat for a range of native frog species. One (1) native frog species – Spotted grass frog (*Limnodynastes tasmaniensis*) - was recorded from this area during the recent surveys. One introduced frog species – Cane toad (*Bufo marinus*) – was also observed utilising this vegetation as habitat.	The loss of 0.100ha of potential habitat for commonly occurring native frog species is not considered significant when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site.
Reptiles	As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate	The loss of 1.747ha of potential habitat for commonly occurring native reptile species is not considered significant when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site.

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
	and other factors affecting thermoregulation such as shade and availability of shelter and basking sites. The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction. Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. Suitable ground habitat (i.e. logs, fallen branches, leaf litter etc.) is present within the vegetation proposed for removal and may provide suitable habitat for a range of native reptile species. Two (2) native reptile species – Friendly sun skink (*Lampropholis amicula*) and Dark flecked sun skink (*L. guichenoti*) - were recorded from this area during the recent surveys.	
Birds	The significance of near coastal environments of the NSW Far North Coast and South-East Queensland as over-wintering habitat for migratory birds has been established by many observers and bird banders. These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia. Many insectivorous birds from higher latitudes and elevation over-winter in the locality. Birds such as honeyeaters and lorikeets are blossom nomads. These birds move locally in response to variation in the availability of	The loss of 1.747ha of potential habitat for commonly occurring open country and disturbance-adapted native bird species is not considered significant when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site.

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
	nectar and or pollen, important components in their diet. A sequence of important nectar-bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon provide a continuity of food for nectarivorous birds. Suitable habitat is present within the vegetation proposed for removal and may provide suitable habitat for a range of open country and disturbance-adapted native bird species. The vegetation is not considered suitable for forest interior or more reclusive species due to the linear nature of the patch and past disturbances. Thirteen (13) native bird species were recorded from this area during the recent surveys: - Magpie (*Gymnorhina tibicen*) - Eastern yellow robin (*Eopsaltria australis*) - Grey fantail (*Rhipidura fuliginosa*) - Grey shrike thrush (*Colluricincla harmonica*) - Laughing kookaburra (*Dacelo novaeguineae*) - Lewins honeyeater (*Meliphaga lewinii*) - Magpie-lark (*Grallina cyanoleuca*) - Noisy miner (*Manorina melanocephala*) - Pied butcherbird (*Cracticus nigrogularis*) - Rainbow lorikeet (*Trichoglossus haematodus*) - Red browed finch (*Neochmia temporalis*) - Torresian crow (*Corvus orru*); and - Variegated wren (*Malurus lamberti*)	
Mammals	Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense	The loss of 1.747ha of potential habitat for commonly occurring open country and disturbance-adapted native mammal species is not considered significant

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
	understorey layer, which provides shelter from predators and provides nesting opportunities, is particularly important. In general medium-large terrestrial mammals such as macropods select habitats which provide dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats. All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Arboreal folivores (e.g. Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate. Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as Banksia and Acacia sp. These species also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivores/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate-producing trees (Sap feed trees) and shrubs (e.g. Acacia sp.).	when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site. There will be no loss of denning opportunities for hollow-dependant mammal species.

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
	Arboreal nectarivores and insectivores are generally hollow-dependent species. Suitable habitat is present within the vegetation proposed for removal for a range of open country and disturbance-adapted ground-dwelling mammal species. Foraging opportunities are also available for a range of native arboreal mammals, however denning opportunities (i.e. old growth and/or hollow-bearing trees) are not present. Three (3) native mammal species were recorded from this area during the recent surveys: - Eastern grey kangaroo (*Macropus giganteus*); - Northern brown bandicoot (*Isodon macrourus*); and - Common brushtail possum (*Trichosurus vulpecula*).	
Threatened fauna species		
- Squirrel glider (*Petaurus norfolcensis*)	Breeding and denning sites for Squirrel glider are provided by tree hollows with a preference for small hollow entrances. The preferred feeding habitat contains winter flowering eucalypts or banksias including Swamp mahogany, Spotted gum, Coast banksia and Swamp paperbark. Foraging opportunities are present for the Squirrel glider within the vegetation proposed for removal, however denning opportunities (i.e. old growth and/or hollow-bearing trees) are absent. No Squirrel gliders were recorded in this area during recent surveys, nor have they been recorded utilising this vegetation during previous fauna surveys of the site.	The loss of 1.747ha of potential Squirrel glider foraging habitat is not considered significant when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site. There will be no loss of denning opportunities for the Squirrel glider.

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
- Glossy black cockatoo (*Calyptorhynchus lathami*)	Breeding sites for the Glossy black cockatoo consist of nests in large trees with large hollows (dead or alive) near streams and within 5-20km of a food source. It feeds on adult *Allocasuarina littoralis* and *A. torulosa* with individual trees believed to be selected on the basis of the nitrogen content of seeds. Stands of regenerating forage resources (i.e. *Allocasuarina* sp.) were observed in the southern half of the vegetation patch proposed for removal, however no mature *Allocasuarina* trees were observed, and no evidence of recent Glossy black cockatoo foraging activity (i.e. chewed cones) was recorded, nor have they been recorded utilising this vegetation during previous fauna surveys of the site. It is noted that foraging activity was recorded elsewhere on the broader development site during the recent surveys. No potential nesting sites (i.e. hollow-bearing trees) were observed.	The loss of approximately 0.87ha of potential Glossy black cockatoo foraging habitat is not considered significant when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site. There will be no loss of nesting opportunities for the Glossy black cockatoo.
- Southern myotis (*Myotis adversus*)	Breeding and sheltering habitat for the Southern myotis consists of any forested riparian and adjacent vegetation around water bodies and coastal lakes and streams greater than first order streams. Breeding is in hollows, as well as under bridges and in caves. The Southern myotis forages in still water bodies with associated vegetation (tree line) and feeds on aquatic and other flying insects and small fish. The vegetation proposed for removal is not considered to represent suitable habitat for this species.	The proposed vegetation removal is not considered to impact on the Southern myotis or its habitat on the subject site.
- Little bent-wing bat (*Miniopterus australis*)	Breeding sites for Little bent-wing bats consist of limestone caves, where it usually occurs in association with the Common bent-wing bat. It congregates in high numbers in maternity roosts (in 1000's). It also shelters in a range of artificial structures including culverts,	The loss of 1.747ha of potential foraging habitat for the Little bent-wing bat is not considered significant when compared to available habitat to be

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
	drains, mines etc. The Little bent-wing bat forages on flying insects in forested areas, predominantly swamp forest, moist eucalypt forest, rainforest and some dry forests. The vegetation proposed for removal does not contain suitable breeding or roosting habitat for this species. This species may occasionally forage within the vegetation.	retained/rehabilitated elsewhere on the broader development site. There will be no loss of breeding or roosting opportunities for this species.
- Osprey (*Pandion haliaetus*)	Ospreys forage for fish in fresh, brackish or saline waters of rivers, lakes, estuaries and inshore coastal waters. A breeding pair requires a suitable foraging area with nesting sites nearby. The nest is a large bulky structure of dead sticks, often located in a tall dead tree or on artificial structures such as power transmission poles or towers. It is used year after year for as long as it lasts. The vegetation proposed for removal does not represent suitable forage habitat for this species. No nest sites were observed in this patch of vegetation.	The proposed vegetation removal is not considered likely to impact on the Osprey or its habitat on the subject site.
- Black-necked stork (*Ephippiorhnchus asiaticus*)	The Black-necked stork inhabits swamps, mangroves, mudflats, dry floodplains, and irrigated land. An abundant supply of frogs and fish is required, together with suitable roost and nest trees, usually overhanging rivers and swamps. The vegetation proposed for removal is not considered to represent suitable habitat for this species.	The proposed vegetation removal is not considered likely to impact on the Black-necked stork or its habitat on the subject site.
- Wallum froglet (*Crinia tinnula*)	Wallum froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country. Wallum is a banksia-dominated lowland heath ecosystem characterised by acidic waterbodies. This species does not utilise open or free water in swamps but prefers the vegetated, muddy edges of pools, both temporary and permanent. Refuge habitat consists of a dense cover of ground vegetation, with interspersed tree canopy cover.	The proposed vegetation removal is not considered likely to impact on the Wallum froglet or its habitat on the subject site.

Fauna group	Habitat provided by vegetation proposed for removal	Impacts
	Breeding occurs in late winter in ephemeral sites such as larger puddles in heath or puddles in watercourses and creek-lines. The vegetation proposed for removal is not considered to represent suitable habitat for this species.	
- Koala (*Phascolarctos cinereus*)	Koalas utilise areas with a high diversity of known food trees (three or more) including Tallowwood, Grey gum, Forest oak, Sydney blue gum, Swamp mahogany and Red gums. The Koala shelters in larger trees with big lateral branches (not necessarily food trees). The Koala can disperse over any open habitat (including pasture and grassland) as long as scattered trees are present. Whilst a small number of Tallowwoods are scattered throughout the vegetation proposed for removal, no evidence of Koala activity (i.e. scats) was recorded during the recent surveys despite extensive searches, nor has the Koala been recorded from this area of the site during past surveys.	The loss of 1.747ha of potential habitat for the Koala is not considered significant when compared to available habitat to be retained/rehabilitated elsewhere on the broader development site.

TABLE 9

ASSESSMENT OF LIKELY POST-DEVELOPMENT CORRIDOR VALUES OF ADDITIONAL VEGETATION TO BE REMOVED

Fauna group	Corridor requirements	Impacts
Amphibians	A narrow sufficiently vegetated riparian/wetland corridor linking suitable habitat is generally sufficient for Amphibian movement, depending on species present. The core riparian area should be sufficient to provide protection from predators and to maintain moisture levels during extended periods of drought.	The vegetated corridor provided by the open space between residential precincts 1 and 2 is not considered suitable for amphibians due to the lack of riparian vegetation. The removal of this vegetation is not considered likely to impact on movement opportunities for amphibian species occurring on the site.

Fauna group	Corridor requirements	Impacts
Reptiles	A diversity of habitats is required to allow the movement of sun-loving and shade-loving species. A dense core habitat area should be provided as well as more open outer habitat areas.	The vegetated corridor provided by the open space between residential precincts 1 and 2 may provide suitable movement opportunities for a range of reptile species. However, these movement opportunities would be severely limited however by the road crossings at both the northern and southern ends of the corridor, lack of connecting vegetation to the south and potential edge effects associated with APZ construction and maintenance. The removal of this vegetation is not considered likely to impact on movement opportunities for reptile species occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.
Birds	A densely vegetated corridor is adequate to enable most birds to move between remnant habitat areas up to 1.2km apart. Corridors should include a densely vegetated core area and an outer densely vegetated buffer area to reduce impacts by introduced opportunistic species such as the Noisy minor. Fragmented ecosystems within an unnatural or hostile matrix may also create unnatural metapopulations i.e. where fragmented vegetation is more likely to be dominated by more aggressive edge species.	Suitable movement opportunities for a range of open country and disturbance-adapted native bird species is likely to be provided by the vegetated corridor provided by the open space between residential precincts 1 and 2. The vegetation is not considered suitable as a corridor for forest interior or more reclusive species due to the linear nature of the patch and past disturbances. The removal of this vegetation is not considered likely to impact on movement opportunities for reptile species occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.
Mammals	Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure, particularly in	The vegetated corridor proposed to be removed lacks densely vegetated or moist forest habitats required

Fauna group	Corridor requirements	Impacts
	areas with a dense understorey layer that provides shelter from predators and which offers nesting opportunities. Macropods require dense habitats for shelter but will readily graze in open areas and may be sensitive to edge effects such as an increase in light, noise and activity. Minimisation of these effects will enhance the value of the corridor. Minimisation of dog predation can enhance the value of corridors for macropods. Many species of arboreal marsupials appear to be sensitive to edge effects such as light, noise and activity. Microchiropteran bats use riparian corridors (amongst other features) for navigation, although an open flyway of any structure will encourage movement between habitat areas. These species readily disperse through disturbed landscapes. Megachirpteran bats also readily disperse through disturbed landscapes. Movements of this group are extensive and unrestricted by cleared or developed areas.	to facilitate the movement of forest interior species or species dependent on high levels of cover. More open forest types are present and may facilitate the movement of woodland or grassland species and Macropods. However, these movement opportunities would be severely limited however by the road crossings at both the northern and southern ends of the corridor, lack of connecting vegetation to the south and potential edge effects associated with APZ construction and maintenance. Potential edge effects are also likely to limit the suitability of this vegetated corridor for forest interior species and arboreal mammals. The removal of this vegetation is not considered likely to impact on movement opportunities for mammal species occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.
Threatened fauna species		
- Squirrel glider (*Petaurus norfolcensis*)	Many species of arboreal marsupials appear to be sensitive to edge effects such as light, noise and activity and this is considered to include the Squirrel glider.	Potential edge effects associated with APZ construction and maintenance are likely to limit the suitability of this vegetated corridor for the Squirrel glider. The removal of this vegetation is not considered likely to impact on movement opportunities for Squirrel gliders occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.

Fauna group	Corridor requirements	Impacts
- Glossy black cockatoo (*Calyptorhynchus lathami*)	This highly mobile species is not considered to be reliant on vegetated corridors for movement through the landscape.	The removal of this vegetation is not considered likely to impact on movement opportunities for the Glossy black-cockatoo.
- Southern myotis (*Myotis adversus*)	Microchiropteran bats use riparian corridors (amongst other features) for navigation, although an open flyway of any structure will encourage movement between habitat areas. These species readily disperse through disturbed landscapes	The removal of this vegetation is not considered likely to impact on movement opportunities for Southern myotis occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.
- Little bent-wing bat (*Miniopterus australis*)	Microchiropteran bats use riparian corridors (amongst other features) for navigation, although an open flyway of any structure will encourage movement between habitat areas. These species readily disperse through disturbed landscapes.	The removal of this vegetation is not considered likely to impact on movement opportunities for Little bent-wing bats occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.
- Osprey (*Pandion haliaetus*)	This highly mobile species is not considered to be reliant on vegetated corridors for movement through the landscape.	The removal of this vegetation is not considered likely to impact on movement opportunities for the Osprey.
- Black-necked stork (*Ephippiorhnchus asiaticus*)	This highly mobile species is not considered to be reliant on vegetated corridors for movement through the landscape.	The removal of this vegetation is not considered likely to impact on movement opportunities for the Black-necked stork.
- Wallum froglet (*Crinia tinnula*)	A narrow wetland corridor linking suitable habitat would be considered sufficient for the Wallum froglet. The core wetland/wallum habitat area should be sufficient to provide protection from predators and to maintain moisture levels during extended periods of drought.	The vegetated corridor provided by the open space between residential precincts 1 and 2 is not considered suitable for the Wallum froglet due to the lack of wetland/wallum vegetation. The removal of this vegetation is not considered likely to impact on movement opportunities for Wallum froglets occurring on the site.

Fauna group	Corridor requirements	Impacts
- Koala (*Phascolarctos cinereus*)	Koalas are known to use widely spaced trees to move between larger patches of forest. Koalas also move across landscapes by utilising 'stepping stones' of remnant vegetation. However, in residential areas where there are many hazards, such as the incidence of dog attack, car strike and stress amongst Koalas, 100m wide corridors in which tree canopies touch are preferential for long-term stability.	The vegetated corridor proposed to be removed may provide suitable movement opportunities for Koalas. However, these movement opportunities would be severely limited by the road crossings at both the northern and southern ends of the corridor, lack of connecting vegetation to the south and potential edge effects associated with APZ construction and maintenance. The removal of this vegetation is not considered likely to impact on movement opportunities for Koalas occurring on the site when compared to other retained corridors along Moonee Creek and Skinners Creek.

The assessment has determined that the likely post-development corridor values of the vegetation for native fauna species, including threatened fauna species previously recorded from the broader development site, are likely to be restricted to stepping stone habitat for highly mobile species only. The corridor values of the vegetation are considered to be significantly reduced due to (**FIGURE 16**):

- Road crossings at both the northern and southern ends of the corridor. The approved development plans do not allow for any fauna diversion or exclusion infrastructure at these road crossing (e.g. culverts, rope bridges, fences). Native fauna species would be at risk of injury or death at these road crossing points.
- Lack of connecting vegetation to the south. Whilst vegetation retention and rehabilitation works are proposed in open space areas to the south of the corridor, under the approved development layout these areas will be separated from the corridor by a road (discussed above), recreational areas (i.e. a playground, picnic facilities, boardwalks etc.), and stormwater treatment devices/basins. Fauna movement to the south would therefore be restricted to highly mobile species only.
- Edge effects. The approved development plans include the construction and maintenance of bushfire Asset Protection Zones (APZs) 20-40m wide within the eastern and western edges of the retained vegetation patch. This vegetation clearing/thinning and subsequent regular maintenance of APZs is considered likely to significantly reduce the habitat and corridor values of this vegetation patch for native fauna species, particularly forest interior species or species susceptible to edge effects.
- Lack of connectivity to significant habitat area. The subject site has limited connectivity to National Parks and Nature Reserves in the locality. The dual carriageway Pacific Highway to the west of the site represents a significant obstruction to fauna movement opportunities, as does existing residential development to the north and south of the site.

The development will retain (and embellish) significant fauna movement corridors occuring on the site along Moonee and Skinners Creeks. Riparian vegetation associated with these waterways provides connectivity between larger habitat areas. Waterway vegetation often provide higher quality corridor habitat because the vegetation around waterways is generally denser than surrounding areas and provides protection to, and facilitates the movement of, a range of fauna groups including more cryptic and slow-moving animals (Naiman and Décamps, 1997; Fitzgibbon *et al.*, 2007). Furthermore, waterways often have high invertebrate abundance and provide good sources of water and food for many animals.

3.3.7 Results of Fauna Surveys

3.3.7.1 Introduction

This section provides the results of all records and observations of fauna for the 2004 and 2017 surveys. Approximate locations of all Threatened species recorded on the Subject site and the surrounding The Glades development site are shown in **FIGURE 17**. A full list

LEGEND

- Possible Fauna Movements to Habitat Corridors After Development
- Additional Impact Area Subject to Mod Application
- Subject Site
- The Glades Development Site

Proposed Offset Areas

- Proposed Rehabilitation / Offset Areas (13.71ha)
- Proposed Revegetation / Offset Areas (3.87ha)

Vegetation Management Plan

- Existing forest, swamp and mangrove communities protected and enhanced. Grazing removed and recreation contained to structured path ways. These areas will be fenced to allow rehabilitation to occur.
- Rehabilitation of indigenous forest communities. Natural buffer enhanced. Revegetation utilises existing seed source and fencing to aid re-establishment
- Rehabilitation of existing wetland, sedgeland, swamp sclerophyll and heath communities. Revegetation utilises existing seed source and fencing to aid re-establishment
- Revegetation of indigenous heath community. Slasing is to cease to allow natural recovery of plant species. The majority of this area will also be fenced to aid re-establishment
- Intensive landscape management within this zone. Recreation facilities are contained within areas of grassed open space with feature planting and interconnected via pathways. Area will be regularly mown and monitored to ensure quality of all landscape ad recreation features
- Proposed grouped indigenous tree planting (no understorey)
- Connecting laneway or medium strip, will be intensively managed and contain pathway, trees and grass
- * Any area shown white internal to the site will be mown and operate with dual primary purposes of storm water filtration and secondary as open space suitable for a variety of recreation uses
- Asset Protection Zone (APZ)

This zone has been identified for bushfire protection and complies with requirements recommended by the NSW Rural Fire Services. This zone also acts as an effective buffer between urban dwellings and natural vegetation. The APZ is part of the open space network and is characterised or may contain:

- recreation nodes
- perimeter roads
- block setbacks
- walking / cycle tracks
- playground / picnic facilities
- trees with no understorey
- will be slashed or mown regularly
- will operate as storm water filtering areas

0 150m

1 : 5000

SOURCE: JWA 2004 & 2017; ERM Annex H Plan 4 Veg Mgt (Jan 2018) (Ref: 20180206093044348.pdf)
SCALE: 1 : 5000 @ A3

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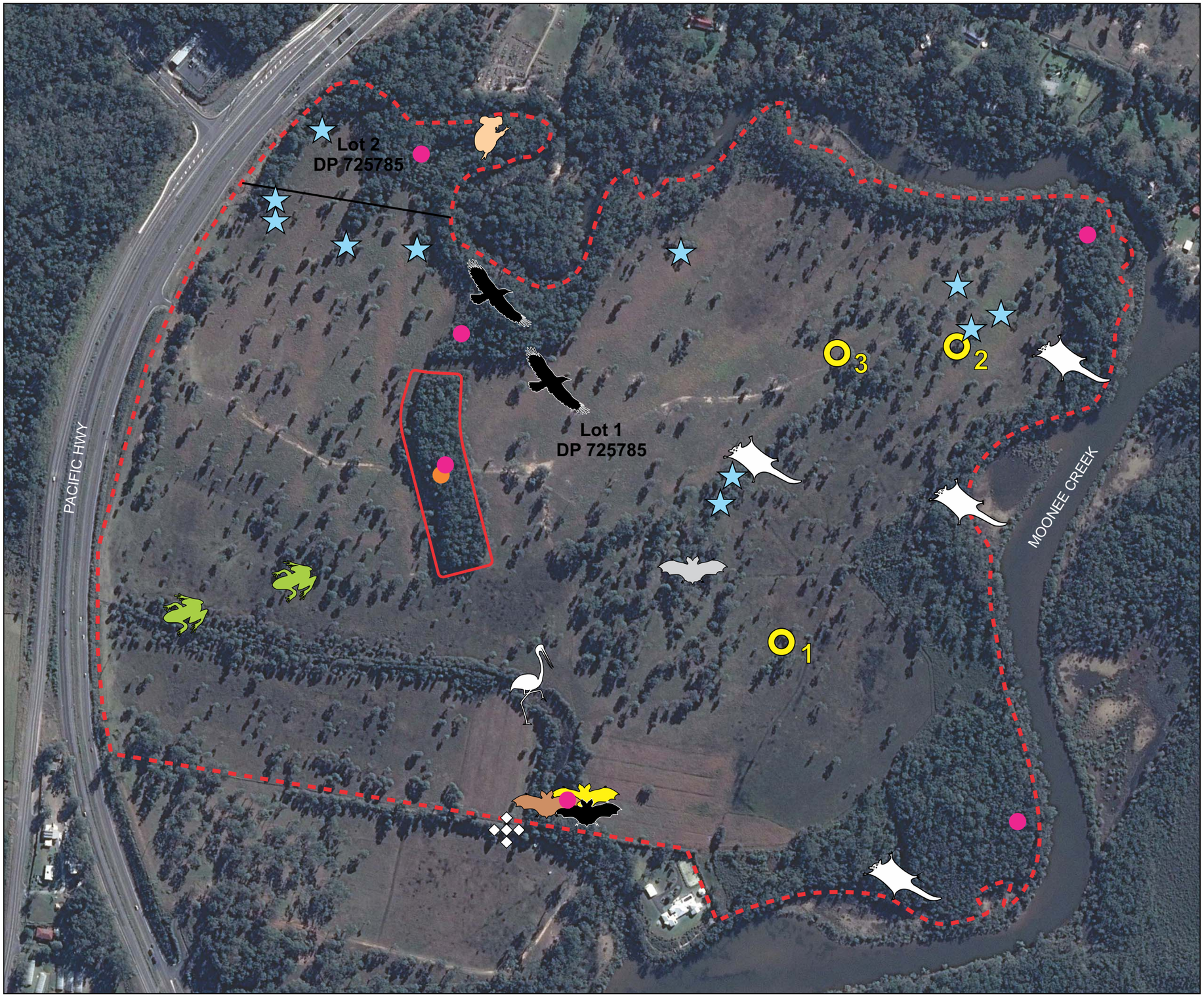
FIGURE 16

PREPARED: BW
DATE: 22 February 2018
FILE: N02066_Fauna Mvt.cdr

TITLE
PROPOSED OFFSET AREAS & POSSIBLE FAUNA MOVEMENTS AFTER DEVELOPMENT



LEGEND

- Subject Site
- The Glades Development Site

2004-2005 Surveys

- Squirrel glider
- Glossy black cockatoo
- Southern myotis
- Little bent-wing bat
- Common bent-wing bat
- Grey headed flying fox
- Osprey nest location (approximate)
- Black-necked stork
- Wallum froglet*
- Koala (scat)
- Koala feed tree within CHCC Secondary Koala Habitat (within development area only)
- Hollow bearing tree (within development area only)

2017 Surveys

- Common planigale
- Glossy black cockatoo (chewed cones)

* These records may have been a mis-identification of the Beeping froglet (*Crinia parinsignifera*).

Note: Koala feed trees and hollow bearing trees have been located by GPS survey which may contain an error of up to 4 metres.

0 150m

1 : 5000

SOURCE: JWA Site Investigations 2004 & 2017; Google Earth June 2016 Aerial Photo

SCALE: 1 : 5000 @ A3

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FIGURE 17

PREPARED: BW
DATE: 16 October 2017
FILE: N02066_Fauna.cdr

TITLE

FAUNA RECORDS

of fauna species recorded and the year/s they were recorded in is provided in **APPENDIX 2.**

3.3.7.2 Reptiles

Five (5) reptile species were recorded during the 2004 fauna survey, and three (3) were recorded during the 2017 fauna survey, bringing the total to six (6) reptile species (**APPENDIX 2**). No Threatened reptiles were recorded.

3.3.7.3 Amphibians

Six (6) amphibian species were recorded during the 2004 site surveys, and are shown in **APPENDIX 2**. One Threatened species, the Wallum froglet was recorded in an incidental visit to The Glades site on the 3rd of June 2004 and was recorded from earlier surveys of The Glades site by JWA in 2003 (**FIGURE 17)**. However, this species was not recorded during the main survey period (May 2004). The main survey was completed in late Autumn during a relatively long dry spell. Amphibian activity could be expected to be low.

An additional survey was completed for Wallum froglets on The Glades development site in September 2005. Wallum froglets were not recorded during the targeted survey in 2005. However, six (6) other amphibian species were recorded, including two (2) additional species compared to the 2004 survey. A final targeted survey for the species was completed by frog expert Dr. Arthur White (Biosphere Consulting) in July 2006, however no Wallum froglets were recorded on Subject site during this survey either. White (2006) concluded that Wallum froglets utilise The Glades site periodically when conditions are favourable, and that no breeding habitat occurred on The Glades site, although potential breeding habitat did occur on neighbouring land to the south (Lot 7). As a result of field investigations, it is considered that the southern drain and adjacent land to the north and south comprise dispersal and forage habitat for the Wallum froglet on The Glades site and that no breeding habitat occurs on the Subject site.

Six (6) amphibian species were recorded during 2017 site surveys, bringing the total to ten (10) amphibian species (**APPENDIX 2**). The Threatened Wallum froglet was not recorded during the 2017 surveys despite suitable conditions being present. It is possible that the Wallum froglet continues to persist in small numbers on The Glades development site, but has suffered from competition with and been outcompeted by more aggressive open country species. Very large numbers of the Beeping froglets (*Crinia parinsignifera*) in particular have been recorded from the Subject site during the 2005 and 2017 surveys.

3.3.7.4 Birds

Fifty-nine (59) bird species were recorded throughout the The Glades development site in 2004, and thirty-seven (37) species in 2017, bringing the total to seventy-three (73) bird species. Birds recorded during the survey(s) are shown in **APPENDIX 2**.

Two (2) Threatened species have been recorded from The Glades development site - the Glossy black cockatoo (*Calyptorynchus lathami*) and Osprey (*Pandion haliaetus*). The

Black-necked stork (*Ephippiorhnchus asiaticus*) was also recorded in a preliminary survey by JWA in 2003. Locations of Threatened bird species records on or adjacent to the Subject site are shown in **FIGURE 17**.

3.3.7.5 Mammals

Twenty-nine (29) mammal species were recorded in 2004, including six (6) Threatened species:

- Squirrel glider (*Petaurus norfolcensis*)
- Little bent-wing bat (*Miniopterus australis*)
- Common bent-wing bat (*Miniopterus schreibersii*)
- Large-footed myotis (*Myotis macropus*)
- Koala (*Phascolarctos cinereus*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)

Seven (7) introduced species including the Black rat, House mouse, Cow, Pig, Horse, Cat and Dog were also recorded in 2004.

Nine (9) mammal species were recorded in 2017, including two (2) Threatened species:

- Common planigale (*Planigale maculata*); and
- Grey-headed flying-fox (*Pteropus poliocephalus*).

One (1) introduced species, Cow, was also recorded on the Subject site in 2017.

A complete list of mammals recorded on or adjacent to (i.e. The Glades development site) the Subject site is shown in **APPENDIX 2**.

3.3.8 Threatened species considered possible occurrences on the Subject site

Based on the assessment of available habitat, Threatened fauna species known from the locality were assessed for the likelihood of their occurrence on the Subject site (**APPENDIX 3**). Nineteen (19) Threatened fauna species were known to occur or considered possible occurrences on the Subject site, including:

- Barred cuckoo-shrike (*Coracina lineata*);
- Brown treecreeper (*Climacteris picumnus*);
- Brush-tailed phascogale (*Phascogale tapoatafa*);
- Common blossom bat (*Syconycteris australis*);
- Common planigale (*Planigale maculata*) - RECORDED[#];
- Eastern freetail-bat (*Mormopterus norfolkensis*);
- Eastern grass owl (*Tyto longimembris*);
- Eastern osprey (*Pandion cristatus*) - RECORDED[#];
- Glossy black-cockatoo (*Calyptorhynchus lathami*) - RECORDED[#];
- Green-thighed frog (*Litoria brevipalmata*);

- Grey-headed flying-fox (*Pteropus poliocephalus*) - RECORDED[#];
- Koala[#] (*Phascolarctos cinereus*) - RECORDED[#];
- Little bentwing bat (*Miniopterus australis*) - RECORDED[#];
- Little lorikeet (*Glossopsitta pusilla*);
- Masked owl (*Tyto novaehollandiae*);
- Square-tailed kite (*Lophoictinia isura*);
- Squirrel glider (*Petaurus norfolcensis*) - RECORDED[#];
- Stephen's banded snake (*Hoplocephalus stephensii*); and
- Yellow-bellied glider (*Petaurus australis*).

[#]Recorded on The Glades development site.

Two (2) migratory fauna species were also considered to be possible occurrences on the subject site:

- Cattle egret (*Ardea ibis*); and
- Fork-tailed swift (*Apus pacificus*).

4 IMPACTS AND AMELIORATION

4.1 Impacts of the Proposed Development

4.1.1 Flora

The Subject site covers approximately 1.75 hectares, the majority of which is advanced regrowth closed forest. The proposed development intends to remove the vegetation within the Subject site and incorporate residential development (i.e. an additional 31 allotments).

A Flora and Fauna Assessment was completed for the Subject site in 2004 as part of The Glades development assessment (JWA 2007). This assessment identified the vegetation within the open space area as (**FIGURE 6**):

- Community 1f – Tall closed forest (*Eucalyptus planchoniana, Syncarpia glomulifera, Eucalyptusa pilularis*);
- Community 2b – Mid-high swamp sclerophyll forest (*Melaleuca sieberi +/- Melaleuca quinquenervia*); and
- Community 4a – Low closed grassland (*Andropogon virginicus, Themeda triandra*) with scattered trees.

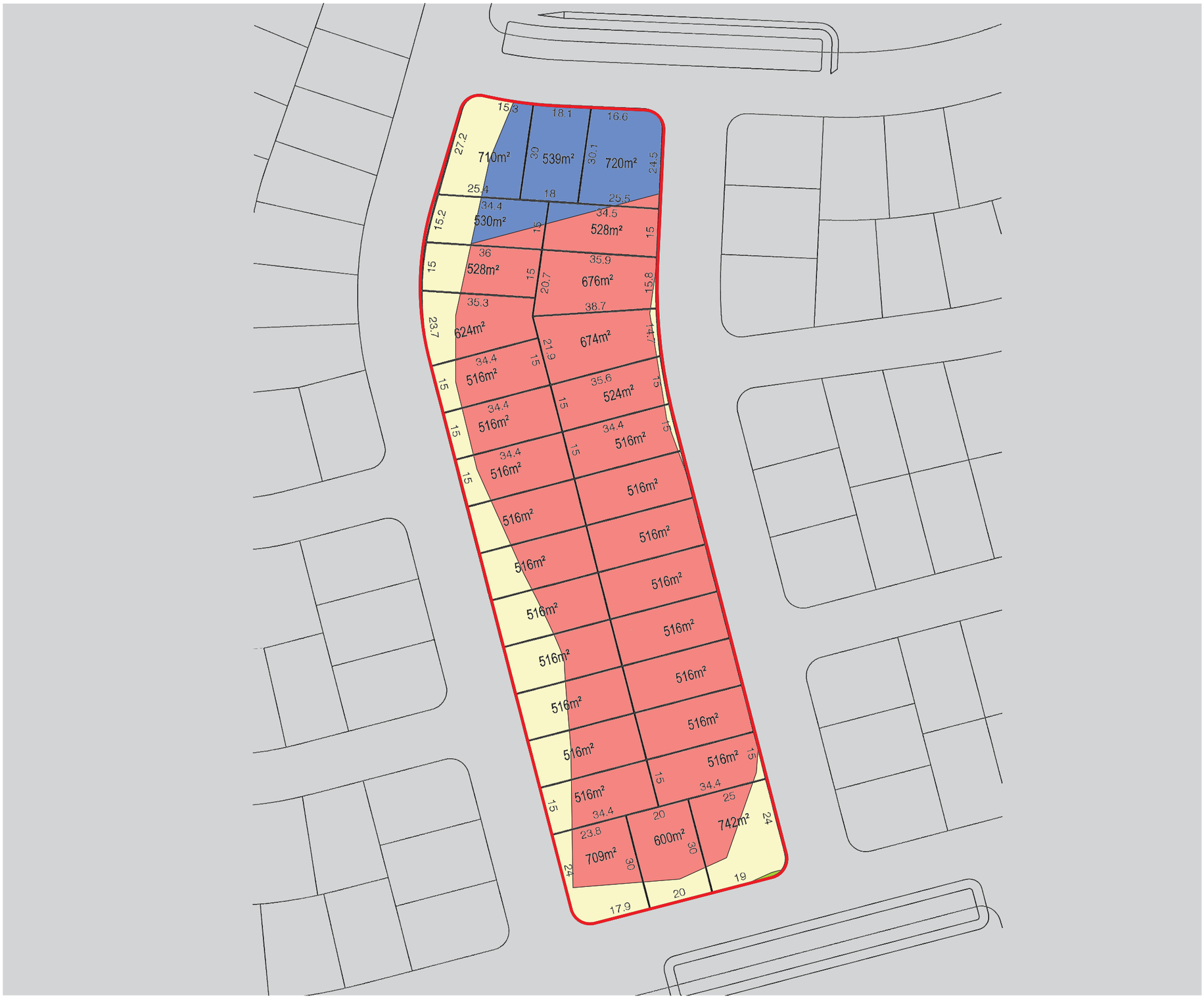
The boundaries and vegetation community descriptions were slightly modified in 2017 to reflect the current condition of these communities. **FIGURE 18** shows the impacts of the development layout to vegetation communities occurring on the Subject site. A summary of vegetation types to be lost and their respective areas are shown in **TABLE 10**. In total 1.75 ha of vegetation is proposed to be cleared. Of this vegetation to be lost, 1.37 ha is considered to be relatively intact native vegetation (i.e. communities 1f & 2b).

TABLE 10
VEGETATION TO BE LOST AS A RESULT OF THE PROPOSED DEVELOPMENT

Vegetation	Total Area	Area to be Removed	Area to be Retained
1f: Tall closed forest (*Eucalyptus planchoniana*, *Syncarpia glomulifera*, *Eucalyptus pilularis*)	1.19 ha	1.19 ha	0 ha
2b: Mid-high swamp sclerophyll forest (*Melaleuca sieberi +/- Melaleuca quinquenervia*)	0.18 ha	0.18 ha	0 ha
4a: Low closed grassland (**Andropogon virginicus* (Whiskey grass), *Themeda triandra* (Kangaroo grass)) with scattered trees.	0.37 ha	0.37 ha	0 ha
TOTAL	**1.75 ha**	**1.75 ha**	0 ha

Additional impacts on vegetation communities may include:

- Potential for degradation of retained areas of vegetation along Moonee Creek.



N

LEGEND

Subject Site

The Glades Approved Development Site

Dry Sclerophyll Forest/Woodland Communities

Community 1f - Tall closed forest (*Eucalyptus planchoniana*, *Syncarpia glomulifera*, *Eucalyptus pilularis*)

Swamp Sclerophyll Communities

Community 2b - Mid-high swamp sclerophyll forest (*Melaleuca sieberi*)

Grassland Communities

Community 4a - Low closed grassland (*Andropogon virginicus*, *Themeda triandra)* with scattered trees

Community 4b - Low closed grassland (*Themeda triandra*, *Juncus* sp.*)*

0 25m

1 : 1 250

SOURCE: RDM dwg no. 16083-1 & 16083-2 dated 12/10/17 (Ref: 20171013070442509.pdf); JWA Site Investigations 2004 & 2017

SCALE: 1 : 1250 @ A3

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FIGURE 18

PREPARED: BW
DATE: 24 October 2017
FILE: N02066_Impact Veg.cdr

TITLE

IMPACT ON VEGETATION COMMUNITIES

- Clearance of areas on the Subject site represents a loss of habitat available for dispersal for plants and will reduce visits by pollination and dispersal vectors.
- Disturbance to the Subject site creates opportunities for weeds to colonise. Weeds may be introduced to the Subject site in construction materials or by vehicles. Occupation of the Subject site creates opportunities for weeds to become established. Landscape species may escape to retained areas of vegetation.
- The removal of vegetation from the Subject site represents the loss of organic material from the site.
- Residents may create walking tracks through adjacent bushland areas retained within The Glades site to gain access to Moonee Creek. This may result in direct loss of vegetation, change in vegetation structure and increased opportunities for weeds and disturbance adapted animal species.
- Occupation of the Subject site may increase the risk of fire release into the surrounding bushland.

4.1.2 Fauna

The proposed development will result in some loss of foraging, sheltering and breeding habitat for native fauna occurring in the locality. This loss may have a range of impacts including:

- Loss of forage habitat for nectarivorous and insectivorous fauna species, including the loss of autumn/winter flowering plants.
- Minor decrease in the size of local fauna populations and increased susceptibility to threatening processes acting in the locality.
- Minor decrease in the size of the prey base for carnivorous species.
- Increased fragmentation of habitat in the locality.
- Some decrease in the genetic base for local fauna populations.
- Loss of sheltering and breeding habitat for native fauna.
- Reduction in opportunities for movement through the Subject site.
- Loss of trees containing hollows represents a loss of shelter habitat for hollow-dependent fauna. Loss of sub-mature eucalypts represents a decrease in the future recruitment of hollows.
- Loss of eucalypts, paperbarks, banksias and flowering shrubs decrease the food supply for nectarivores.
- Animals may be killed or injured during the clearance of vegetation.
- Domestic dogs and cats prey on native fauna and may have significant impacts on the populations of native species.
- Development of the Subject site may favour native and introduced disturbance adapted competitors. For example, Cane toads may out-compete other

amphibians and reptiles, aggressive open country bird species (e.g. Noisy miner, Crow, Pied currawong) may out-compete other birds, and non-native mammals (Black rat and House mouse) may out-compete other native small mammals).

- Increased light, noise and activity may cause reclusive species to move away from habitat edges.
- The proposed development will result in an increase in traffic on and to the Subject site. This increases the likelihood of animals being killed or injured by vehicles.
- Alterations to site hydrology and land use may alter the water quality or hydrological regime in Paperbark Communities or neighbouring areas of Moonee Creek.

The loss of 1.37 ha of intact native vegetation from the Subject site has the potential to impact on fauna movement. However, an assessment of biodiversity and corridor values of the area in question has determined that the likely impacts of the proposed vegetation clearing on native fauna species, including threatened fauna species previously recorded from the broader The Glades development site, and their habitats, is likely to be minimal. The habitat provided by this area of vegetation is not considered to be significant for any native fauna groups or threatened fauna species previously recorded from the broader development site. Furthermore, the post-development (The Glades development) corridor values of the Subject site are likely to be restricted to stepping stone habitat for highly mobile species only, as fauna movement opportunities would be significantly limited by adjacent roads, lack of connecting vegetation to the south, and edge effects.

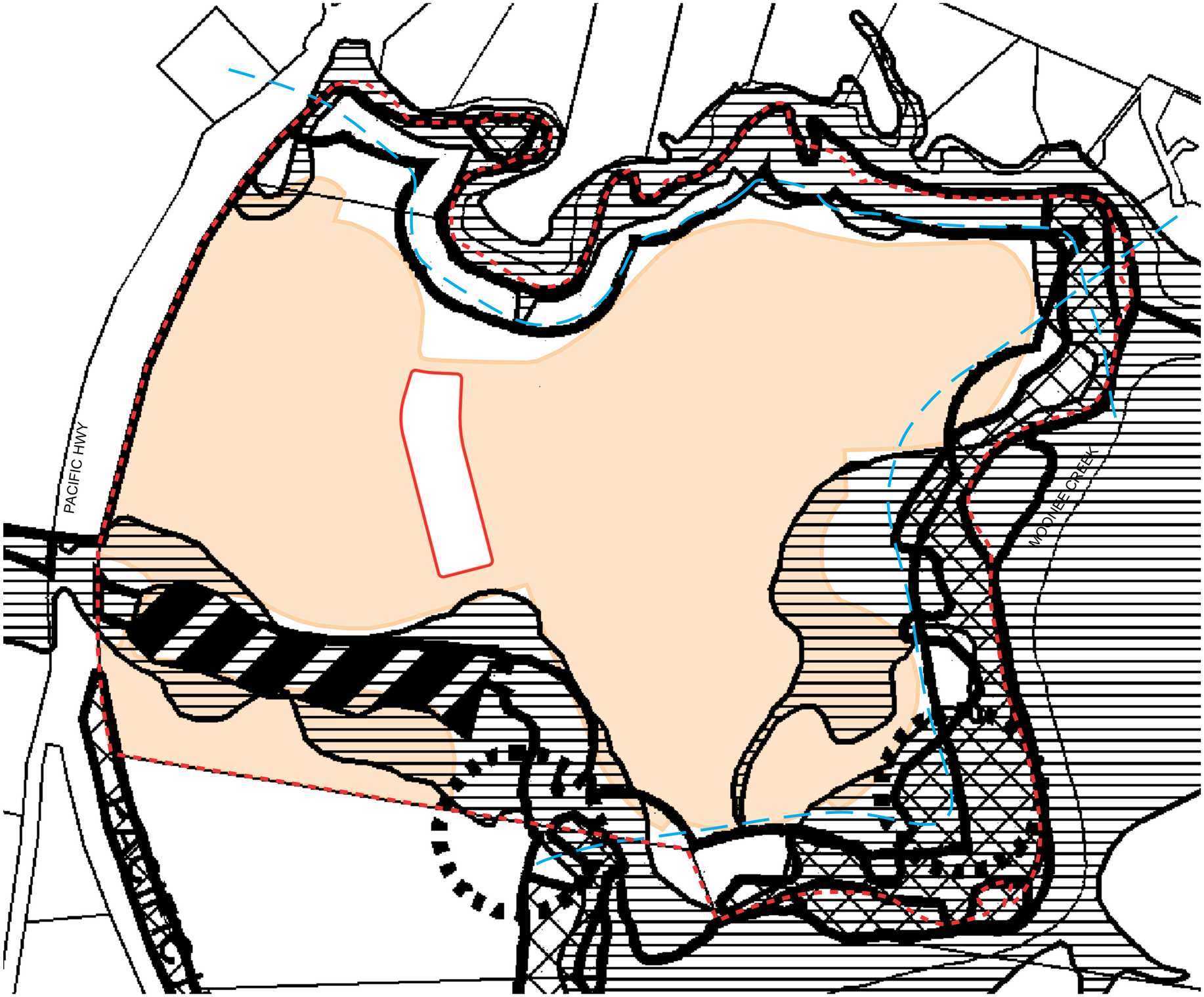
4.1.3 The Coffs Harbour City Council Moonee Development Control Plan

The Moonee Development Control Plan (DCP) was adopted by Coffs Harbour City Council on the 22 September 2004. The DCP applies to the Moonee Release Area, in which the Subject site occurs. Environmental mapping has been completed for the Moonee Release Area under the 2004 DCP.

FIGURE 19 shows the Moonee DCP environmental mapping in the context of the proposed development. No environmental mapping, such as buffers, flooding, SEPP 14 wetlands, protected vegetation, Osprey nests (which require a 100m buffer) or Wallum froglet habitat were mapped on the Subject site.

4.1.4 Impacts on Threatened species

The possible impacts of the Proposed development on Threatened fauna species recorded during the site survey (including Threatened species recorded within The Glades development site) are discussed as follows.



LEGEND

- Subject Site
- The Glades Development Site
- The Glades Impact Area
- Cadastre
- Creek Buffer

Moonee DCP

- Creek Buffers
- Flooding
- SEPP 14 Wetlands
- Wetlands Buffer
- Protected Vegetation
- Osprey Nest Buffer
- Wallum Froglet Habitat

0 150m

1 : 5000

SOURCE: Coffs Harbour City Council Moonee DCP Map 4; ERM Annex H - Plan 4 Veg Mgt (updated plan Jan 2018) (Ref: 20180206093044348.pdf)

SCALE: 1 : 5000 @ A3

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FIGURE 19

PREPARED: BW
DATE: 09 February 2018
FILE: N02066_DCP.cdr

TITLE
ENVIRONMENTAL MAPPING OF THE SUBJECT SITE BY CHCC DCP

4.1.4.1 Wallum froglet

The investigations undertaken by JWA and Arthur White have considered the mapped Wallum froglet investigation area (CHCC), and the results show that habitat for the species on the Subject site is restricted to the area adjacent to (and including) the southern drainage line (**FIGURE 20**) of The Glades development site, and consists of foraging habitat only. White (2006) notes that no breeding habitat occurs on The Glades site.

Development of the Subject site (refer to **FIGURE 20**) will not result in the loss of any Wallum froglet habitat (as mapped by White 2006).

4.1.4.2 Osprey

The Moonee DCP requires a 100m minimum buffer around active Osprey nests. Osprey nests have been located in the south-eastern corner and south of The Glades development site, as shown in **FIGURE 17** (Moonee DCP 2004). However, both nests were not observed during the 2017 site surveys, and are considered to have collapsed. No Osprey nests were recorded within the Subject site. There is some potential for occupation of the proposed development to impact on the nesting Ospreys through disturbance, although this is not considered to be significant.

4.1.4.3 Glossy black-cockatoo

The proposed development will result in the removal of some Black she-oak, a Glossy black cockatoo feed tree, from within grasslands with scattered trees on the Subject site. No suitable nest trees for this species occur within the development area, however loss of eucalypts from the development area will decrease the future recruitment of suitable nest hollows. Disturbance from the proposed development may reduce the likelihood of Glossy black-cockatoos feeding in proximate areas, although Glossy black-cockatoos are known to forage close to disturbance sources.

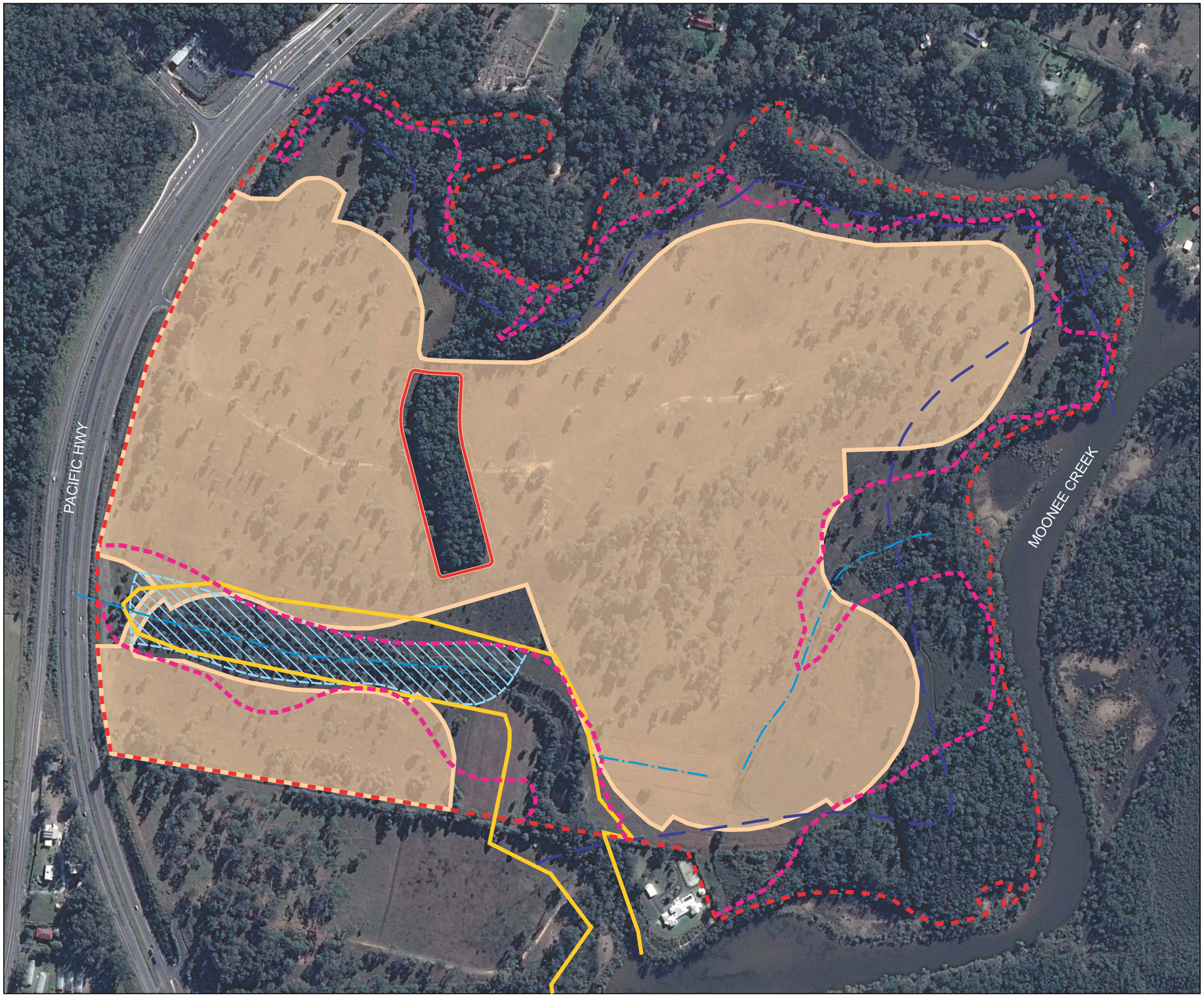
4.1.4.4 Black-necked stork

The proposed development within the Subject site will not result in disturbance to or the removal of habitat for this species.

4.1.4.5 Koala

The Coffs Harbour Koala Plan of Management (KPoM) (1999) details the operation actions to identify, protect and enhance koala habitat in the Coffs Harbour Area. The Coffs Harbour KPoM replaces the requirement under SEPP 44 for developments in Coffs Harbour LGA to address koala issues individually, and sets out a framework for conserving koalas in Coffs Harbour LGA. The KPoM has been addressed in **SECTION 4.2.4.** Primary or secondary Koala habitat has not been mapped on the Subject site by CHCC (**FIGURE 15**). It should be noted that a number of tree species present on the Subject site have also been identified in the Coffs Harbour KPoM as feed tree species. These are:

- Broad-leaved paperbark



LEGEND

- Subject Site
- The Glades Development Site
- The Glades Impact Area
- Creek Buffer

Wallum Froglet Habitat

- Core Wallum froglet habitat (JWA)
- Wallum froglet habitat area (Biosphere Environmental Consultants, Aug 2006)
- Drain
- Q100 Flood Line (Auspacific Engineers)

N

0 150m

1 : 5000

SOURCE: JWA Site Investigations; ERM Annex H - Plan 4 Veg Mgt (updated plan Jan 2018) (Ref: 20180206093044348.pdf)
SCALE: 1 : 5000 @ A3

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FIGURE 20

PREPARED: BW
DATE: 09 February 2018
FILE: N02066_Impacts WSF.cdr

TITLE
JWA'S MAPPING OF CORE WALLUM FROGLET HABITAT ON THE SITE

- Blackbutt
- Forest oak
- Tallowwood
- Swamp mahogany
- Forest red gum

Koala scats were found to the north of The Glades development site in vegetation fringing Skinners Creek where Tallowwood occur in an area of mapped as Secondary Koala Habitat. Clancy (1998) notes that Koalas have previously been recorded in this area. No koalas or evidence of their occurrence on the Subject site were observed in the 2004 or 2017 survey.

The proposed development is likely to limit opportunities for Koala movement over the Subject site, with movement restricted to retained vegetation along the northern and eastern margins of The Glades site. There is also the potential for Koalas to be injured or killed during clearing of vegetation on the Subject site, or from vehicle strike within the developed urban areas. Urban development of the Subject site also has the potential to increase risks to Koalas from straying dogs, and drowning in swimming pools.

Whilst the Subject site is not mapped as primary or secondary koala habitat, the clearing of this area will result in the loss of *Eucalyptus pilularis* trees, which is listed as a primary koala habitat tree species that should not be removed unless the development will not destroy, damage or compromise the values of the land as koala habitat (CHCKP 1999). As koalas have not been recorded in this area of the Subject site, the removal of *E. pilularis* from this portion of the Subject site is not considered likely to destroy, damage or compromise the values of the land as koala habitat.

4.1.4.6 Grey-headed flying-fox

The proposed development will result in the loss of foraging habitat for this species and reduce the foraging efficiency of any individuals foraging on the Subject site. There is no suitable roosting habitat for this species on the Subject site. The Grey-headed flying-fox is likely to continue to forage in retained areas of vegetation on The Glades development site, and will not be significantly affected by the proposed development.

4.1.4.7 Squirrel glider

Squirrel gliders were recorded on the eastern margins of The Glades development site in eucalypt woodland, and also within scattered eucalypts within grasslands in the centre of The Glades site. This species is likely to utilise most of the sclerophyll and paperbark communities along the eastern edge of the Subject site, including scattered eucalypts in grassland adjacent to these communities.

Loss of vegetation within the Subject site will result in a reduction of forage habitat for the Squirrel glider and diminish movement corridors. There is potential for increased

disturbance to Squirrel gliders feeding and denning in vegetated areas proximate to the development, and the further possibility of predation from cats. There is also the potential for direct mortality during construction.

4.1.4.8 Little bent-wing bat

The Little bent-wing bat forages on insects in forested habitats and roosts in caves, tunnels and similar structures. The proposed development will result in the loss of some foraging habitat for this species in the woodland environment of the Subject site, which will reduce the foraging efficiency of any individuals foraging on the Subject site.

4.1.4.9 Common bent-wing bat

As for Little bent-wing bat.

4.1.4.10 Large-footed myotis

The Large-footed myotis forages over creeks and other water bodies. It roosts in caves, tunnels, under bridges and in tree-hollows. The proposed development will not affect foraging or roosting habitat for this species, but may result in the loss of tree hollows that may provide future potential roost sites.

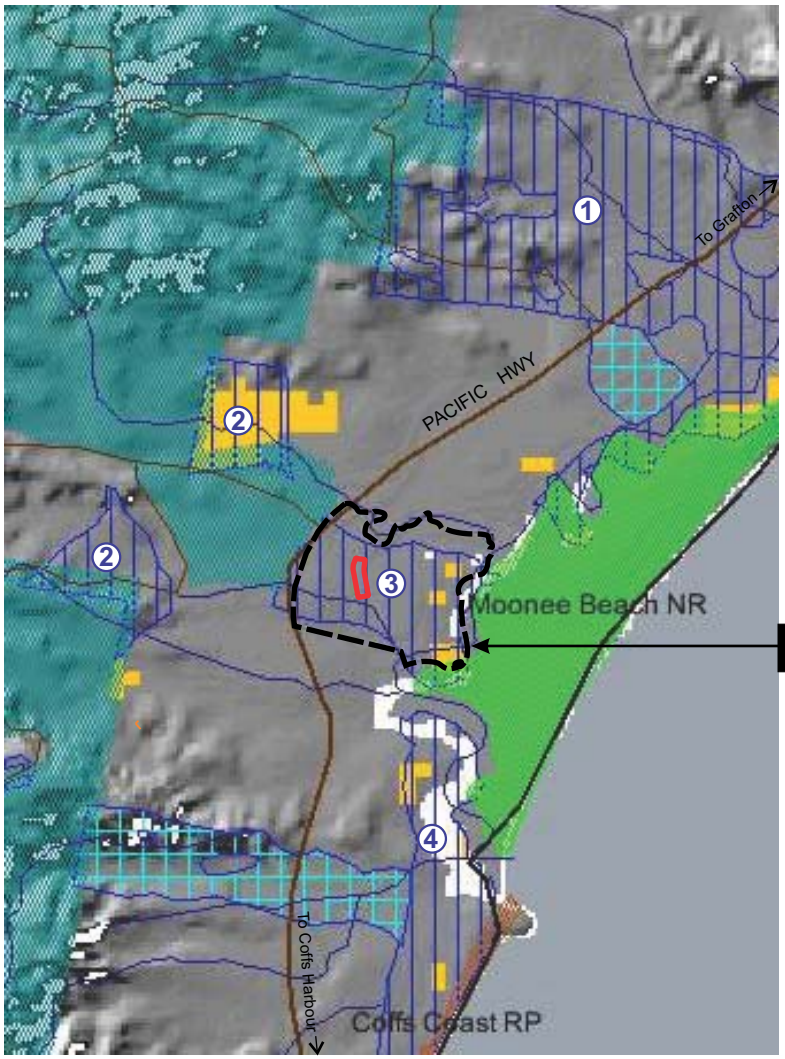
4.1.4.11 Common planigale

The Common planigale forages in dry sclerophyll, swamp sclerophyll, heathland and grassland at ecotone with rainforest. Breeding and sheltering sites for Common planigales consist of nests of eucalypt leaves in logs or under bark, cracks in soil, grass tussocks, and building debris. They require dense leaf litter or ground cover. Loss of vegetation within the Subject site will result in a reduction of forage and nesting habitat for the Common planigale. There is potential for increased disturbance to Common planigales feeding and nesting in vegetated areas proximate to the development, and the further possibility of predation from cats. There is also the potential for direct mortality during construction.

4.1.5 Corridor Impacts

The NPWS Key Habitats and Corridors database shows several regional habitat corridors within the locality of the Subject site. These are shown in **FIGURE 21**. The Subject site itself occurs within the Wedding Bells – Moonee Beach Regional Corridor which links Moonee Beach Nature Reserve and Skinners Creek. This corridor is comprised of the following fauna assemblages identified by NPWS:

- Moist escarpment foothills UNC
- Dry coastal foothills UNC
  UNC = Upper North Coast



LEGEND

Subject Site

The Glades Development Site

Key Habitats & Corridors

Key Habitat

Regional Corridor

Sub-regional Corridor

① Moonee Regional Corridor

② Hoys Regional Corridor

③ Wedding Bells - Moonee Beach Regional Corridor

④ Moonee Nature Reserve Regional Corridor

Tenure

Aboriginal Area

Historical Site

National Park

Nature Reserve

Regional Park

State Recreation Area

State Forest

0 1.5km

SOURCE: CANRI Website 12.11.04
Key Habitats & Corridors in North East NSW

SCALE: 1 : 50 000 @ A4

JWA PTY LTD
Ecological Consultants

CLIENT
Winten Property Group Pty Ltd

PROJECT
Flora & Fauna Assessment
Lots 1 & 2 DP725785
Pacific Highway, Moonee NSW
Coffs Harbour City Council LGA

FIGURE 21

PREPARED: BW
DATE: 24 October 2017
FILE: N02066_NPWS Corridors.cdr

TITLE

NPWS KEY HABITATS & CORRIDORS

To the south of the Subject site lies the Moonee Nature Reserve – Sapphire Regional Corridor which links Moonee Beach Nature reserve and Hills Beach, and consists of the following fauna assemblages:

- Moist escarpment foothills UNC
- Dry coastal foothills UNC
- Coastal complex UNC

The Hoys Corridor occurs to the west of the Subject site in two areas which link Skinners Creek with Skinners Road in the north and Cunninghams Creek in the south. Fauna assemblages consist of:

- Wet escarpment UNC
- Moist escarpment foothills UNC

The proposed development will contribute towards a reduction in the efficacy of the Subject site as a corridor due to habitat loss and fragmentation. However, the northern and eastern parts of the broader The Glades site will retain movement habitat to consolidate the link between the Moonee Beach Nature Reserve and habitats on the southern side of Skinners Creek. These areas are considerd to have greater corridor values than the Subject site as vegetation provides a generally wider corridor and does not encourage wildlife to enter roadways or residential areas where hazards exist.

The proposed S75 ammendment for the additional 31 allotments will result in the removal of 1.747 ha of land containing an isolated patch of native vegetation. Consideration was given to the likely post-development corridor values of this retained vegetation. The ongoing corridor values of the vegetation were considered to be significantly reduced due to (**FIGURE 16**):

- Approved road crossings at both the northern and southern ends of the corridor. The approved The Glades development plans do not allow for any fauna diversion or exclusion infrastructure at these road crossings (e.g. culverts, rope bridges, fences). Native fauna species would be at risk of injury or death at these road crossing points, and they may act as a disincentive for dispersal for some species due to lack of cover.
- Lack of connecting vegetation to the south. While vegetation retention and rehabilitation works are proposed in open space areas to the south of the corridor, under the approved development layout these areas will be separated from the corridor by a road (discussed above), recreational areas (i.e. a playground, picnic facilities, boardwalks etc.), and stormwater treatment devices/basins. Fauna movement to the south would therefore be restricted to highly mobile species only.
- Edge effects. The approved The Glades development plans include the construction and maintenance of bushfire Asset Protection Zones (APZs) 20-40m wide within the eastern and western edges of the retained vegetation patch (i.e. vegetation within the Subject site). This vegetation clearing/thinning and

subsequent regular maintenance of APZs is likely to significantly reduce the habitat and corridor values of this vegetation patch for native fauna species, particularly forest interior species or those susceptible to edge effects.

- Lack of connectivity to significant habitat area. The Subject site has limited connectivity to National Parks and Nature Reserves in the locality. The dual carriageway Pacific Highway to the west of the Subject site presents a significant obstruction to fauna movement, as does existing residential development to the north and south of the Subject site.

The assessment determined that following the approved development, corridor values would be likely restricted to stepping stone habitat for highly mobile species. The loss of this 'stepping stone' habitat as a result of the proposed S75 modification is considered unlikely to have any significant impacts on native fauna species (including Threatened species) utilising the Subject site, and more common disturbance adapted species are likely to continue to use street and landscape trees to move across the Subject site.

It is acknowledged that the removal of scattered trees throughout the site may result in a restriction in dispersal opportunities for the both the Squirrel and Feathertail glider, however these species will be able to disperse via vegetation to the east of the The Glades site.

FIGURE 16 shows the extent of dispersal opportunities for fauna on the broader The Glades development site following the approved development and the proposed development of the Subject site.

4.1.6 Impacts on Moonee Beach Nature Reserve

The proposed development has the potential to result in impacts on habitats within Moonee Beach Nature Reserve as a result of increased visitation to the reserve.

Nature Reserves, as opposed to National Parks, are managed for conservation purposes only and are not intended to provide for visitors. Impacts associated with increased visitation may include creation of informal pathways, trampling of vegetation, picking of wildflowers, increased disturbance of fauna, increased risk of fire, increased potential for dumping of rubbish and increased potential for invasion of exotic flora and fauna.

4.1.7 Other Possible Impacts

Other possible impacts from the proposed development include alterations to the hydrology, and impacts on water quality on the Subject site.

4.2 Amelioration

4.2.1 Introduction

This section discusses possible ameliorative measures and opportunities for enhancing the natural environment on the Subject site and associated The Glades development i.e. plant communities, fauna communities, and Threatened species.

It should be noted that the original Project Approval for The Glades development incorporates general rehabilitiation and revegetation works in accordance with an approved Vegetation Management Plan. However, these areas are now proposed to be rehabilitated/revegated to a much higher standard towards PCT benchmarks and will therefore generate credits to offset impacts of the proposed additional 31 allotments on the Subject site.

4.2.2 Amelioration for Plant Communities

It is possible that the proposed loss of 1.37 ha of realatively intact native vegetation will be required to be offset. Whilst it is understood that Coffs Harbour City Council has specified its own offset requirements within the Development Control Plan 2015, Part E Environmental Controls, determination of offsets based on NSW BioBanking Assessment Methodology (BBAM) is considered the most up-to-date and equitable approach for determining ecological offset requirments in NSW.

In this regard, surveys of the impact site and proposed offset sites have been completed utilising the BBAM. The BBAM provides a streamlined process to assess biodiversity values at a site (e.g. vegetation condition) and to determine the quantum of offsets required. The process would generally be as follows:

- The BBAM is established under section 127B of the Threatened Species Conservation Act 1995. It is used to assess the biodiversity values of a development site for the purpose of obtaining a biobanking statement, or a biobank (offset) site for the purpose of entering into a biobanking agreement.
- A range of scientifically based criteria have been collected by an accredited assessor from the impact area. This involved comprehensive assessment using plot and transect techniques within each vegetation type to be affected.
- These have been entered into the BioBanking Credit Calculator (BBCC) which is an online application that applies the BBAM to calculate the number and type of biodiversity credits required to offset the impacts of developments on biodiversity.
- This included ecosystem credits for native vegetation types along with species credits for individual threatened species habitat. The number of credits calculated depends on a number of factors such as site values (e.g. the structure and function of ecosystems) and landscape context (e.g. the values for connectivity and area of vegetation).
- The results have indicated that 74 ecosystem credits would be required to offset the loss of intact native vegetation from the subject site (**APPENDIX 4**). The required 74 ecosystem credits for this component of the development can be readily offset on the broader The Glades development site. Proposed comprehensive rehabilitation/revegetation works towards PCT benchmarks as offset for the additional 31 allotments are over and above the general rehabilitation and revegetation works required under the Project Approval.

- Credits required can either be purchased from an existing biobank site or generated by undertaking conservation management at a new biobank (offset) site.
- The proposed offset may be provided on site, or alternatively, off site as long as it generates credits for the impacted vegetation/species and occurs within the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion (based on major catchment areas).
- The BBAM was therefore used to calculate the number and type of credits that can be created (e.g. through revegetation or rehabilitation of existing vegetation).
- The results have indicated that rehabilitation of existing vegetation to be retained on site would create 112 ecosystem credits (**APPENDIX 5**). Furthermore, the revegetation of 3.87 ha of currently cleared land over The Glades development site would potentially create an additional 38 credits.
- An Offset Strategy/Management Plan would need to be prepared including:
    - identification of offset location/s;
    - Justification for offset calculation methodology;
    - Details of rehabilitation/revegetation strategy;
    - Techniques for weed control/removal;
    - Ongoing maintenance requirments; and
    - Monitoring and reporting procedures.

Other amelioration measures include:

- Weeds should be controlled during construction.
- Vegetation removed during construction should be mulched for use on the Subject site. This will prevent the introduction of weeds from seeds in mulch brought in from elsewhere.
- Weeds should be controlled in landscaped areas and areas of retained vegetation.
- Known environmental weeds (e.g. Umbrella tree) should be avoided.
- Landscape plantings should include a majority of native species that will provide forage habitat for nectarivorous and frugivorous birds and bats.
- Landscaping trees should be situated where possible to reduce the amount of disturbance to retained areas of habitat.

4.2.3 Amelioration for Fauna

Vegetation clearance for the proposed development will result in some loss of habitat for fauna utilising the Subject site. However, suitable habitat will be retained within the adjacent The Glades development site, particularly along the northern and eastern boundaries. Amelioration for fauna and Threatened fauna not significantly affected by

the proposed development is included below, while amelioration for the Koala, Squirrel glider, Glossy black-cockatoo and Common planigale are discussed in **SECTION 4.2.4.**

The following amelioration measures apply:

- Landowners should control dogs on the Subject site. All animals should reside within fenced enclosures and be on a leash when outside of the enclosure. Cats should be banned from the Subject site under the companion Animals Act (1998) to reduce likely impacts on local fauna.
- Appropriate disposal of rubbish and food scraps reduces opportunities for non-native predators and disturbance adapted competitors.
- Landscape and landfill materials should be sourced from a supplier where Cane toads do not occur.
- A qualified fauna handler should be on site when clearing occurs.
- 40 km/hr speed limit to be imposed on internal access roads.
- Lighting and koala exclusion fencing is provided where appropriate on roadways adjacent to koala habitat.

4.2.4 Amelioration for Threatened species

4.2.4.1 Koala

The Subject site proposed for development contains potential koala habitat that will be lost, however this area is not mapped as primary or secondary koala habitat under the Coffs Harbour CKPOM. It should be noted however that *Eucalyptus pilularis* is present within the Subject site.

It is recommended that:

- Koala habitat trees (e.g. Broad-leaved paperbark, Blackbutt, Forest oak, Tallowwood, Swamp mahogany, Forest red gum) be included as part of proposed revegetation/offset plantings over The Glades development site (**FIGURE 6**) to compensate for any Koala habitat trees removed.
- Dogs should be strictly controlled within the proposed development, i.e.: must be contained within an appropriately fenced yard, and on a leash at all times when outside of a fenced enclosure.
- Swimming pools should be fenced to restrict access by Koalas.

It is unlikely that Koala feed trees will be retained within the development envelope and it is not considered desirable that Koalas be able to access or move through developed/residential areas of the Subject site. Suitable movement habitat occurs along the northern and eastern boundaries of The Glades development site.

4.2.4.2 Squirrel glider

Some loss and fragmentation of forage habitat for the Squirrel glider will occur due to the loss of habitat within the Subject site. It is recommended that:

- Cats should be banned under the Companion Animals Act (1998) to reduce likely impacts on Squirrel gliders.
- A qualified fauna handler should be on the Subject site when clearing occurs.

4.2.4.3 Glossy black cockatoo

While all the Black she-oak to be lost to the proposed development are immature and do not currently constitute a food resource for the Glossy black cockatoo, it is recommended that this Glossy black cockatoo food tree species be included as part of proposed revegetation/offset plantings over The Glades development site (**FIGURE 6**) to compensate for any trees removed.

4.2.4.4 Common planigale

There will be some loss and fragmentation of forage habitat for the Common planigale as a result of the proposed development. It is recommended that:

- Cats should be banned under the Companion Animals Act (1998) to reduce likely impacts on Common planigales.
- A qualified fauna handler should be on the Subject site when clearing occurs.

4.2.5 Amelioration for Wildlife Corridors

It is considered that movement opportunities for the majority of fauna species will persist on the broader The Glades site through the retention of vegetation in north, south and east of the site. However, the proposed development of the Subject site will result in the loss of some 'stepping stone' corridor features. As a result, the following amelioration measures are proposed:

- Rehabilitation of currently cleared or degraded areas of vegetation in the east, north and south of the greater The Glades site (**FIGURE 16**). This is expected to further enhance current movement opportunities in these areas both within The Glades site and onto adjacent properties.
- Exclusion fencing should be installed as appropriate to encourage fauna such as Koalas to utilise corridor habitat areas and avoid entering hazardous areas such as roadways.

5 Statutory Considerations

5.1 Introduction

This section includes assessments of the impacts of the Proposed development with regard to:

- Section 5A of the *Environment Protection & Assessment Act (1979)* (Assessment of Significance);
- *State Environmental Planning Policy No. 44* (SEPP 44) – Koala Habitat Protection; and
- The *Commonwealth Environment Protection and Biodiversity Conservation Act (1999)*.

5.2 Assessment of Significance (Seven Part Test)

5.2.1 Background

An Assessment of Significance (7-part test equivalence) has been undertaken for all listed species/EECs recorded on the Subject site, including threatened fauna predicted to occur over time **(SECTION 3.3)**. Potential impacts on threatened species, populations or ecological communities, or their habitats were assessed using the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2007).

The Assessment of Significance should not be considered a "pass or fail" test as such, but a system allowing proponents to undertake a qualitative analysis of the likely impacts and ultimately whether further assessment needs to be undertaken via a Species Impact Statement. All factors must be considered and an overall conclusion must be drawn from all factors in combination. Where there is any doubt regarding the likely impacts, or where detailed information is not available, a Species Impact Statement should be prepared.

Mitigating, ameliorative or compensatory measures proposed as part of the action, development or activity should not be considered in determining the degree of the effect on threatened species, populations or ecological communities, unless the measure has been proven successful for that species in a similar situation. In many cases where complex mitigating, ameliorative or compensatory measures are required, such as translocation, bush restoration, purchase of land, further assessment through the Species Impact Statement process is likely to be required.

In determining the nature and magnitude of an impact, it is important to consider matters such as:

- Pre-construction, construction and occupation/maintenance phases;
- All on-site and offsite impacts, including location, installation, operation and maintenance of auxiliary infrastructure and fire management zones;
- All direct and indirect impacts;

- The frequency and duration of each known or likely impact/action;
- The total impact which can be attributed to that action over the entire geographic area affected, and over time;
- The sensitivity of the receiving environment; and
- The degree of confidence with which the impacts of the action are known and understood.

Recovery and threat abatement plans, priorities action statements and threatened species profiles may provide further guidance on whether an action/activity is likely to be significant.

Application of the precautionary principle requires that a lack of scientific certainty about the potential impacts of an action does not itself justify a decision that the action is not likely to have a significant impact. If information is not available to conclusively determine that there will not be a significant impact on a threatened species, population or ecological community, or its habitat, then it should be assumed that a significant impact is likely.

5.2.2 Flora

No Threatened flora species were recorded on the Subject site.

5.2.3 Endangered Ecological Communities (EECs)

No Endangered Ecological Communities (EECs) occur on the Subject site.

5.2.4 Fauna

5.2.4.1 Background

Eleven (11) threatened fauna species have been recorded on or within the vicinity of the Subject site (**FIGURE 17**). Based on an assessment of available habitat, a further thirteen (13) threatened fauna species are considered to possibly occur on the Subject site over time. An 'Assessment of Significance' has been completed for each of these twenty-four (24) species in **APPENDIX 6**.

5.2.4.2 Result of Assessment of Significance

On the basis of the assessments provided in **APPENDIX 6**, which included consideration of proposed amelioration measures that have been used successfully for threatened fauna species in similar situations, it is considered that a Species Impact Statement (SIS) is not required for threatened fauna species occurring on (or possibly occurring on) the Subject site.

5.3 Koala Habitat Assessment

A Comprehensive Koala Plan of Management (KPoM) was prepared by the NSW NPWS in close consultation with Coffs Harbour City Council (CHCC) under the statutory provisions of SEPP 44 – Koala Habitat Protection. The adoption of the KPoM replaces the requirement under SEPP 44 for developments in Coffs Harbour LGA to address Koala issues individually and sets out a framework for conserving Koalas in Coffs Harbour LGA (Lunney *et al* 1999). The adoption of the KPoM does not negate the responsibility of Council or a proponent considering undertaking a development requiring Council consent to fully consider whether such an activity is likely to result in a significant effect on a threatened species, population or ecological community or their habitat.

The Subject site is not mapped as primary or secondary koala habitat under the Coffs Harbour CKPOM. However, the clearing of this area will result in the loss of *Eucalyptus pilularis* trees, which is listed as a primary koala habitat tree species that should not be removed unless the development will not destroy, damage or compromise the values of the land as koala habitat (CHCKP 1999). Koala habitat trees identified in the Coffs Harbour CKPOM are protected under the local Tree Preservation Order. Any of these trees required to be removed for development must be replaced in the vicinity according to the "*Guidelines for Planting Koala Trees In Coffs Harbour LGA*" contained in the Coffs Harbour CKPOM.

Impacts on Koalas have been discussed in **SECTION 4** of this report. Amelioration measures have been recommended to satisfy the requirements of the Coffs Harbour KPoM.

5.4 Commonwealth Environment Protection and Biodiversity Conservation Act (1999)

5.4.1 Introduction

The *Environment Protection & Biodiversity Conservation (EPBC) Act (1999)* was passed by Commonwealth Parliament in June 1999 and came into force on 16 July 2000. A person must not, without an approval under the Act, take an action that has or will have, or is likely to have, a significant impact on a matter of National Environmental Significance (NES). These matters are listed as:

a) the world heritage values of a declared World Heritage property,
b) the ecological character of a declared Ramsar wetland,
c) a threatened species or endangered community listed under the Act,
d) a migratory species listed under the Act, or
e) the environment in a Commonwealth marine area or on Commonwealth land.

The Act also prohibits the taking, without an approval under the Act, of:

a) a nuclear action, or
b) an action in a Commonwealth marine area or on Commonwealth land, that has or will have, or is likely to have, a significant impact on the environment.

An action includes a project, development, undertaking or an activity or series of activities. An action does not require approval if it is a lawful continuation of a use of land, sea or seabed that was occurring before the commencement of the Act. An enlargement, expansion or intensification of a use is not a continuation of a use.

The *EPBC Act (1999)* does not require Commonwealth approval for the rezoning of land. It does, however, suggest that when rezoning land, planning authorities should consider whether to allow actions that could significantly affect NES matters or the environment of Commonwealth land.

Matters of NES in NSW are:

a) Declared World Heritage Areas;
b) Declared Ramsar Wetlands;
c) Listed Threatened Species;
d) Listed Ecological Communities in NSW;
e) Listed migratory species (JAMBA and CAMBA).

5.4.2 Subject Site Assessment

A Commonwealth Assessment will be required for proposed activities on the Subject site if they affect a matter of NES. Matters of NES in NSW were identified in the previous section. There are no declared World Heritage Areas or Ramsar Wetlands in the Locality, adjacent to, or on Subject site.

5.4.3 Listed Threatened Species

A number of species listed as threatened in the *Commonwealth Environmental Protection and Biodiversity Conservation Act (1999)* are known from the wider locality, these are listed in **TABLES 3 and 6**.

No Commonwealth Threatened flora species were recorded on the Subject site.

Three (3) Commonwealth Threatened fauna species, the Swift parrot, Koala and the Grey-headed Flying-fox, are considered possible or known occurrences at the Subject site.

If the proposed development is deemed to have a significant impact on any of these species, Commonwealth approval will be required.

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or

- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.

The Critically Endangered Swift parrot is considered a possible but unlikely occurrence on the Subject site. It is considered that the proposed development is unlikely to have a significant impact on this species, due to the retention of foraging habitat along Moonee and Skinners Creeks as part of The Glades development.

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or
- interferes substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

It is considered that Proposed development will not result in any such impacts on the Vulnerable Grey-headed flying-fox or Koala, due to the retention of foraging habitat along Moonee and Skinners Creeks as part of The Glades development. This species forages widely and is likely to utilise a large area of forage habitat within the locality.

It is considered that the Subject site does not support an important population of any species listed as vulnerable in the *EPBC Act (1999)* and a significant impact on these species will not be incurred.

5.4.4 Listed Ecological Communities in NSW

None of the ecological communities currently listed in the *EPBC Act (1999)* occur on the Subject.

5.4.5 Listed Migratory Species

Listed migratory species in NSW are considered predominantly in the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA).

Two (2) Commonwealth listed migratory species, the White-bellied sea eagle and Osprey have been recorded on the adjoining The Glades development site. Another two (2) listed migratory species, the Cattle egret and Fork-tailed swift, are considered possible to be possible occurrences on the Subject site.

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of *important habitat* of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of *important habitat* of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an *ecologically significant proportion* of the population of the species.

(* Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.)

An area of important habitat is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an *ecologically significant proportion* of the population of the species, or
- habitat utilised by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

It is considered that although a number of listed migratory species are known or likely to occur occasionally on the Subject site, no area of important habitat occurs on the Subject site for listed migratory species.

5.4.6 Requirement for Commonwealth Assessment

On the basis of the above assessment, it is concluded that Commonwealth Assessment is not required for the proposed development of the Subject site.

6 Summary and Conclusions

JWA have been engaged by Rothwell to complete a Flora and Fauna Assessment for part of The Glades development site (Lots 1 & 2 DP 725785) at Moonee. The subject site is a 1.75 ha of land within the central portion of The Glades development.

It is understood that Rothwell Boys propose to lodge an application (75W modification application) seeking to modify Project Approval 06-0143 issued by the Minister for Planning on 5th March 2009, to include additional residential subdivision over a 1.75 ha of land within the central portion of The Glades development (i.e. the subject site). The current report is an amended and updated version of the Flora and Fauna Assessment prepared by JWA in 2007 and includes additional field surveys and an impact assessment for the proposed additional allotment layout.

The proposed development is for the Subject site to be subdivided into thirty-one (31) residential allotments. The proposed development will result in the loss of vegetation for the construction of houses, access roads, driveways and associated infrastructure. There are potential associated impacts on flora, fauna (including Threatened species), and the Moonee Nature Reserve adjacent to the Subject site.

In total 1.75 hectares of vegetation is proposed to be cleared, the majority of which is advanced regrowth closed forest. Of this vegetation to be lost, 1.37 ha is considered to be relatively intact native vegetation (i.e. communities 1f & 2b). The proposed development will result in minor loss of foraging, sheltering and breeding habitat for native fauna occurring in the locality. Impacts of the proposed development on most Threatened species recorded on the Subject site is not considered to be significant.

The Subject site is not mapped as primary or secondary koala habitat under the Coffs Harbour CKPOM. However, the clearing of this area will result in the loss of *Eucalyptus pilularis* trees, which is listed as a primary koala habitat tree species. Any of these trees required to be removed for development must be replaced in the vicinity according to the "*Guidelines for Planting Koala Trees In Coffs Harbour LGA*" contained in the Coffs Harbour CKPOM.

It is possible that the proposed loss of intact native vegetation within the Subject site (comprising an area of 1.37 ha) will be required to be offset. In this regard, surveys of the impact site and proposed offset sites have been completed utilising the BioBanking Assessment Methodology (BBAM). The results have indicated that 74 ecosystem credits would be required to offset the loss of this vegetation. The BBAM was also used to calculate the number and type of credits that can be created (e.g. through revegetation or rehabilitation of existing vegetation) on the broader The Glades development site. The results have indicated that rehabilitation of existing vegetation to be retained on site would create 112 ecosystem credits, whilst the revegetation of 3.87 ha of currently cleared land over The Glades development site would potentially create an additional 38 credits.

It is noted that the original Project Approval for The Glades development incorporates general rehabilitiation and revegetation works in accordance with an approved Vegetation Management Plan. However, these areas are now proposed to be rehabilitated/revegated to a much higher standard towards PCT benchmarks and will therefore generate credits to offset impacts of the proposed additional 31 allotments on the Subject site. Therefore, the required 74 ecosystem credits for this component of the development can be readily offset on the broader The Glades development site.

A Section 5A assessment (Assessment of Significance) was undertaken for twenty-four (24) Threatened fauna species known or considered a possible occurrence at the Subject site over time. The assessment concluded that the impacts of the proposed development would be unlikely to result in the local extinction of any of these species. A Species Impact Statement is not required.

An assessment under the *Commonwealth Environment Protection and Biodiversity Conservation Act (1999)* concluded that the proposed development will not have a significant impact on any matters of National Environmental Significance. Commonwealth assessment of the proposal is therefore not required.

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Appendix 1 - Plant Species List

Grouping and Family		Botanical Name	Common Name
Ferns and Fern Allies	Adiantaceae	*Adiantum hispidulum*	Rough maidenhair
Ferns and Fern Allies	Adiantaceae	*Adiantum aethiopicum*	Common maidenhair
Ferns and Fern Allies	Blechnaceae	*Blechnum indicum*	Swamp water fern
Ferns and Fern Allies	Dennstaedtiaceae	*Hypolepis muelleri*	Harsh ground fern
Ferns and Fern Allies	Dennstaedtiaceae	*Pteridium esculentum*	Bracken fern
Ferns and Fern Allies	Lindsaeaceae	*Lindsaea dimorpha*	
Ferns and Fern Allies	Polypodiaceae	*Platycerium bifurcatum*	Elkhorn fern
Ferns and Fern Allies	Sealaginellaceae	*Selaginella uliginosa*	Swamp selaginella
Gymnosperms	Pinaceae	*Pinus Elliottii**	Slash pine
Monocotyledons	Anthericaceae	*Sowerbaea juncea*	Vanilla plant
Monocotyledons	Blandfordiaceae	*Blandfordia grandiflora* [#]	Christmas bells
Monocotyledons	Cyperaceae	*Baumea articulata*	
Monocotyledons	Cyperaceae	*Baumea rubiginosa*	Bog rush
Monocotyledons	Cyperaceae	*Caustis blakei*	
Monocotyledons	Cyperaceae	*Caustis recurvata*	Curly wigs
Monocotyledons	Cyperaceae	*Cyperus difformis*	Rice sedge
Monocotyledons	Cyperaceae	*Eleocharis equisetina*	Sag
Monocotyledons	Cyperaceae	*Gahnia clarkei*	Tall saw sedge
Monocotyledons	Cyperaceae	*Gahnia sieberiana*	Red-fruited saw sedge
Monocotyledons	Cyperaceae	*Ptilothrix deusta*	Feather sedge
Monocotyledons	Iridaceae	*Patersonia sericea*	Silky purple flag
Monocotyledons	Juncaceae	*Juncus kraussii*	Salt rush
Monocotyledons	Juncaceae	*Juncus planifolius*	
Monocotyledons	Juncaceae	*Juncus remotiflorus*	
Monocotyledons	Juncaceae	*Juncus* sp.	
Monocotyledons	Juncaceae	*Juncus usitatus*	
Monocotyledons	Lomandraceae	*Lomandra hystrix*	Matrush
Monocotyledons	Lomandraceae	*Lomandra longifolia*	Spiny-headed matrush
Monocotyledons	Luzuriagaceae	*Eustrephus latifolius*	Wombat berry
Monocotyledons	Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling lily
Monocotyledons	Orchidaceae	*Cryptostylis subulata*	

Grouping and Family		Botanical Name	Common Name
Monocotyledons	Orchidaceae	*Cryptostylis erecta*	
Monocotyledons	Orchidaceae	*Thelmyitra* sp.	
Monocotyledons	Phormiaceae	*Dianella caerulea*	Blue flax lily
Monocotyledons	Poaceae	*Avena* sp.*	Wild oats
Monocotyledons	Poaceae	*Echinopogon* sp.	
Monocotyledons	Poaceae	*Entolasia* sp.	Panic
Monocotyledons	Poaceae	*Imperata cylindrica*	Blady grass
Monocotyledons	Poaceae	*Ischaemum australe*	
Monocotyledons	Poaceae	*Oplismenus hirtellus* ssp. *Imbecillis*	Basket grass
Monocotyledons	Poaceae	*Paspalum dilatatum**	Paspalum
Monocotyledons	Poaceae	*Phragmites australis*	Common reed
Monocotyledons	Poaceae	*Sporobolus indicus* var. *indicus**	Parramatta grass
Monocotyledons	Poaceae	*Sporobolus virginicus*	Salt couch
Monocotyledons	Poaceae	*Themeda triandra*	Kangaroo grass
Monocotyledons	Restionaceae	*Empodisma minus*	
Monocotyledons	Restionaceae	*Lepyrodia interrupta*	Heath rush
Monocotyledons	Restionaceae	*Lepyrodia scariosa*	
Monocotyledons	Smilacaceae	*Smilax glyciphylla*	Sweet sarsparilla
Monocotyledons	Xanthorrhoeaceae	*Xanthorrhoea fulva*	Swamp grass tree
Dicotyledons	Apiaceae	*Centella asiatica*	Pennywort
Dicotyledons	Apocynaceae	*Parsonsia straminea*	Common silkpod
Dicotyledons	Araliaceae	*Polyscias sambucifolia*	Elderberry panax
Dicotyledons	Asclepiadaceae	*Gomphocarpus physocarpus**	Balloon cotton bush
Dicotyledons	Asteraceae	*Ageratina adenophora**	Crofton weed
Dicotyledons	Asteraceae	*Ageratum houstonianum**	Blue billygoat weed
Dicotyledons	Asteraceae	*Baccharis halimifolia**	Groundsel
Dicotyledons	Avicenniaceae	*Avicennia marina* var *australasica*	Grey mangrove
Dicotyledons	Baueraceae	*Bauera capitata*	Dog rose
Dicotyledons	Caesalpinioideae	*Senna pendula* var *glabrata**	Winter senna
Dicotyledons	Casuarinaceae	*Allocasuarina littoralis*	Black she-oak
Dicotyledons	Casuarinaceae	*Allocasuarina torulosa*	Forest oak
Dicotyledons	Casuarinaceae	*Casuarina glauca*	Swamp oak
Dicotyledons	Chenopodiaceae	*Sarcocornia quinqueflora*	Samphire
Dicotyledons	Clusiaceae	*Hypericum gramineum*	Small St Johns wort
Dicotyledons	Dilleniaceae	*Hibbertia linearis*	
Dicotyledons	Dilleniaceae	*Hibbertia obtusifolia*	

Grouping and Family		Botanical Name	Common Name
Dicotyledons	Dilleniaceae	*Hibbertia scandens*	Climbing guinea flower
Dicotyledons	Dilleniaceae	*Hibbertia riparia*	
Dicotyledons	Dilleniaceae	*Hibbertia vestita*	
Dicotyledons	Droseraceae	*Drosera spathulata*	Spoon-leaved sundew
Dicotyledons	Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry ash
Dicotyledons	Epacridaceae	*Epacris calvertiana*	
Dicotyledons	Epacridaceae	*Epacris microphylla*	
Dicotyledons	Epacridaceae	*Leucopogon microphyllus*	
Dicotyledons	Epacridaceae	*Leucopogon parviflorus*	Coastal bearded heath
Dicotyledons	Epacridaceae	*Melichrus procumbens*	Jam tarts
Dicotyledons	Epacridaceae	*Monotoca scoparia*	Prickly monotoca
Dicotyledons	Epacridaceae	*Sprengelia sprengelioides*	
Dicotyledons	Epacridaceae	*Styphelia viridis*	Green styphelia
Dicotyledons	Epacridaceae	*Trochocarpa laurina*	Tree heath
Dicotyledons	Ericaceae	*Epacris obtusifolia*	Blunt-leaf heath
Dicotyledons	Euphorbiaceae	*Breynia oblongifolia*	Coffee bush
Dicotyledons	Euphorbiaceae	*Bridelia exaltata*	Brush ironbark
Dicotyledons	Euphorbiaceae	*Glochidion ferdinandi* var. *ferdinandi*	Cheese tree
Dicotyledons	Euphorbiaceae	*Glochidion ferdinandi var. pubens*	Hairy cheese tree
Dicotyledons	Euphorbiaceae	*Ricinocarpos pinifolius*	Wedding bush
Dicotyledons	Fabaceae	*Aotus lanigera*	
Dicotyledons	Fabaceae	*Bossiaea ensata*	
Dicotyledons	Fabaceae	*Dillwynia floribunda*	
Dicotyledons	Fabaceae	*Dillwynia glaberrima*	
Dicotyledons	Fabaceae	*Hovea purpurea*	
Dicotyledons	Fabaceae	*Jacksonia scorparia*	Dogwood
Dicotyledons	Fabaceae	*Pultenaea daphnoides*	
Dicotyledons	Fabaceae	*Pultenaea retusa*	
Dicotyledons	Fabaceae	*Pultenaea* species J	
Dicotyledons	Gompholobium	*Gompholobium pinnatum*	Pinnate wedge pea
Dicotyledons	Goodeniaceae	*Dampiera stricta*	Blue dampiera
Dicotyledons	Haloragaceaea	*Gonocarpus teucrioides*	Raspwort
Dicotyledons	Lauraceae	*Cassytha glabella*	Devil's twine
Dicotyledons	Lauraceae	*Cinnamomum camphora**	Camphor laurel
Dicotyledons	Lauraceae	*Cryptocarya microneura*	Murrogan
Dicotyledons	Lauraceae	*Endiandra sieberi*	Hard corkwood

Grouping and Family		Botanical Name	Common Name
Dicotyledons	Menispermaceae	*Stephania aculeata*	Prickly snake vine
Dicotyledons	Mimosaceae	*Acacia disparrima*	Hickory wattle
Dicotyledons	Mimosaceae	*Acacia brownii*	Heath wattle
Dicotyledons	Mimosaceae	*Acacia fimbriata*	Fringed wattle
Dicotyledons	Mimosaceae	*Acacia floribunda*	Gossamer wattle
Dicotyledons	Mimosaceae	*Acacia longissima*	Narrow leaf acacia
Dicotyledons	Mimosaceae	*Acacia myrtifolia*	Red-stemmed wattle
Dicotyledons	Mimosaceae	*Acacia sophorae*	Coastal wattle
Dicotyledons	Mimosaceae	*Acacia suaveolens*	Sweet wattle
Dicotyledons	Mimosaceae	*Acacia ulicifolia*	Prickly moses
Dicotyledons	Moraceae	*Ficus coronata*	Creek sandpaper fig
Dicotyledons	Myrsinaceae	*Aegiceras corniculatum*	River mangrove
Dicotyledons	Myrtaceae	*Angophora costata*	Rusty gum
Dicotyledons	Myrtaceae	*Ochrosperma lineare*	Straggly baeckea
Dicotyledons	Myrtaceae	*Callistemon pachyphyllus*	Crimson bottlebrush
Dicotyledons	Myrtaceae	*Callistemon salignus*	Willow bottlebrush
Dicotyledons	Myrtaceae	*Corymbia intermedia*	Pink bloodwood
Dicotyledons	Myrtaceae	*Eucalyptus eugenoides*	Narrow-leaved stringybark
Dicotyledons	Myrtaceae	*Eucalyptus globoidea #*	White stringybark
Dicotyledons	Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Dicotyledons	Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Dicotyledons	Myrtaceae	*Eucalyptus planchoniana*	Bastard tallowwood
Dicotyledons	Myrtaceae	*Eucalyptus resinifera*	Red mahogany
Dicotyledons	Myrtaceae	*Eucalyptus robusta*	Swamp mahogany
Dicotyledons	Myrtaceae	*Eucalyptus siderophloia*	Northern grey ironbark
Dicotyledons	Myrtaceae	*Eucalyptus tereticornis*	Forest red gum
Dicotyledons	Myrtaceae	*Eucalyptus tindaliae*	Queensland white stringybark
Dicotyledons	Myrtaceae	*Kunzea capitata*	
Dicotyledons	Myrtaceae	*Leptospermum juniperinum*	Tea-tree
Dicotyledons	Myrtaceae	*Leptospermum polygalifolium*	Tea-tree
Dicotyledons	Myrtaceae	*Leptospermum whitei*	White's teatree
Dicotyledons	Myrtaceae	*Lophostemon suaveolens*	Swamp turpentine

Grouping and Family		Botanical Name	Common Name
Dicotyledons	Myrtaceae	*Lophostemon confertus*	Brushbox
Dicotyledons	Myrtaceae	*Melaleuca linariifolia*	Flax-leaved paperbark
Dicotyledons	Myrtaceae	*Melaleuca nodosa*	Prickly-leaved paperbark
Dicotyledons	Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved paperbark
Dicotyledons	Myrtaceae	*Melaleuca sieberi*	Sieber's paperbark
Dicotyledons	Myrtaceae	*Melaleuca thymifolia*	
Dicotyledons	Myrtaceae	*Syncarpia glomulifera*	Turpentine
Dicotyledons	Myrtaceae	*Tristaniopsis laurina*	Water gum
Dicotyledons	Nymphaeceae	*Nymphaea* sp.	Waterlily
Dicotyledons	Oleaceae	*Notelaea ovata*	Mock olive
Dicotyledons	Onagraceae	*Ludwigia peploides*	Water primrose
Dicotyledons	Passifloraceaea	*Passiflora edulis* *	Passionfruit
Dicotyledons	Pittosporaceae	*Billardiera scandens*	Apple berry
Dicotyledons	Plantaginaceae	*Plantago spp.**	Plantains
Dicotyledons	Polygonaceae	*Persicaria strigosa*	Smartweed
Dicotyledons	Proteaceae	*Banksia integrifolia*	Coast banksia
Dicotyledons	Proteaceae	*Banksia oblongifolia*	Swamp banksia
Dicotyledons	Proteaceae	*Banksia spinulosa*	Hairpin banksia
Dicotyledons	Proteaceae	*Lomatia silaifolia*	Crinkle bush
Dicotyledons	Proteaceae	*Persoonia conjuncta*	Geebung
Dicotyledons	Proteaceae	*Persoonia stradbrokensis*	Geebung
Dicotyledons	Proteaceae	*Persoonia virgata*	Geebung
Dicotyledons	Ranunculaceae	*Clematis aristata*	Mountain clematis
Dicotyledons	Rhamnaceae	*Alphitonia excelsa*	Red ash
Dicotyledons	Rutaceae	*Boronia safrolifera*	Pink boronia
Dicotyledons	Sapindaceae	*Dodonaea triquetra*	Hop bush
Dicotyledons	Sapindaceae	*Guioa semiglauca*	Guioa
Dicotyledons	Solanaceae	*Solanum nigrum**	Black-berry nightshade
Dicotyledons	Thymelaeaceae	*Pimelea glauca*	
Dicotyledons	Thymelaeaceae	*Pimelea linifolia*	Slender riceflower
Dicotyledons	Verbenaceae	*Lantana camara**	Lantana
Dicotyledons	Violaceae	*Viola hederacea* subsp. *Hederaceae*	Native violet
Dicotyledons	Vitaceae	*Cissus hypoglauca*	Five-leaf water vine

* Introduced Species

Significant (Sheringham & Westaway 1995)

Appendix 2 – Fauna Species List

Common name	Scientific name	Method of identification	Survey year
REPTILES			
Dark flecked sun skink	*Lampropholis guichenoti*	Capture	2004
Friendly sun skink	*Lampropholis amicula*	Capture	2004, 2017
Eastern bearded dragon	*Pogona barbata*	Observed	2004, 2017
Pink tongue lizard	*Cyclodomorphus gerrardii*	Observed	2017
Swamp snake	*Hemiaspis signata*	Capture	2004
Southern calyptotis	*Calyptotis ruficauda*	Capture	2004
AMPHIBIANS			
Beeping froglet	*Crinia parinsignifera*	Capture, call	2005, 2017
Common eastern froglet	*Crinia signifera*	Call, capture	2004, 2005, 2017
Dusky toadlet	*Uperoleia fusca*	Call	2005
Eastern dwarf tree frog	*Litoria fallax*	Call	2004, 2005, 2017
Red-backed broodfrog	*Pseudophryne coriacea*	Capture, call	2017
Striped marsh frog	*Limnodynastes peronii*	Call	2004, 2005, 2017
Spotted grass frog	*Limnodynastes tasmaniensis*	Capture, call	2004, 2005
Broad-palmed rocket frog	*Litoria latopalmata*	Capture	2004
Wallum froglet	*Crinia tinnula*	Call	2005
Emerald-spotted tree frog	*Litoria peronii*	Call	2017
BIRDS			
Bar-shouldered dove	*Geopelia humeralis*	Observed	2017
Black duck	*Anas superciliosa*	Observed	2004
Black-faced cuckoo-shrike	*Coracina novaehollandiae*	Observed	2017
Black-necked stork#	***Ephippiorhnchus asiaticus***	Observed	2003
Blue-faced honeyeater	*Entomyzon cyanotis*	Observed	2017
Brahminy kite	*Haliastur indus*	Observed	2004
Brown goshawk	*Accipiter fasciatus*	Observed	2004
Brown thornbill	*Acanthiza pusilla*	Observed	2004, 2017
Eastern rosella	*Platycercus eximius*	Observed	2004, 2017
Eastern spinebill	*Acanthorhynchus tenuirostris*	Observed	2017
Eastern yellow robin	*Eopsaltria australis*	Observed	2004
Fan-tailed cuckoo	*Cacomantis flabelliformis*	Observed	2004
Forest kingfisher	*Todiramphus macleayii*	Observed	2017
Galah	*Eolophus roseicapilla*	Observed	2017

Common name	Scientific name	Method of identification	Survey year
Glossy black cockatoo	***Calyptorhynchus lathami***	Observed	2004, 2017 (chewed cones)
Golden whistler	*Pachycephala pectoralis*	Observed	2004, 2017
Grey butcherbird	*Cracticus torquatus*	Observed	2017
Grey fantail	*Rhipidura fuliginosa*	Observed	2004
Grey shrike thrush	*Colluricincla harmonica*	Observed	2004
Kookaburra	*Dacelo novaeguineae*	Observed	2004, 2017
Lewins honeyeater	*Meliphaga lewinii*	Observed	2004, 2017
Little lorikeet	*Glossopsitta pusilla*	Observed	2004
Magpie	*Gymnorhina tibicen*	Observed	2004, 2017
Magpie-lark	*Grallina cyanoleuca*	Observed	2004, 2017
Masked lapwing	*Vanellus miles*	Observed	2004, 2017
Mistletoe bird	*Dicaeum hirundinaceum*	Observed	2004
Nankeen night heron	*Nycticorax caledonicus*	Observed	2004
Noisy friarbird	*Philemon corniculatus*	Observed	2004, 2017
Noisy minor	*Manorina melanocephala*	Observed	2004, 2017
Osprey	***Pandion haliaetus***	Observed	2004
Pelican	*Pelecanus conspicillatus*	Observed	2004
Pheasant coucal	*Centropus phasianinus*	Observed	2017
Pied butcherbird	*Cracticus nigrogularis*	Observed	2004, 2017
Pied cormorant	*Phalacrocorax varius*	Observed	2004
Pied currawong	*Strepera graculina*	Observed	2004, 2017
Purple swamp hen	*Porphyrio porphyrio*	Observed	2004, 2017
Rainbow bee-eater	*Merops ornatus*	Observed	2004
Rainbow lorikeet	*Trichoglossus haematodus*	Observed	2004, 2017
Red browed finch	*Neochmia temporalis*	Observed	2004
Red wattlebird	*Anthochaera carunculate*	Observed	2017
Sacred kingfisher	*Todiramphus sanctus*	Observed	2004, 2017
Satin bowerbird	*Ptilonorhynchus violaceus*	Observed	2004
Scaly breasted lorikeet	*Trichoglossus chlorolepidotus*	Observed	2004
Scarlet honeyeater	*Myzomela sanguinolenta*	Observed	2004, 2017
Scarlet robin	*Petroica multicolor*	Observed	2004
Silvereye	*Zosterops lateralis*	Observed	2017
Spotted pardalote	*Pardalotus punctatus*	Observed	2004
Sprangled drongo	*Dicrurus bracteatus*	Observed	2004, 2017
Striated pardalote	*Pardalotus striatus*	Observed	2004
Superb wren	*Malurus cyaneus*	Observed	2004
Tawny frogmouth	*Podargus strigoides*	Observed	2004, 2017
Tawny grassbird	*Megalurus timoriensis*	Observed	2017
Torresian crow	*Corvus orru*	Observed	2004, 2017
Varied sitella	*Daphoenositta chrysoptera*	Observed	2004
Variegated wren	*Malurus lamberti*	Observed	2004

Common name	Scientific name	Method of identification	Survey year
Wedge tailed eagle	*Aquila audax*	Observed	2004
Weebill	*Smicronis brevirostris*	Observed	2017
Welcome swallow	*Hirundo neoxena*	Observed	2004
Whistling kite	*Haliastur sphenurus*	Observed	2004, 2017
White-browed scrubwren	*Sericornis frontalis*	Observed	2017
White cheeked honeyeater	*Phylidonyris nigra*	Observed	2004
White faced heron	*Egretta novaehollandiae*	Observed	2004, 2017
White ibis	*Threskiornis molucca*	Observed	2004
White-bellied cuckoo shrike	*Coracina papuensis*	Observed	2004
White-bellied sea eagle	*Haliaeetus leucogaster*	Observed	2004
White-breasted woodswallow	*Artamus leucorynchus*	Observed	2004
White-naped honeyeater	*Melithreptus lunatus*	Observed	2004
White-necked heron	*Ardea pacifica*	Observed	2004
White-throated treecreeper	*Cormobates leucophaeus*	Observed	2004
Willie wagtail	*Rhipidura leucophrys*	Observed	2017
Yellow faced honeyeater	*Lichenostomus chrysops*	Observed	2004
Yellow-faced honeyeater	*Lichenostomus chrysops*	Observed	2004
Yellow-tailed black cockatoo	*Calyptorhynchus funereus*	Observed	2004, 2017
MAMMALS			
DASYURIDAE			
Antechinus flavipes	Yellow-footed antechinus	Elliottt	2004
Planigale maculata	Common planigale	Elliott, camera traps	2017
PARAMELIDAE			
Isodon macrourus	Northern brown bandicoot	Cage	2004
PETAURIDAE			
Petaurus norfolcensis	Squirrel glider	Spotlighting	2004
Petaurus breviceps	Sugar glider	Spotlighting	2017
PHALANGERIDAE			
Trichosurus vulpecula	Common brushtail possum	Spotlighting, capture, camera	2004, 2017
MACROPODIDAE			
Macropus giganteus	Eastern grey kangaroo	Observed	2004, 2017
Macropus rufogriseus	Red-necked wallaby	Camera trap	2017
Wallabia bicolor	Swamp wallaby	Observed	2004

Common name	Scientific name	Method of identification	Survey year
PHASCOLARCTIDAE			
Phascolarctos cinereus	Koala	Scat	2004
PTERIPODIDAE			
Pteropus poliocephalus	Grey-headed flying fox	Call, sighting	2004, 2017
MURIDAE			
Mus musculus	House mouse*	Elliottt	2004
Rattus fuscipes	Bush rat	Elliottt	2004, 2017
Rattus lutreolus	Swamp rat	Elliottt	2004
Rattus rattus	Black rat*	Elliottt	2004
BOVIDAE			
Bos taurus	European cattle*	Observed	2004, 2017
CANIDAE			
Canis familiaris	Dog*	Scat, tracks	2004
ACROBATIDAE			
Acrobates pygmaeus	Feathertail glider	Observed	2004, 2017
SUIDAE			
Sus scrofa	Pig*	Observed	2004
EQUIDAE			
Equus caballus	Horse*	Scat, tracks	2004
FELIDAE			
Felis catus	Cat*	Scat, tracks	2004
VESPERTILIONIDAE			
Chalinolobus gouldii	Gould's wattled bat	Anabat	2004
Chalinolobus morio	Chocolate wattled bat	Anabat	2004
Miniopterus australis	Little bent-wing bat	Harp trap, Anabat	2004
Miniopterus schreibersii	Common bent-wing bat	Anabat	2004
Nyctophilus gouldi	Gould's long-eared bat	Harp trap, Anabat	2004
Vespadelus darlingtoni	Large forest bat	Anabat	2004
Vespadelus regulus	Southern forest bat	Anabat	2004
Vespadelus vulturnus	Little forest bat	Harp trap	2004
Myotis macropus	Large-footed myotis	Harp trap	2004
Scotorepens sp.	Broadnosed bat sp.	Anabat	2004
MOLOSSIDAE			
Mormopterus sp.	Freetail bat sp.	Anabat	2004
Threatened species are shown in **bold** # Recorded in 2003 JWA survey *Introduced species			

Appendix 3 – Habitat suitability assessment

LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA SPECIES ON SUBJECT SITE

Species	Likelihood of occurrence on the Subject site	Notes
Australasian bittern (*Botaurus poiciloptilus*)	Unlikely	The Australasian bittern is widespread but uncommon in south-west and south-east Australia, generally preferring freshwater habitats with tall, dense vegetation with bulrushes and spikerushes.
Australian fritillary (*Argynnis hyperbius inconstans*)	Unlikely	They are restricted to open, swampy, coastal areas where the larval food plant, *Viola betonicifolia*, grows as a small, insignificant ground herb in association with *Lomandra longifolia* (long leaved matrush) and grasses, especially the grass *Imperata cylindrica* (blady grass). Habitat does not occur on the site.
Australian painted snipe *(Rostratula australis)*	Unlikely	The Painted Snipe occurs in the better watered areas of eastern Australia and the NT. They are generally rare and prefer shallow freshwater swamps or saltmarsh areas.
Barred cuckoo-shrike *(Coracina lineata)*	**Possible**	The Barred cuckoo-shrike is generally uncommon and is rare in NSW, living in rainforest, eucalypt forests and woodland, swamp woodlands and timber, along watercourses, wandering nomadically in search of fruit.
Beach stone-curlew	Unlikely	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves (Dept. Environment 2012). Suitable habitat does not occur on the Subject site.

Species	Likelihood of occurrence on the Subject site	Notes
Black bittern (*Ixobrychus flavicollis*)	Unlikely	This species occurs in coastal and sub-coastal areas of south-west, north and eastern Australia. It is usually found in the dense vegetation fringing streams, swamps, tidal creeks and mudflats, particularly amongst Swamp she-oaks and Mangroves.
Black-breasted button-quail (*Turnix melanogaster*)	Unlikely	In north-east NSW, there are few reliable records, all north of the Bruxner Highway and east of the Great Divide. This species prefers drier rainforests and viney scrubs, often in association with Hoop Pine and a deep, moist leaf litter layer.
Black-faced monarch (*Monarch melanopsis*)	Unlikely	This species occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest. During winter or migration, this species also occurs in marginal habitats such as 20-30 years old regrowth rainforest, nearby open eucalypt forest (mainly wet sclerophyll forests), especially in gullies with a dense, shrubby understorey as well as dry sclerophyll forests and woodlands, often with a patchy understorey. (Dept. Environment 2012).
Black-necked stork (*Ephippiorhynchus asiaticus*)	Unlikely. Recorded in The Glades development site in 2003	This species is widespread in northern Australia but sparse on the east coast from Qld to southern NSW. It inhabits swamps, mangroves, mudflats, dry floodplains and irrigated land and occasionally forages in open grassy woodland. Suitable habitat does not occur within the Subject site, however it has been observed foraging near the dam in The Glades development site.
Brolga (*Grus rubicunda)*	Unlikely	This species occurs in shallow wetlands and open grassland habitats. Suitable habitat occurs on the Subject site and may be utilised by this species, particularly after heavy rain.

Species	Likelihood of occurrence on the Subject site	Notes
Brown treecreeper (*Climacteris picumnus*)	**Possible**	This species occupies eucalypt woodlands, particularly those without a dense understorey. It nests in tree hollows in permanent territories and has been recorded in Moonee Beach Nature Reserve.
Brush-tailed phascogale (*Phascogale tapoatafa*)	**Possible**	This species inhabits dry sclerophyll open forest as well as heathlands, swamps, rainforest and wet sclerophyll forest. Suitable habitat occurs on the Subject site.
Brush-tailed rock-wallaby (*Petrogale penicillata*)	Unlikely	This species lives on rocky escarpments, granite outcrops and cliffs, which have caves and ledges for shelter and face north for warmth. Suitable habitat for this species is not considered to occur within the study area.
Cattle egret (*Ardea ibis*)	**Possible**	This species inhabits tropical and temperate grasslands, wooded lands and terrestrial wetlands. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. This species often forages away from water on low lying grasslands, improved pastures and croplands. It is commonly found in cattle fields and other farm areas that contain livestock. This species roosts in trees, or amongst ground vegetation in or near lakes and swamps (Dept. Environment 2012).
Comb-crested jacana (*Irediparra gallinacea*)	Unlikely	This species lives on floating vegetation in freshwater lakes and ponds.
Common blossom bat	**Possible**	They often roost in littoral rainforest and feed on flowers in adjacent heathland and paperbark swamps. Common Blossom Bats in NSW, the Southern part of their range, feed mostly on nectar. There are a number of blossom producing trees on the Subject site.
Common greenshank (*Tringa nebularia*)	Unlikely	This species is known to occupy habitat associated with estuaries.

Species	Likelihood of occurrence on the Subject site	Notes
Common planigale *(Planigale maculata)*	**Recorded on site in March 2017**	This species occurs in coastal north-east NSW, occupying a wide range of habitats. The Common planigale is found in Rainforest, Sclerophyll forest, Grasslands, Marshlands, rocky areas, some suburban areas and usually close to water. Suitable habitat occurs within the study area.
Common sandpiper (*Actitis hypoleucos*)	Unlikely	This species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. This species has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. This species generally forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves (Dept. Environment 2012).
Curlew sandpiper (*Calidris ferruginea*)	Unlikely	Suitable habitat for this species includes tidal reefs and pools, weed-covered rocks, pebbly, shelly and sandy shores with stranded seaweed, and mudflats (Dept. Environment 2012).
Dusky woodswallow	Unlikely	The Dusky Woodswallow is found in open forests and woodlands, and may be seen along roadsides and on golf courses. Occurs in small flocks, hawking insects through clearings and above the canopy. Suitable habitat for this species is considered to occur on the Subject site.
Eastern bent-wing bat *(Miniopterus schreibersii oceanensis)*	Unlikely	This species occurs throughout Eastern Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.

Species	Likelihood of occurrence on the Subject site	Notes
Eastern bristlebird (*Dasyomis brachypterus*)	Unlikely	This species inhabits moist, mountain ranges within about 100km of the coast. In Queensland most sightings have been within localised pockets of relatively open eucalypt forest in close proximity to denser vegetation along creek lines and rainforest. Soils are relatively fertile, derived from basalts of the Main Range Volcanics and Mt Warning Shield. The ground stratum of the eucalypt forests favoured by the eastern bristlebird is a mosaic of dense clumped grasses interspersed with patches of shrubs, ferns, tangled vines and fallen logs. The more common grasses include wild sorghum (*Sarga leiocladum*), kangaroo grass (*Themeda triandra*) and tussock grass (*Poa labillardieri*). The presence of mature wild sorghum tussocks is thought to be a good indicator of high quality bristlebird habitat (DEHP 2013).
Eastern curlew (*Numenius madagascariensis*)	Unlikely	This wading species is usually associated with estuaries, bays and lagoons where intertidal mud and sandflats occur. Occasionally also found on beaches, reefs and rocky islets.
Eastern freetail-bat (*Mormopterus norfolkensis*)	**Possible**	This species is sparsely distributed in coastal eastern Australia, from approximately Sydney to Fraser Island. This is a poorly known species for which specific habitat requirements are not known. Inferences from wing morphology and echo-location call design suggest that it forages in more open environments. This species has been recorded from forest types ranging from rainforest to dry sclerophyll forest and woodland, but most records are from dry sclerophyll forest and woodland. Suitable habitat for this species is considered to occur on the Subject site.
Eastern grass owl (*Tyto longimembris*)	**Possible**	Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth. Suitable habitat for this species is considered to occur on the Subject site.

Species	Likelihood of occurrence on the Subject site	Notes
Eastern osprey *(Pandion cristatus)*	**Possible. Recorded in The Glades development side in May 2004**	This raptor is thinly distributed in coastal Australia. It nests in singularly overtopping, generally dead trees. The Eastern osprey hunts in coastal rivers, estuaries and streams and may gather nesting material from nearby forests. Suitable nesting habitat occurs within the study area. Two Osprey nests occur on The Glades development site, with the species observed over the site and Moonee Creek.
Fork-tailed swift (*Apus pacificus*)	**Possible**	The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (DoE 2016).
Gang-gang cockatoo (*Callocephalon fimbriatum*)	Unlikely	The Gang-gang cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests from southern Victoria through south and central-eastern New South Wales. Suitable habitat for this species does not occur on the Subject site. Suitable habitat does not occur on the Subject site.
Giant barred frog *(Mixophyes iteratus)*	Unlikely	Giant barred frogs forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000m. They breed around shallow, flowing rocky streams from late spring to summer. Suitable habitat does not occur within the study area.

Species	Likelihood of occurrence on the Subject site	Notes
Glossy black cockatoo *(Calyptorhynchus lathami)*	**Possible. Recorded on site in May 2004 and chewed cones observed in March 2017**	The Glossy black-cockatoo is found in coastal forests and open inland woodland of eastern Australia. The Glossy Black's distribution is limited to habitat containing sufficient seed reserves of their three favoured species: *Allocasuarina littoralis*, *A. torulosa* and *A. verticillata* (Forshaw, 1981) in addition to suitable large hollow bearing trees for nesting. Suitable habitat exists within the study area.
Golden-tipped bat	Unlikely	This species occurs in rainforest habitats. Suitable habitat does not occur on the Subject site.
Great egret (*Ardea alba*)	Unlikely	The Great Egret has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial). These include swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs. The species usually frequents shallow waters (DoE 2016).
Greater glider	Unlikely	The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Suitable habitat for this species is not considered to occur on the Subject site.

Species	Likelihood of occurrence on the Subject site	Notes
Green-thighed frog	**Possible**	This species occurs in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface waters gather after rain. It prefers wetter forests in the south of its range, but extends into drier forest in northern NSW and southern Queensland. Breeding occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred. Foraging also occurs in leaf litter within 300m of breeding habitat (NSW OEH 2014).
Grey-crowned babbler *(Pomatostomus temporalis)*	Unlikely	The Grey-crowned babbler is patchily distributed throughout northern and eastern Australia but is considered rare in NSW. This species inhabits Open woodlands and along streams where vegetation is cleared. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.
Grey-headed flying fox *(Pteropus poliocephalus)*	**Possible.** Recorded on site in 2004 and 2017	This species occurs from central eastern Qld south to Victora. In NSW the Grey-headed flying fox mainly occurs in coastal areas and along river valleys. They typically roost in conspicuous camps in Lowland rainforest and Swamp forest, often in isolated remnants or on islands in rivers. They forage on fruit, nectar and pollen in Rainforests and Eucalypt forests.
Koala *(Phascolarctos cinereus)*	**Possible. Recorded on the adjacent The Glades development site in May 2004**	The Koala occurs in Eucalypt woodlands and forests throughout eastern Australia. They inhabit areas where there are appropriate food trees. No signs of Koala activity were recorded during surveys. Small numbers of preferred food trees occur on the site.

Species	Likelihood of occurrence on the Subject site	Notes
Large-eared pied bat *(Chalinolobus dwyeri)*	Unlikely	This species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. It is usually recorded in well-timbered areas containing gullies. Suitable habitat does not occur within the study area.
Large-footed myotis *(Myotis macropus)*	Unlikely. Recorded on The Glades development site in May 2004	This species is distributed throughout eastern Australia. It forages over bodies of water ranging from rainforest streams to large lakes and reservoirs. It roosts during the day in caves, mines, tunnels, tree hollows and under bridges. Suitable habitat is not present within study area. However, this species has been recorded foraging over dams within the study area.
Latham's snipe (*Gallinago hardwickii*)	Unlikely	This species prefers freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). No suitable habitat is present on this site.
Little bent-wing bat *(Miniopterus australis)*	**Possible.** Recorded on The Glades development site in May 2004	This species occurs in coastal north-east NSW and eastern Qld. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. This species was recorded from the study area during the survey and is likely to forage widely over the site.
Little eagle (*Hieraaetus morphnoides*)	Unlikely	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland.

Species	Likelihood of occurrence on the Subject site	Notes
Little lorikeet (*Glossopsitta pusilla*)	**Possible**	Distribution extends from north of Cairns, around the east coast of Australia, to Adelaide. It mostly occurs in dry, open eucalypt forests and woodlands. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Suitable potential habitat for this species is found on the Subject site (i.e. flowering Eucalypts, Melaleucas and tree hollows).
Long-nosed potoroo *(Potorous tridactylus)*	Unlikely	This species inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.
Masked owl (*Tyto novaehollandiae*)	**Possible**	In NSW, this species is recorded sporadically in the north-east along the coast and tablelands. It inhabits dry eucalypt forest and woodlands. It has a large home range of 500 – 1000 hectares covering forested and partly open country. Suitable habitat does not exist within the study area.
New Holland mouse (*Pseudomys novaehollandiae*)	Unlikely	Across the species' range, the New Holland Mouse is known to inhabit the following types of habitat (DoE 2016): • open heathland; • open woodland with a heathland understorey; and • vegetated sand dunes. Due to the largely granivorous diet of the species, sites where the New Holland Mouse is found are often high in floristic diversity, especially leguminous perennials (DoE 2016).

Species	Likelihood of occurrence on the Subject site	Notes
Oriental cuckoo (*Cuculus optatus*)	Unlikely	*Cuculus optatus* (also known as *C. saturatus optatus*) uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears quite often along edges of forests, or ecotones between forest types (DoE 2016).
Painted snipe (*Rostratula benghalensis*)	Unlikely	This species inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia* or canegrass or sometimes tea-tree (*Melaleuca*). The species sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber. Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands , provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (Dept. Environment 2012).
Pectoral sandpiper (*Calidris melanotos*)	Unlikely	Small, migratory wader that prefers shallow fresh to saline wetlands. This species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.
Pied oystercatcher	Unlikely	This species is a coastal shorebird. It forages and nests on ocean beaches and estuarine sandflats. The Pied oystercatcher has been recorded in Moonee Nature Reserve and during studies in the locality.

Species	Likelihood of occurrence on the Subject site	Notes
Pin-tailed snipe (*Gallinago sternura*)	Unlikely	Most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands (Higgins & Davies 1996).
Pink underwing moth (*Phyllodes imperiallis smithersi*)	Unlikely	The Pink Underwing Moth is found below the altitude of 600 m in undisturbed, subtropical rainforest. It occurs in association with the vine *Carronia multisepalea*, a collapsed shrub that provides the food and habitat the moth requires in order to breed (DoE 2016).
Powerful owl (*Ninox strenua*)	Unlikely	The Powerful owl is found throughout south-eastern Australia but is uncommon. They have large home ranges (more than 1000 hectares) and occur in a variety of habitats, from woodland and open forest to tall moist forests and rainforests.
Rainbow bee-eater (*Merops ornatus*)	Unlikley	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including mallee, and in open forests that are usually dominated by eucalypts, and farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches (DoE 2016).
Red goshawk *(Erythrotriorchis radiatus)*	Unlikely	Most records of this species are from the Clarence River catchment, with a few from the lower Richmond and Tweed Rivers. In NSW this species is mainly found along or near watercourses, in swamp forest and woodlands and on the coastal plain. This is a very rare species and is unlikely to be found within the study area.

Species	Likelihood of occurrence on the Subject site	Notes
Red knot (*Callidris canutus*)	Unlikely	Suitable habitat for this species includes tidal reefs and pools, weed-covered rocks, pebbly, shelly and sandy shores with stranded seaweed, and mudflats (Dept. Environment 2012).
Regent honeyeater (*Anthochaera phrygia*)	Unlikely	This species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. They prefer woodlands that have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp mahogany and Spotted gum forests, particularly on the central coast and occasionally on the upper north coast. This species is very rarely recorded in the locality. However, the Coffs Harbour area is known as a preferred coastal foraging area for this species.
Rose-crowned fruit-dove *(Ptilinopus regina)*	Unlikely	The Rose-crowned fruit-dove occurs along the coast and the ranges of Qld and Eastern NSW. It occurs mainly in subtropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.
Rufous bettong (*Aepyprymnus refescens*)	Unlikely	Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter. Suitable habitat for this species is not considered to occur on the Subject site.

Species	Likelihood of occurrence on the Subject site	Notes
Rufous fantail (*Rhipidura ruffrons*)	Unlikely	The Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E.cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests, where they have been recorded in temperate Lilly Pilly (*Acmena smithi*) rainforest, with Grey Myrtle (*Backhousia myrtifolia*), Sassafras (*Doryphora sassafras*) and Sweet Pittosporum (*Pittosporum undulatum*) subdominants. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted Gum (*Eucalyptus maculata*), Yellow Box (*E. melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey (DoE 2016).
Satin flycatcher (*Myiagra cyanoleuca*)	Unlikely	Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests than the Leaden Flycatcher, *Myiagra rebecula*, often occurring in gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover, and are generally absent from rainforest. In south-eastern Australia, they occur at elevations of up to 1400 m above sea level, and in the ACT, they occur mainly between 800 m above sea level and the treeline (DoE 2016).

Species	Likelihood of occurrence on the Subject site	Notes
Scarlet robin (*Petroica boodang*)	Unlikely	The scarlet robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species occurs in both mature and regrowth vegetation and occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. An important component of the habitat is abundant logs and fallen timber (NSW OEH 2015). The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude.
Sharp-tailed sandpiper (*Calidris acuminata*)	Unlikely	These birds forage on grasslands and mudflats. This species prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves (Dept. Environment 2017).
Sooty owl (*Tyto tenebricosa*)	Unlikely	Occurs in rainforests, including dry rainforest, subtropical and warm temperate rainforest, and moist eucalypt forests. They roost by day in the hollow of a tall forest tree or in heavy vegetation, and hunt by night for small ground mammals or tree-dwelling mammals such as Common ringtail possums or Sugar gliders. They nest in very large tree-hollows. Suitable habitat does not occur on the Subject site.
Sooty oystercatcher (*Haematopus fuliginosus*)	Unlikely	This species is a coastal shorebird. It prefers rocky shore habitats.

Species	Likelihood of occurrence on the Subject site	Notes
Spectacled monarch (*Monarch trivirgatus*)	Unlikely	The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves. Also inhabits Rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest, when migrating, more open woodlands (Birdlife Australia 2016; Pizzey and Knight 2002).
Spotted-tailed quoll *(Dasyurus maculatus)*	Unlikely	The Spotted-tailed quoll occurs along the escarpments, tablelands and coast of the eastern seaboard. It inhabits a range of habitats including dry and moist sclerophyll forests, woodlands, coastal heathlands and rainforests. The Quolls require large intact habitat patches and are generally only recorded from forested areas of the Great Dividing Range.
Square-tailed kite (*Lophoictinia isura*)	**Possible**	This species is thinly distributed through open forests, woodland and sandplains, both coastal and sub-coastal. The Subject site may provide suitable foraging habitat for this species
Squirrel glider (*Petaurus norfolcensis*)	**Possible.** Recorded on The Glades development site in May 2004	The Squirrel glider occupies wet and dry sclerophyll forests with open dry sclerophyll forests regarded as optimum habitat. This species was recorded in eucalypt woodland to the east of the Subject site.
Stephen's banded snake (*Hoplocephalus stephensii*)	**Possible**	Rainforest and eucalypt forests and rocky areas up to 950m. Nocturnal, and shelters between loose bark and tree-trunks, amongst vines, or in hollow trunks, limbs, rock crevices or under slabs of rock during the day. At night it hunts frogs, lizards, birds and small mammals (NPWS 2002). Habitat on the Subject site may suit this species.
Stuttering frog (*Mixophyes balbus*)	Unlikely	Inhabits temperate and sub-tropical rainforest and wet sclerophyll forest.
Swift parrot (*Lathamus discolor*)	Possible, but unlikely	Mainland populations of this species favour winter-flowering eucalypt forest and woodland, usually where abundant supplies of Eucalypt nectar exist. This species is rarely recorded in the locality. The last record within 5kms of the Subject site is from 1983.

Species	Likelihood of occurrence on the Subject site	Notes
Swinhoe's snipe (*Gallinago megala*)	Unlikely	This species inhabits shallow freshwater wetlands of various kinds including paddy fields, swamps and sewage farms, with bare mud or shallow water for feeding, with nearby vegetation cover. This species is also known to occur in grasslands, drier cultivated areas and market gardens (Higgins and Davies 1996). Most species records are from the Northern Territory.
Varied sittella	Unlikely	The Varied sittella are a sendentry species that inhabits eucalypt forests and woodlands, especially rough barked species and mature smooth-barked gums with dead branches, in most of mainland Australia. This species may forage periodically over the Subject site.
Wallum froglet *(Crinia tinnula)*	Unlikely. Recorded on The Glades development site in 2003 and in June 2004	The Wallum froglet is found in coastal areas from South-East Qld to the central coast of NSW. It is found only in acid Paperbark swamps and sedge swamps of the coastal 'wallum' country. The Wallum froglet is found in Paperbark swamps growing in areas with acid sandy (Wallum) soils, warm temperate grassland or near the edge of ponds.
Wallum sedge frog *(Litoria olongburensis)*	Unlikely	This species occurs in coastal areas from Frazer Island in south-east Qld to Yuraygir National Park in northern NSW. It inhabits paperbark swamps and sedge swamps of the coastal 'wallum' country. This species may occur within swampy areas of the study area.
White-bellied sea-eagle	Unlikely	This species has a large distribution range throughout SE QLD and is found in association with coasts, large rivers and estuaries and prefers to nest in large trees adjacent watercourses (Dept. Environment 2012).

Species	Likelihood of occurrence on the Subject site	Notes
White-throated needletail (*Hirundapus caudacutus*)	Unlikely	The White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps (DoE 2016).
Wompoo fruit dove	Unlikely	This species is primarily associated with large undisturbed patches of tropical or subtropical evergreen rainforest. Occasionally this species will occur in patches of monsoon forest, closed gallery forest, wet sclerophyll forest, tall open forest, open woodlands or vine thickets near rainforests (Marchant and Higgins 1993). Suitable habitat does not occur on the Subject site.
Yellow-bellied glider	**Possible. Recorded on The Glades development site by Clancy (1998)**	Preferred habitats are tall open mature sclerophyll forests with a range of eucalypt species in areas of high rainfall. Eucalypt forest on the Subject site is relatively small in area, however may be utilised by Yellow-bellied gliders within the locality.
Yellow-bellied sheathtail-bat	**Possible**	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. 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 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. Suitable habitat occurs on the Subject site for this species.

Appendix 4 – BBAM Assessment (Impacts)

BioBanking Credit Calculator

Ecosystem credits

Proposal ID :	202/2017/4659D
Proposal name :	Glades Moonee Beach
Assessor name :	Matthew Jenkins
Assessor accreditation number :	202
Tool version :	v4.0
Report created :	17/11/2017 13:56

Assessment circle name	Landscape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
1	22.00	NR124_Moderate/Good	Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Moderate/Good	No	1	1.19	60.00	0.00	60.00	0	60	Masked Owl	88.89	3.00	60
1	22.00	NR217_Moderate/Good	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Moderate/Good	Yes	2	0.18	100.00	0.00	100.00	0	14	Barking Owl	100.00	3.00	14

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 17/11/2017 13:56

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / number of loss	Negligible loss	Red flag status	Number of credits
			No					

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 17/11/2017 Time: 2:11:40PM Calculator version: v4.0

Development details

Proposal ID:	202/2017/4659D
Proposal name:	Glades Moonee Beach
Proposal address:	Pacific Highway Moonee NSW
Proponent name:	Rothwell Boys Pty Ltd
Proponent address:	Lower North Shore Sydney
Proponent phone:	0467099119
Assessor name:	Matthew Jenkins
Assessor address:	PO Box 1465 Ballina NSW 2478
Assessor phone:	02 6686 3858
Assessor accreditation:	202

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	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;

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
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	1.19	60.00	No
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	0.18	14.00	Yes
Total	1.37	74	

Credit profiles

1. Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion, (NR124)

Number of ecosystem credits created 60

IBRA sub-region Coffs Coast & Escarpment

Offset options - vegetation types	Offset options - CMA sub-regions
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion, (NR124) Blackbutt - Tallowwood dry grassy open forest of the central parts NSW North Coast Bioregion, (NR119) Blackbutt grassy open forest of the lower Clarence Valley of the NSW North Coast Bioregion, (NR125) Brush Box tall moist forest of the northern ranges of the NSW North Coast Bioregion, (NR144) Red Mahogany open forest of the coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion, (NR222) Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast, (NR263) Tallowwood dry grassy forest of the far northern ranges of the NSW North Coast Bioregion, (NR267)	Coffs Coast & Escarpment and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion, (NR217)

Number of ecosystem credits created 14

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

Species credits summary

Appendix 5 – BBAM Assessment (Offsets)

BioBanking Credit Calculator

Ecosystem credits

Proposal ID :	202/2017/4662B
Proposal name :	Glades Moonee Beach - Offset areas
Assessor name :	Matthew Jenkins
Assessor accreditation number :	202
Tool version :	v4.0
Report created :	17/11/2017 14:02

Assessment circle name	Landscape score	TS subzone number	Vegetation zone name	Vegetation type name	Condition	Management zone name	Management zone area	Current site value	Future site value	Gain in site value	Total credit created for management zone
1	12.00	NR124_Moderate/Good_1	NR124_Moderate/Good	Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Moderate/Good	1	7.89	80.67	100.00	19.33	79
1	12.00	NR217_Moderate/Good_1	NR217_Moderate/Good	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Moderate/Good	2	2.75	87.33	100.00	12.67	23
1	12.00	NR220_Moderate/Good_1	NR220_Moderate/Good	Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Moderate/Good	3	3.85	91.67	100.00	8.33	29

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 17/11/2017 14:02

Scientific name	Common name	Species TG value	Biobank on identified population?	Number found?	Units	Number of credits
			No			

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 17/11/2017 Time: 2:10:03PM Calculator version: v4.0

Biobank details

Proposal ID:	202/2017/4662B
Proposal name:	Glades Moonee Beach - Offset areas
Proposal address:	Pacific Highway Moonee Beach
Proponent name:	Rothwell Boys Pty Ltd
Proponent address:	Lower North Shore Sydney
Proponent phone:	0467099119
Assessor name:	Matthew Jenkins
Assessor address:	PO Box 1465 Ballina NSW 2478
Assessor phone:	02 6686 3858
Assessor accreditation:	202

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	7.89	79.00
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	2.75	23.00
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	3.85	29.00
Total	14.49	131

Credit profiles

1. Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion, (NR124)

Number of ecosystem credits created	79
IBRA sub-region	Coffs Coast & Escarpment

2. Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion, (NR220)

Number of ecosystem credits created	29
IBRA sub-region	Coffs Coast & Escarpment

3. Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion, (NR217)

Number of ecosystem credits created	23
IBRA sub-region	Coffs Coast & Escarpment

Species credits summary

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Exclude commercial apiaries
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Exclude miscellaneous feral species
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Feral and/or over-abundant native herbivore control
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Fox control
Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Slashing
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Control of feral pigs
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Exclude commercial apiaries
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Exclude miscellaneous feral species
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Fox control
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Maintain or re-introduce natural flow regimes
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Slashing
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Control of feral pigs
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Exclude commercial apiaries
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Exclude miscellaneous feral species
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Feral and/or over-abundant native herbivore control
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Fox control
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Slashing

Appendix 6 - Assessment of Significance (7 Part Test)

Fauna

(a) In the case of a Threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Tables showing the distribution, habitat and life cycle requirements of each species considered a possible occurrence at the Subject site are included as **APPENDIX 7.**

Barred cuckoo-shrike

Extent of the local population
The NPWS database contained two (2) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained eleven (11) sightings of this species in the Coffs Harbour LGA.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for the Barred cuckoo-shrike as consisting of low elevation subtropical and littoral rainforest and coastal wet sclerophyll forest close to fruiting figs with the preferred habitat being a mature canopy. The Barred cuckoo-shrike forages in mature canopy and feeds on fruit and large insects including cicadas and phasmids with other small fruited figs as their preferred food.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Barred cuckoo-shrike, with the following results:

1st order disturbances	Urban development Weed invasion Loss of habitat trees (fig trees) in agricultural land Intensive horticulture

The proposed development will not result in significant loss of nesting or forage habitat for this species. Retention of all main areas on vegetation along Moonee and Skinners Creeks as part of the broader The Glades development provide suitable forage habitat for this species with connectivity to similar habitat to the west, north and south.

Likelihood of local extinction
It is considered unlikely that the proposed development will result in the local extinction of this species.

Black-necked stork

Extent of the local population
The NPWS database contained eleven (11) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained one (1) sighting of this species in the Moonee Beach Nature Reserve, and one-hundred and forty-two (142) sightings in the Coffs Harbour LGA.

This species was recorded on The Glades development site, adjoining the Subject site, foraging near the dam in the preliminary study (JWA 2003).

Stages of the life-cycle affected by the proposed development
The Black-necked stork inhabits swamps, mangroves, mudflats, dry floodplains, and irrigated land. It occasionally forages in open grassy woodland (Environment Australia 1999). An abundant supply of frogs and fish is required, together with suitable roost and nest trees, usually overhanging rivers and swamps (SFNSW 1995). It strides through the water probing for prey with its bill and may chase fish. The nest is a large flat pile of sticks, grass and rushes in a tree, usually near water (NPWS 2002).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. This analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Black-necked stork, with the following results:

1st order disturbances	Drainage of wetlands Dams
2nd order disturbances	Power lines Intensive horticulture (tea trees)
3rd order disturbances	Pesticide contamination of wetlands Urban development Loss of nest trees
4th order disturbances	Shooting

The proposed development will not result in significant loss of nesting or forage habitat for this species. There may be some increase in the level of disturbance to foraging birds as a result of increased visitation to the dam and associated wetland area within The Glades development site. Forage habitat around the dam and drainage line within The Glades site will not be affected by the proposed development.

Likelihood of local extinction
It is considered unlikely that the proposed development will result in the local extinction of this species.

Brown treecreeper

Extent of the local population
The NPWS database contained two (2) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained one (1) sighting of this species in the Moonee Beach Nature Reserve, and six (6) sightings in the Coffs Harbour LGA.

Stages of the lifecycle affected by the proposed development
The Brown Treecreeper is a medium-sized insectivorous bird that occupies eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups. Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (NPWS 2002).

The NPWS Threatened Species Unit discusses the following threats for the Brown treecreeper:

- Clearance and the fragmentation of woodland habitat including removal of dead timber;
- Habitat degradation, including loss of hollow bearing trees, threatens Brown Treecreeper populations;
- Grazing by stock in woodland areas leads to a decrease in the diversity of ground-dwelling invertebrates decreasing the availability of food for the birds; and
- Brown Treecreepers are likely to be threatened by such factors as increased competition with aggressive honeyeater species and increased levels of nest predation that are a consequence of fragmentation of habitat.

The proposed development will result in the loss of suitable habitat for this species. However, major areas of vegetation (mostly dry sclerophyll forest) occurring along the northern and eastern boundaries of the broader The Glades development site are to be retained. The retained vegetation within The Glades site will provide suitable habitat for the Brown treecreeper. However, the loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Brush-tailed phascogale

Extent of the local population
The NPWS database contained two (2) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained no sightings of this species in the Moonee Beach Nature Reserve, and sixteen (16) sightings in the Coffs Harbour LGA.
Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for the Brush-tailed phascogale as consisting of nests in tree hollows. The Brush-tailed phascogale forages in a broad range of habitats, more common in dry sclerophyll forest and woodlands associated with flatter landscapes where foxes are scarce or absent.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Brush-tailed phascogale, with the following results:

1st order disturbances	Predation by cats Predation – fox Baiting for dingoes Clearing – loss of habitat
2nd order disturbances	Intensive horticulture - Clearing for tea tree horticulture

The proposed development will result in the loss of a small area of suitable habitat for this species, with the majority of suitable habitat to be retained within The Glades development site. However, the loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Common blossom bat

Extent of the local population
The NPWS database contained twelve (12) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained three (3) sightings of this species in the Moonee Beach Nature Reserve, and twenty (20) sightings in the Coffs Harbour LGA.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for Common blossom bat as consisting of subtropical and littoral rainforest. This species breeds twice, in the coastal complex and riverine rainforest in spring and in the coastal complex in autumn. It needs a diverse array of nectivorous plant communities nearby. The Common blossom bat forages in a diverse range of nectar producing plant communities year-round; occasionally eating some rainforest fruits.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Common blossom bat, with the following results:

1st order disturbances	Clearing – habitat loss Management burns, including illegal
2nd order disturbances	Clearing resulting in fragmentation, increasing predation and decreasing food availability Wildfire Apiary Weed invasion Drainage of swamps Sand mining
3rd order disturbances	Logging of coastal sclerophyll forests with Banksia understorey Aerial spraying of bitou bush
4th order disturbances	Sand dune disturbance from recreational 4WDs
5th order disturbances	Barbed wire fences Introduced predators

This species forages on nectar-producing plants in Paperbark and Eucalypt habitats and is likely to forage on the Subject site at times. The proposed development will contribute toward the loss and fragmentation of habitat for this species and will result in a minor reduction in the availability of forage resources, primarily eucalypts and paperbarks. However, the majority of suitable habitat for this species is to be retained within The Glades development site. However, the loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species

Common planigale

Extent of the local population
The NPWS database contained three (3) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained six (6) sightings of this species in the Coffs Harbour LGA.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for Common planigales as consisting of nests of eucalypt leaves in logs or under bark, cracks in soil, grass tussocks, and building debris. The Common planigale forages in dry sclerophyll, swamp sclerophyll, heathland and grassland at ecotone with rainforest. Requires dense leaf litter or ground cover.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Common planigale, with the following results:

1st order disturbances	Predation (cats) – potential interaction between predators and other processes Clearing – loss of habitat
2nd order disturbances	Altered fire regimes Baiting for dingoes
3rd order disturbances	Exotic competitors
4th order disturbances	Predation – cane toad

The proposed development will result in the loss of some foraging and shelter resources for this species. There is potential for increased disturbance to Common planigales feeding and nesting in vegetated areas proximate to the development, and the further possibility of predation from cats. The majority of suitable habitat for this species is to be retained within The Glades development site. However, the loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
It is considered unlikely that the proposed development will result in the local extinction of this species.

Eastern free-tail bat (*Mormopterus norfolkensis*)

Extent of the local population
The OEH database contained three (3) records of this species within 10 kilometres of the subject site and twelve (12) records of this species in the Coffs Harbour LGA.

The local population of this species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. This species is highly mobile. The local population is therefore likely to extend to areas outside of the study area.

Stages of the life-cycle affected by the proposed development
The Eastern Free-tail Bat is a poorly known species for which specific habitat requirements are not known. The species has been recorded from forest types ranging from Rainforest to Dry Sclerophyll Forest and Woodland, but most records are from Dry Sclerophyll Forest and Woodland (NPWS 2002).

Breeding sites for the Eastern free-tail bat as consist of large mature tree hollows in dry forest woodland and possibly in moist forest (Environment Australia 1999). Inferences from wing morphology and echolocation call design suggest that it forages for flying insects in more open forest as well as adjacent cleared areas (Allison 1983).
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east

region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Eastern free-tail bat, with the following results:

1st order disturbances	Logging – loss of hollows Clearing – loss of habitat
3rd order disturbances	Clearing - fragmentation Pesticides Grazing
4th order disturbances	Logging – loss of Understorey
5th order disturbances	Wildfire

The proposed development will not reduce the forage resource within the study area for this species. It is anticipated that this species will continue to forage over the study area and adjacent areas.

Likelihood of local extinction
It is considered unlikely that the proposed development would lead to the extinction of any local population of this species.

Eastern grass owl (*Tyto longimembris*)

Extent of the local population
The OEH database contained one (1) record of this species within 10 kilometres of the subject site and eight (8) records in the Coffs Harbour LGA.

The local population of this species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. This is a highly mobile and dispersive species (Morcombe 2004). The local population is therefore likely to extend to areas well outside of the study area.

Stages of the life-cycle affected by the proposed development
The OEH Threatened Species Unit records the following information on the habitat and ecology of the Eastern grass owl.

Eastern grass owls are found in areas of tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on flood plains. They rest by day in a 'form' – a trampled down platform in a large tussock or other heavy growth. When disturbed they burst out of cover, flying rather slowly, before dropping straight down again into cover. They also nest in trodden down grass.

The OEH Threatened Species Unit discusses the following threats for the Eastern grass owl:

- Loss of suitable habitat from grazing, agriculture and development;
- Disturbance and habitat degradation by stock;
- Use of pesticides in agriculture to control rodent populations thereby reducing food sources for owls, and potentially poisoning owls; and

- Frequent burning, which reduces ground cover.

The proposed development is not likely to reduce the forage and nesting resources within the study area for this species. It is anticipated that this species will continue to forage over the study area and adjacent areas.

Likelihood of local extinction
It is considered unlikely that the proposed development would lead to the extinction of any local population of this species.

Glossy black cockatoo

Extent of the local population
The NPWS database contained thirty-nine (39) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained no sightings of this species in the Moonee Beach Nature Reserve, and four hundred and fifty-seven (457) sightings in the Coffs Harbour LGA.

This species was recorded flying over the Subject site on several occasions and signs of forage activity were observed.

Stages of the life-cycle affected by the proposed development
Breeding sites for the Glossy black cockatoo consist of nests in large trees with large hollows (dead or alive) near streams and within 5-20 km of a food source. The Glossy black cockatoo will shelter in stands of tall trees in elevated locations like ridgelines within range of the feeding resource. There is a relationship between roost sites and surface water sites (Environment Australia 1999; Forshaw 1981).

The Glossy black cockatoo usually forages close to the nest but is capable of travelling up to 20km away. It feeds on adult *Allocasuarina littoralis* and *A. torulosa* with individual trees believed to be selected on the basis of the nitrogen content of seeds. It will occasionally use alternative foods (Environment Australia 1999).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Glossy black cockatoo, with the following results:

1st order disturbances	Clearing for agriculture Grazing and associated burning Urban development Logging that reduces age classes of eucalypts and *Allocasuarina*
3rd order disturbances	Cats climbing into nests Firewood collection

The proposed development of the Subject site will result in the loss of areas of forest containing Forest oak. This species is present in low numbers on the site in the central vegetated area.

Forest oak is a common species in dry sclerophyll forests in this part of the coast. Blackbutt Forest is the largest group in the Urunga Management Area of State Forests NSW. The group includes Forest Types 36 (moist Blackbutt) and 37 (dry Blackbutt). Approximately 70% of all sites in moist and dry locations within the Urunga Management Area have Forest oak as a dominant sub-canopy species (Tweedie *et al* 1995).

Nest sites for the Glossy black-cockatoo consist of hollows in the trunk, stump, spout or limb of eucalypts, living or dead (Higgins (Ed.) in press). The diameter of the hollow has been recorded as around 21 to 22.5cm (Higgins (Ed.) in press).

The proposed development will not result in the loss of potential nesting trees for this species. The loss of sub-mature eucalypts, particularly within the open space area proposed for clearing, represents a decrease in the future recruitment of nest trees.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Green-thighed frog (*Litoria brevipalmata*)

Extent of the local population
The NPWS database contained three (3) records of this species within 10 kilometres of the subject site and six (6) sightings within the Coffs Harbour LGA.

The local population of this species would comprise of any individuals known to occur in the study area along with any individuals occurring in adjoining areas, contiguous or otherwise, that are known to, or that may utilise habitat in the study area.

Stages of the life-cycle affected by the proposed development
Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. Breeding occurs following heavy rainfall from spring to autumn. The frogs are thought to forage in leaf-litter (OEH 2017).

The NSW Office of Environment and Heritage consider the following, direct and indirect impacts, as threats to the survival of the Green-thighed frog (OEH 2017):

- Changes to drainage patterns which reduce periodic local flooding;
- Damage to semi-permanent and ephemeral ponds and flood-prone vegetation;
- Clearing of habitat for development;
- Clearing of habitat for agriculture;
- Habitat disturbance through timber harvesting;
- Reduction in water quality through pasture fertilisation;

- Reduction in habitat and water quality as a result of grazing; and
- Reduction of leaf-litter and cover of fallen logs through burning for agricultural purposes.

The Proposed development will result in the minor loss of suitable habitat for this species, with the majority of suitable habitat to be retained within The Glades development site. The loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species.

With the adoption of the recommended amelioration measures, it is considered that the proposed development is unlikely to result in the local extinction of this species.

Grey-headed flying fox

Extent of the local population
The NPWS database contained twenty-nine (29) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained four (4) sightings of this species in the Moonee Beach Nature Reserve, and two-hundred and eighty-five (285) sightings in the Coffs Harbour LGA. This species was recorded on The Glades development site foraging in flowering Blackbutts.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for the Grey-headed flying fox as consisting of mainly rainforest and moist riparian forest with a complex mosaic of rainforest, swamp and sclerophyll forest resources less than 40-50km from roost. There is high site fidelity with roosts often in riverine rainforest. The Grey-headed flying fox forages in subtropical rainforest with a mosaic of resources – rainforest fruit, nectar and pollen. The Grey-headed flying fox is less restricted to rainforest remnants than the Black flying fox.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Grey-headed flying fox, with the following results:

1st order disturbances	Clearing – habitat loss
2nd order disturbances	Direct disturbance to camps Drainage of swamps
3rd order disturbances	Powerlines Logging of Sclerophyll Management burns Shooting
4th order disturbances	Clearing resulting in fragmentation

	Wildfire
5th order disturbances	Disease – lyssavirus Apiary Barbed wire fences Weed invasion
6th order disturbances	Climate change

The proposed development will result in the minor loss of suitable forage habitat for this species. Suitable roosting habitat does not occur on site.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Koala

Extent of the local population
The NPWS database contained seventy (70) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained three (3) sightings of this species in the Moonee Beach Nature Reserve, and one thousand seven hundred and seventy-six (1776) sightings in the Coffs Harbour LGA.

Koala scats were found in vegetation to the north of the Subject site within The Glades development site, flanking Skinners Creek.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified feeding sites for Koalas in coastal forested environments (not woodland) as areas with stands with a high diversity of known food trees (three or more) including Tallowwood, Grey gum, Forest oak, Sydney blue gum, Swamp mahogany and Red gums. The Koala shelters in larger trees with big lateral branches (not necessarily food trees). The Koala disperses over any open habitat (including pasture and grassland) as long as scattered trees are present.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Koala, with the following results:

1st order disturbances	Habitat clearing
2nd order disturbances	Introduced predators – foxes and dogs
3rd order disturbances	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive) Logging that fails to retain stems in the 30-80 DBH size class.

4th order disturbances	Wildfire
5th order disturbances	Road kills
6th order disturbances	Disease

Impacts on the Koala have been considered in **SECTION 4**. The proposed development will result in some minor loss and fragmentation of habitat for this species. There is the potential of injury or mortality from vehicle strike, or harassment by dogs.

Likelihood of local extinction
With the adoption of amelioration measures discussed in **SECTION 4**, the proposed development is unlikely to result in the local extinction of this species.

Large-footed myotis

Extent of the local population
The NPWS database contained seven (7) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained no sightings of this species in the Moonee Beach Nature Reserve, and thirty-one (31) sightings in the Coffs Harbour LGA.

The Large-footed myotis was recorded in the Moonee Release Area by Clancy (1998) flora foraging over Cunningham's Creek to the west of The Glades development site. The Large-footed myotis was also recorded by JWA (2003) at Lot 122 DP 105 2566 Moonee Beach Road, approximately 1 km south-east of the site.

The Large-footed myotis was recorded near the dam on The Glades development site during 2017 survey.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering habitat for the Large-footed myotis as consisting of any forested riparian and adjacent vegetation around water bodies and coastal lakes and streams greater than first order streams. Breeding is in hollows, as well as under bridges and in caves. The Large-footed myotis forages in still water bodies with associated vegetation (tree line), and feeds on aquatic and other flying insects and small fish.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Large-footed myotis, with the following results:

1st order disturbances	Clearing – habitat loss (riparian vegetation) Clearing - fragmentation
2nd order disturbances	Use of chemicals Grazing Use of chemicals – mosquito control, pesticides

3rd order disturbances	Altered hydrology - sedimentation Altered hydrology - altered flow Bridge removal Eutrophication from grazing, agriculture and sewage Dams
4th order disturbances	Logging – loss of hollows Frequent burning
5th order disturbances	Recreational activities – fly fishing, boating Weeds
6th order disturbances	Fish (trout)

The proposed development is highly unlikely to affect forage habitat or decrease the foraging efficiency of Large-footed myotis occurring in the area.

There are no known roost sites (caves, tunnels) for the Large-footed myotis in the Subject site. It is unlikely that the local population of Large-footed myotis is dependent upon tree hollows within the development area for its continued survival. It is likely that the extent of the local population of Large-footed myotis has been underestimated due to the lack of targeted survey in the locality.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Little bent-wing bat

Extent of the local population
The NPWS database contained twenty-seven (27) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained one (1) sighting of this species in the Moonee Beach Nature Reserve, and one hundred and seventy (170) sightings in the Coffs Harbour LGA.

The Little bent-wing bat was recorded on the Subject site.
Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for Little bent-wing bat as consisting of limestone caves, where it usually occurs in association with the Common bent-wing bat. It congregates in high numbers in maternity roost (in 1000's). It also shelters in a range of artificial structures including culverts, drains, mines etc. The Little bent-wing bat forages on flying insects in forested areas, predominantly swamp forest, moist eucalypt forest, rainforest and some dry forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Little bent-wing bat, with the following results:

1st order disturbances	Clearing – habitat loss
2nd order disturbances	Disturbance to camps/caves by limestone mining (cave collapse, altered air flow, noise, dust etc) and recreational activities.
3rd order disturbances	Clearing – fragmentation Logging – loss of foraging habitat Frequent burning Altered hydrology/microclimate – old growth-regrowth
4th order disturbances	Grazing Wildfire Pesticides
5th order disturbances	Introduced predators

This species forages in a variety of habitats and is likely to forage in the Subject site at times. The proposed development will contribute toward the loss and fragmentation of habitat for this species and will result in a minor reduction in the availability of forage resources. Roosting habitat will not be affected.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Little lorikeet (*Glossopsitta pusilla)*

Extent of the local population
The NPWS database contained twenty-nine (29) records of this species within 10 kilometres of the subject site and ninety-three (93) sightings within the Coffs Harbour LGA.

The local population of this species would comprise of any individuals known to occur in the study area along with any individuals occurring in adjoining areas, contiguous or otherwise, that are known to, or that may utilise habitat in the study area.

Stages of the life-cycle affected by the proposed development
The Little lorikeet forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards. The species roosts in treetops, often distant from feeding areas. Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt.

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Little lorikeet (DEC 2005):

- extensive clearing of woodlands for agricultural purposes, resulting a loss in lorikeet food trees, as well as a decrease in survival and reproduction rates;
- loss of hollow bearing trees; and
- competition for resources with the introduced Honeybee.

The Proposed development will result in the minor loss of suitable forage habitat for this species, with the majority of suitable habitat to be retained within The Glades development site. The loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species.

With the adoption of the recommended amelioration measures, it is considered that the proposed development is unlikely to result in the local extinction of this species.

Masked owl

Extent of the local population
The NPWS database contained six (6) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained no sightings of this species in the Moonee Beach Nature Reserve, and one hundred and three (103) sightings in the Coffs Harbour LGA.

Stages of the life-cycle affected by the proposed development
The Masked owl feeds in sclerophyll forest with sparse, open understorey, particularly in the ecotone between wet and dry forest and non-forest habitat. It feeds on medium and small terrestrial mammals, some arboreal mammals and birds (Environment Australia 1999; Kavanagh & Murray 1996). Studies by Kavanagh & Murray (1996) suggest that the Masked owl may forage over a large area (1,000ha) containing a mosaic or relatively undisturbed and disturbed environments.

Nesting occurs at any time of year in deep hollows (usually vertical) in large, live trees (tall Eucalypts are favoured) or ledges in caves (Environment Australia 1999; Debus 1993). This owl shelters in hollows and in densely foliaged native and exotic understorey trees.
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Masked owl, with the following results:

1st order disturbances	Clearing for agriculture
2nd order disturbances	Logging which increases structural density of forest which effects mid to ground layer and thus affects manoeuvrability
3rd order disturbances	Fire – high frequency
4th order disturbances	Clearing for urban development
5th order disturbances	Road-kills
6th order disturbances	Nest and roost site disturbance

This species forages over a wide area and may forage over the Subject site at times. The proposed development will contribute toward the loss and fragmentation of habitat for this species and will result in some reduction in the availability of prey.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Osprey

Extent of the local population
The NPWS database contained twenty-eight (28) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained four (4) sightings of this species in the Moonee Beach Nature Reserve, and two hundred and three (203) sightings in the Coffs Harbour LGA.

An active Osprey nest occured in 2004 on the northern boundary of the adjacent Lot 7, south of the subject site. However, this nest was not seen in the 2017 surveys. Ospreys are also known to nest to the south of Moonee township (Draft Moonee DCP, 2003).

Ospreys were recorded within the nest tree, and flying over the Subject site to forage over Moonee Creek.

Stages of the life-cycle affected by the proposed development
Ospreys forage for fish in fresh, brackish or saline waters of rivers, lakes, estuaries and inshore coastal waters (NPWS 2002; Marchant and Higgins 1993). A breeding pair requires a suitable foraging area with nesting sites nearby. The nest is a large bulky structure of dead sticks, often located in a tall dead tree or on artificial structures such as power transmission poles or towers. It is used year after year for as long as it lasts (NPWS 2002).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The RFA analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Osprey, with the following results:

1st order disturbances	Drainage of wetlands Chemical pollutants Urban development Loss of nest sites Commercial fishing (removal of prey, especially mullet)

Potential impacts on the Osprey are considered in **SECTION 4** of this report. The Osprey nest in the adjacent property to the south was being utilised in previous surveys, however not seen in 2017, while the nest site recorded in the south-east of the Subject site appears to have collapsed. While there may be some disturbance to Ospreys during the construction period, this species is unlikely to be significantly affected by the proposed development.

Likelihood of local extinction
The proposed development has the potential to result in the disturbance of the potential nest sites by the resident pair of Ospreys. The proposed development is unlikely to result in the local extinction of this species.

Square-tailed kite

Extent of the local population
The NPWS database contained six (6) record of this species within 10 kilometres of the Subject site.

The NPWS online database contained one (1) sighting of this species in the Moonee Beach Nature Reserve, and thirty-eight (38) sightings in the Coffs Harbour LGA.

Stages of the life-cycle affected by the proposed development
Square-tailed kites are uncommon yet widespread. They inhabit dry woodland and open forest mainly in coastal or subcoastal districts, preferring vegetation along major rivers and belts of trees in urban or semi-urban areas for hunting (NPWS 2002; Marchant & Higgins 1993).

Breeding sites for the Square-tailed kite as consist of nests in tall trees with large branches in tall, open sclerophyll forest and woodland with or adjacent to areas of high densities of passerine birds (Environment Australia 1999). The Square-tailed kite forages on a high density of passerine birds, particularly honeyeaters. It will occasionally take lorikeets, quail, pipits as well as fledglings and nestlings, lizards and insects (Environment Australia 1999; Marchant & Higgins 1993).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Square-tailed kite, with the following results:

1st order disturbances	Clearing for agriculture
2nd order disturbances	Grazing and associated burning Logging which increases the structural density through reducing age classes, decreased nectar production Intensive horticulture Nest site loss
3rd order disturbances	Urban development
4th order disturbances	Egg collecting

This species forages over a wide area and is likely to forage over the Subject site at times. The proposed development will contribute toward some loss and fragmentation of habitat for this species and will result in some reduction in the availability of prey.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Squirrel glider

Extent of the local population
The NPWS database contained eight (8) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained one (1) sighting of this species in the Moonee Beach Nature Reserve, and ninety-one (91) sightings in the Coffs Harbour LGA.

This species was recorded on the eastern margins and within scattered trees within grasslands on The Glades development site.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for Squirrel glider as tree hollows with a preference for small hollow entrances. A single study found that densities declined linearly when the abundance of trees with hollows fell below 6/ha (Smith, 1998). The preferred feeding habitat contains winter flowering eucalypts or banksias including Swamp mahogany, Spotted gum, Coast banksia and Swamp paperbark. Probable association with larger trees with high nectar flows. The Squirrel glider shelters in hollow bearing trees.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Squirrel glider, with the following results:

1st order disturbances	Habitat clearing
2nd order disturbances	High frequency burning
3rd order disturbances	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive). Removal of large trees and hollows, includes firewood collection
4th order disturbances	Apiary – competition for hollows
5th order disturbances	Introduced predator – foxes, dogs and cats

The proposed development will result in the loss of eucalypts occurring within vegetated areas on the Subject site, and the subsequent fragmentation of habitat for this species. The future recruitment of tree hollows will also be affected as a result of the loss of sub-mature eucalypts on the Subject site. The majority of suitable habitat is to be retained within The Glades development site. However, the loss of vegetation within the Subject site may require offsets.

Likelihood of local extinction
With the adoption of amelioration measures recommended in **SECTION 4**, the proposed development is unlikely to result in the local extinction of this species.

Stephen's banded snake

Extent of the local population
The NPWS database contained six (6) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained no sightings of this species in the Moonee Beach Nature Reserve, and twenty-seven (27) sightings in the Coffs Harbour LGA.

Clancy (1998) notes that the Stephen's banded snake has been recorded on several occasions in an area about 2-3km south-west of the Subject site.

Stages of the life-cycle affected by the proposed development
Stephen's banded snake inhabits dry and moist hardwood forest and rainforest in coastal and near coastal areas from southern Queensland to Gosford in New South Wales (NPWS 2002; Cogger 1996; Wilson and Knowles 1988). Key elements of the preferred habitat for this species are a dense understorey and canopy structure which are required for foraging and movement (Ehmann 1992).

Identified breeding and sheltering sites for Stephens' banded snake as consisting of nests in stags, strangler figs, creepers and vines, hollow bearing trees, decorticating bark, stumps, rock crevices and slabs and arboreal termitaria (Environment Australia 1999).

Prey items consist of small mammals (including bats) and frogs and lizards in riparian vegetation and water (frogs).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Stephens' banded snake, with the following results:

1st order disturbances	Any fire Grazing and associated burning changes the structure of understorey and ground cover
2nd order disturbances	Predation by introduced species Clearing for urban development Logging –changing canopy structure Road-kills
3rd order disturbances	Clearing for agriculture Clearing – partial for grazing Weed invasion

The proposed development will not result in the loss of appropriate habitat for this species. However, any local population may be affected by predation from dogs and cats. The proposed development may result in a reduction in the prey base of this species due to a decrease in the diversity and abundance of prey species associated with fragmentation and loss of habitat.

Likelihood of local extinction
The proposed development is unlikely to result in the local extinction of this species.

Wallum froglet (*Crinia tinnula*)

Extent of the local population
The OEH database contained two (2) records of this species within 10 kilometres of the subject site and seventy-eight (78) records in the Coffs Harbour LGA.

The local population of this species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis identified breeding habitat of this species as consisting of marshy or swampy areas with acidic, tannin stained water, typically associated with paper barks and tea trees. Breeding habitat is often, but not always, ephemeral. Eggs are laid in acid paper bark swamps. Tadpoles are free living and adults are terrestrial. The Wallum froglet forages around sedges and rushes adjacent to breeding habitat. This species is closely associated with the coastal zone and is found in altitudes up to 40m.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Wallum froglet, with the following results:

1st order disturbances	Habitat clearing Wetland swamp drainage for mosquito control Altered hydrology from earthworks
2nd order disturbances	Mining/quarrying
3rd order disturbances	Fish Pollution
4th order disturbances	Tea-tree harvesting

The proposed development will not reduce the potential habitat within the study area for this species.

Likelihood of local extinction

It is considered unlikely that the proposed development would lead to the extinction of any local population of this species.

Wallum sedge-frog (*Litoria olongburensis*)

Extent of the local population
The OEH database contained no records of this species within 10 kilometres of the subject site and no records in the Coffs Harbour LGA.

The local population of this species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding habitat for the Wallum sedge-frog as consisting of marshy or swampy wallum areas with emergent vegetation. Breeding habitat is often, but not always, ephemeral. Tadpoles are free living. The Wallum sedge-frog feeds adjacent to breeding habitat around emergent low vegetation, sedges and rushes and low foliage.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Wallum sedge-frog, with the following results:

1st order disturbances	Habitat clearing Wetland swamp drainage for mosquito control Altered hydrology etc earthworks
2nd order disturbances	Mining/quarrying, particularly sand mining
3rd order disturbances	Fish Pollution
4th order disturbances	Tea tree harvesting

The proposed development will not reduce the potential habitat within the study area for this species.

Likelihood of local extinction
It is considered unlikely that the proposed development would lead to the extinction of any local population of this species.

Yellow-bellied glider

Extent of the local population
The NPWS database contained thirty-four (34) records of this species within 10 kilometres of the Subject site.

The NPWS online database contained three-hundred and four (304) sightings of this species in the Coffs Harbour LGA.

Clancy (1998) also notes that the Yellow-bellied glider has been recorded in the north-west corner of The Glades development site.

Stages of the life-cycle affected by the proposed development
As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for Yellow-bellied gliders as consisting of large hollow trees. It requires trees within gliding distance (on flat ground in tall forest >40m). In steep forest, glides may be much longer (up to 300m). Trees may be quite scattered. The Yellow-bellied glider forages in mature forests with high eucalypt species diversity, winter flowering eucalypts, smooth-barked eucalypts, and sap trees. Larger trees have higher nectar/sap yields.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Yellow-bellied glider, with the following results:

1st order disturbances	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive). Logging that fails to retain a high proportion of large trees and hollows.
2nd order disturbances	Habitat clearing
3rd order disturbances	High frequency burning

The proposed development will result in the loss of some foraging resources for this species.

Likelihood of local extinction
It is considered unlikely that the proposed development will result in the local extinction of this species.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

Thirty-three (33) endangered populations have been identified under the *TSC Act*. The following endangered populations occur in north-eastern NSW:

- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Low growing form of *Zieria smithii*, Diggers Head; and
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.

The proposed development will not affect any of these endangered populations.

(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 Subject site is considered to provide potential habitat for the Threatened species mentioned above. For the majority of these species however, all suitable habitats on the Subject site will be retained along the northern and eastern boundaries of The Glades development site. Threatened species with potential habitat within the proposed development area within the Subject site are:

- Brown treecreeper;
- Brush-tailed phascogale;
- Common blossom bat;
- Common planigale;

- Glossy black-cockatoo;
- Green-thighed frog;
- Grey-headed flying fox;
- Koala;
- Little bent-wing bat;
- Little lorikeet;
- Masked owl;
- Square-tailed kite;
- Squirrel glider; and
- Yellow-bellied glider.

No hollow-bearing trees will be removed within the Subject site which represents potential den sites for the Yellow-bellied glider, Squirrel glider, or nest sites for the Glossy black-cockatoo. Mature forest to be retained adjacent to the Subject site (i.e. within The Glades development site) comprises a high density of tree hollows. These habitat trees to be retained are considered more suitable as den/nest trees and are more likely to be occupied by these Threatened species should they occur within the study area.

Forage habitat for the Common blossom bat, Grey-headed flying-fox and Little lorikeet may be slightly reduced by the removal of Paperbarks and other flowering species from the development area. However, large areas of more suitable forage habitat will be retained.

Potential foraging and/or nesting habitat for the Brown treecreeper, Brush-tailed phascogale, Common planigale, Green-thighed frog, Little bent-winged bat, Masked owl and Square-tailed kite may be slightly reduced by the loss of habitat from the development area.

The removal of preferred Koala feed trees from the development area represents a reduction in forage resources for the Koala on the Subject site, however, more suitable forage habitat will be retained on the adjacent The Glades development site. It is further recommended that Koala trees be replanted in the north-west corner of The Glades site to consolidate Koala habitat.

Whilst the proposed development within the Subject site may reduce opportunities for dispersal across some areas of study area, it is worth noting that post-development (i.e. the approved The Glades development) corridor values would likely be restricted to stepping stone habitat for highly mobile and disturbance adapted species only. This is due to lack of connecting vegetation to the south, edge effects, roads, and the lack of connectivity to significant habitat areas. The retention of intact forest communities on The Glades site will ensure that dispersal opportunities will persist for fauna species within the study area.

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

Critical habitat areas listed under the Threatened Species Conservation Act (1995) currently consist of habitat for Gould's Petrel at Cabbage Tree Island, off the coast of Port

Stephens, Mitchell's rainforest snail in Stott's Island Nature Reserve, habitat for the Little penguin population in Sydney's North Harbour and habitat for the Wollemi Pine in Wollemi National Park within the Greater Blue Mountains World Heritage Area.

There will be no adverse effects on any critical habitat listed, in the Register of critical habitat in NSW, from the action proposed.

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

An Approved recovery plan exists for the Yellow-bellied glider which is considered a possible occurrence on the Subject site. The objectives of this recovery plan are:

- Co-ordinate the recovery of the Yellow-bellied glider in NSW;
- Encourage and assist in improving the protection and management of the Yellow-bellied glider and its habitat;
- Identify and monitor significant populations of this species;
- Facilitate strategic research into the ecology of the Yellow-bellied glider that is relevant to its conservation; and
- Increase community awareness of the Yellow-bellied glider and encourage community involvement in its conservation.

The Yellow-bellied glider has previously been recorded from The Glades site (Clancy 1998), but was not recorded during this assessment. However, it is considered that this species may occasionally forage over the Subject site. No den sites or feeding scars (sap trees) were located at the Subject site. It is considered that the proposed development is consistent with the objectives and actions of the Recovery Plan for the Yellow-bellied glider.

A Draft recovery plan exists for the Koala which is considered a possible occurrence on the Subject site. The objectives of this recovery plan are:

- To conserve Koalas in their existing habitat;
- To rehabilitate and restore Koala habitat and populations;
- To develop a better understanding of the conservation biology of Koalas;
- To ensure that the community has access to factual information about the distribution, conservation and management of Koalas at a national, state and local level;
- To manage captive, sick or injured Koalas and orphaned wild Koalas to ensure consistent and high standards of care; and
- To manage over-browsing to prevent both Koala starvation and ecosystem damage in discreet patches of habitat.

The proposed development will result in some minor loss and fragmentation of habitat for this species. Suitable habitat will be retained on the adjacent The Glades development site, however there is the potential of injury or mortality from vehicle strike, or harassment by dogs. A number of amelioration measures have been proposed to satisfy the

requirements of the CHCC Koala Plan of Management. It is considered that the proposed development is consistent with the objectives and actions of the Recovery Plan for the Koala.

A Draft recovery plan exists for the large forest owls (Powerful owl, Masked owl & Sooty owl) of which the Masked owl is considered a possible occurrence on the Subject site. The objectives of this recovery plan are to:

- To minimise further loss and fragmentation of habitat outside conservation reserves and State Forests by protection and fragmentation of significant owl habitat (including protection of individual nest sites);
- To minimise the impacts of development activities on large forest owls and their habitat outside conservation reserves and State forests;
- To assess the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not protected;
- To monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range of the three species and across different land tenures and disturbance histories;
- To assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the three owl species and, (if necessary), to use this information to refine the prescriptions so that forestry activities on State forests are not resulting in adverse changes in species abundance and breeding success;
- To improve the recovery and management of the three large forest owls based on an improved understanding of key areas of their biology and recovery;
- To raise awareness of the conservation requirements of the three large forest owls among the broader community, to involve the community in owl conservation efforts and in so doing increase the information base about owl habitats and biology; and
- To coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.

Neither the Powerful owl, Masked owl, nor the Sooty owl were recorded from the Subject site. However, it is considered that the Masked owl may occasionally forage over the Subject site. No nest sites were located at the Subject site. It is considered that the proposed development is consistent with the objectives of the Recovery Plan for the large forest owls.

Two Approved Threat abatement plans (TAP) have been completed:

- Predation by the Plague Minnow
- Predation by the Red fox

The Plague Minnow has little relevance to the terrestrial fauna considered in this assessment. The occurrence of the Red fox constitutes a threat to ground nesting birds and

ground dwelling mammals. The Common planigale was recorded on site and may be predated upon by Red foxes. The goal of the Red fox TAB is to minimise the impact of foxes on biodiversity in Australia and its territories by:

- Protecting affected native species and ecological communities; and
- Preventing further species and ecological communities from becoming threatened.

The objectives of the Red fox TAB are to:

1. Prevent foxes occupying new areas in Australia and eradicate foxes from high-conservation-value 'islands';
2. Promote the maintenance and recovery of native species and ecological communities that are affected by fox predation;
3. Improve knowledge and understanding of fox impacts and interactions with other species and other ecological processes;
4. Improve the effectiveness, target specificity, integration and humaneness of control options for foxes; and
5. Increase awareness of all stakeholders of the objectives and actions of the TAP, and of the need to control and manage foxes.

It is considered that the proposed development is consistent with the objectives of the TAP for Threatened ground-dwelling species, such as the Common planigale, that may be present within the Subject site.

(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.

A "threatening process" means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)*.

Key Threatening Processes (Schedule 3):

- Invasion and establishment of exotic vines and scramblers;
- Invasion and establishment of the Cane toad, Bufo marinus;
- Invasion of the yellow crazy ant;
- Feral pigs;
- Competition and habitat destruction by feral goats;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Introduction of the large earth Bumble bee, *Bombus terrestris*;
- Removal of dead wood and dead trees;
- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Invasion of native plant communities by exotic perennial grasses;

- Infection of frogs by amphibian chytrid, causing the disease chytrodiomycosis
- Competition from feral honeybees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of native vegetation;
- Anthropogenic climate change;
- Removal of Bush rock;
- High frequency fire;
- Invasion by Bitou Bush (*Chrysanthemoides monilifera*);
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox (*Vulpes vulpes*);
- Predation by the Feral cat (*Felis catus*);
- Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island;
- Predation by the Plague Minnow (*Gambusia holbrooki*);
- Infection of native plants by *Phytophthora cinnamomi*;
- Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

The proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (*e.g.* loss of populations of pollinators or seed dispersers) and changes to soil biota.

The amount of native vegetation to be cleared is discussed in Section 4. In total approximately 1.37 hectares of native vegetation will be lost from the Subject site. Amelioration measures have been recommended to minimise the loss of native vegetation on the Subject site.

The Proposed development will not increase the impact of any other key threatening processes.

On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.

Appendix 7 - Fauna Distribution Tables

Name	**Barred cuckoo shrike** (*Coracina lineata*)	
Status	Vulnerable – Schedule 2 TSC Act 1995.	
Geographical Distribution	This species occurs from Cape York Peninsula in Queensland to the Manning River district in NSW (Schodde and Tidemann 1986).	
Description	Medium sized (26-28cm) songbird, face is dark with black lores and yellow eyes. It is dark grey above with darker wings, breast to abdomen is white, strongly barred with black (Simpson and Day 1996).	
Habitat	Blakers et al (1984) note that this species inhabits rainforests and eucalypt forests including margins and regrowth, where it feeds on fruits and insects. A major habitat component is the presence of fruiting trees, particularly figs (*Ficus* sp.).	
Life Cycle Requirements	Forage	The Barred cuckoo shrike flies freely from one feeding tree to another but once settled the birds tend to be quiet and undemonstrative. Aside from rainforest fruits, this species has been reported also to feed on beetles, insect larvae and dragonflies (Shields 1993). Roosting is communal.
	Nesting	Nesting is between October and January, with a small nest of dry twigs and foliage usually built high in a tree (Shields 1993).
	Movements	The bird is often encountered alone or in pairs, but it also congregates in flocks at temporarily abundant food sources.
Conservation Reserves	Border Ranges, Mt. Warning, Nightcap National Parks. Iluka, Limeburners, Sea Acres Nature Reserves.	
Threatening Processes	This is mainly a tropical and subtropical species of lowland rainforest. This habitat has been subject to extensive clearing for residential and agricultural purposes.	
References	Blakers, M.; Davies, S.J.J.F.; and Reilly, P.N. (1984). The Atlas of Australian birds. RAOU and Melbourne University Press: Melbourne. Schodde, R. and Tidemann, S. (Eds) (1986) Readers Digest Complete Book of Australian Birds. Second Edition. Readers Digest Services, Sydney. Shields, J.M. (1993) Yellow-eyed cuckoo shrike *Coracina lineata*. In: Strahan, R (Ed). Cuckoos, Kingfisher and Nightbirds of Australia. Angus and Robertson, Sydney. Simpson, K. & Day, N (1996). Field Guide to the Birds of Australia. Viking: Penguin Books, Sydney.	

Name	**Black-necked stork** (*Xenorhynchus asiaticus)*	
Status	Endangered –Schedule 1 TSC Act (1995)	
Geographical Distribution	This species occurs sparsely throughout much of its northern and north-east Australian range. It is more common in the Coastal northern Territory and along northern and south eastern Queensland coast and plains. Breeding populations are found mainly in these zones.	
Description	An impressive very tall (1.29-1.37m) black and white bird with pipestem red legs: They have a heavy black bill, glossy green-black head and neck. The eye in males is black and in females yellow (Pizzey 1993).	
Habitat	The Black-necked stork inhabits riverine swamps, large permanent pools and coastal wetlands and estuaries. Fresh, brackish or saline water is used (SFNSW 1995). An abundant supply of frogs and fish is required, together with suitable roost and nest trees, usually overhanging rivers and swamps. Foraging occurs singly or in pairs. Critical habitat components for this species include their aquatic food base, water quality and availability of suitable nest and roost trees. The Black necked stork will therefore be sensitive to disturbance of these habitat components.	
Life Cycle Requirements	Foraging	This species forages in shallow water for small invertebrates, fish, amphibians, reptiles and possibly small mammals (Marchant and Higgins 1990). Once settled in specific localities, individual birds may become established for several years (Salmon 1965).
	Breeding	Breeding occurs from March to June with nests forming large stick platforms built in live or dead trees in secluded swamps.
	Movements	The Black-necked stork is an occasional breeding vagrant or transient in the locality. Elsewhere in Australia this species is widespread and moderately abundant as a breeding resident across the north of the continent. Many, if not all of the birds present in the locality may be transients overflowing from populations from the north, although there is no proof of this.
Conservation Reserves	Bundjalung, Broadwater and Yuraygir National Parks. Limeburners Creek Nature Reserve.	
Threatening Processes	The Black-necked stork is primarily threatened by the loss of suitable swamp habitats through draining of wetlands for agricultural and urban development; disturbance of feeding habitat by livestock grazing; contamination of water and food supplies by urban and agricultural nutrients and chemicals and the loss of roost and nest trees.	
References	Pizzey, G and Doyle (1993). A Field Guide to the Birds of Australia. Angus and Robertson. Salmon (1965). Distribution of the Jabiru in central and northern coastal NSW. *Emu*, **65:** 149-151. State Forests of NSW. (1995). Coffs Harbour Urunga Management Area - Environmental Impact Statement. Vol C, Proposed forestry operations - Schedule 12 Fauna. SFNSW, Northern Region.	

Name	**Brush-tailed phascogale** (*Phascogale tapoatafa*)	
Status	Endangered– Schedule 1 TSC Act (1995)	
Geographical Distribution	The species prefers open forest with sparse ground cover. The species was formerly distributed throughout the dry sclerophyll forest and woodlands of temperate and tropical Australia.	
Description	Head and body length is 181mm (approximately) for males. Uniform grizzled grey above, cream to white below. Large naked ears. Conspicuous black bottle-brush tail with hairs up to 55mm long.	
Habitat	The preferred habitat of this species is reported to be dry open forest and woodland containing box, stringybark and ironbark trees (Cuttle 1982, Trail and Coates 1993) but it has also been recorded from coastal forest in NE NSW containing Blackbutt and red bloodwood (Quin, cited in AMBS 1995).	
Life Cycle Requirements	Breeding	The requirement for hollow-bearing trees for nesting sites indicates that this species will require some component of old-growth within its habitat and therefore is likely to be sensitive to removal of this habitat component. This species occurs patchily and in low densities throughout its entire range.
	Foraging	This species is known to forage over the trunks and major limbs of trees, taking arthropods from the bark surface and in shallow bark crevices, and it is thought that they may also forage on logs (Trail and Coates 1993). Foraging takes place throughout the home range of this species rather than at particular sites (Soderquist 1995). The Phascogale forages as it travels, and all parts of the home range therefore represent forage habitat.
	Dispersal	Recent studies by Soderquist (1995) in Victoria have shown that both females and males occupy large home ranges (41ha and 106ha respectively). The home range of males was found to expand during the breeding season to an average length of 2.7km.
Conservation Reserves	Barrington Tops NP, Bundjalung NP, Dorrigo NP, Limeburners Ck. NR, Mt. Warning NP, New England NP, Washpool NP, Werrikimbe NP, Yuraygir NP.	
Threatening Processes	*P. tapoatafa* is sensitive to the loss of critical nest, shelter and feeding habitat such as tree hollows and suitable foraging substrate (especially fallen logs), and predation by feral carnivores such as foxes and cats (CHUMA - Supporting Document 4, 1995). Little is known about this species ecology but an overly frequent fire regime in drier forests is likely to be detrimental to the species through reduction in cover and increased exposure to predation (Smith *et al.*, 1994).	
References	Australian Museum Business Services (1995). Urbenville Management Area - Fauna Impact Statement Vol. D. State Forests of N.S.W., Pennant Hills. Cuttle, P (1982) Life history of the dasyurid marsupial *Phascogale tapoatafa* pp13-22. In Carnivorous Marsupials Ed by M. Archer, Royal Zoological Society of NSW, Sydney. Soderquist, T.R. (1995) Spatial organisation of the arboreal carnivorous marsupial *Phascogale tapoatafa*. Journal of Zoology, 237 pp 385-398.	

	Traill, B.J. and Coates, T.D. (1993). Field Observations on the Brush-tailed Phascogale (Phascogale tapoatafa) Marsupalia: Dasyuridae. *Australian Mammalogy*, 16: 61-65.

Name	**Common blossom bat** (*Syconycteris australis*)	
Status	Vulnerable –Schedule 2 TSC Act (1995).	
Geographical Distribution	This species occurs in eastern Queensland from Cape York south, with disjunct populations occurring south to the mid north coast of NSW around Taree. The southern limit distribution of the Common blossom bat in NSW is latitude 32°19'S at Booti Booti National Park, and may be a determent of climatic factors (Law 1994a).	
Description	The Common blossom bat is one of the smallest pteropids, about the size of a mouse. It has fawn to reddish fur that is very soft. The nostrils are raised above the surface of the muzzle and it has a long brush-like tongue (Strahan 1995).	
Habitat	The Queensland blossom bat is a nectarivore and takes nectar from species such as Banksia and Melaleuca in autumn and winter and from coastal Eucalypts in summer. The Bat prefers to roost in coastal Rainforest or other communities containing broad-leaved species where the canopy provides good protection from rain and wind (B Law, pers. comm).	
Life Cycle Requirements	Foraging	Foraging resources for the Common blossom bat species are produced in a number of habitats throughout coastal NSW and include heaths, paperbark swamps, coastal Eucalypt forest and sub-tropical rainforest. An essential requirement for the occurrence of the Queensland Blossom Bat is a diversity of habitats proximate to rainforest roost sites, so as to ensure a year round supply of nectar and pollen through sequential flowering of different species.
	Roosting	Individuals tend to roost solitarily, shifting roost sites within rainforest habitat depending on prevailing weather conditions.
	Movements	Commuting distances from these roosts to foraging areas are greater in spring and autumn (mean 1.4km) than in winter (mean 0.8km). Adults often change roosts each day, moving approximately 100m, while juveniles re-use roosts over longer periods (Law 1993).
Conservation Reserves	Broadwater, Broken Head, Bundjalung, Mt. Warning, Yuraygir National Parks. Iluka, Limeburners Creek Nature Reserves.	
Threatening Processes	The dominant threat to the critical habitat of this species in NSW is the extensive development of the coastal zone which disrupts the proximity of food supplies and roost sites.	
References	Law, B.S. (1993) "Roosting and Foraging Ecology of the Queensland Blossom Bat (*Syconycteris australis*) in north-eastern New South Wales: Flexibility in response to seasonal variation". Wildlife Research, 20: 419-431. Law, B.S. (1994a) "Climatic limitations of the southern distribution of the Common blossom bat (*Syconycteris australis*) in New South Wales." Aust. J. Ecology 19:366-374. Strahan R. (1995) "The Mammals of Australia". Reed Books, Chatswood.	

Name	**Glossy black cockatoo** (*Calyptorhynchus lathami)*	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	This species occurs from about the Clarke Range in Queensland to Gippsland and the Central Highlands of Victoria along the eastern seaboard. It occurs as far west as the Riverina and Pilliga Scrub (Blakers *et al* 1984).	
Description	This is the smallest of the Black cockatoos with a body length of about 48cm. Plumage I brownish black, with two panels in the tail: these panels are bright red in males, barred and shot with yellow in females. The bill is more bulbous than that of the Red-tailed black cockatoo (Simpson and Day 1996).	
Habitat	Found in coastal forests and open inland woodland in eastern Australia. The Glossy black-cockatoos distribution is limited to habitat which contains sufficient seed reserves of their three favoured species of food trees: *Allocasuarina littoralis, Allocasuarina torulosa* and *A. verticillata* (Forshaw, 1981) and suitable large hollow bearing trees for nesting.	
Life Cycle Requirements	Foraging	It is noticeable that birds appear to favour a certain tree, perhaps when seeds are at correct maturity and sweeter, or perhaps the tree is easily accessible (Clout 1989).
	Breeding	The cockatoos require large hollows in tall mature Eucalyptus for nesting (Forshaw 1981). Successful breeding of this species is dependent on cones having high seed-fill rates (% of viable seed per cone). Higher seed fill rate, often in excess of 80% appears to be influenced by geology, soil and moisture (Garnett 1997 *in press*).
	Movements	This cockatoo is mainly sedentary with pairs isolating themselves from groups to breed and then rejoin the main group with their young (Joseph, 1989). This species live in loose groups of 2 to 20 birds (Blakers *et al* 1984). Groups may disperse over wider areas during times of reduced she-oak seed occurrence within their normal range. There are no known barriers to the movement of this species.
Conservation Reserves	Barrington Tops, Border Ranges, Bundjalung, Dorrigo, Gibraltar Range, Guy Fawkes River, Hat Head, New England, Nymboida, Washpool, Werrikimbe, Woko and Yuraygir National Parks.	
Threatening Processes	The Glossy black cockatoo is threatened by any action that significantly reduces the quantity, quality or availability of the seed crop of the preferred *Allocasuarina* species, and/or results in the removal or destruction of potential nest sites.	

References	Blakers, M. Davies, S.J.J.F.; and Reilly, P.N. (1984). The Atlas of Australian birds. RAOU and Melbourne University Press: Melbourne. Clout, M.N. (1989). Foraging behaviour of Glossy Black Cockatoos. Aust Wild. Res. 16, 467-473. Forshaw, J.M (1981). Australian Parrots. Second (revised) Edition. Lansdowne Press, Melbourne. Joseph, L. (1989). The Glossy Black-Cockatoo in the South Mount Lofty Ranges. South Australian Ornithologists, 30: 202-204. Simpson, K. & Day, N (1996). Field Guide to the Birds of Australia. Viking: Penguin Books, Sydney.

Name	**Grey-headed Flying Fox** (*Pteropus poliocephalus)*	
Status	Vulnerable (Schedule 2 TSC Act (1995); Tidemann *et al.*, 1999	
Recovery Plan	Under the *Threatened Species Conservation Act* 1995, a Recovery Plan for the Grey-headed Flying Fox is required to be prepared by 2006.	
Geographical Distribution	Occurs along the east coast from Bundaberg in Queensland to Melbourne in Victoria (Eby, 2000a). The distribution of this species has contracted south, formerly ranging north to Rockhampton (Eby, 2000a). This species may range to the western slopes of the Great Dividing Range in northern NSW (Eby, 1991). At any one time the majority of animals only occupy a small proportion of this entire range.	
Description	The Grey-headed Flying Fox has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. This species can be distinguished from other flying-fox species by leg fur which extends to the ankle. Wing membranes are black and the wingspan can be up to one metre with a head and body length 23-30cm and weight of 600-1000g. (Tidemann, 1995 and Eby, 1995)	
Habitat	The Grey-headed Flying Fox inhabits "sub – tropical and temperate rainforests, tall sclerophyll forest and woodlands, heaths and swamps" (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species.	
Life Cycle Requirements	Breeding/ nesting	Mating occurs annually with mating commencing in January, the majority to a single young.
	Foraging	The nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia* (Eby, 2000a), and fruits of rainforest trees and vines. This species is an important pollinator and seed-disperser of native trees.
	Movements	The Grey-headed Flying Fox migrate in response to food availability, sometimes travelling hundreds of kilometres. In addition, during periods when native food is limited, during periods when native food is limited, they disperse from colonial roosts, often foraging in cultivated gardens and fruit crops. This species occasionally inflicts severe crop damage during periods of native food shortage. (Ratcliffe, 1932; Eby, 1991; Parry-Jones & Augee, 1992). This results in large fluctuations of the numbers of this species in NSW from as few as 20% of the total population in winter up to around 75% of the total population in summer (Eby, 2000a).
Conservation Reserves	In NSW, Grey-headed Flying Fox have been recorded in numerous conservation reserves along the east coast, and the tablelands and eastern slopes of the Great Dividing Range.	
Threatening Processes	Destruction and fragmentation of roosting and foraging habitat pose significant threats to this species in NSW. Unregulated shooting, electrocution on power lines, persecution due to poor understanding of diseases they may carry and competition and hybridisation with the Black Flying-fox (*Pteropus alecto*).	

References	Eby, P. 1991. Seasonal movements of Grey-headed Flying-foxes, *Pteropus poliocephalus* (Chiroptera: Pteropodidae). From two maternity camps in northern New South Wales. *Wildlife Research* 18:547-559. Eby, P. 1995. The biology and management of flying-foxes in NSW; Species management report number 18 Llewellyn, L. (ed). NPWS, Hurstville. Eby, P. 2000a. The results of four synchronous assessments of relative distribution and abundance of Grey-headed Flying-fox *Pteropus poliocephalus*. In *Proceedings of a Workshop to Assess the Status of the Grey-headed Flying-fox in New South Wales*. Richards, G. (ed). http://batcall.csu.edu.au/abs/ghff/ghffproceedings.pdf Eby, P. 2000b. A case for listing Grey-headed Flying-fox *Pteropus poliocephalus* as threatened in NSW under IUCN creiterion A2. In *Proceedings of a Workshop to Assess the Status of the Grey-headed Flying-fox in New South Wales*. Richards, G. (ed). http://batcall.csu.edu.au/abs/ghff/ghffproceedings.pdf Parry-Jones, K.A. and Augee, ML. 1992. Movements of Grey-headed Flying Foxes (*Pteropus poliocephalus*) to and from a colony site on the central coast of New South Wales. *Wildlife Research* 19:331-340. Ratcliffe, F.N. 1932. Notes on the fruit bats (*Pteropus spp*.) of Australia. *Journal of Animal Ecology* 1:32-57. Tidemann, C.R., Eby P., Parry-Jones, K.A. and Vardon, M. 1999. Grey-headed Flying-fox. In *The Action Plan for Australian Bats*. Duncan, A., Baker, G.B. and Montgomery, N. (eds.). Environment Australia, Canberra.

Name	**Koala** (*Phascolarctos cinereus*)	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	The Koala has a broad distribution in eastern Australia, extending from South Australia through to north Queensland (Lee and Martin 1988). Reed *et al* (1990) noted that the distribution of the Koala in NSW was sparse on the south coast but there was a concentration of sightings on the north coast, northern tablelands and western slopes.	
Description	The Koala is an arboreal marsupial with woolly, pale to dark grey fur on the back, lighter on the underside. The tail is vestigial. Animals from the northern part of the range are smaller than those from the south (Martin and Handasyde 1995)	
Habitat	Koalas primarily inhabit Eucalypt woodlands and open forest and occasionally grazing lands and residential developments, although the later obviously do not constitute optimal habitat. Home ranges can vary from 1ha to 67ha depending on the resource availability (MKES 1994).	
Life Cycle Requirements	Breeding	Breeding occurs in summer. Females become sexually active at two years and produce one young each year after a gestation period of about 35 days. Weaning occurs at 12 months and at 18 months dispersal may occur. Females breed to more than 14 years of age (Martin and Handasyde 1995)
	Foraging	Schedule 2 of State Environmental Planning Policy No. 44 (SEPP 44) - Koala Habitat Protection, supplies a list of ten (10) Koala Feed Tree Species, noting that "almost all occurrences of Koalas in NSW have been associated with the presence of one or more of these species." The nominated species are; Forest red gum (*Eucalyptus tereticornis*), Tallowwood (*E. microcorys*), Grey gum (*E. punctata*), Ribbon gum (*E. viminalis*), River red gum (*E. camaldulensis*), Broad - leaved scribbly gum (*E. haemastoma*), Scribbly gum (*E. signata*), White box (*E. albens*), Bimple box (*E. populnea*) and Swamp mahogany (*E. robusta*). Department of Planning: 1995).
	Movements	The Koala is solitary. Home range size is related to the density of occurrence of large trees, preferred feed trees and population density. Homer range can vary from several hectares to 15ha in area (Mitchell 1990).
Conservation Reserves	Billinudgel NR, Bongil Bongil NP, Border Ranges NP, Broadwater NP, Broken Head NR, Brunswick Heads NR, Bundjalung NP, Chaelundi NR, Cudgen NR, Dorrigo NP, Iluka NR, Koreelah NP, Mallanganee NP, Mebbin NP, Mt. Warning NP, Nightcap NP, Richmond Range NP, Stotts Island NR, Toloom NP, Toonumbar NP, Ukerebagh NR and Wilson NR. In NSW, Koalas have been recorded in numerous conservation reserves along the east coast and the slopes and tablelands of the Great Dividing Range (NPWS 1999).	

Threatening Processes	The most serious threat to the koala is the removal of food trees (Braithwaite 1993). The optimal habitat of this species has been mainly cleared for agriculture and forestry activities.
References	Lee A.K. and Martin R.W. 1988. The Koala a Natural History. New South Wales University Press, Kensington. Reed P.C., Lunney D. and Walker P. 1990. A 1986-1987 survey of the koala *Phascolarctos cinereus* (Goldfuss) in New South Wales and an ecological interpretation of its distribution, in A.K. Lee, K.A. Handasyde and G.D. Sanson (Eds). Biology of the Koala. pp 55-74. Surrey Beatty and Sons, Sydney. Martin R.W. and Handasyde K.A. 1995. Koala *Phascolarctos cinereus* (Goldfuss, 1817), in R. Strahan (Ed). The Mammals of Australia. pp 195-198. Reed Books, Chatswood. Mitchell P. 1990. The home ranges and social activity of koalas – a quantitative analysis, in A.K. Lee, K.A. Handasyde and G.D. Sanson (Eds). Biology of the Koala. pp 171-187. Surrey Beatty & Sons, Sydney.

Name	**Large-footed myotis** (*Myotis macropus*)	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	This species is widely but sparsely distributed in eastern and northern Australia in coastal and sub-coastal regions. This species has been redefined in a recent taxonomic revision to include two similar species in eastern Australia. *Myotis macropus* is relatively common in riparian habitat in the study region.	
Description	The species is normally grey-brown above, paler below, but the fur gets more ginger as the bats get older. The feet are exceptionally large. Head and body length is 52-56mm (Richards 1995b).	
Habitat	This species roosts in tunnels and caves, and prefers riparian habitat over 500m in length Hall and Richards (1979). It generally requires forested waterways with nearby roosting opportunities. The most significant foraging habitats for this species are streams, creeks, rivers, lagoons, lakes and other waterbodies and their banks.	
Life Cycle Requirements	Breeding/ Roosting	The Large-footed myotis has been recorded roosting in caves, mines, tunnels, bridges, buildings and dense foliage in tropical areas. Males establish territories within the colony and monopolise a cluster of females during the breeding season (Strahan 1995). This species goes into torpor during winter and utilises caves during this period which are separate from maternity caves (SFNSW 1995).
	Foraging	This species forages by making feeding passes over the surface of water bodies for small aquatic insects, including water boatmen and mayflies Vestjens and Hall (1977). It seldom occurs far from waterbodies which range from rainforest streams to large reservoirs and even brackish water (Richards 1991c).
	Movements	This species is now known to travel significant distances from roost sites in caves to forage areas. Bats from a colony at Samford near Brisbane have been observed to fly each night to feed on a Lake 10km away (Richards *pers. comm*. 1998).
Conservation Reserves	Border Ranges, Bundjalung, Nightcap, Nymboida National Parks.	
Threatening Processes	State wide threats to this species include toxic accumulation of agricultural chemicals (such as pesticides and herbicides) in body fat used during winter torpor (Dunsmore *et al* 1974), predation at roost sites from foxes (Dwyer 1964), and destruction and modification of foraging habitat.	

References	Richards, G.C. (1995). Large-footed myotis *Myotis macropus* (Morsfield 1824). In: Strahan, R. (Ed). Mammals of Australia. The Australian Museum and Reed Books Sydney Richards (1991) Yellow bellied sheath-tail bat In: Strahan, R. (Ed). Mammals of Australia. The Australian Museum and Reed Books Sydney, p.315 Hall, L.S. and Richards, G.C (1979) "Bats of Eastern Australia" Booklet No. 12. Queensland Museum, Brisbane. Strahan R. (1995) "The Mammals of Australia". Reed Books, Chatswood. Dunsmore, J.D., Hall, L.S. & Kottek, K.H. (1974). "DDT in the Bent-winged Bat in Australia". Search 5: 110-111. State Forests of NSW. (1995) "Coffs Harbour Urunga Management Area – Environmental Impact Statement. Vol C, Proposed forestry operations - Schedule 12 Fauna." SFNSW, Northern Region. Dwyer, P.D. (1964). "Fox Predation on Cave Bats". Australian Journal of Science 26: 397-98. Vestjens, W.J.M. and Hall, L.S (1977). Stomach contents of forty two species of bat from the Australasian region. Australian Wildlife Research, 4: 25-35.

Name	**Little bent-wing bat** (*Miniopterus australis*)	
Status	Vulnerable –Schedule 2 TSC Act (1995).	
Geographical Distribution	Regionally, this species is widely distributed with records from coastal districts to the Great dividing range. This species becomes increasingly coastal in the southern part of its range in eastern Australia. In north eastern NSW it occurs from the Macleay River watershed to the Hunter River. Nationally this species occurs along the coastal plains and adjacent ranges from Cape York to north east NSW and around the Hunter Valley (Strahan 1992).	
Description	This bat is chocolate brown on the upper surface, with paler fur on the underside. It is similar to M. schreibersii but tends to have lighter and more subtle shades of colour and can be distinguished by smaller size and lighter weight (Dwyer 1995b).	
Habitat	The Little bentwing bat is generally found in forested areas, particularly well timbered habitats, where it forages below and above the tree canopy (Dwyer 1995b).	
Life Cycle Requirements	Foraging	Dwyer (1991) identifies this species as a sub-canopy forager, however Strahan (1992) notes that the Little Bent-wing Bat feeds above the forest canopy in wet and dry open forest, catching insects on the wing.
	Roosting	This species roosts in caves, old mines, stormwater channels and buildings. Roost sites tend to be located adjacent to large areas of dense vegetation.
	Movements	It is known to migrate over large distances to maternity sites, apparently using different roosts for different seasonal needs (Dwyer 1991).
Conservation Reserves	Border Ranges, Broadwater, Broken Head, Bundjalung, New England, Mt. Warning, Yuraygir National Parks, Iluka and Tyagarah Nature Reserves.	
Threatening Processes	State wide threats to this species include disturbance of maternity and winter roost sites from human visitation, destruction of roost sites in caves and mine tunnels, toxic accumulation of agricultural chemicals (such as pesticides and herbicides) in body fat used during winter torpor (Dunsmore *et al* 1974), predation at roost sties from foxes (Dwyer 1964), and destruction and modification of foraging habitat, which is assumed to be forested areas and wetlands.	
References	Dunsmore, J.D., Hall, L.S. & Kottek, K.H. (1974). DDT in the Bent-winged Bat in Australia. Search 5: 110-111. Dwyer, P.D. (1995b) Little bent-wing bat (Miniopterus australis). In The Australian Museum Complete book of Australian Mammals. R. Strahan (ed). Surrey Beatty and Sons, Sydney. Dwyer, P.D (1991b) Little bent-wing bat (Miniopterus australis). In The Australian Museum Complete book of Australian Mammals. R. Strahan (ed). Angus and Robertson, Sydney. Pp. 338-339. Dwyer, P.D. (1964). Fox Predation on Cave Bats. Australian Journal of Science 26: 397-98. Strahan R. (1992) Encyclopedia of Australian Animals: Mammals. Angus and Robertson Publishers, Sydney.	

Name	**Masked Owl** (*Tyto novaehollandiae*)

Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	Closely resembles the Barn owl from which it is not easily distinguished visually. Distinguishing characteristics are fully feathered legs as opposed to the sparsely feathered legs of the Barn owl.	
Description	The Masked owl occurs along all of coastal and sub coastal Australia except for a small section of the Western Australian coastline.	
Habitat	The southern subspecies novaehollandiae occurs from Cooktown in north-eastern Queensland, around the southern coast of Australia to the Pilbara in Western Australia (Schodde and Mason 1980). Although it occurs mainly on the coast, records also occur from the Nullabor Plain and up to 1000km inland along watercourses (Garnett 1992).	
Life Cycle Requirements	Forage	The preferred foraging areas of this species appear to be in open forests with a very sparse or grassy ground cover near creeks or small drainage lines, and near the ecotones between forest and natural or man made clearings (Kavanagh and Murray 1996). The diet of the Masked owl in disturbed environments has been observed to consist mainly of introduced species of small terrestrial mammals, particularly *Rattus rattus*, although birds have also been taken (Kavanagh and Murray 1996). In more intact forest, this species has been observed to feed most frequently on the Bush rat (*Rattus fuscipes*), Brown antechinus (*Antechinus stuartii*) and Dusky antechinus (*Antechinus swainsonii*) (Kavanagh 1996).
	Nesting	Nesting occurs at any time of the year with nests in deep vertical tree hollows (tall Eucalypts are favoured) or ledges in caves. Nests are prepared by the male and used for successive years. Masked owls roost during the day inside large Eucalypt hollows or among dense foliage and in caves (Debus 1993).
	Movements	This owl can range over an area of at least 200-300 hectares (and may range up to 3 km from any detection point). Recent studies by Kavanagh and Murray (1996) suggest that the Masked Owl may forage over a much larger area (over 1000ha) that may contain a mosaic of relatively undisturbed and disturbed environments.
Conservation Reserves	Barrington Tops, Border Ranges, Bundjalung, Dorrigo, Gibraltar, Guy Fawkes, Nightcap, Werrikimbe and Yuraygir National Parks. Limeburners Creek Nature Reserve.	
Threatening Processes	Threats to this species include loss of habitat and vehicle strike.	
References	Debus, S.J.S. (1993). The mainland Masked Owl *Tyto novaehollandiae* A Review. *Aust. Bird Watcher,* 15, 168-191. Garnett, S (1992). Threatened and Extinct Birds of Australia. RAOU Report 82. Kavanagh, R.P. (1996). The Breeding biology and Diet of the Masked owl *Tyto novaehollandiae* Near Eden, New South Wales. EMU, 96, pp 158-165 Kavanagh, R.P. and Murray, M. (1996). Home range, Habitat and Behaviour of the Masked Owl *Tyto novaehllandiae* near Newcastle, New South Wales. Emu, 96. Pp250-257 Schodde, R and Mason, I.J. (1980) Nocturnal Birds. Lansdowne Editions, Melbourne.	

Name	**Osprey** (*Pandion haliaetus*)	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	Most of the Australian coastline in suitable but limited habitat (Marchant and Higgins 1993).	
Description	Dark brown above with a mainly white head, neck and underside. A distinctive bold black stripe passes through the eye. A variable dusky breast band may be present. Length is 50 to 60cm, wingspan 145-170cm (Marchant and Higgins 1993).	
Habitat	Ospreys require adequate supplies of fish, expanses of open water, tall trees for use as feeding bases, nest sites and vantage points. The preferred habitats are coastal lakes, rivers, estuaries, oceans and beaches. Offshore islands are utilised, and this species may range inland along large rivers, particularly in the northern part of the country. Extensive sheets of clear open water, fresh, brackish or saline are needed for fishing.	
Life Cycle Requirements	Breeding/ nesting	This species breeds mainly on coasts and islands; nesting near the ocean or other large waterbodies for fishing, in open position for access and visibility, and in site protected from predators be height or surrounding water; often in a prominent position on rocky headlands, stacks, cliffs, palm trees, or in tall dead trees or on artificial platforms (Marchant and Higgins 1993).
	Foraging	Ospreys are specialist predators of live fish, taking prey often by submergence to a depth of one metre.
	Movements	The Osprey is mainly a sedentary species but forages over a wide area during the non breeding season. It remains faithful to nest sites and nest-site territories over successive years (Marchant and Higgins 1993).
Conservation Reserves	Broadwater, Broken Head, Bundjalung, Hat Head, Yuraygir National Parks, Limeburners and Iluka Nature Reserves.	
Threatening Processes	The main threats to the survival of this species are the loss of suitable feeding, nesting and roosting habitat and disturbance of nest sites by humans.	
References	Marchant, S. and Higgins, P.J. (eds) (1993) Handbook of Australian, New Zealand and Antarctic birds. Vol. 2 Raptors to Lapwings. Oxford University Press, Melbourne.	

Name	**Square-tailed kite** (*Lophoictinia isura)*	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	This species is widespread in its distribution throughout Australia but is uncommon in the arid shrublands and grasslands of central Australia (Debus and Czechura 1989).	
Description	The Square-tailed kite closely resembles several other hawks in appearance. The tail is long and broad with angular corners and shadowy grey and black bars below. At rest the wingtips extend past the tail. Other features include: pale, dark streaked head, slight crest, rufous dark-streaked body, blackish back, fawn mark on shoulder.	
Habitat	Habitat utilised is open forests and woodlands, particularly those on fertile soils and with abundant passerines. This species may range into open habitats nearby but not extensive treeless regions (Marchant and Higgins 1993).	
Life Cycle Requirements	Forage	The Square-tailed kite predates mainly on the fledglings and nestlings of passerines, lizards and insects. Kites usually forage singly among forests and woodlands at or just above the canopy.
	Nesting	Breeding occurs in Spring. Nests are built high in trees, typically on a large horizontal bough of a Eucalypt and 12 to 26m from the ground. Two or three eggs are laid, these hatch in 37 to 42 days and fledging takes 8 to 10 weeks (Marchant and Higgins 1993).
	Movements	The species is migratory through much of it's range and it is a spring/summer breeding migrant in the south-east, east and south-west of Australia (Marchant and Higgins 1993).
Conservation Reserves	Bundjalung and Gibraltar Range National Parks.	
Threatening Processes	Habitat destruction is the main threat to the survival of the Square-tailed kite, as at least half of the area of open dry eucalypt forest and woodland in southern and eastern Australia has been cleared for settlement or agriculture.	
References	Debus, S.J.S and Czechura, G.V. (1988). The Square-tailed Kite *Lophoictinia isura*: a review. Australian Birdwatcher, 13, 81-97. Marchant, S. and Higgins, P.J. (eds) (1993) Handbook of Australian, New Zealand and Antarctic birds. Vol. 2 Raptors to Lapwings. Oxford University Press, Melbourne.	

Name	**Squirrel glider** (*Petaurus norfolcensis*)	
Status	Vulnerable –Schedule 2 TSC Act (1995).	
Geographical Distribution	The range of the Squirrel glider has, in the past, been considered to lie to west of the Great Dividing Range and extend from western Victoria to northern Queensland (Strahan 1995). However recent records would tend to suggest that the Squirrel glider is also present in suitable habitat on the coastal lowlands of NSW and Queensland.	
Description	The Squirrel glider is similar to the Sugar glider but has a longer and more pointed face, longer and narrower ears and bushier tail and the facial markings often more distinct (Suckling 1995)..	
Habitat	The Squirrel glider occupies wet and dry sclerophyll forests (Smith & Winter 1984) with open dry sclerophyll forests regarded as optimum habitat (Tyndale-Biscoe & Calaby 1975). Although Davey (1984) has found Squirrel gliders in rainforest, it is unlikely that they occur extensively in this habitat type.	
Life Cycle Requirements	Foraging	Critical habitat consists of mixed stands of Eucalypts which invariably include gum barked species and high proportion of winter nectar producing trees. Mixed species Eucalypt forests may provide a more reliable year round food resource than do less diverse forests. This may attribute to the greater availability of microhabitats for invertebrates and to the availability of nectar for a greater part of the year.
	Nesting	Dens or hollows in trees are another critical habitat component and Squirrel gliders require several hollow trees within a home range. Dens are communal and are occupied by 2-9 adults (Quin 1993).
	Movements	In Victoria (Traill & Coates 1993) have estimated the home range of the Squirrel glider to be 13 hectares with an average density of 0.4 individuals/hectare. The Squirrel glider generally has a higher density than the Sugar glider and as a result where the two occur together the Squirrel glider is usually the more common (Suckling 1984).
Conservation Reserves	Border Ranges, Bundjalung, Mt. Warning, new England, Washpool, Werrikimbe, Yuraygir National Parks. Limeburners Creek Nature Reserve.	
Threatening Processes	Threats to Squirrel glider populations are likely to include: clearing of habitat *which* provides critical habitat components, particularly older Eucalypt stands which provide a large number of hollow bearing trees. Domestic animals, particularly cats are a major threat. Squirrel glider kills have been observed where motor vehicles pass through or near habitat (based on AKF 1995).	
References	Davey, S.M. (1984). Habitat preferences of arboreal marsupials within coastal forests in Southern NSW. In: Smith, A.P. and Hume, I.D. (Eds.) *Possums and Gliders*. Surrey Beatty and Sons, Chipping Norton, Sydney, pp. 509-516 Tyndale-Biscoe, C,H and Calaby, J.H. (1975) Eucalypt forests as refuges for wildlife. Australian Forestry 38, 117-133.	

	Quin, D.G. (1993). Socio-ecology of the Squirrel Glider and the Sugar Glider. PhD Thesis, University of New England, Armidale. Strahan R. (1995). The Mammals of Australia. Reed Books, Chatswood. Suckling, G.C. (1984). Population ecology of the sugar glider, *Petaurus breviceps*, in a system of fragmented habitats. *Aust. Wild. Res.* 11: 49-75.Traill, B.J. and Coates, T.D. (1993). Field Observations on the Brush-tailed Phascogale (*Phascogale tapoatafa*) Marsupalia: Dasyuridae. *Australian Mammalogy*, 16: 61-65.

Name	**Stephens' banded snake** (*Hoplocephalus stephensii*)	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	On the coast and Great Dividing Range from Gosford in NSW to Kroombit Tops is southern Queensland (Wilson and Knowles 1988).	
Description	A medium sized (65cm) nocturnal semi-arboreal snake. The dorsal surface is usually brownish to yellowish and can have the colour pattern of broad dark cross bands, but is may lack this pattern entirely. The head is black with a brown or creamy patch either side of the nape. The lips are barred with black and cream (Cogger 1994).	
Habitat	Stephens' banded snake inhabits dry and moist hardwood forest and rainforest in coastal and near coastal areas (Cogger 1992; Wilson and Knowles 1988). It also occurs in rocky outcrops, particularly those comprising exfoliated granite (Wilson and Knowles 1988; Ehmann 1992) and occasionally sandstone in the southern parts of its range (Wells *et al* 1988). The key elements of the preferred habitat for Stephens' banded snake are a dense understorey and canopy structure which are required for foraging and movement.	
Life Cycle Requirements	Forage	Hollows, tree scars and loose bark in mature or senescent trees, and to a lesser extent large hollow logs, are required for foraging. It feeds in the canopy as well as on the ground. Prey is lizards and small mammals, including bats, that occur in the tree canopy or in its roost site in trees (Ehmann 1992).
	Breeding	Breeding habitat is analogous with sheltering habitat. Females appear to reproduce every two years, producing a litter of 3 to 8 young in December to February.
	Shelter	Hollows, tree scars and loose bark in mature or senescent trees, and to a lesser extent large hollow logs, are required for sheltering sites.
	Dispersal	Not known.
Conservation Reserves	Mt. Warning, Dorrigo, Nymboida, Gibraltar Range and Border Ranges National Parks	
Threatening Processes	Stephens' banded snake is threatened by habitat loss brought about by logging and Clearing Rainforest, Dry hardwood forest and Moist hardwood forest.	
References	Cogger, H. (1992). Reptiles and Amphibians of Australia. Reed International Books. Cogger, H. (1994) Reptiles and Amphibians of Australia. Reed International Books. Ehmann H., (1992). Encyclopaedia of Australian Animals. Reptiles. Angus and Robertson 495pp. Wells, R.W., Wellington, C.R. & Williams D.J (1988) Notes on Stephens' Banded Snake *Hoplocephalus stephensii* Krefft, 1869. The Australian Herpetologist No. 512. Wilson, S.K. and Knowles, D.G. (1988) Australia's reptiles: A photographic Guide to the terrestrial Reptiles of Australia. Collins, Sydney.	

Name	**Wallum froglet** (*Crinia tinnula*)

Status	Vulnerable – Schedule 2 TSC Act (1995)	
Geographical Distribution	Strictly coastal from Tin Can Bay in Queensland to Wyong in NSW. Distribution along this strip is not continuous.	
Description	Similar in most respects to the Common Eastern froglet (*Crinia signifera*) from which it differs in having a median line of white dots on the throat, a more pointed snout and a distinctive call.	
Habitat	In NSW this species is most often recorded from coastal heath sites and Paperbark swamps. In Queensland this species is associated with Paperbark swamps on coastal alluvial sands (Straughan and Main 1966)	
Life Cycle Requirements	Breeding	Breeding occurs in ephemeral sites such as larger puddles in heath or puddles in watercourses and creek-lines (White 1995). Breeding also occurs on the periphery of permanent wetlands and drains (J. Richard pers. obs.)
	Foraging	The Wallum froglet appears to feed on small arthropods in sedges and grasses around the fringes of wetland or wet heathland sites (AMBS 1995).
	Dispersal	The Wallum froglet will disperse into highly disturbed habitats such as grasslands during flood events (J. Richard pers. obs).
Conservation Reserves	Broadwater NP, Bundjalung NP, Yuraygir NP, Myall Lakes NP, Tyagarah NR, Broken Head NR.	
Threatening Processes	The Wallum froglet is threatened by the loss of coastal wetland and wet heath habitats, and declines in the quality of water entering such habitats.	
References	Australian Museum Business Services (1995). Urbenville Management Area - Fauna Impact Statement Vol. D. State Forests of N.S.W., Pennant Hills. Straughan, I.R. and Main, A.R. (1966). Speciation and polymorphism in the genus Crinia (*Anura Leptodactylidae*) in Queensland. Proceedings of the Royal Society of Queensland, 78, 11-28. White (1995) *Crinia tinnula* distribution extension. Frogcall. Newsletter of the NSW Frog and Tadpole Study Group.	

Name	**Yellow-bellied glider** (*Petaurus australis)*	
Status	Vulnerable – Schedule 2 TSC Act (1995)	
Recover Plan	NSW National Parks and Wildlife Service (2003). Recovery Plan for the Yellow-bellioed Glider (*Petaurus australis*). NSW National Parks and Wildlife Service, Hurstville.	
Geographical Distribution	The Yellow-bellied glider has a patchy distribution along the east coast and adjacent ranges of Australia from south-eastern South Australia to North Queensland. The southern subspecies *P. australis australis* occurs along the east coast of Australia to central Queensland and the northern subspecies *P.a. reginae* occurs in two small populations in North Queensland (Russell 1995).	
Description	Grey fur above, whitish to orange fur underneath and large bare ears. Individuals have a gliding membrane that extends from the wrists to the ankles. The head and body is much longer than that of the Sugar or Squirrel glider but shorter than in the Greater glider. Tail is fluffy and about one and a half times the length of its body and relatively much longer than in other gliders. Males and females are similar in appearance.	
Habitat	Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows and yearround food resources are available from a mixture of eucalypt species (Goldingay & Kavanagh 1991; Tanton 1994; Craig 1985).	
Life Cycle Requirements	Breeding	A single young is born between May and September, with the variation likely to reflect the abundance of food resources (Goldingay & Kavanagh 1991). The yound remains in the pouch for up to 100 days after which time it is left in the nest while the mother forages. After leaving the pouch, the young is suckled for up to 60 days (Russell 1995).
	Foraging	Primarily made up of eucalypt nectar, eucalypt sap, honeydew, manna and invertebrates found under decorticating bark and pollen (Goldingay & Kavanagh 1991). Incises the bark of eucalypts to obtain sugar-rich sap.
	Dispersal	Homerange between 30 and 65 ha (Goldingay & Kavanagh 1991) usually occurs in densities of 0.05-0.14 individuals per ha (Russell 1995). This is a gregarious species and lives in family groups of between 3 (in southern parts of its range) and 6 (in the north).
Conservation Reserves	Yellow-bellied glider occurs in various conservation reserves along the east coast and adjacent inland areas in NSW (NPWS 1999).	
Threatening Processes	The loss and fragmentation of habitat through clearing and the activities associated with clearing is a threat as the logging of oldgrowth elements removes the number of hollow bearing trees available for nesting. Inappropriate fires regimes reduces the availability of food resources and isolates populations making them vulnerable. Predation by feral carnivores such as foxes and cats is also a threat.	

References	Craig, S.A. 1985. Social organization, reproduction and feeding behaviour of a population of Yellow-bellied Glider *Petaurus australis* (Marsupalia: Petauridae). *Australian Wildlife Research* 12:1-18. Goldingay, R.L. and Kavanagh, R.P. 1991. The Yellow-bellied Glider: a review of its ecology, and management considerations, in D. Lunney (Ed.) Conservation of Australia's Forest Fauna. Royal Zoological Society of NSW, Mosman. Russell, R. 1995. Yellow-bellied Glider *Petaurus australis* Shaw 1791, in R. Strahan (Ed.) The Mammals of Australia. Reed Books, Chatswood. Tanton, M.T.T. 1994. Fauna Impact Statement. Proposed Forestry operations in the Eden Management Area. Environmental Impact Statement. Vol. B: Appendix 1. State Forests of NSW, Sydney.

Appendix D – Engineering Report

Proposed Subdivision

Coffs Harbour City Council

Rothwell Boys Pty Ltd

Lot 1 DP 725785

The Glades, Moonee Beach NSW

March 2019

Engineering Infrastructure Report

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Contents

1. Background 1

2. Site Context 2

2.1 Existing Site 2
2.2 Proposed Development 3

3. Infrastructure and Services 4

3.1 Traffic 4
3.2 Road Network 5
3.3 Footpaths and Cycleways 6
3.4 Earthworks 6
3.5 Trunk Water Supply 8
3.6 Trunk Sewer 8
3.7 Water Reticulation 8
3.8 Sewer Reticulation 9
3.9 Electricity and Telecommunications 10

4. Stormwater Management 11

4.1 Site Description 11
4.2 Contributing Catchments 12
4.3 Contributing Flows 12
4.4 Stormwater Quantity and Detention 13
4.5 Flooding 13
4.6 Proposed Drainage Network 13
4.7 Stormwater Quality 14
4.8 Soil and Water Management 17

Appendices 19

Figures

Figure 1: Subject Site 2
Figure 2: Site Plan 3
Figure 3: Characteristics of Roads in Residential and Industrial Road Networks 5
Figure 4: Low Density Residential Dwellings 5
Figure 5: Acid Sulfate Soils 7
Figure 6: Proposed Water Reticulation 9
Figure 7: Proposed Sewer Reticulation 10
Figure 8: Subject Site 11
Figure 9: Proposed Drainage Network 14
Figure 10: MUSIC Modelling Results 17
Figure 11: MUSIC Model Diagram 18

Appendices

A. Engineering Drawings
B. MUSIC Sub-catchments and Bioswales

1. Background

Resource Design and Management Pty Ltd (RDM) has been engaged to provide an engineering assessment and report to support the proposed development by Rothwell Boys Pty Ltd.

The proposed development entails the subdivision of the site to create 31 residential lots.

The development site comprises a portion of the property located within the approved residential subdivision known as The Glades Estate, formally described as Lot 1 DP 725785.

2. Site Context

2.1 Existing Site

The subject site comprises an area of approximately 16,800m^2 within the approved Glades Estate (MP 06_0143). The site is a portion of the residual lot created by the Glades Estate subdivision. The subject site is currently vegetated and treed.

Services and easements for services are located to the west of the site adjacent the Pacific Highway through the Glades Estate. The easements provide for trunk services (including electricity, telecommunications, water and sewer) for the Glades Estate and future residential developments to the south.

The site is bounded to the east and west by future residential lots of the Glades Estate, and to the north and south by future public reserve which falls to Moonee Creek to the north, and a minor tributary of Moonee Creek to the south.

The site falls from RL8.5m in the centre of the site and falls to the south to RL3.5m (an average gradient of 10%), and falls to the north to RL5.0m (an average gradient of 2.5%). Existing stormwater runoff is directed to Moonee Creek to the north, and a natural watercourse to the south where it eventually contributes to the Moonee Creek system.

Figure 1: Subject Site

2.2 Proposed Development

The proposed development provides for a residential subdivision creating 31 residential lots with an average area of 560sq.m.

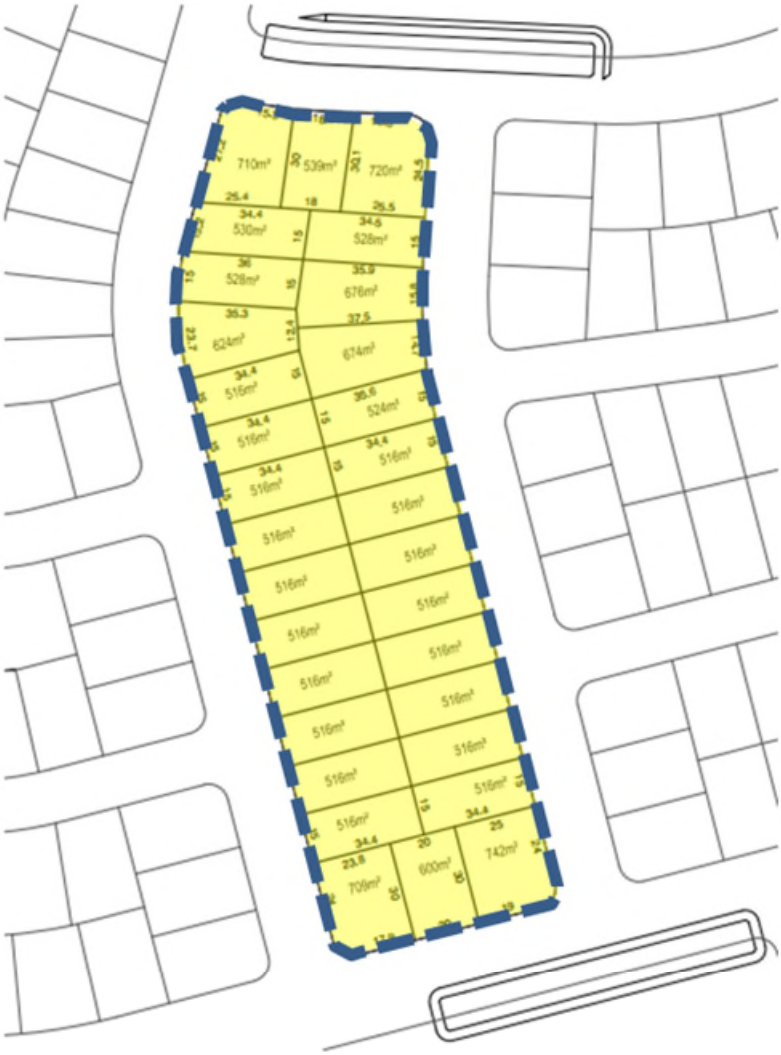


Figure 2: Site Plan

The proposed development comprises bulk earthworks, integration of the proposed lots with the surrounding road and footpath network approved for the Glades Estate, extension of the proposed Glades Estate Council water and sewer infrastructure to service the proposed residential lots, the provision of electricity and telecommunication infrastructure, and the integration of the proposed Glades Estate stormwater drainage network, including provision for stormwater detention and stormwater quality improvement.

The following section provides detail of the proposed engineering infrastructure required to adequately service the proposed development.

3. Infrastructure and Services

3.1 Traffic

The site will have vehicular access to the surrounding road network proposed by the Glades Estate development. The east and west roads (Road 5 and Road 9) will be a 7 metre wide formed Council road within a 20 metre wide road reserve. This conforms to Coffs Harbour City Council's (CHCC) classification of a local road. According to CHCC development specifications a designated local road can have a maximum traffic volume of 2,000 vehicles per day. Refer to Figure 3 below.

The road directly to the north of the site (Road 1) is considered a local road, however, due to this road being a perimeter road for bushfire fighting purposes, the road will be an 8metre wide formed Council road within a 20metre wide road reserve.

The road directly to the south of the site (Road 1) is considered a collector road, with a 9metre wide formed Council road within a 24metre wide road reserve.

Road Type	Max Traffic Volume (vpd)(1)	Max Speed(2) (km/h)	Carriageway Width (m)(3)		Parking Provision Within Road Reserve	Kerbing(4)	Footpath Required	Bicycle Path Required	Verge Width (each side)
			Min	Max					
Local Street	2,000	40	7.0	8.0	Carriage way	As above	1.2m wide(7)	No	Min 4.0m
Collector Street	6,000 (with access to lots)	50(8)	9.0 (10)	11.0	Carriage way or indented parking	Rollover 9.0m(9) SA 11.0m	1.2m wide both sides	No 1.0m gap in proturb for cyclist(10)	Min 4.0m(14)

NOTES:

(7) A minimum of one footpath on one side of the street to be constructed initially with provision to construct a second footpath if required by residents in the future.
(8) Reduced speeds are required at designated pedestrian/bicycle crossing. A speed of 20km/h is desirable, achieved by the road design principles outlined in AUS-SPEC.
(9) Barrier kerbing may be used if required for drainage purposes without reducing the carriageway width.

(10) On bus routes, 9.0m travelled way with 2.0m wide indented parking and bus bays defined by kerbed protuberances. Where bicycle way can be anticipated, a bicycle lane is required along the kerb.
(14) Provide adequate road reserve width for widening of carriageway for future bus route if required.

Source CHCC AUS-SPEC 2008

Figure 3: Characteristics of Roads in Residential and Industrial Road Networks

Based on the NSW Roads and Maritime Service (RMS) Technical Direction – Guide to Traffic Generating Development, Updated Traffic Surveys (August 2013), residential dwellings generate 7.4 daily vehicle trips per dwelling, and 0.78 weekday peak hour trips per dwelling. Refer Figure 4.

Rates

Daily vehicle trips = 10.7 per dwelling in Sydney, 7.4 per dwelling in regional areas
Weekday average evening peak hour vehicle trips = 0.99 per dwelling in Sydney (maximum 1.39), 0.78 per dwelling in regional areas (maximum 0.90).
Weekday average morning peak hour vehicle trips = 0.95 per dwelling in Sydney (maximum 1.32), 0.71 per dwelling in regional areas (maximum 0.85).
(The above rates do **not** include trips made internal to the subdivision, which may add up to an additional 25%).

Source RMS

Figure 4: Low Density Residential Dwellings

The proposed 31 residential dwellings will produce 230 vehicle movements per day, and 24 vehicle movements during peak hour.

The expected traffic generated by the residential development, combined with the vehicle usage generated by the Glades Estate, will not generate traffic volumes sufficient to warrant a change to the local / collector road designations. It is considered that the additional traffic volumes generated by the proposed development can be satisfactorily catered by the Glades Estate road network.

The proposed development does not propose any alteration to the approved Glades Estate layout. Intersections shall comply with Safe Intersection Sight Distance as per the approved Glades Estate intersection locations.

3.2 Road Network

The development proposes to provide a Council road network to service the proposed dwellings. The road will be a flexible pavement with an asphalt wearing course. The pavement thickness will be designed in accordance with Council requirements during the detailed design phase.

The proposed roads will be constructed to local road standard, being 7m wide carriageway within a 20m wide road reserve.

The perimeter road will have 8m wide carriageway within a 20m wide road reserve to comply with Planning for Bush Fire Protection requirements.

The collector road will have 9m wide carriageway within a 24m wide road reserve.

All roads will be 2-way, 3% crossfall with roll kerb and gutter on each side of the road.

The proposed road network will have a minimum longitudinal gradient of 0.5% and will not exceed 16%. Access gradients to each lot will not exceed 14%.

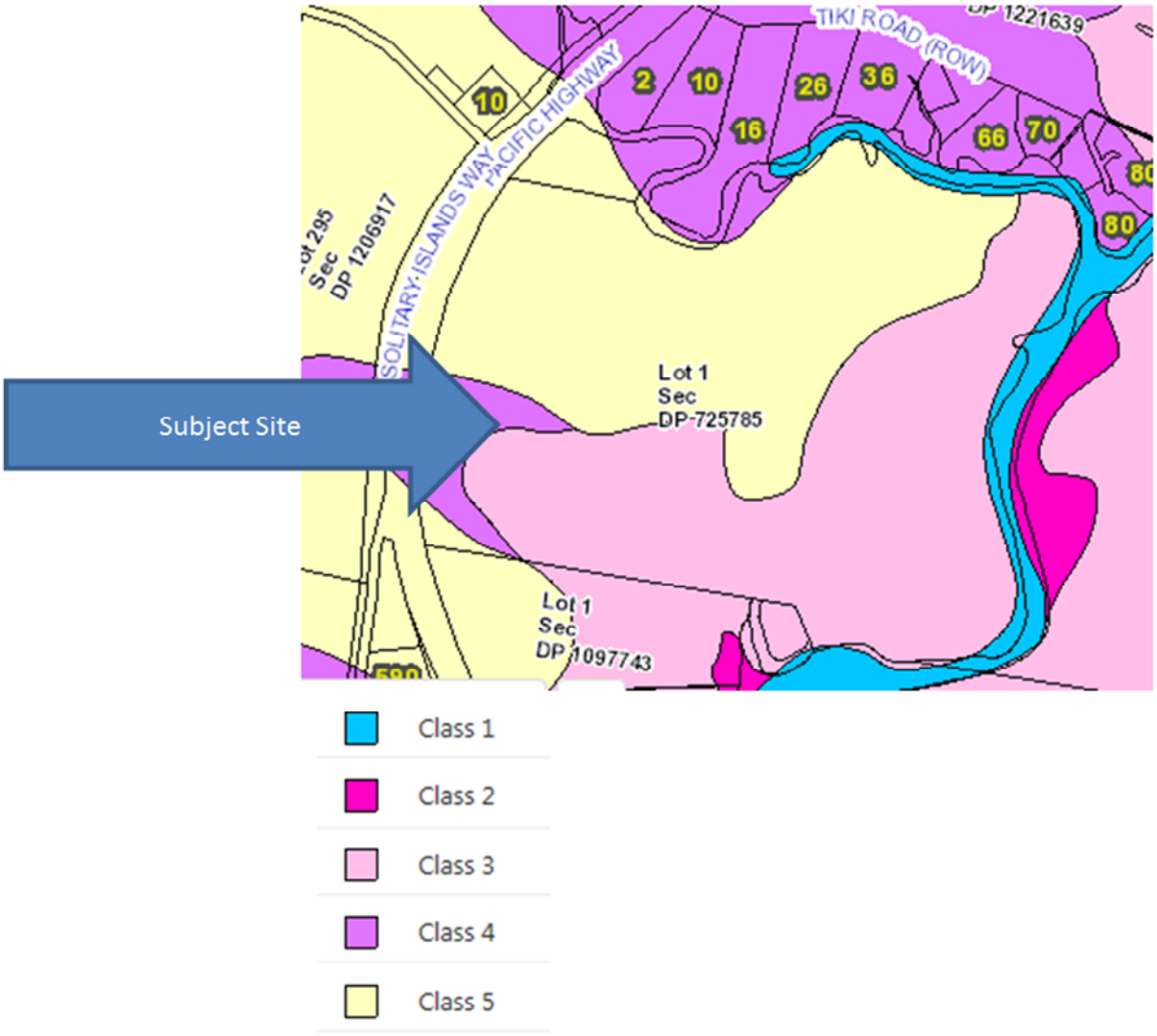
3.3 Footpaths and Cycleways

A proposed footpath and cycleway network exists within the surrounding road network approved as Major Project 06_0143. The proposed development will be serviced by the proposed path network within the immediately surrounding road network.

3.4 Earthworks

A geotechnical investigation will be undertaken to inform the detailed design of the proposed development. The investigation will inform the soil types, strengths, stability, or the presence of hard rock or groundwater levels present on the site. The geotechnical results will determine the road pavement type and thickness, and building foundation requirements.

The site is identified as having potential acid sulfate soils. Refer Figure 5 below.



Source CHCC Mapping

Figure 5: Acid Sulfate Soils

It is anticipated that an Acid Sulfate Management Plan will be required for the site. There is risk that site excavation services and utilities, roads, and building footings could expose acid sulfate soils. The Acid Sulfate Management Plan will include a remediation plan should acidic soils be disturbed.

The proposed 31 additional lot development has sought to provide an integrated balanced cut/fill within the entire Glades Estate site. Preliminary calculations suggest that a total cut of approximately 4,700m^3 is designed for a total fill of approximately 12,200m^3. This leaves a shortfall of 7,500m^3 which will be sourced from within the remainder of the Glades Estate development.

The proposed development will have a maximum cut depth of 1m and a maximum fill depth of 2.5m to ensure the final ground surface is above the Flood Planning Level. The lower lying area of the site will be at or above existing natural levels to minimise any impact by acidic soils and groundwater levels.

3.5 Trunk Water Supply

A trunk water main is proposed to be constructed within the proposed collector road from Bucca Road to the north, to connect to the constructed trunk water main in Moonee Creek Drive to the south. The size of the watermain is to be confirmed by Coffs Harbour City Council.

The proposed water trunk main will service the Glades Estate (including this development) and the remainder of the Moonee Urban Release Area to the south.

3.6 Trunk Sewer

The Glades Estate has proposed a number of sewer pump stations situated throughout the site to receive sewer from the estate. The pump stations will operate collectively to transfer sewer to the Sewage Reclamation Plant in Bucca Road.

The detailed design of the sewer pump stations and associated sewer rising mains will provide for the additional 31ET load generated by the development.

3.7 Water Reticulation

The approved Glades Estate development has made provision for a 100mm DIA water main located within all the roads surrounding the site. The development proposes to realign these water mains to provide efficiency of the overall design. The proposed modifications are minor and do not impact the functionality of the original design intent.

The development proposes to utilise these water mains for the provision of house services to each lot.

The water main and water services will be constructed in accordance with Coffs Harbour City Council requirements. Fire hydrants are to be installed to comply with Council requirements.

The proposed water reticulation for the development is shown below as Figure 6.

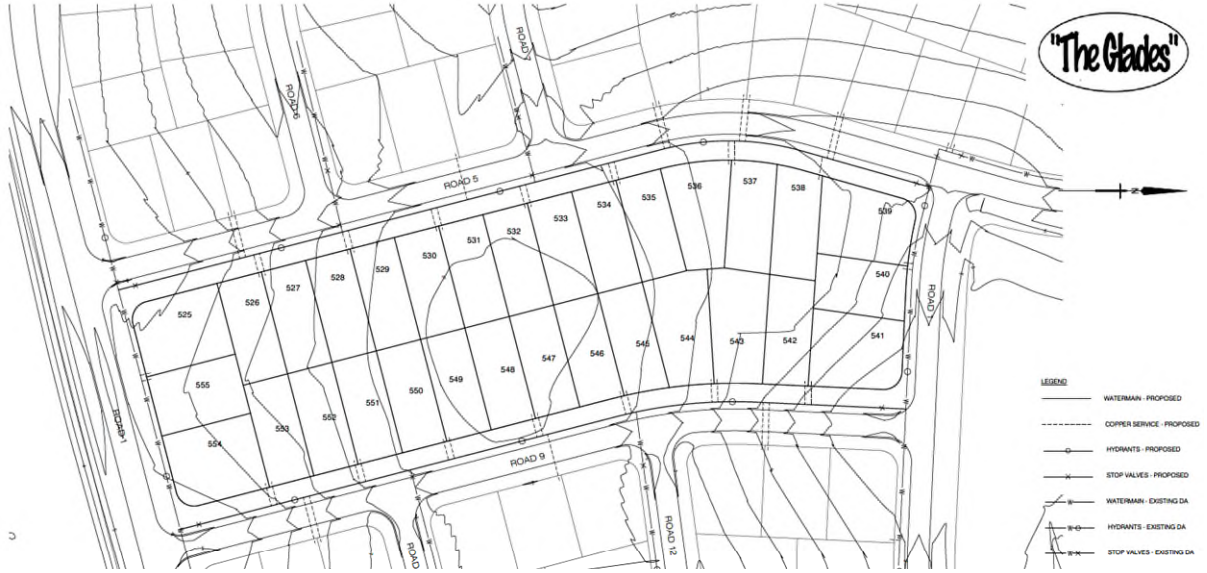


Figure 6: Proposed Water Reticulation

3.8 Sewer Reticulation

The development proposes to connect the internal site sewer to the approved Glades Estate sewer network. Minor redirection of the approved sewer layout will occur to provide for efficient sewer network design. The site is located adjacent to two proposed sewer pump stations affecting only minor localised increased loads to the sewer network.

Detailed design of the combined sewer network will ensure that appropriate pipe diameters and gradients are specified.

There is currently no existing recycled water reticulation in the vicinity of the site. The proposed development does not make provision for any future reticulated recycled water.

The proposed sewer reticulation for the development is shown below as Figure 7.

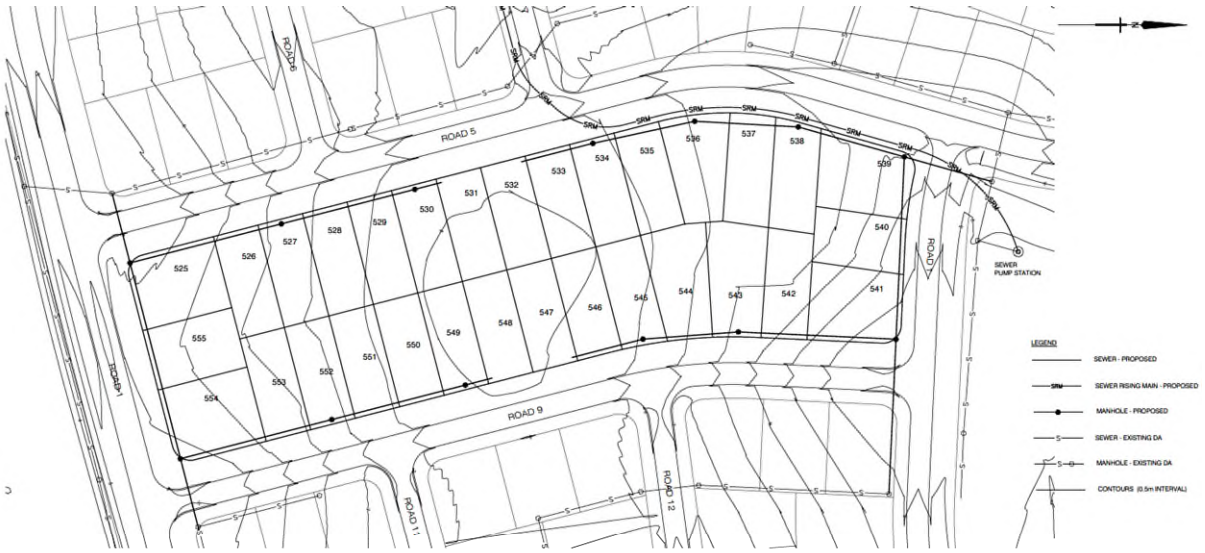


Figure 7: Proposed Sewer Reticulation

3.9 Electricity and Telecommunications

Electricity and telecommunications networks are required for the surrounding Glades Estate. Detail design of the electrical and telecommunications networks will determine the effects of additional loads on the existing systems, and any potential upgrades of existing infrastructure to cater for the additional loads.

4. Stormwater Management

4.1 Site Description

The subject site comprises an area of approximately 16,800m^2 within the approved Glades Estate (MP 06_0143). The site is a portion of the residual lot created by the Glades Estate subdivision. The subject site is currently vegetated and treed.

The site falls from RL8.5m in the centre of the site and falls to the south to RL3.5m (an average gradient of 10%), and falls to the north to RL5.0m (an average gradient of2.5%). Existing stormwater runoff is directed to Moonee Creek to the north, and a natural watercourse to the south where it eventually contributes to the Moonee Creek system.

Figure 8: Subject Site

4.2 Contributing Catchments

The site is located on a hill crest within the Glades Estate. The northern portion of the site falls north towards Moonee Creek, and the southern portion of the site falls to the south.

The surrounding Glades Estate road and drainage network directs stormwater away from the site. It is considered that there is no external catchment contributing to the site.

The landform of the proposed development directs runoff from the site to the surrounding road and drainage network, where, after treatment it is discharged to receiving waters.

4.3 Contributing Flows

Pre-development flows were determined using the kinematic wave equation.

Analysing the development site only, the catchment area of 16,800m^2 was determined to have an impervious area of 10%, flow length of 110m, assumed retardance of 0.35, and slope of 5%. Pre-developed flows for the development site were calculated as:

293L/s for 20%AEP, tc= 24minutes

686L/s for 1%AEP, tc= 19minutes

Post-development flows utilising the kinematic wave equation were determined as follows:

For the development site only, with 50% impervious area, flow length of 110m, assumed retardance of 0.21, and a slope of 3%, the post-developed flows for the development site are calculated as:

363L/s for 20%AEP, tc= 20minutes

861L/s for 1%AEP, tc= 15minutes

The assumed impervious area of 50% is consistent with an urban residential area for which this catchment is zoned.

The urbanisation of the site results in an approximate 25% increase to peak flow rates generated by the site. The detailed design of the stormwater drainage network will cater for urbanisation flows generated by the site and surrounding Glades Estate.

4.4 Stormwater Quantity and Detention

The site's location near to the catchment outlet suggests that site peak discharges occur on the rising limb of the hydrograph for the overall Moonee Creek catchment and that detention of flows from the site may adversely impact on the peak catchment flows by releasing water closer to the peak which would otherwise have been released earlier in the flood event. Consistent with the surrounding Glades Estate development, there is no stormwater detention system proposed for the site's generated stormwater discharge.

Detailed design of the proposed drainage network will include a detailed analysis of the existing drainage network to ensure that all council requirements with respect to urban drainage are met.

4.5 Flooding

The proposed 31 lot development is within the study area of the flooding Assessment prepared by Martens (2018) for the Glades Estate. The proposed development does not impact on the modelled flood terrain, and the lots are located above the Flood Planning Level (FPL) determined for the Glades Estate by the Martens report as shown on Drawing PS01-A050.

4.6 Proposed Drainage Network

A conceptual design for the proposed drainage network for the development has been prepared for the proposed site. The design intent is outlined below:

- The proposed road and western footpath are to convey overland flow designed to cater for 1%AEP storm events.
- All overland flow routes to comply with Council's velocity / depth requirements.
- Each dwelling will direct roof and surface water to the road kerb to be conveyed by the road drainage network.
- Each urban sub-catchment has had the impervious area calculated from the proposed site plan, and an assumed 250m^2 roof area. Generally, each dwelling catchment is between 40% to 50% impervious.
- Detail design of the stormwater system will consider sensitivity analysis of discharging to flood affected tailwater.

Figure 9: Proposed Drainage Network

4.7 Stormwater Quality

The Glades development proposes to construct bioswales around the perimeter of the development area to treat stormwater runoff to meet stormwater quality targets. A new stormwater quality assessment was undertaken to include the additional proposed residential lots, and to assess the altered earthworks and contributing catchments.

Coffs Harbour City Council's Water Sensitive Urban Design Policy has set objectives for the improvement of stormwater quality for new developments. The specified stormwater quality objectives are:

- 80% reduction in the average annual total suspended solids load
- 60% reduction in the average annual total phosphorus load
- 45% reduction in the average annual total nitrogen load
- 90% reduction in the average annual gross pollutant load

Alternatively, the Handbook of Stormwater Drainage Design referred to by Coffs Harbour City Council's Water Sensitive Urban Design Policy requires that post-development stormwater quality is controlled to pre-development conditions by achieving neutral or beneficial effect (NorBE) on the receiving environment.

Urbanisation of the subject site will generate additional pollutant loads. A MUSIC model has been developed to determine the treatment measures necessary to meet Council's stormwater quality

targets. We have adopted the NorBE target for the site development.

Coffs Harbour City Council MUSIC parameters were assigned to the model via the MUSIC-link portal. The MUSIC-link Validation Report is provided as an appendix to this report.

Bioswales are proposed to treat each contributing catchment of the Glades estate. Each subcatchment has been specified a pollution generation rate based on the proposed land use. Each developed subcatchment comprises an area of sealed road, roof area, and residential grassed area. The sealed road area is considered 100% impervious, and the area determined from preliminary design plans. The remainder of the area of each subcatchment is divided into 50% roof area and 50% residential area. The roof area is considered 100% impervious, and the residential area is considered 10% impervious for the purposes of the MUSIC modelling.

Each roof area has been modelled for each residential lot to discharge to a 4kL rainwater tank with a conservative 0.15kL/day reuse. Overflows from the tank are directed to the Bioswales.

Each bioswale consists of a standard swale section underlain by a 0.5m bioretention filter with a perforated PVC pipe laid at the base of the trench to collect and discharge treated stormwater. The bioswales will be sized to accommodate a flow with a 3 month average recurrence interval (ARI). Flows in excess of a 3 month ARI will have either a controlled conveyance and discharge to the receiving watercourse, or a controlled overtopping of the swale to provide sheet flow to the receiving watercourse.

The MUSIC modelling results predict that the average annual runoff quantities of suspended solids, nitrogen and phosphorus exported from the developed site are at levels below what is currently exported from the undeveloped site, meeting Council's NorBE targets.

Figure 10 below summarises the pollutant loads generated for the pre-developed sub-catchment, the proposed area of bio-retention filter area for each sub-catchment, and the resultant pollutant loads for each sub-catchment following stormwater treatment.

	AREA (ha) (Pre-Development)		AREA (ha) (Post-Development)		Pre-Development Pollutant Loads		BioRetention Area(sq.m)	Post-Development Pollutant Loads	
Cat 1	Agriculture	1.658	Road	0.273	TSS(kg/yr)	4310	50	TSS(kg/yr)	855
			Roof	0.692	TP(kg/yr)	4.45		TP(kg/yr)	3.44
	Forest	0	Grassed	0.693	TN(kg/yr)	26.1		TN(kg/yr)	24.9
			Total	1.658	GP(kg/yr)	0		GP(kg/yr)	0
Cat 2	Agriculture	1.735	Road	0.233	TSS(kg/yr)	4440	50	TSS(kg/yr)	827
			Roof	0.751	TP(kg/yr)	4.59		TP(kg/yr)	3.54
	Forest	0	Grassed	0.751	TN(kg/yr)	27.4		TN(kg/yr)	26
			Total	1.735	GP(kg/yr)	0		GP(kg/yr)	0
Cat 3	Agriculture	1.858	Road	0.29	TSS(kg/yr)	4700	50	TSS(kg/yr)	998
			Roof	0.784	TP(kg/yr)	5.1		TP(kg/yr)	3.94
	Forest	0	Grassed	0.784	TN(kg/yr)	29.5		TN(kg/yr)	29
			Total	1.858	GP(kg/yr)	0		GP(kg/yr)	0
Cat 4	Agriculture	3.075	Road	0.323	TSS(kg/yr)	7900	70	TSS(kg/yr)	1550
			Roof	1.376	TP(kg/yr)	8.29		TP(kg/yr)	6.2
	Forest	0	Grassed	1.376	TN(kg/yr)	48.3		TN(kg/yr)	48
			Total	3.075	GP(kg/yr)	0		GP(kg/yr)	0
Cat 5	Agriculture	3.96	Road	0.54	TSS(kg/yr)	9980	110	TSS(kg/yr)	2160
			Roof	1.71	TP(kg/yr)	10.8		TP(kg/yr)	8.28
	Forest	0	Grassed	1.71	TN(kg/yr)	62.1		TN(kg/yr)	60.5
			Total	3.96	GP(kg/yr)	0		GP(kg/yr)	0
Cat 6	Agriculture	6.039	Road	0.983	TSS(kg/yr)	16200	280	TSS(kg/yr)	3020
			Roof	2.96	TP(kg/yr)	16.6		TP(kg/yr)	13.4
	Forest	0.864	Grassed	2.96	TN(kg/yr)	96.3		TN(kg/yr)	96.1
			Total	6.903	GP(kg/yr)	0		GP(kg/yr)	0
Cat 7	Agriculture	4.049	Road	0.691	TSS(kg/yr)	10700	170	TSS(kg/yr)	1960
			Roof	1.895	TP(kg/yr)	11		TP(kg/yr)	8.88
	Forest	0.432	Grassed	1.895	TN(kg/yr)	63.8		TN(kg/yr)	63.7
			Total	4.481	GP(kg/yr)	0		GP(kg/yr)	0
Cat 8	Agriculture	3.68	Road	0.654	TSS(kg/yr)	9770	170	TSS(kg/yr)	1870
			Roof	1.735	TP(kg/yr)	10.3		TP(kg/yr)	8.12
	Forest	0.444	Grassed	1.735	TN(kg/yr)	59.7		TN(kg/yr)	57.7
			Total	4.124	GP(kg/yr)	0		GP(kg/yr)	0
Cat 9	Agriculture	4.14	Road	0.672	TSS(kg/yr)	10600	120	TSS(kg/yr)	2310
			Roof	1.734	TP(kg/yr)	11.1		TP(kg/yr)	8.97
	Forest	0	Grassed	1.734	TN(kg/yr)	64		TN(kg/yr)	63.8
			Total	4.14	GP(kg/yr)	0		GP(kg/yr)	0
Cat 10	Agriculture	5.027	Road	0.579	TSS(kg/yr)	13100	120	TSS(kg/yr)	2670
			Roof	2.224	TP(kg/yr)	13.8		TP(kg/yr)	10.4
	Forest	0	Grassed	2.224	TN(kg/yr)	80.2		TN(kg/yr)	78.9
			Total	5.027	GP(kg/yr)	0		GP(kg/yr)	0
Cat 11	Agriculture	4.404	Road	0.696	TSS(kg/yr)	11300	110	TSS(kg/yr)	2630
			Roof	1.854	TP(kg/yr)	11.9		TP(kg/yr)	9.73
	Forest	0	Grassed	1.854	TN(kg/yr)	69.6		TN(kg/yr)	69.4
			Total	4.404	GP(kg/yr)	0		GP(kg/yr)	0

Cat 12	Agriculture	2.358	Road	0.416	TSS(kg/yr)	6180	60	TSS(kg/yr)	1250
			Roof	0.971	TP(kg/yr)	6.36		TP(kg/yr)	4.95
	Forest	0	Grassed	0.971	TN(kg/yr)	37		TN(kg/yr)	36.5
			Total	2.358	GP(kg/yr)	0		GP(kg/yr)	0
Cat 13	Agriculture	3.856	Road	0.606	TSS(kg/yr)	9930	100	TSS(kg/yr)	2160
			Roof	1.625	TP(kg/yr)	10.4		TP(kg/yr)	8.24
	Forest	0	Grassed	1.625	TN(kg/yr)	60.4		TN(kg/yr)	60.2
			Total	3.856	GP(kg/yr)	0		GP(kg/yr)	0
Cat 14	Agriculture	4.62	Road	0.618	TSS(kg/yr)	11900	130	TSS(kg/yr)	2420
			Roof	2.001	TP(kg/yr)	12.5		TP(kg/yr)	9.81
	Forest	0	Grassed	2.001	TN(kg/yr)	17.8		TN(kg/yr)	71
			Total	4.62	GP(kg/yr)	0		GP(kg/yr)	0
Cat 15	Agriculture	1.32	Road	0.17	TSS(kg/yr)	3500	30	TSS(kg/yr)	643
			Roof	0.575	TP(kg/yr)	3.62		TP(kg/yr)	2.69
	Forest	0	Grassed	0.575	TN(kg/yr)	21		TN(kg/yr)	20.6
			Total	1.32	GP(kg/yr)	0		GP(kg/yr)	0
Cat 16	Agriculture	0.326	Road	0.326	TSS(kg/yr)	838		TSS(kg/yr)	1240
			Roof	0	TP(kg/yr)	0.886		TP(kg/yr)	2.05
	Forest	0	Grassed	0	TN(kg/yr)	5.09		TN(kg/yr)	7.29
			Total	0.326	GP(kg/yr)	0		GP(kg/yr)	0

TOTAL	Agriculture	52.105	Road	8.07	TSS(kg/yr)	136000	1620	TSS(kg/yr)	28300
			Roof	22.887	TP(kg/yr)	141		TP(kg/yr)	113
	Forest	1.74	Grassed	22.888	TN(kg/yr)	826		TN(kg/yr)	816
			Total	53.845	GP(kg/yr)	0		GP(kg/yr)	0

Figure 10: MUSIC Modelling Results

A screenshot of the MUSIC model is provided as Figure 11 below.

Appendix B provides a diagrammatic representation of the sub-catchments and locations of the proposed bioswales.

4.8 Soil and Water Management

Sediment and erosion control measures will be implemented during the construction phase in accordance with the principles and procedures outlined in with the Landcom document Soils and Construction, Managing Urban Stormwater (the Blue Book).

A concept Sediment Erosion Control Plan is provided with the Development Application documents. A detailed Sediment Erosion Control Plan will be submitted with the Construction Certificate documentation for Council approval. The final soil and water management plan, including the detailed sediment and erosion control plan, will assess and incorporate the following principles:

(i) assess the soil properties such as erosivity, groundwater, and acid sulphate potentials of the soils, and address issues where soil disturbance is likely to expose and/or exacerbate this problem;

(ii) plan for erosion and sediment control concurrently with engineering design and before earthworks begin, ensuring proper assessment of site constraints and integration of the various components;

(iii) minimise the area of soil disturbed and exposed to erosion;

(iv) conserve topsoil for later site rehabilitation/revegetation;

(v) control water flow from the top of, and through the development area, where possible diverting clean water away from the site;

(vi) rehabilitate disturbed lands quickly; and

(vii) maintain soil and water management measures appropriately during the construction phase.

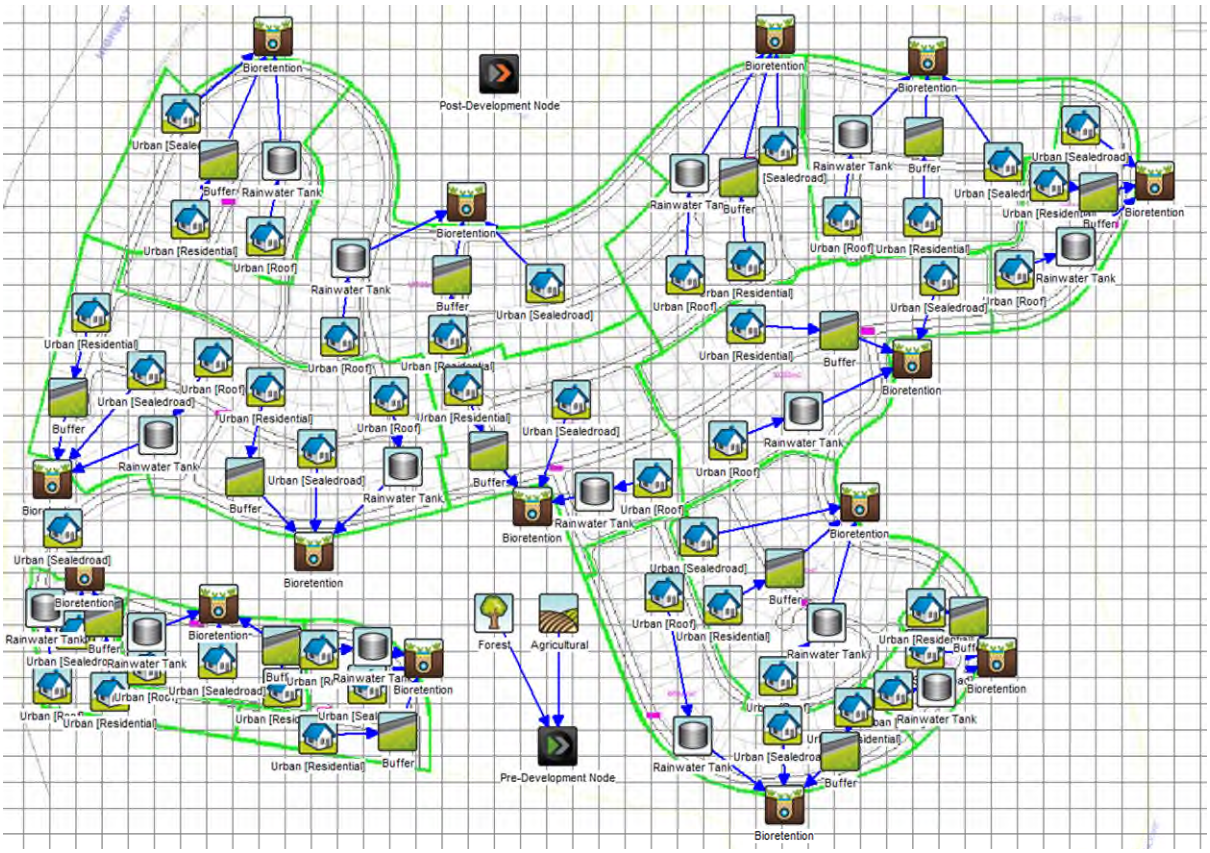


Figure 11: MUSIC Model Diagram

Appendices

Annexure A ~ Engineering Drawings

"THE GLADES ESTATE"

RESIDENTIAL SUBDIVISION
PT. LOT 1 DP 725785
PACIFIC HIGHWAY - MOONEE BEACH
DA CONCEPT ENGINEERING PLANS

LOCALITY MAP

DRAWING SCHEDULE

DWG. No.		REVISION
16083-10	COVER SHEET	.
16083-11	OVERALL SITE PLAN	
16083-12	LAYOUT PLAN	
16083-13	CUT & FILL PLAN - DEPTH CONTOURS	
16083-14	ROAD & DRAINAGE AND EROSION & SEDIMENT CONTROL PLAN	
16083-15	SEWER RETICULATION PLAN	
16083-16	WATER RETICULATION PLAN	

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Scale 0 20 40 60 80 100metres
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Drawn	**Date**
Iain Craig	21st November 2017

Project **THE GLADES ESTATE**

Title PT.LOT 2 DP 725785
DEVELOPMENT APPLICATION
OVERALL SITE PLAN

Drawing No.	Revision
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LEGEND

EXISTING CONTOURS (0.5m INTERVAL)

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Drawn Iain Craig	Date 21st November 2017

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Title PT.LOT 2 DP 725785
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LAYOUT PLAN

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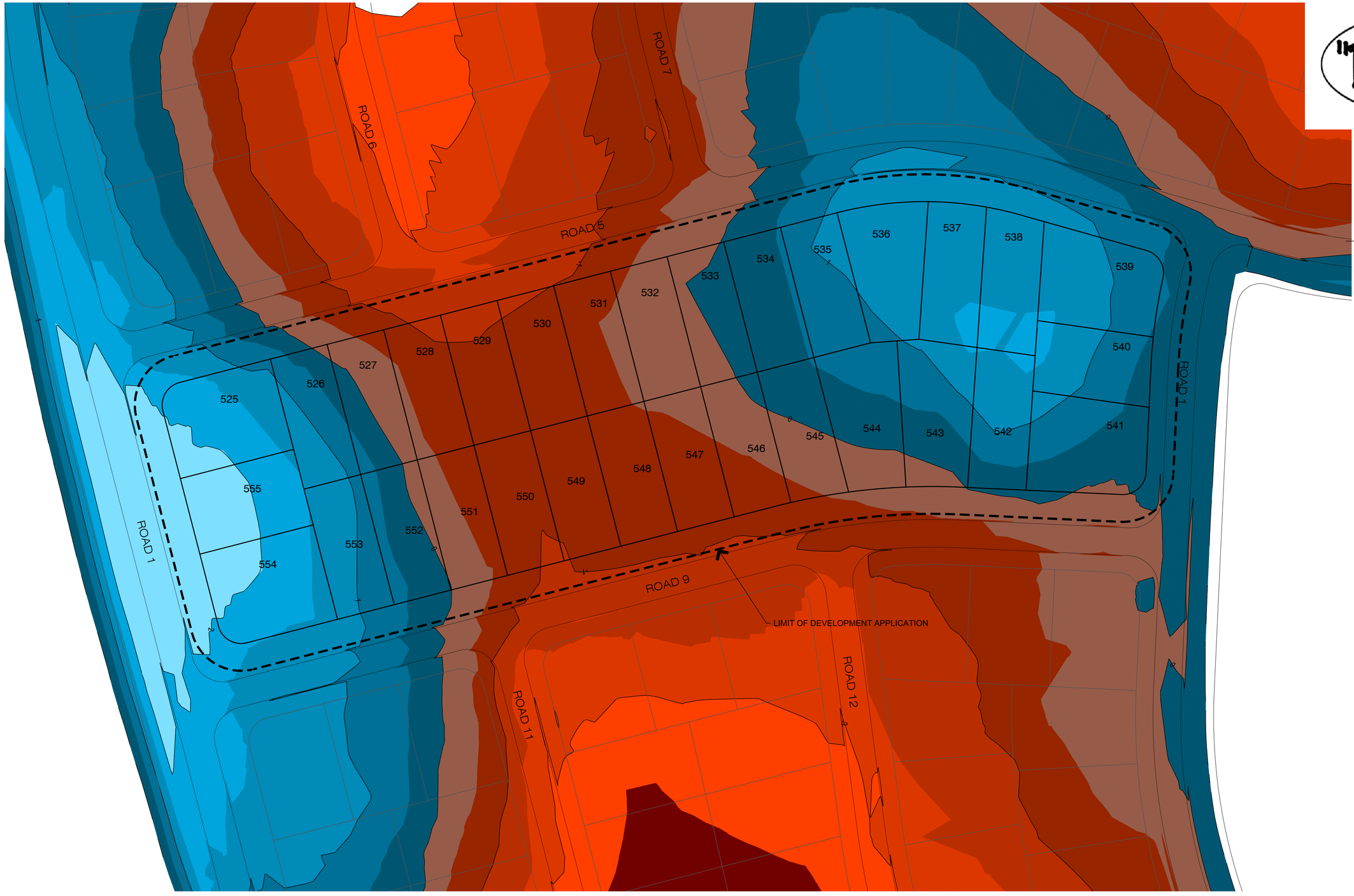

CUT / FILL DEPTHS

Lower Value		Upper Value		Colour
-5	to	-4.5	m	
-4.5	to	-4	m	
-4	to	-3.5	m	
-3.5	to	-3	m	
-3	to	-2.5	m	
-2.5	to	-2	m	
-2	to	-1.5	m	
-1.5	to	-1	m	
-1	to	-0.5	m	
-0.5	to	0	m	
0	to	.5	m	
.5	to	1	m	
1	to	1.5	m	
1.5	to	2	m	
2	to	2.5	m	
2.5	to	3	m	

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DEVELOPMENT APPLICATION
CUT & FILL PLAN - DEPTH CONTOURS

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ROAD 6
ROAD 7
ROAD 5
CONSTRUCTION EXIT
ROAD 1
ROAD 9
ROAD 11
ROAD 12
SEDIMENT BASIN
SEDIMENT BASIN

525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555

N

DRAINAGE LEGEND

- DRAINAGE LINE - PROPOSED
- DRAINAGE PIT - PROPOSED
- DRAINAGE HEADWALL - PROPOSED
- CATCH DRAIN
- CONTOURS (0.5m INTERVAL)

ESC LEGEND

- KERB INLET PIT SEDIMENT TRAP
- SEDIMENT FENCE

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DEVELOPMENT APPLICATION
ROAD & DRAINAGE AND
EROSION & SEDIMENT CONTROL PLAN

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16083-14	.
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LEGEND

- SEWER - PROPOSED
- SRM — SEWER RISING MAIN - PROPOSED
- MANHOLE - PROPOSED
- S — SEWER - EXISTING DA
- S — MANHOLE - EXISTING DA
- CONTOURS (0.5m INTERVAL)

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Title
PT.LOT 2 DP 725785
DEVELOPMENT APPLICATION
SEWER RETICULATION PLAN

Drawing No.	Revision
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LEGEND

- WATERMAIN - PROPOSED
- COPPER SERVICE - PROPOSED
- HYDRANTS - PROPOSED
- STOP VALVES - PROPOSED
- WATERMAIN - EXISTING DA
- HYDRANTS - EXISTING DA
- STOP VALVES - EXISTING DA

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Drawn	**Date**
Iain Craig	21st November 2017

Project
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Title
PT.LOT 2 DP 725785
DEVELOPMENT APPLICATION
WATER RETICULATION PLAN

Drawing No.	Revision
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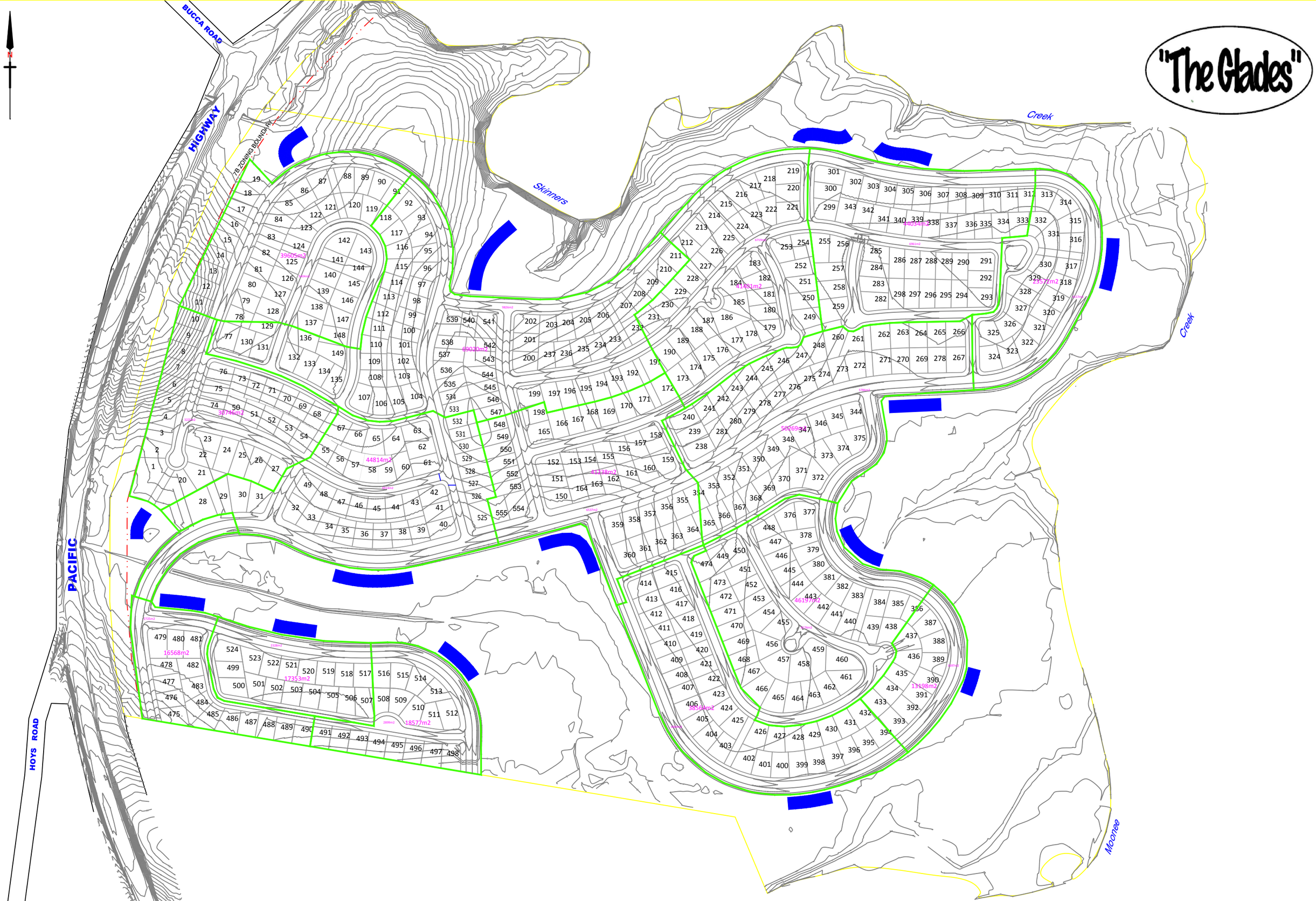
Annexure B ~ Sub-catchments & Bioswales



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Drawn: Iain Craig	Date: 16th January 2018

Project: THE GLADES ESTATE

Title: LOTS 1 & 2 DP 725785
MUSIC MODELLING
CATCHMENT PLAN

Drawing No.	Revision
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CAD File	
STMWTR CATCHMENTS	

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MUSIC-*link* Report

Project Details		Company Details	
Project:	Glades Estate Spine	**Company:**	RDM
Report Export Date:	11/23/2017	**Contact:**	Wayne Cooper
Catchment Name:	Spine	**Address:**	
Catchment Area:	3.06ha	**Phone:**	0428 426 292
Impervious Area*:	46.42%	**Email:**	wayne@resdesman.com.au
Rainfall Station:	59040 COFFS		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1985 - 31/12/1994 11:54:00 PM		
Mean Annual Rainfall:	1642mm		
Evapotranspiration:	1456mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.30		
Study Area:	Coffs Harbour		
Scenario:	Coffs Harbour Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	2.52%	Rain Water Tank Node	1	Urban Source Node	4
TSS	87.6%	Bio Retention Node	1	Agricultural Source Node	1
TP	59.5%				
TN	56.5%				
GP	100%				

Comments

Non-conformance shown is only 0.5%

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Agricultural	Agricultural	Area Impervious (ha)	None	None	0.168
Agricultural	Agricultural	Area Pervious (ha)	None	None	1.511
Agricultural	Agricultural	Total Area (ha)	None	None	1.68
Bio	Bioretention	Exfiltration Rate (mm/hr)	0	None	0
Bio	Bioretention	Filter depth (m)	0.4	1	0.5
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	0	None	100
Bio	Bioretention	Orthophosphate Content in Filter (mg/kg)	0	55	55
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Bioretention	Total Nitrogen Content in Filter (mg/kg)	1	800	800
Post	Post-Development Node	% Load Reduction	None	None	2.52
Post	Post-Development Node	GP % Load Reduction	90	None	100
Post	Post-Development Node	TN % Load Reduction	45	None	56.5
Post	Post-Development Node	TSS % Load Reduction	80	None	87.6
Pre	Pre-Development Node	% Load Reduction	None	None	0
Rain	Rainwater Tank	% Reuse Demand Met	None	None	0
Urban	Urban	Area Impervious (ha)	None	None	0.775
Urban	Urban	Area Impervious (ha)	None	None	0.090
Urban	Urban	Area Impervious (ha)	None	None	0.554
Urban	Urban	Area Impervious (ha)	None	None	0.554
Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Area Pervious (ha)	None	None	0.814
Urban	Urban	Area Pervious (ha)	None	None	0.825
Urban	Urban	Area Pervious (ha)	None	None	0.825
Urban	Urban	Total Area (ha)	None	None	0.775
Urban	Urban	Total Area (ha)	None	None	0.905
Urban	Urban	Total Area (ha)	None	None	1.38
Urban	Urban	Total Area (ha)	None	None	1.38

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Post	Post-Development Node	TP % Load Reduction	60	None	59.5
Pre	Pre-Development Node	GP % Load Reduction	90	None	0
Pre	Pre-Development Node	TN % Load Reduction	45	None	0
Pre	Pre-Development Node	TP % Load Reduction	60	None	0
Pre	Pre-Development Node	TSS % Load Reduction	80	None	0

Only certain parameters are reported when they pass validation

Appendix E – Flood Assessment

Rothwell Boys Pty Ltd
C/- Resource Design and Management

Flood Assessment:
The Glades Development,
Lot 1 and 2 DP725785, Pacific Highway,
Moonee Beach, NSW

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P1706361JR01V01
January 2018

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Limitations Statement

The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to provide a flood assessment at the subject site in accordance with the scope of services set out in the contract / quotation between Martens & Associates Pty Ltd and Rothwell Boys Pty Ltd C/- Resource Design and Management (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

Martens & Associates Pty Ltd derived the data in this report primarily from a number of sources which included site inspections, correspondence regarding the proposal, examination of records in the public domain, interviews with individuals with information about the site or the project, and field explorations conducted on the dates indicated. The passage of time, manifestation of latent conditions or impacts of future events may require further examination / exploration of the site and subsequent data analyses, together with a re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, Martens & Associates Pty Ltd may have relied upon and presumed accurate certain information (or absence thereof) relative to the site. Except as otherwise stated in the report, Martens & Associates Pty Ltd has not attempted to verify the accuracy of completeness of any such information (including for example survey data supplied by others).

The findings, observations and conclusions expressed by Martens & Associates Pty Ltd in this report are not, and should not be considered an opinion concerning the completeness and accuracy of information supplied by others. No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings and conclusions are based solely upon site conditions, information and drawings supplied by the Client *etc*. in existence at the time of the investigation.

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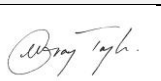
Document and Distribution Status

Author(s)	Reviewer(s)	Project Manager	Signature
Paul Dinh	Daniel Dhiacou Daniel Martens	Gray Taylor	

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				File Copy	Resource Design and Management		
1	Development Application	FINAL	25.01.2017	1P, 1E	1P		

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All enquiries regarding this project are to be directed to the Project Manager.

Executive Summary

Martens & Associates Pty Ltd (MA) have prepared this flood assessment to support a development application (DA) for a proposed low density residential subdivision at Lot 1 and 2 DP 725785 (the site). This report documents the procedures and findings of hydrologic and hydraulic modelling of the site in existing and proposed conditions.

Modelling concluded that:

1. Proposed flood characteristics are largely consistent with existing conditions, and differences due to the proposed development are negligible.

2. The proposed residential development footprint within the site is predominantly flood free in all 1% AEP flood events modelled.

3. The proposed development would have negligible offsite flood impacts.

4. Compliance with Council flood planning level requirements for buildings will be achievable.

5. The proposed development is compatible with the existing floodplain environment.

Contents

1 INTRODUCTION 6
1.1 Overview 6
1.2 Project Scope and Objectives 6
1.3 Relevant Guidelines 6
1.4 Definitions 7
2 SITE DESCRIPTION AND BACKGROUND DATA 8
2.1 Location and Site Description 8
2.2 Catchment Description 8
2.3 Site Flood Mechanisms 8
2.4 Previous Flood Studies 9
2.5 Proposed Development 12
3 HYDROLOGY MODELLING 14
3.1 Overview 14
3.2 Model Setup 14
3.3 Results 15
4 HYDRAULIC MODELLING 18
4.1 Overview 18
4.2 Scenarios 18
4.3 Terrain Data 19
4.4 Detailed Existing Model Setup 19
4.5 Detailed Proposed Conditions Model Set Up 21
4.6 Results 21
4.7 Discussion 22
5 SUMMARY AND RECOMMENDATIONS 26
6 REFERENCES 27
7 ATTACHMENT A: SITE SURVEY AND LOT LAYOUT 29
8 ATTACHMENT B: FLOOD ASSESSMENT PLANSET 31

1 Introduction

1.1 Overview

Martens & Associates Pty Ltd (MA) have prepared this flood assessment to support a development application (DA) for a proposed residential subdivision at Lot 1 and 2 DP 725785, Pacific Highway, Moonee Beach, NSW (the site, 'The Glades'). Refer to Attachment A for site survey and proposed development layout.

MA previously prepared a flood assessment for this region to support a sub-division at Lot 1 DP1097743, Pacific Highway, Moonee Beach, NSW, which is the lot immediately south of the site. The flood assessment for Lot 1 DP1097743 is documented in MA report P1002663JR08V02 (MA, August 2015). That flood assessment was subject to peer review and has since been approved by Coffs Harbour City Council (CHCC). The hydrologic and hydraulic models used for that assessment have been included and updated to inform the flood assessment at the site.

1.2 Project Scope and Objectives

Project scope and objectives are:

1. Update the previously prepared hydrologic model (RAFTS) for the adjacent site determine the peak flow of the 5% annual exceedance probability (AEP) flood, 1% AEP flood, 1% AEP flood with climate change, and the probable maximum flood (PMF) events.

2. Update the previous hydraulic model (TUFLOW) for the site under existing and proposed conditions.

3. Prepare relevant flood maps including flood extents, depths, levels, velocities, hazards and impacts for the critical 1% AEP flood event.

4. Comment on flood characteristics and model outcomes in existing and proposed conditions.

1.3 Relevant Guidelines

This report has been prepared in accordance with the following guidelines and policies:

1. Coffs Harbour Council (2008), *Climate Change Policy*.

2. Coffs Harbour Council (2009), *Coffs Harbour Engineering Design Guidelines – Stormwater Drainage*.

3. Coffs Harbour Council (2013), *Coffs Harbour Local Environmental Plan (LEP)*.

4. Coffs Harbour Council (2015), *Coffs Harbour Development Control Plan (DCP)*.

5. NSW Department of Environment and Climate Change (2007), *Floodplain Risk Management Guideline Practical Consideration of Climate Change*.

6. NSW Department of Environment and Climate Change (2010), *Flood Risk Management Guide*.

7. NSW Department of Infrastructure, Planning and Natural Resources (2005), *Floodplain Development Manual*.

1.4 Definitions

AEP	Annual exceedance probability: the probability of a flood event occurring within a year. A 1% AEP flood has a 1% chance of occurring in any given year.
ARI	Average recurrence interval: the average time between flood events occurring. A 100 year ARI flood occurs on average once every 100 years.
ARR	Australian Rainfall & Runoff
BOM	Bureau of Meteorology
Council	Coffs Harbour City Council (CHCC)
DA	Development application
IFD	Intensity frequency duration – design rainfall data for frequent and infrequent storm events.
MA	Martens & Associates Pty Ltd
PMF	Probable maximum flood – the most extreme flood event possible for a certain location, with an approximate ARI of 100,000 to 1,000,000 years.
PMP	Probable maximum precipitation – design rainfall data for extreme storm events.

2 Site Description and Background Data

2.1 Location and Site Description

Existing site description summary is provided in Table 1.

Table 1: Existing site description summary.

Address	Lot 1 and 2 DP 725785, Pacific Highway, Moonee Beach, NSW
Lot / DP	Lot 1 and 2 DP 725785
Site Area	Approximately 92.55 ha
Local Government Area (LGA)	Coffs Harbour City Council (CHCC)
Current Land Use	Vacant
Current Zoning	This land is currently zoned Residential 2A Low Density under Coffs Harbour Local Environmental Plan 2000.
Site Description	The site is currently mostly cleared with some bushland. No structures or intensive land use are currently seen on the site.
Surrounding Land Uses	The site is bordered by the Pacific Highway to the west, partially cleared land to the south, bushland to the north and Moonee Creek to the east.
Site Elevation	Approximately 16 mAHD at western site boundary falling to sea level at the northern and eastern boundaries.
Site Grading & Aspect	Raised in centre of site at 12 mAHD, falling to approximately 4% in northern, eastern, and southern directions.
Site Drainage	Skinners Creek runs along the northern boundary of the site. Bucca Creek runs through the southern portion of the site. Moonee Creek runs along the eastern site boundary.

2.2 Catchment Description

We note the following regarding the catchment upstream of the site:

- The site is located within the Moonee Creek catchment.
- Upstream catchments are primarily bushland and rural residential areas, and include the suburbs of Moonee Beach, Sapphire Beach and Emerald Beach.
- The total upstream catchment area is approximately 4,181 ha, and is shown in Attachment B K000.

2.3 Site Flood Mechanisms

The site is likely affected by the following flood mechanisms:

- Overland flows from the local upstream catchment (refer Section 2.2).

- High tailwater conditions in Moonee Creek causing upstream flows to back up onto the site.

- Storm surge causing high ocean levels and upstream flows to back up onto the site.

2.4 Previous Flood Studies

A review of previous flood investigations was undertaken to assess likely local flood behaviour and characteristics for the site and the Moonee Creek catchment. Review identified four previous flood studies which would be relevant to this assessment.

2.4.1 Paterson Consultants (1998) Moonee Creek Flood Study

Paterson Consultants conducted a flood assessment for this catchment on behalf of Coffs Harbour Council, and summarised the assessment in the report *Moonee Creek Flood Study* (1998), hereafter referred to as the Paterson flood study. As part of their study, Paterson used RORB for hydrologic modelling and MIKE 11 for hydraulic modelling.

A series of flood maps showing flood characteristics for the 1% AEP flood (heights and hazards) were produced that show a peak flood level of approximately 2.8 mAHD in Moonee Creek adjacent to the site. Hazard mapping showed the subject site to be largely outside of existing 1% AEP flood extents, with some portions of the site identified as having a 'Low Hazard' rating. These figures are provided as Figure 1 (flood levels) and Figure 2 (flood hazard).

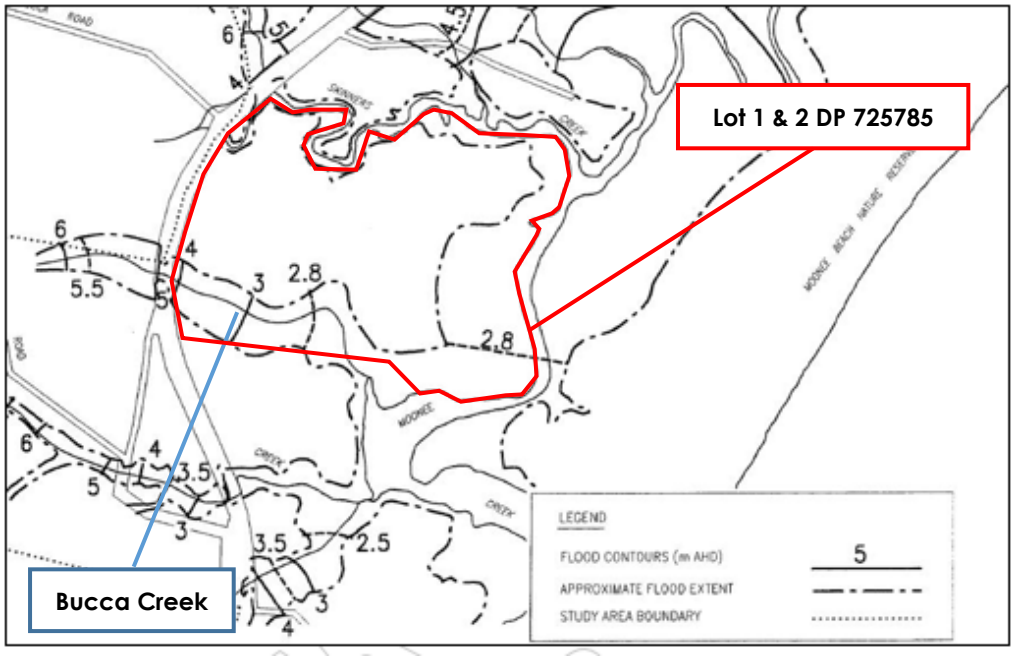

Figure 1: 1% AEP flood level map for Moonee Creek and Bucca Creek in the vicinity of the subject site (Paterson Consultants, 1998).

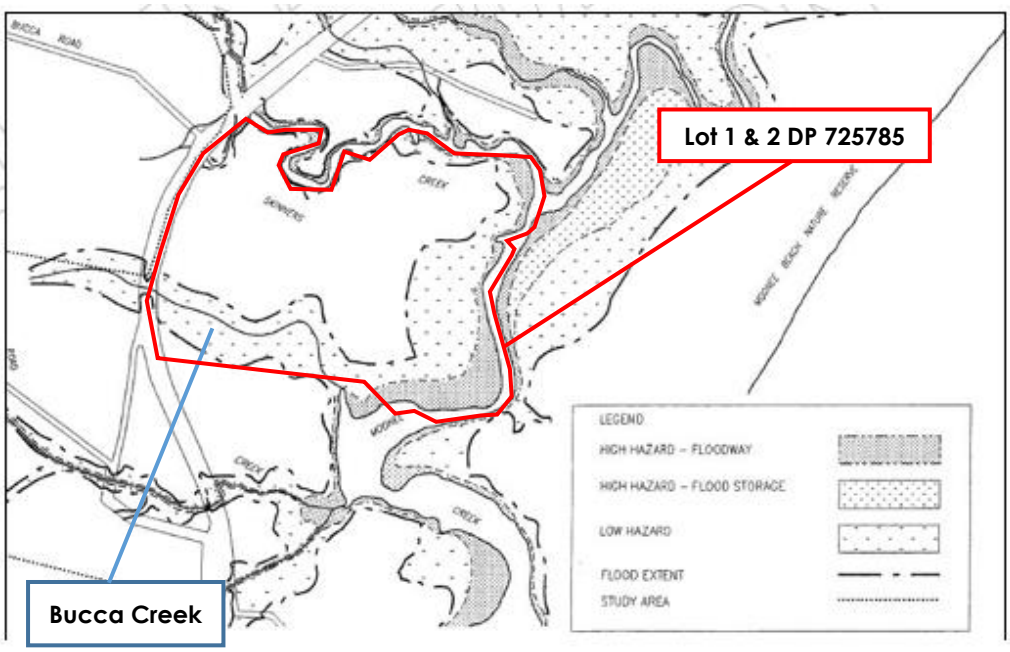

Figure 2: 1% AEP flood hazard map for Moonee Creek and Bucca Creek in the vicinity of the subject site (Paterson Consultants, 1998).

2.4.2 *Bewsher Consulting (2005) Coffs Creek Floodplain Risk Management Plan*

This assessment was completed by Bewsher Consulting on behalf of Coffs Harbour City Council and provides details a floodplain risk management plan for Coffs Creek. Whilst Moonee Creek and its tributaries were not included in this assessment, a flooding and hazard extents map was prepared for areas to the north of Coffs Creek, based on the previous assessment conducted by Paterson Consultants (1998). This map (Figure 3) shows that a portion of the site is affected by the 1 in 100 year ARI peak flood extents.

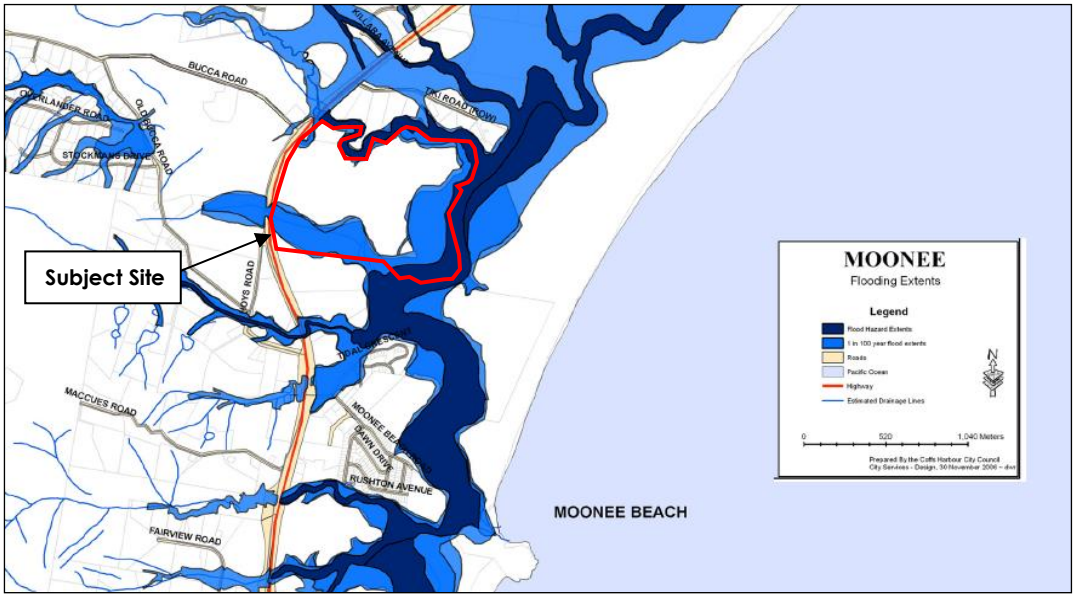

Figure 3: Flood extents mapping for Moonee Creek and tributaries (Bewsher Consulting, 2005).

2.4.3 *Cardno Lawson Treloar (2007) The Glades, Moonee Beach – Hydraulic Assessment*

Cardno Lawson Treloar (CLT) previously developed a detailed MIKE 11 model for the 'The Glades' development (the site).

Full details of the CLT model are provided in the report, *The Glades, Moonee Beach – Hydraulic Assessment,* (Cardno Lawson Treloar, 2007). As part of their study, CLT extended the Paterson Model which utilised RORB for hydrologic modelling and MIKE 11 for hydraulic modelling, updated to the latest version and supplemented with additional cross-sections and the addition of the Pacific Highway bridge over Skinners Creek to improve model accuracy in the vicinity of the development.

The assessment considered three flood simulations (i.e. flood envelope) to determine the 1% AEP flood event envelope curve as follows:

- 1% AEP flood event flows with normal high tide level as boundary conditions (0.6 mAHD).
- 5% AEP flood event flows with 5% AEP tide level as boundary conditions (adopted as 2.3 mAHD).
- 20% AEP flood event flows with 1% AEP tide level as boundary conditions (adopted as 2.6 mAHD).

The development was modelled by assuming that all developed areas would be filled to be above the 1% AEP flood level.

Modelling results for flood levels showed that the effects of the adjacent development on local flooding levels were contained within the relevant site (Lot 1 DP 725785). Modelling results indicated that downslope of Moonee Creek section 6580, peak flood levels resulted from the high tailwater scenarios rather than the peak flood flow scenario.

The CLT model and report have been verified and accepted by Coffs Harbour City Council and has been reviewed by MA. The Cardno report has been evaluated and will be superseded by this report.

2.4.4 Martens and Associates (2015) Flood Assessment: Moonee Beach Sub-division of Lot 1 DP 1097743

Martens and Associates conducted a flood assessment for the area, and summarised the assessment in the report *Flood Assessment: Moonee Beach Sub-division of Lot 1 DP 1097743* (2015), hereafter referred to as the previous MA flood assessment (MA, 2015). As part of the study, MA used XP-RAFTS for hydrologic modelling and TUFLOW for hydraulic modelling. This flood assessment was subject o a peer review and has since been approved by Coffs Harbour City Council (CCHC).

MA have used the previous MA flood assessment as a basis for the preparation of the 'existing conditions' hydraulic model for the site in this study.

2.5 Proposed Development

2.5.1 Subdivision Details

Proposed site subdivision is provided in Attachment A and includes:

- Creation of 555 residential lots with lot sizes ranging from 600 to1,842 m^2.
- A series of internal roads connecting the various stages of the development and linking the site to future developments to the south.

- Parks and recreational areas.

2.5.2 Earthworks Design Details

Proposed site earthworks includes:

- Grading of proposed internals roads.
- Fill for proposed residential areas above flood plain.

2.5.3 Flood design details

Attachment B P1706361PS01 A050 shows 3 x 1.8 m x 2.4 m box culverts are to be provided under 'Road 4' to convey flows from Bucca Creek through the southern portion of the site. These culverts have been sized to minimize offsite flood impacts and maximise flood free areas in the site.

3 Hydrology Modelling

3.1 Overview

The RAFTS software package was used to assess the 5% AEP flood, 1% AEP flood, 1% AEP flood with climate change and PMF peak flow rates for a range of storm durations between 10 minutes and 24 hours.

3.2 Model Setup

Parameters used in the model are provided in Table 2 and Table 3. Model inputs are as follows:

1. Sub-catchment delineation, flow paths and slopes were developed using the 1:25,000 Moonee Beach topographic map from Land and Property Information (2001). Refer to Attachment B PS01-K000 for catchment plan. The unidentified creek line south of Cunninghams Creek is labelled Cunninghams Creek South for the remainder of this report.

2. Sub-catchment impervious areas were adopted based on zoning maps and recent catchment aerials obtained from Nearmaps (2017).

3. Roughness coefficients (PERN) were determined using a weighted average based on the XP-RAFTS (1996) *User's Manual* and each sub-catchment's land use based on recent site aerials obtained from Nearmaps (2017).

4. RAFTS parameters have been derived from the suggested values in the XP-RAFTS (1996) *User Manual*. Sub-catchment surface soils are assumed to be clay loam, based on the NSW Government Environment & Heritage (2017) *eSPADE – NSW Soil and Land Information* website.

5. Intensity Frequency Duration (IFD) data was obtained from Australian Rainfall and Runoff (1987). BOM IFD data is consistent with the previous MA flood model (MA, 2015).

6. 1% AEP rainfall intensities were increased by 10% for the worst-case climate change scenario in accordance with the *Floodplain Risk Management Guideline – Practical Consideration of Climate Change* (2007) for catchments within the Northern Rivers, as was adopted for the previous MA flood study (MA, 2015).

7. Probable Maximum Precipitation (PMP) intensities and temporal distributions were determined using the BOM (2003) *Generalised Short-Duration Method* and BOM (2003) *Generalised Tropical Storm*

Method. Rainfall data are consistent with the previous MA flood model (MA, 2015).

Table 2: Details of sub-catchments used in RAFTS modelling.

Sub-catchment [1]	Area (ha) [1]	Impervious Area (ha) [2]	Pervious Area (ha) [2]	Impervious PERN [3]	Pervious PERN [3]	Slope (%) [1]
Moonee Upper	1,804.9	38.4	1,766.4	0.015	0.089	2.2
Moonee Lower	224.4	16.7	207.7	0.015	0.087	0.3
Skinners Ck	785.6	21.7	763.9	0.015	0.089	3.8
Bucca Ck	78.6	13.5	65.1	0.015	0.062	2.0
Cunninghams Ck	278.0	6.7	271.3	0.015	0.090	4.4
Cunninghams Ck South	82.6	19.0	63.6	0.015	0.063	6.4
Sugar Mill Ck	926.9	70.4	856.6	0.015	0.075	6.3
Total	**4,181.0**	**186.4**	**3,994.6**	**0.015**		

Notes

1. Obtained based on 1:25,000 Moonee Beach topographic map. Refer to Attachment B plan PS01-K000 for site catchment plan.
2. Adopted based on recent catchment aerials obtained from Nearmaps (2017).
3. Obtained from the weighted average land use based on recent catchment aerial photographs obtained from Nearmaps (2017) and the XP-RAFTS User Manual (1996).

Table 3: Probable maximum precipitation data used in RAFTS modelling

PMP Data [1]	Unit	Value
PMP 15 min rainfall intensity	mm/hr	136.1
PMP 30 min rainfall intensity	mm/hr	200.1
PMP 45 min rainfall intensity	mm/hr	254.1
PMP 1 hour rainfall intensity	mm/hr	302.1
PMP 1.5 hour rainfall intensity	mm/hr	353.6
PMP 2 hour rainfall intensity	mm/hr	400.5
PMP 3 hour rainfall intensity	mm/hr	457.8
PMP 6 hour rainfall intensity	mm/hr	588.5
PMP 9 hour rainfall intensity	mm/hr	725.0
PMP 12 hour rainfall intensity	mm/hr	860.0
PMP 18 hour rainfall intensity	mm/hr	1100.0

Notes

1. Obtained using the BOM (2003) Generalised Short-Duration Method and BOM (2003) Generalised Tropical Storm Method.

3.3 Results

Results of peak flow rates for catchments arriving at the site for the critical duration 5% AEP flood event, 1% AEP flood event, 1% AEP flood event with climate change and PMF events are summarised in Table 4.

Additional storm durations were modelled to determine the critical storm duration for the Bucca Creek catchment, in line with the peer reviewer comments from the previous MA flood study (BMT WBM). RAFTS model results for critical storm durations are provided in Table 4 and Table 5.

The critical storm duration for the Moonee Creek catchment was determined to be 9 hours for all modelled flood events. The critical storm duration for the Bucca Creek catchment was determined to be 1.5 hours for all modelled flood events. Results for critical storm duration peak flow rates are provided in Table 4 and Table 5.

Table 4: Peak design storm flow rates for critical duration storms for the Monee Creek catchment estimated by RAFTS modelling for sub-catchment flows.

Event	5% AEP	1% AEP	1% AEP (CC [1])	PMF
Storm Duration Total (hr)	9.0 [2]	9.0 [2]	9.0 [2]	9.0 [2]
Sub-catchment	**Peak Sub-catchment Flow Rates (m^3/s)**			
Moonee Creek Upper	127.5	193.4	215.5	605.5
Moonee Creek Lower	9.3	14.8	16.7	53.3
Skinners Creek	79.5	113.7	125.4	336.9
Bucca Creek	11.3	15.3	16.8	42.5
Cunninghams North	34.0	47.0	51.7	137.1
Cunninghams South	14.2	18.9	20.7	53.1
Sugar Mill Creek	119.6	164.1	180.3	471.6
Total [3]	380.2	548.0	607.8	1,682.8

Notes

1. Based on 10% increased rainfall intensity in accordance with the *Floodplain Risk Management Guideline – Practical Consideration of Climate Change* (2007) for catchments within the Northern Rivers.
2. The 9 hr storm duration is for critical Moonee Creek for all flood events modelled.
3. The offset of the timing of each catchment's hydrograph means the total flow rate is not always equal to the sum of all catchment peak flow rates.

Table 5: Peak design storm flow rates for critical duration storms for the Bucca Creek catchment estimated by RAFTS modelling for sub-catchment flows.

Event	5% AEP	1% AEP	1% AEP (CC [1])	PMF
Storm Duration Total (hr)	1.5 [2]	1.5 [2]	1.5 [2]	1.5 [2]
Sub-catchment	**Peak Sub-catchment Flow Rates (m^3/s)**			
Moonee Creek Upper	50.1	79.8	91.0	375.2
Moonee Creek Lower	12.6	16.0	17.5	49.0
Skinners Creek	41.7	65.5	74.9	295.6
Bucca Creek	12.3	16.4	18.1	58.0
Cunninghams North	21.9	33.8	38.5	141.9
Cunninghams South	20.2	27.1	30.5	101.6
Sugar Mill Creek	80.9	119.4	135.2	494.5
Total [3]	219.6	322.6	366.3	1373.4

Notes

1. Based on 10% increased rainfall intensity in accordance with the *Floodplain Risk Management Guideline – Practical Consideration of Climate Change* (2007) for catchments within the Northern Rivers.
2. The 1.5 hour storm is critical for Bucca Creek for all flood events modelled.
3. The offset of the timing of each catchment's hydrograph means the total flow rate is not always equal to the sum of all catchment peak flow rates.

4 Hydraulic Modelling

4.1 Overview

The TUFLOW hydraulic model was used to determine flood characteristics including flood extents, levels, depths, velocities and hydraulic hazard for the 1% AEP flood (envelope analysis), 1% AEP flood with climate change and probable maximum flood (PMF) events for existing and proposed conditions.

4.2 Scenarios

The hydraulic model was setup to represent the following flood condition scenarios:

1. Existing condition: the catchment and site in their current state as described in Sections 2.1, 2.2 and 2.3.

2. Proposed condition: the catchment in its current state and the site in its proposed state as described in Section 2.5.

The site is subject to storm surge and high ocean levels as described in Section 2.3. Combinations of catchment flooding and high ocean levels were adopted from Department of Environment, Climate Change & Water (DECC, 2010). Determining the joint probability of each of these events coinciding at the site is outside the scope of this assessment. Each of these scenarios was simulated in the hydraulic model to represent an envelope analysis of possible site flood conditions.

As part of this envelope analysis, critical storm durations for the Moonee Creek catchment and the local Bucca Creek catchment were assessed in line with the peer reviewer's comments from the previous MA flood study (MA, 2015). Details of critical storm durations for these catchments are provided in Section 3.

In addition, climate change scenarios were assessed in accordance with the NSW Department of Environment and Climate Change (2007), *Floodplain Risk Management Guideline Practical Consideration of Climate Change*. This included an increased rainfall intensity of 10% and an increased ocean level of 0.91 m. The combinations of those flood event scenarios were assessed in the hydraulic model as summarised in Table 6.

Table 6: Combinations of catchment and ocean flood events adopted for modelling.

Scenario	Catchment Event [1]	Ocean Event [2]	Peak Ocean Level (mAHD) [2]
1	5% AEP (9 Hour)	1% AEP	2.60
2	1% AEP (9 Hour)	5% AEP	2.25
3	1% AEP (9 Hour)	Neap tide	0.60
4	PMF (9 Hour)	Neap tide	0.60
5	1% AEP + CC [3] (9 hour)	5% AEP (CC [3])	3.16 [3]
6	5% AEP (1.5 hour)	1% AEP	2.60
7	1% AEP (1.5 hour)	5% AEP	2.25
8	1% AEP (1.5 hour)	Neap tide	0.60
9	PMF (1.5 hour)	Neap tide	0.60
10	1% AEP + CC [3] (1.5 hour)	5% AEP (CC [3])	3.16 [3]

Notes

1. Critical duration flood events for Moonee Creek and Bucca Creek catchments as determined by RAFTS modelling, refer Section 3.
2. Ocean levels obtained from Department of Environment, Climate Change & Water (2010), *Flood Risk Management Guide: Incorporating sea level rise benchmarks in flood risk assessments*.
3. Climate change analysis included a 10% increased rainfall intensity and a 0.91 m increased ocean level, in accordance with NSW Department of Environment and Climate Change (2007), *Floodplain Risk Management Guideline Practical Consideration of Climate Change*.

In summary, a total of 20 scenarios were modelled as part of this assessment (2 flood condition scenarios and 10 flood events each). The proposed conditions surface also included site design grading provided by RDM (2017).

4.3 Terrain Data

3D surfaces for the local floodplain environment used in the TUFLOW model are based on LIDAR provided by LPI (2013) and survey/LIDAR data provided by Resource Design & Management (RDM, 2017) for 'The Glades' development.

4.4 Detailed Existing Model Setup

4.4.1 Existing Conditions Model Setup

TUFLOW model construction for existing conditions consisted of:

1. Development of a 5.0 m topographic grid based on the available data provided in Section 4.3.

2. Establishment of model extents defined from 350 m upstream of Pacific Highway to the east of the site, to upstream of the confluence of Skinners Creek and Moonee Creek approximately 250 m north of the site, to the ocean approximately 2.3 km downstream of the site. Boundary extents were generally located

along catchment ridgelines and connecting catchment high points surrounding the study area.

3. Inclusion of inflow boundary conditions based on the critical duration 5% AEP, 1% AEP, 1% AEP with climate change, and PMF hydrographs from RAFTS for each sub-catchment in Table 4 (see page 16); with inflow locations shown in Attachment B: Flood Assessment Planset.

4. Inclusion of varying ocean water levels for downstream model extent boundary conditions based on DECC (2010) as described in Section 4.2. The tidal events for the 5% AEP, 1% AEP, and 1% AEP with climate change were conservatively modelled with a constant peak water level.

5. Assigning manning's roughness coefficients based on Nearmap Aerials (2017) for hydraulic modelling as shown in Table 7.

6. Inclusion of two bridge crossings under the Pacific Highway as layered flow constrictions. Levels were adopted from RDM survey (2017) and LIDAR, and AECOM SMEC JV (2011), *Bridge Waterway Crossings – Hydrology and Hydraulics study* (BWCHHS). A structural blockage of 0% was adopted based on the assessment procedure in Australian Rainfall and Runoff (Weeks & Rigby, 2016) and as per Council correspondence and recommendation.

7. Inclusion of 2 x 1500 mm concrete pipes at the crossing of Pacific Highway over Bucca Creek. Leveled were adopted from RDM survey (2017). A culvert blockage of 25% was adopted based on the assessment procedure in Australian Rainfall and Runoff (Weeks & Rigby, 2016).

Table 7: Manning's roughness values for TUFLOW modelling.

Catchment Material Type	Manning's Roughness Coefficient [1]
Beach	0.025
Buildings	0.200
Creek	0.04 when depth ≤ 0.3 m
	0.01 when depth > 0.6 m
Bushland / Riparian	0.100
Roads / Concrete	0.013
Rural Residential / Agricultural	0.035
Urban	0.015

Notes
1. Based on typical values from similar catchments and review of Nearmap images (2017).

4.4.2 Proposed Conditions

The following changes were made to the existing conditions flood model to enable detailed modelling of proposed site conditions:

1. Inclusion of the RDM 'Glades' proposed site grading, including internal roads.

2. Updating manning's roughness coefficients for the site to reflect proposed development surfaces.

3. Inclusion of proposed culverts (3 x 1.8 m x 2.4 m rectangular box culverts) at the crossing of Road 4 over Bucca Creek. A culvert blockage of 25% was adopted based on the assessment procedure in Australian Rainfall and Runoff (Weeks & Rigby, 2016). Culvert location is provided in Attachment B: Flood Assessment Planset.

All other model construction elements remained consistent with the existing conditions model.

4.5 Results

Flood mapping results (flood levels, depths, velocities and provisional hazard categories) for the critical duration 1% AEP flood (Scenario 2) in existing and proposed conditions are provided in Attachment B: Flood Assessment Planset, with drawing references summarised in Table 8. These results are provided as they represent the scenario with the worst-case offsite impacts. An additional flood map for the critical duration 1% AEP flood with climate change is also provided as this controls proposed flood planning levels.

Table 8: Flood map drawing references in Attachment B (MA planset P1706361PS01).

Scenario	Flood Event	Water Level & Depth (m)	Water Velocity (m/s)	Provisional Hydraulic Hazard Categories [1]	Water Level Impact (m)
Existing	Scenario 2 [2]	K100	K101	K102	–
Proposed	Scenario 2 [2]	K200	K201	K202	K300
	Scenario 2 [2]	K210	–	–	–

Notes

1. Provisional hydraulic hazard categories are based on NSW Floodplain Development Manual (2005) definitions and are shown in Figure 4.
2. Scenario 2 is the critical duration (9hr) Moonee Creek 1% AEP catchment flood with the 5% AEP ocean level, as described in Table 6.
3. Scenario 5 is the critical duration (9hr) Moonee Creek 1% AEP with climate change event, as described in Table 6. Climate change scenario based on 10% increased rainfall intensity in accordance with the *Floodplain Risk Management Guideline – Practical Consideration of Climate Change* (2007) for catchments within the Northern Rivers.

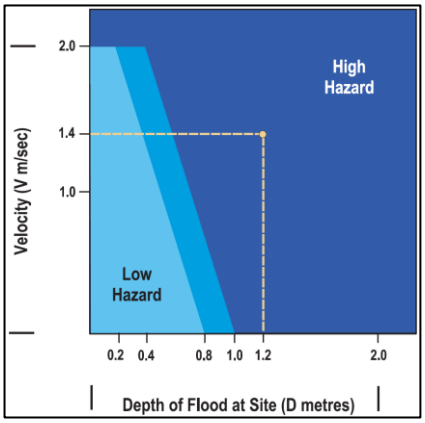

Figure 4: Provisional hydraulic hazard categories (*NSW Floodplain Development Manual*, 2005).

4.6 Discussion

We note the following regarding modelled flood behaviour:

4.6.1 Existing Conditions

1. The primary source of flood affectation at the site is due to the high tailwater condition in Moonee Creek.

2. Flood waters primarily flow through the southwest section of site from west to east in the flow direction of Bucca Creek.

3. Overland flows from the Bucca Creek catchment back up behind Pacific Highway due to the insufficient capacity of the existing 2 x 1,500 mm concrete pipes.

4. Maximum water levels and impacts for all scenarios modelled are governed by the critical duration Moonee Creek events (9 hour

storm) as opposed to the critical duration Bucca creek events (1.5 hour storm).

5. During the critical 1% AEP flood event there are overland flow depths of up to 1.0 m within Bucca Creek. This transitions to ponding at a distance of approximately 130 m downstream of the creek exiting the site, with depths up to 0.8 m. The area immediately adjacent to Bucca Creek is subject to overland flooding and have higher flood levels in the area.

6. Flood velocities for all events up to the critical 1% AEP flood event are generally:

    a. Moderate (<1.0 m/s) in Bucca Creek.

    b. Low (<0.2 m/s) in the area of the site north of Bucca Creek.

    c. Low (<0.4 m/s) in the area of the site south of Bucca Creek.

7. Hydraulic hazard is intermediate to high within the centre of Bucca Creek but is low for all areas outside of creek banks for all events up to the critical 1% AEP flood event.

4.6.2 Proposed Conditions

1. Proposed conditions adjacent to Bucca Creek reduce the area of flood affectation, however the local floodplain characteristics remain largely unchanged from existing conditions.

2. Flow through the existing 2 x 1500 mm concrete pipes in Bucca Creek below Pacific Highway arrive at the site and flow through the 3 x 2.4 x 1.8 m box culverts below proposed Road 4. These culverts are sized to ensure that only a minor degree of overland flow backs up behind the culverts in the critical 1% AEP flood event.

3. The proposed earthworks render the residential footprint largely flood free in the critical 1% AEP flood event. The proposed Road 4 crossing over Bucca Creek is flood free in the 1% AEP flood event, with the road level (5.0 mAHD) 850 mm above the adjacent 1% AEP flood level (4.15 mAHD).

4. None of the proposed roads are affected by flood water in the critical 1% AEP flood event. Of the 555 proposed lots, only 3 are affected by flood waters in the critical 1% AEP flood event – lots 1, 20 and 24 (refer Attachment A). These 3 lots are large (>1000 m^2) and only a small portion of each are affected by shallow, low hazard flood waters. We consider that flood flooding will not be a

major constraint for these lots, as building footprints can be located clear of critical 1% AEP flood extents.

5. The critical 1% AEP flood level ranges from 2.94 to 4.15 mAHD, and proposed earthworks are largely flood free.

6. Flood velocities for all events up to the critical 1% AEP flood event are generally:

    a. Moderate (<1.0 m/s) in Bucca Creek.

    b. Less than 1.7 m/s in the proposed culverts under Road 4.

    c. Eliminated from the development footprint due to the proposed earthworks being above the critical 1% AEP flood event.

7. Hydraulic hazard is intermediate to high within Bucca Creek and is outside the development footprint due to the proposed earthworks. Hydraulic hazard is low within the site up to the 1% AEP flood event with climate change.

8. The PMF flood level varies from 4.5-5.2 mAHD across the site. A shelter-in-place evacuation strategy is recommended for future proposed dwellings with a second story for each building.

4.6.3 Offsite Flood Impacts

1. The proposed development does not have material offsite impacts on water levels. There is a small area of approximately 58 m^2 impact within the Bucca Creek creekline of up to 70 mm in the critical 1% AEP flood event at the sites' western boundary adjacent to Pacific Highway. This impact is negligible considering its small area and its' location within the existing creek.

2. There are no other offsite water level impacts in the critical 1% AEP flood event, and no residential properties are negatively affected. The proposed development therefore has an acceptable impact on the local floodplain environment.

4.6.4 Climate Change Analysis

1. The critical 1% AEP with climate change flood level yields maximum water levels of 3.53 - 4.18 mAHD. To comply with Council's freeboard controls, the proposed flood planning level (FPL) will be 500 mm above the 1% AEP with climate change flood level of 4.03 - 4.68.

2. With the exception of the 3 lots discussed in section 4.6.2, the proposed earthworks are flood free up to the critical 1% AEP flood event with climate change.

3. Table 9 summarises flood levels and the recommended flood planning levels for the proposed development.

Table 9: Flood levels and recommended flood planning level

Scenario	Duration (hr)	Rainfall	Ocean	Flood Level[1] (mAHD)	FPL[1] (mAHD)
2	9.0	1% AEP	5% AEP	2.94 – 4.15	3.44 – 4.65
4	9.0	PMF	Neap Tide	4.51 – 5.22	–
5	9.0	1% AEP + Climate Change	5% AEP + Climate Change	3.53 – 4.18	4.03 – 4.68
7	1.5	1% AEP	5% AEP	2.49 – 4.03	2.99 – 4.53
9	1.5	PMF	Neap Tide	3.76 – 4.66	–
10	1.5	1% AEP + Climate Change	5% AEP + Climate Change	3.29 – 4.06	3.79 – 4.56
				Recommended FPL	4.03 – 4.68 [2]

Notes

1. Flood level and therefore recommended flood planning levels vary across the site. Refer to Attachment B: Flood Assessment Planset for details.
2. We note this is marginally higher than the 4.00 mAHD FPL adopted to the south in the MA 2015 flood report, because this study has adopted slightly higher ocean boundary conditions.

5 Summary and Recommendations

A detailed hydrologic and hydraulic model has been prepared for the site consistent with Council's accepted MA 2015 TUFLOW model provided in MA P1002663JR08V01, with additional site survey and proposed design elements to assess local flood characteristics.

The models were used to determine the existing and proposed flood conditions in the 1% AEP envelope analysis (with and without climate change), and PMF events. Modelling concluded that:

1. The proposed development does not have any material offsite water level impacts.

2. The proposed development area is flood free in the critical 1% AEP flood event with climate change.

3. Compliance with Council flood planning level requirements for future buildings and roads are achievable.

The following recommendations are made:

1. All proposed dwellings are to have a finished floor levels at 4.03 – 4.68 mAHD (0.5m higher than determined flood levels), in accordance with drawing PS01-K210 produced in this report.

2. Should the proposed development footprint change, or significant changes to the proposed design levels and/or culvert design occur (as shown on Drawing PS01-A050), an updated flood model with detailed earthworks should be prepared at Construction Certificate stage.

The proposed development has been designed to ensure compatibility with the existing floodplain environment. As the proposed development has been designed to achieve Council requirements, no further recommendations are considered necessary.

6 References

AECOM SMEC JV (2011), *Bridge Waterway Crossings – Hydrology and Hydraulics Study (BWCHHS)*.

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NSW Department of Environment, Climate Change & Water (2010), *Flood Risk Management Guide: Incorporating sea level rise benchmarks in flood risk assessments.*

NSW Department of Infrastructure, Planning and Natural Resources (2005), *Floodplain Development Manual*.

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Paterson Consultants (1998), *Moonee Creek Flood Study.*

Weeks, W and Rigby, T (2016), *Blockage of Hydraulic Structures,* Chapter 6 of Book 6 in *Australian Rainfall and Runoff – A Guide to Flood Estimation*.

XP-RAFTS (1996), User's Manual.

7 Attachment A: Site Survey and Lot Layout

"The Glades"

BUCCA ROAD

HIGHWAY

PACIFIC

HOYS RD

LOT 2 on DP 725785
(Area = 3.359 ha)

LOT 1 on DP 725785
(Area = 92.550 ha)

LOT 7
DP 252223

HIGHWAY ACCESS FOR CONSTRUCTION ONLY

POTENTIAL CORNER STORE / RESIDENTIAL SITE

Skinners Creek

Moonee Creek

PARK

Road 1 Road 2 Road 3 Road 4 Road 5 Road 6 Road 7 Road 8 Road 9 Road 10

Access Path Way

1 2 3 4 5 6 7 8 9 10 11

LEGEND

524 — LOT NUMBER
620sq m — LOT AREA
20.0 — LOT LENGTH

RECREATION NODE
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

MAJOR PEDESTRIAN / CYCLE (SHAREWAY)
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

MAJOR PEDESTRIAN / CYCLE BOULEVARD
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

LOCAL CONNECTION PATHWAY
(REFER PLAN 6 PATH NETWORK & DEVELOPMENT FACILITIES BY ANNE HARRISON LANDSCAPE ARCHITECTS.)

updated plan
Issued Jan 2018

Stage	No of Lots
1	67
2	40
3	59
4	61
5	51
6	61
7	48
8	48
9	50
10	42
11	28
TOTAL	**555**

0 20 40 60 80 100 200 metres
1 : 2000 (at A1 before reduction)

amdt no.	date	amendment
F	FEB 09	TEMPORARY INTERSECTION AMENDED
E	DEC 08	PATH NETWORK AND FACILITIES ADDED
D	MAY 08	TOTAL SITE APPLICATION
C	APRIL 08	ENTRY AMENDED
B	OCT 07	DRAWING TITLE AMENDMENT
A	SEPT 07	CONCEPT PLAN & PRECINCT NOTED

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The concept plan has been prepared by the Consultant for the benefit of the entity to which it is address ("the Client") and is in response to certain instructions and requests given by the Client. The concept plan therefore may only be relied upon by the Client for the purpose for which it has been prepared and for no other purpose. The concept plan does not represent the Consultant's professional advice, but is merely an overview of potential development outcome and as stated is "preliminary" in nature.
No third party is entitled to rely upon the information contained in the preliminary report and any definitive advice as to budgets, yields, etc., should be sought directly from the consultant.

PRELIMINARY LOT LAYOUT

AUSPACIFIC ENGINEERS

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development consultants, civil, structural and hydraulic engineers
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NERANG QLD 4211
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F 07 5596 3443
E auspacifik@austarnet.com.au

scales	AS SHOWN
design	RKH
drawn	JM
date	NOV 2006
signed	

client: THE ROTHWELL BOYS PTY LTD

project: PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR

dwg no. P1

amendment F

04-1600

8 Attachment B: Flood Assessment Planset

PROJECT: ENGINEERING SERVICES FOR DA - FLOOD ASSESSMENT

PLANSET: FLOOD ASSESSMENT

CLIENT: RESOURCE DESIGN & MANAGEMENT C/- ROTHWELL BOYS

LOCALITY PLAN
N.T.S.

DRAWING LIST		
DWG NO.	REV	DWG TITLE
GENERAL		
PS01-A000	B	COVER SHEET
PS01-A050	B	OVERVIEW PLAN
FLOODING		
PS01-K000	A	CATCHMENT PLAN
PS01-K100	B	1% AEP CATCHMENT + 5% AEP OCEAN EXISTING CONDITION WATER LEVEL (mAHD) & WATER DEPTH (m)
PS01-K101	A	1% AEP CATCHMENT + 5% AEP OCEAN EXISTING CONDITION WATER VELOCITY (m/s)
PS01-K102	A	1% AEP CATCHMENT + 5% AEP OCEAN EXISTING CONDITION PROVISIONAL HYDRAULIC HAZARD CATEGORIES
PS01-K200	B	1% AEP CATCHMENT + 5% AEP OCEAN PROPOSED CONDITION WATER LEVEL (mAHD) & WATER DEPTH (m)
PS01-K201	A	1% AEP CATCHMENT + 5% AEP OCEAN PROPOSED CONDITION WATER VELOCITY (m/s)
PS01-K202	A	1% AEP CATCHMENT + 5% AEP OCEAN PROPOSED CONDITION PROVISIONAL HYDRAULIC HAZARD CATEGORIES
PS01-K210	B	1% AEP CATCHMENT + 5% AEP OCEAN + CLIMATE CHANGE PROPOSED CONDITION WATER LEVEL (mAHD) & WATER DEPTH (m)
PS01-K220	B	PMF CATCHMENT + NEAP OCEAN PROPOSED CONDITION WATER LEVEL (mAHD) & WATER DEPTH (m)
PS01-K300	A	1% AEP CATCHMENT + 5% AEP OCEAN PROPOSED CONDITION WATER LEVEL IMPACT (m)

LGA: COFFS HARBOUR CITY COUNCIL

'GLADES', PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	**MINOR AMENDMENTS**	**25/01/2018**	**PD**	**PD**	**DD**	**DD**
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE

GRID | DATUM | PROJECT MANAGER: GT

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DRAWING TITLE: COVER SHEET

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-A000	B

DRAWING ID: P1706361-PS01-R02-A000

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A1 / A3 LANDSCAPE (A1LC_v02.0.01)

KEY

SITE BOUNDARY

PROPOSED LOT BOUNDARIES

PROPOSED CONTOUR —12—

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	MINOR AMENDMENTS	25/01/2018	PD	PD	DD	DD
A	INITIAL RELEASE	24/01/2018	KW	PD	DD	DD

SCALE
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A1 (A3) 1:2,500 (1:5,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

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DRAWING TITLE
OVERVIEW PLAN

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-A050	B

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DRAWING ID: P1706361-PS01-R02-A050

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CATCHMENT BOUNDARIES

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
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GRID	DATUM	PROJECT MANAGER
		GT

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PROJECT NAME/PLANSET TITLE

ENGINEERING SERVICES FOR DA

FLOOD ASSESSMENT

PACIFIC HIGHWAY, MOONEE BEACH, NSW
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CATCHMENT PLAN

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K000	A

DRAWING ID: P1706361-PS01-R02-K000

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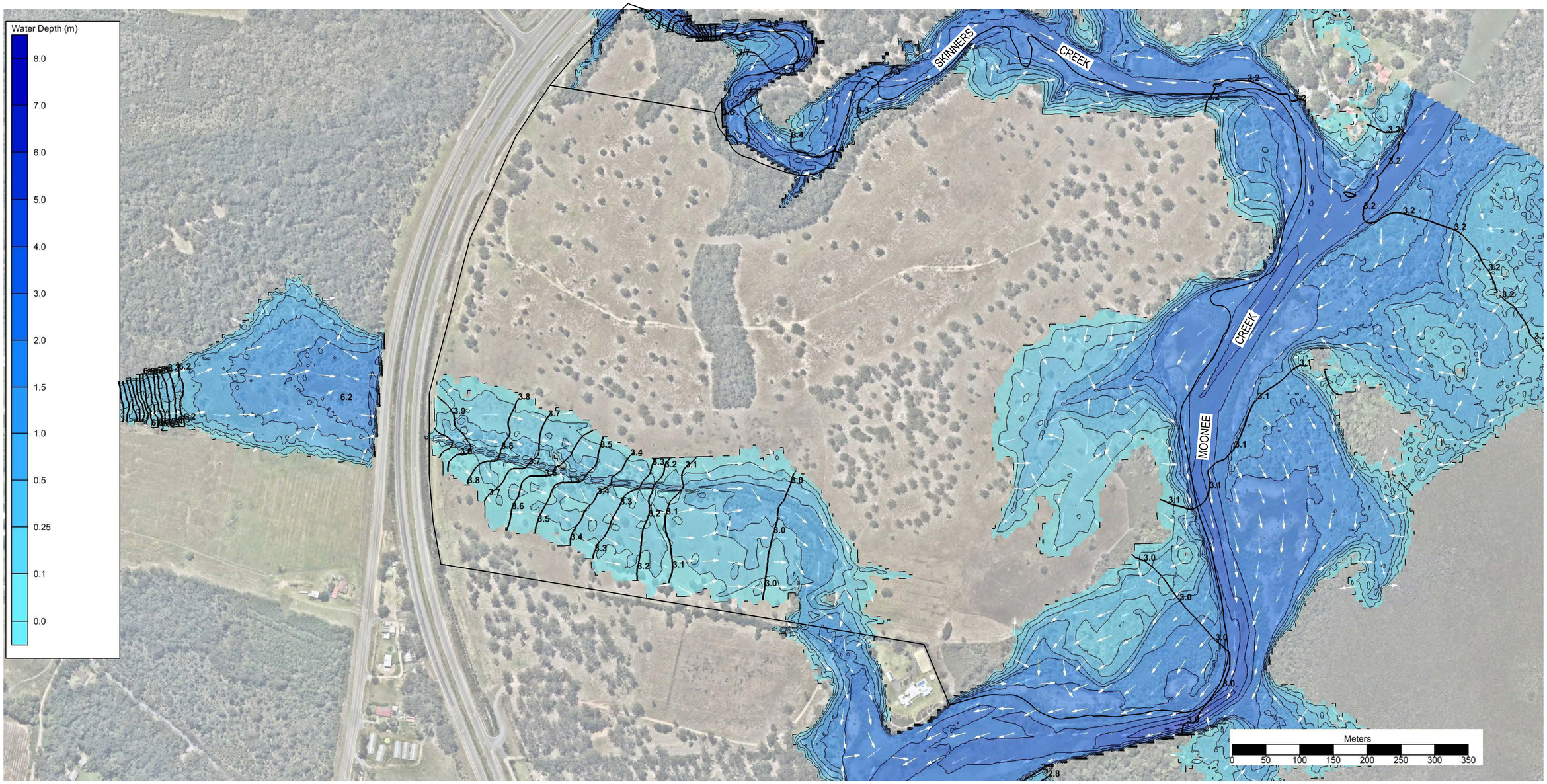

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CADASTRE BOUNDARIES

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A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

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GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

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DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN
EXISTING CONDITION
WATER LEVEL (mAHD) & WATER DEPTH (m)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K100	B

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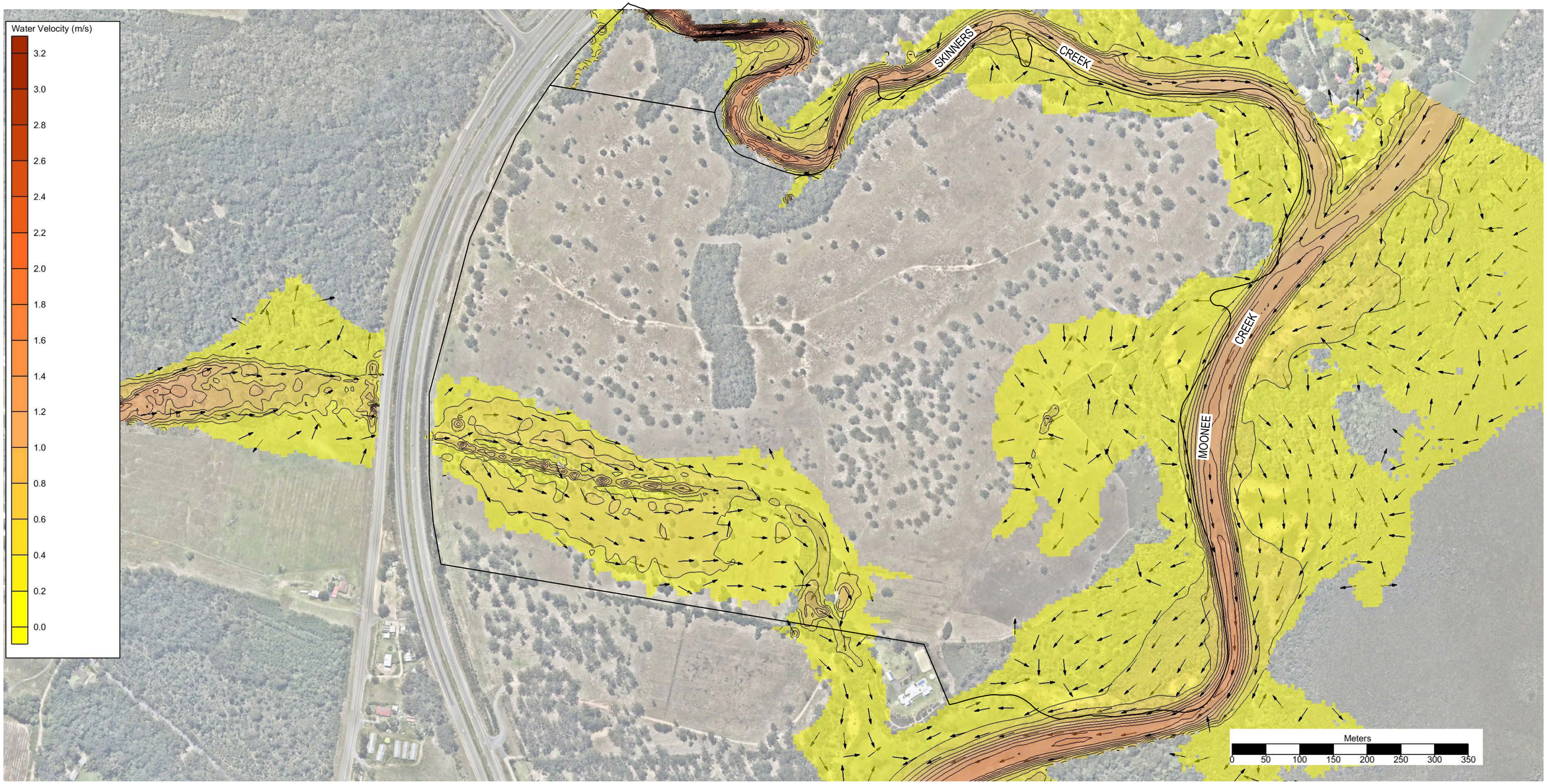

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CADASTRE BOUNDARIES

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
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A1 (A3) 1:3,000 (1:6,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

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EXISTING CONDITION
WATER VELOCITY (m/s)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K101	A

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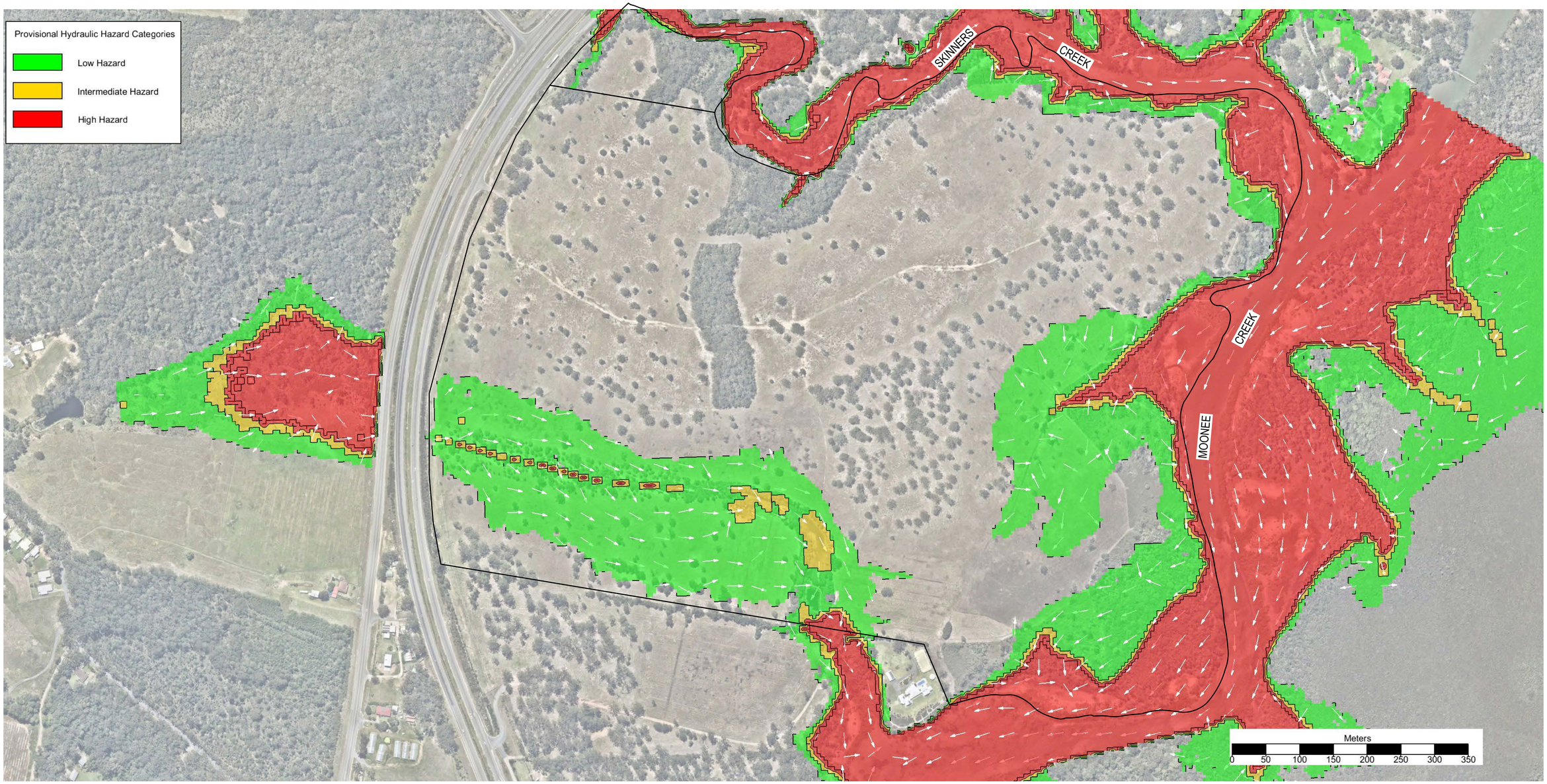

KEY

SITE BOUNDARY

CADASTRE BOUNDARIES

NOTE: HYDRAULIC HAZARD BASED ON NSW GOVERNMENT (2005)
FLOODPLAIN DEVELOPMENT MANUAL PROVISIONAL HYDRAULIC HAZARD CATEGORIES

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

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A1 (A3) 1:3,000 (1:6,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

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DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN
EXISTING CONDITION
PROVISIONAL HYDRAULIC HAZARD CATEGORIES

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K102	A

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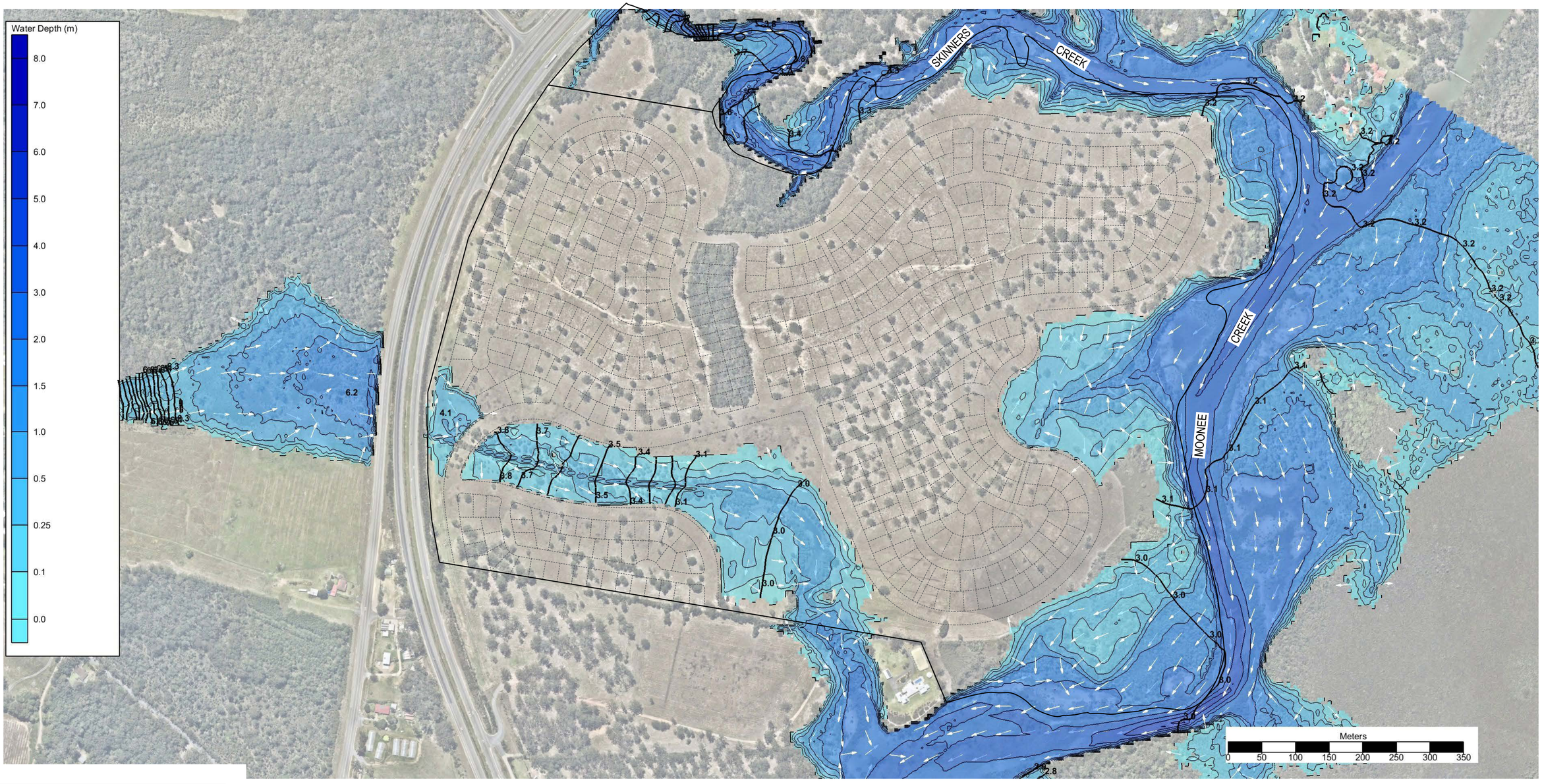

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SITE BOUNDARY

CADASTRE BOUNDARIES

PROPOSED LOT LAYOUT

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	MINOR AMENDMENTS	25/01/2018	PD	PD	DD	DD
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE: A1 (A3) 1:3,000 (1:6,000) METRES

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

CLIENT: RESOURCE DESIGN & MANAGEMENT

PROJECT NAME/PLANSET TITLE: ENGINEERING SERVICES FOR DA
FLOOD ASSESSMENT
PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

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DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN
PROPOSED CONDITION
WATER LEVEL (mAHD) & WATER DEPTH (m)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K200	B

DRAWING ID: P1706361-PS01-R02-K200

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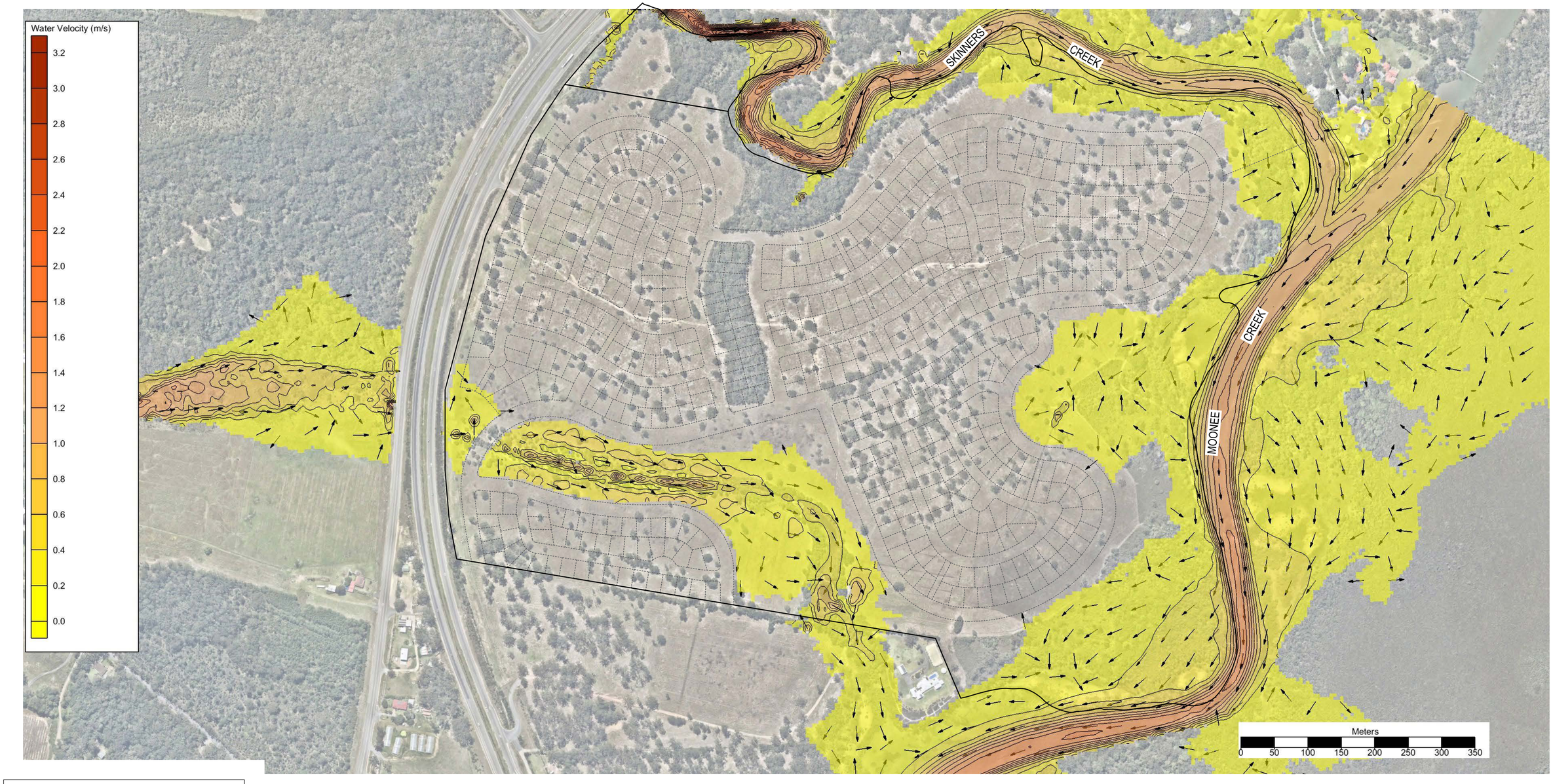

KEY

SITE BOUNDARY

CADASTRE BOUNDARIES

PROPOSED LOT LAYOUT

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE: 0 30 60 90 120 150 180 210 240 270 300 METRES
A1 (A3) 1:3,000 (1:6,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

CLIENT: RESOURCE DESIGN & MANAGEMENT

PROJECT NAME/PLANSET TITLE
ENGINEERING SERVICES FOR DA
FLOOD ASSESSMENT
PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

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DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN
PROPOSED CONDITION
WATER VELOCITY (m/s)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K201	A

DRAWING ID: P1706361-PS01-R02-K201

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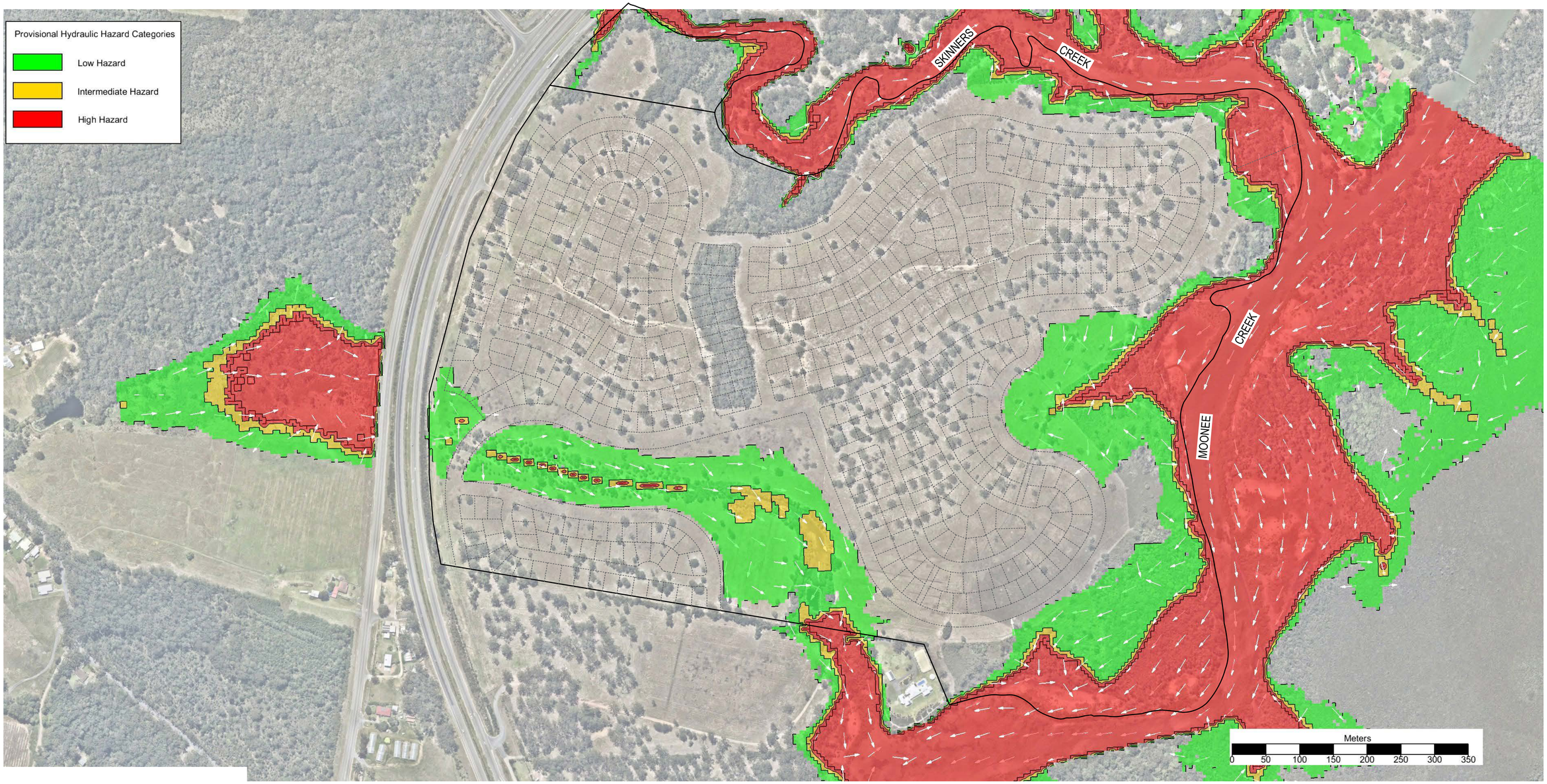

KEY

SITE BOUNDARY

CADASTRE BOUNDARIES

PROPOSED LOT LAYOUT

NOTE: HYDRAULIC HAZARD BASED ON NSW GOVERNMENT (2005)
FLOODPLAIN DEVELOPMENT MANUAL PROVISIONAL HYDRAULIC HAZARD CATEGORIES

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE
0 30 60 90 120 150 180 210 240 270 300 METRES
A1 (A3) 1:3,000 (1:6,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

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RESOURCE DESIGN & MANAGEMENT

PROJECT NAME/PLANSET TITLE
ENGINEERING SERVICES FOR DA
FLOOD ASSESSMENT
PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
Suite 201, 20 George St, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: www.martens.com.au

DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN
PROPOSED CONDITION
PROVISIONAL HYDRAULIC HAZARD CATEGORIES

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K202	A

PRINTED: --- - USER: PDWI
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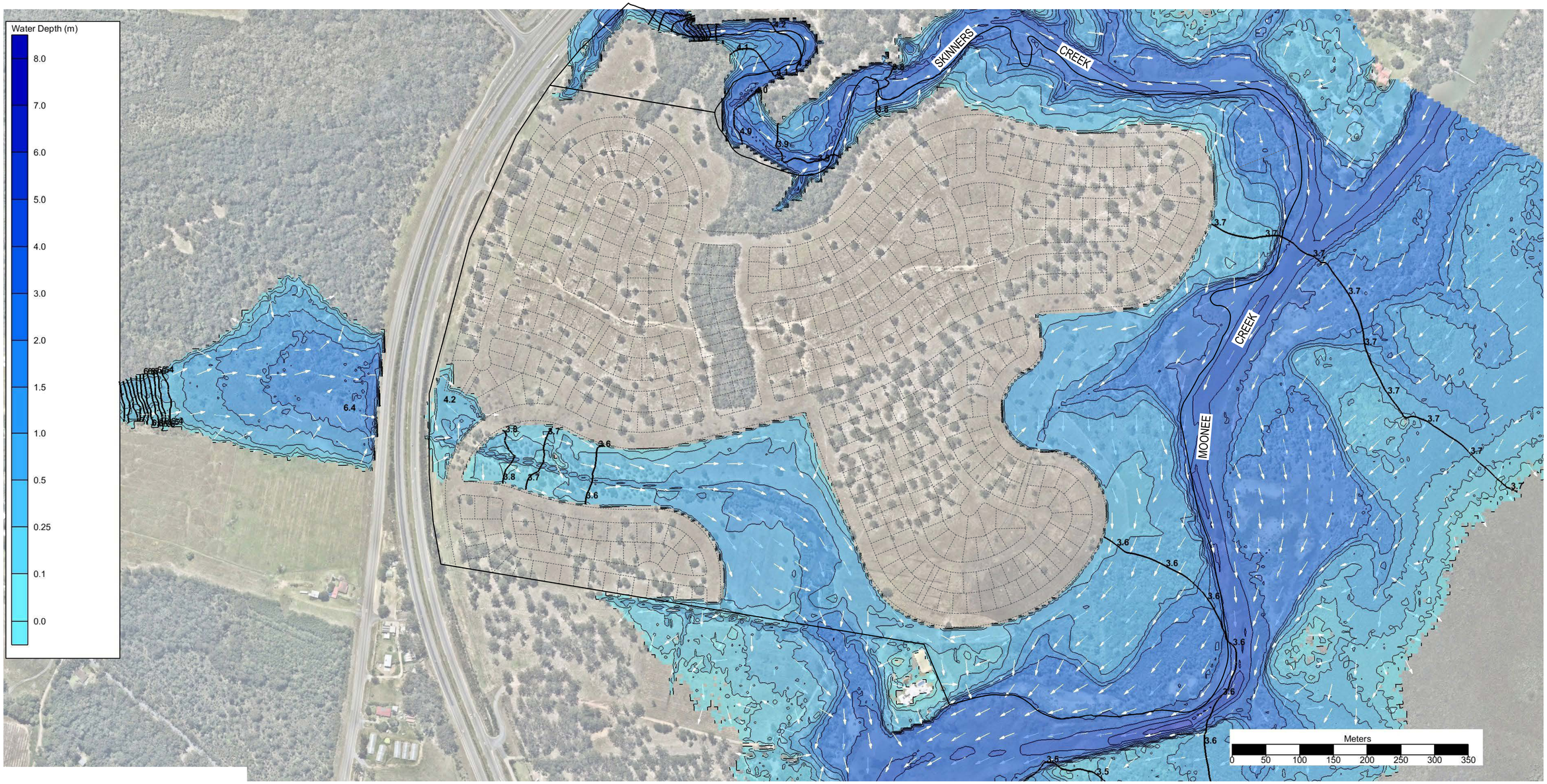
DRAWING ID: P1706361-PS01-R02-K202



KEY

SITE BOUNDARY

CADASTRE BOUNDARIES

PROPOSED LOT LAYOUT

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	**MINOR AMENDMENTS**	**25/01/2018**	**PD**	**PD**	**DD**	**DD**
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE: 0 30 60 90 120 150 180 210 240 270 300 METRES
A1 (A3) 1:3,000 (1:6,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

CLIENT: RESOURCE DESIGN & MANAGEMENT

PROJECT NAME/PLANSET TITLE: ENGINEERING SERVICES FOR DA
FLOOD ASSESSMENT
PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

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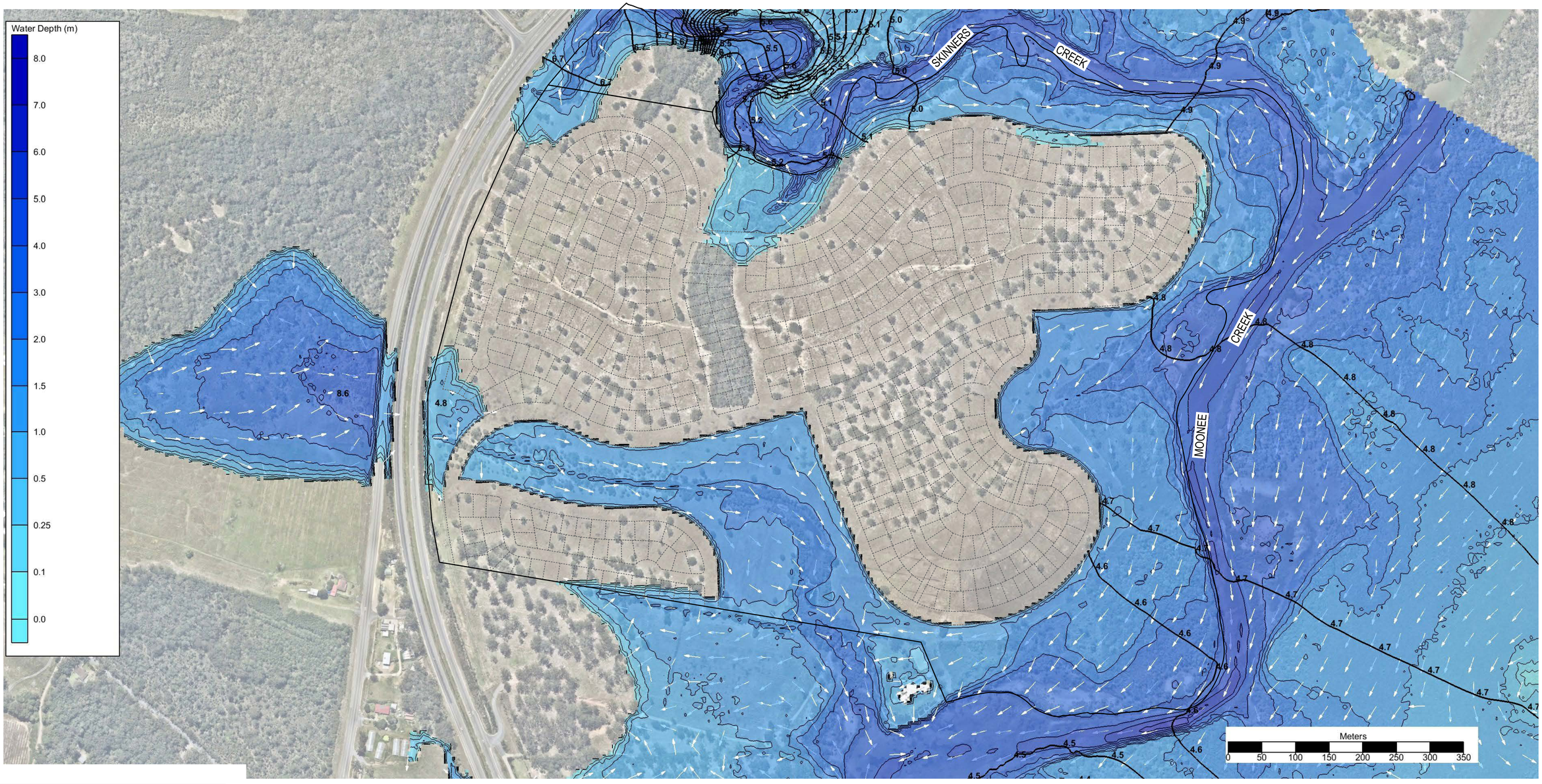
DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN + CLIMATE CHANGE
PROPOSED CONDITION
WATER LEVEL (mAHD) & WATER DEPTH (m)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K210	B

PRINTED: ---- - USER PDMH
A1 / A3 LANDSCAPE (A1LC__v02.0.01)
DRAWING ID: P1706361-PS01-R02-K210



KEY

SITE BOUNDARY

CADASTRE BOUNDARIES

PROPOSED LOT LAYOUT

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	MINOR AMENDMENTS	25/01/2018	PD	PD	DD	DD
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE: 0 30 60 90 120 150 180 210 240 270 300 METRES
A1 (A3) 1:3,000 (1:6,000)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

CLIENT: RESOURCE DESIGN & MANAGEMENT

PROJECT NAME/PLANSET TITLE: ENGINEERING SERVICES FOR DA
FLOOD ASSESSMENT
PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

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DRAWING TITLE
PMF CATCHMENT + NEAP OCEAN
PROPOSED CONDITION
WATER LEVEL (mAHD) & WATER DEPTH (m)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K220	B

PRINTED: ---- USER: PDWH
A1 / A3 LANDSCAPE (A1LC_v02.0.01)
DRAWING ID: P1706361-PS01-R02-K220

KEY

SITE BOUNDARY

CADASTRE BOUNDARIES

PROPOSED LOT LAYOUT

NOTE: AREAS COLOURED WHITE REPRESENT NEGLIGIBLE CHANGE
AREAS COLOURED YELLOW/RED REPRESENT WATER LEVEL INCREASE

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	INITIAL RELEASE	24/01/2018	RK	PD	DD	DD

SCALE
0 30 60 90 120 150 180 210 240 270 300 METRES
A1 (A3) 1:3,000 (1:6,000)

GRID: MGA | DATUM: mAHD | PROJECT MANAGER: GT

CLIENT: RESOURCE DESIGN & MANAGEMENT

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PROJECT NAME/PLANSET TITLE
ENGINEERING SERVICES FOR DA
FLOOD ASSESSMENT
PACIFIC HIGHWAY, MOONEE BEACH, NSW
LOT 1 & 2 DP 725785

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Email: mail@martens.com.au Internet: www.martens.com.au

DRAWING TITLE
1% AEP CATCHMENT + 5% AEP OCEAN
PROPOSED CONDITION
WATER LEVEL IMPACT (m)

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1706361	PS01	R02	PS01-K300	A

DRAWING ID: P1706361-PS01-R02-K300

PRINTED: --- USER PDNH
A1 / A3 LANDSCAPE (A1LC_v02.0.01)

Appendix F – Noise Assessment

12 January 2018

WM Project Number: 12266-G
Our Ref: RB20180112 TD_ltr
Email: wayne@resdesman.com.au

Mr Matt Cooper
Rothwell Boys Pty Ltd
Suite 34, Jetty Village Shopping Centre
COFFS HARBOUR JETTY NSW 2450

Dear Wayne

Re: The Glades - Road Noise Assessment

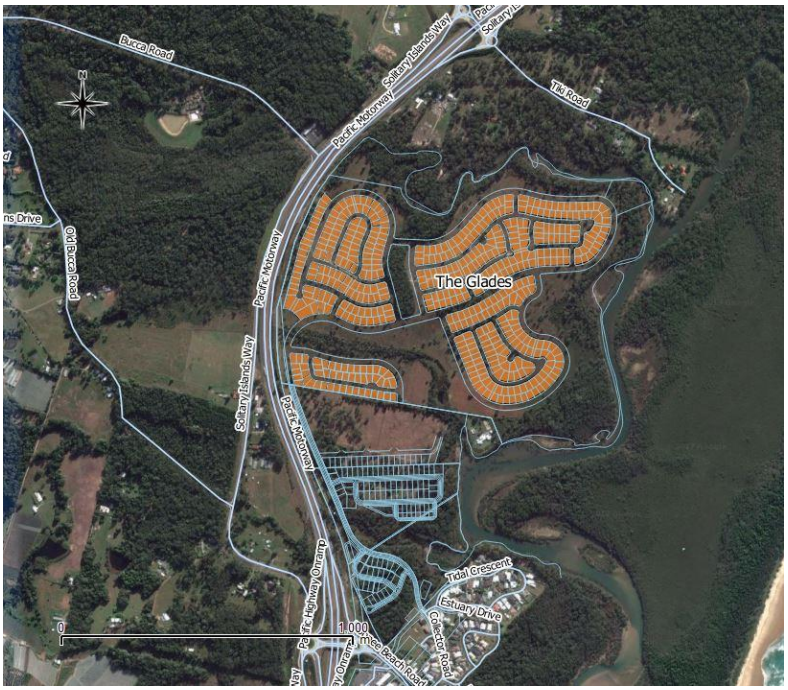
Wilkinson Murray has been engaged by Resource Design and Management Pty Ltd to conduct a noise assessment for the proposed 'The Glades' Sub-division on the Pacific Highway near Moonee Beach.

SITE DESCRIPTION

The proposed sub-development is located approximately 2km north of Moonee Beach. The site is bounded to the west by the Pacific Highway and is approximately 1km from the coast. The topography of the site slopes gently down towards the coast.

The site location and surrounding area is shown in Figure 1. The Pacific Highway is subjected to heavy traffic with daily volumes in excess of 20,000 vehicles per day.

Figure 1 Proposed site location



NOISE CRITERIA

Land use planning offers the greatest potential for minimising conflict between road noise and sensitive land uses, followed closely by the development of appropriately designed and noise insulated buildings.

The State Environmental Planning Policy (Infrastructure) 2008 (Infrastructure SEPP) (Department of Planning 2007) sets internal noise criteria which must be met by new developments along some of the busiest transport corridors in NSW. This is a major initiative to ensure that sustainable higher density living can occur along major transport routes whilst maintaining an acceptable level of amenity for residents. Clause 102 within Infrastructure SEPP is potentially applicable for the Moonee Parklands Sub-division and is reproduced below:

102 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 a road corridor for a freeway, a tollway or a transitway 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 the RTA) 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 child care centre.

The noise criteria is summarised below:

(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 L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building – 35 dBA at any time between 10pm and 7am,

(b) Anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dBA at any time.

The Department of Planning and Infrastructure have released a guideline in support of the SEPP called *Department of Planning "Development near Rail and Busy Roads – Interim Guidelines 2008*. The aim of that guideline is to assists in the planning, design and assessment of development in, or adjacent to busy roads".

The application of the Infrastructure SEPP requirements is mandatory only for residential developments near specific highly trafficked roads (daily traffic volume of more than 40,000 vehicles). However, the guideline also recommends, that it is advisable for new developments on moderately busy roads (where daily traffic volume of more than 20,000 vehicles) follow the design advice offered in the SEPP.

The "Development near Rail and Busy Roads – Interim Guidelines 2008" confirms that the noise criteria is calculated as $L_{Aeq,9hr}$ for night and $L_{Aeq,15hr}$ for day.

The proposed 'the Glades' sub-division is located on the Pacific Highway near Moonee Beach where it is advisable for any new sub-division to meet the requirements of the Infrastructure SEPP.

ASSESSMENT - TRAFFIC NOISE INTRUSION ON SITE

The Pacific Highway around the proposed 'the Glades' Sub-division has been upgraded by Roads and Maritime Services as part of the Sapphire to Woolgoolga upgrade.

RMS has conducted an operational noise management plan for the project which specifically identifies predicted traffic noise levels affecting the site for 2024 (10 years after completion of the upgrade). Noise levels have been predicted using the *CoRTN* traffic noise prediction algorithms as implemented in the Soundplan noise model. The calculations were conducted by AECOM.

The predicted 2024 results of site noise modelling are presented in Figure 2 for day and night time, respectively.

Figure 2 2024 noise modelling results

The Post-Construction Operational Noise Report was completed in 2015 by Renzo Tonin & Associates (NSW) Pty Ltd. The operational noise report concluded that the initial predictions were within acceptable tolerance when compared with the 'as-built' noise model. In the area around Moonee Beach receivers mostly saw a minor decrease in noise levels compared to the operational noise management plan.

A review of the noise contours reveals that external noise levels of 60 $L_{Aeq,15hour}$ and 55 $L_{Aeq,9hour}$ intrude on the proposed sub-division. The 60 $L_{Aeq,15hour}$ and 55 $L_{Aeq,9hour}$ correspond to the point at which an unshielded house would require a reduction of 20dB in order to comply with the Infrastructure SEPP criteria.

Wilkinson Murray has conducted studies on the propagation of noise from roads. Typically, the first row of houses provides up to 8 to 10dB shielding. Once a row of houses is built near the Pacific Highway, the L_{Aeq} contours in Figure 2 will be much closer to the highway.

The current approved project plan involves the inclusion of noise attenuation barriers as shown in Figure 3. Due to other considerations, these barriers will not be included. Therefore, only architectural treatments of the houses are considered.

Figure 3 Approved noise attenuation barriers

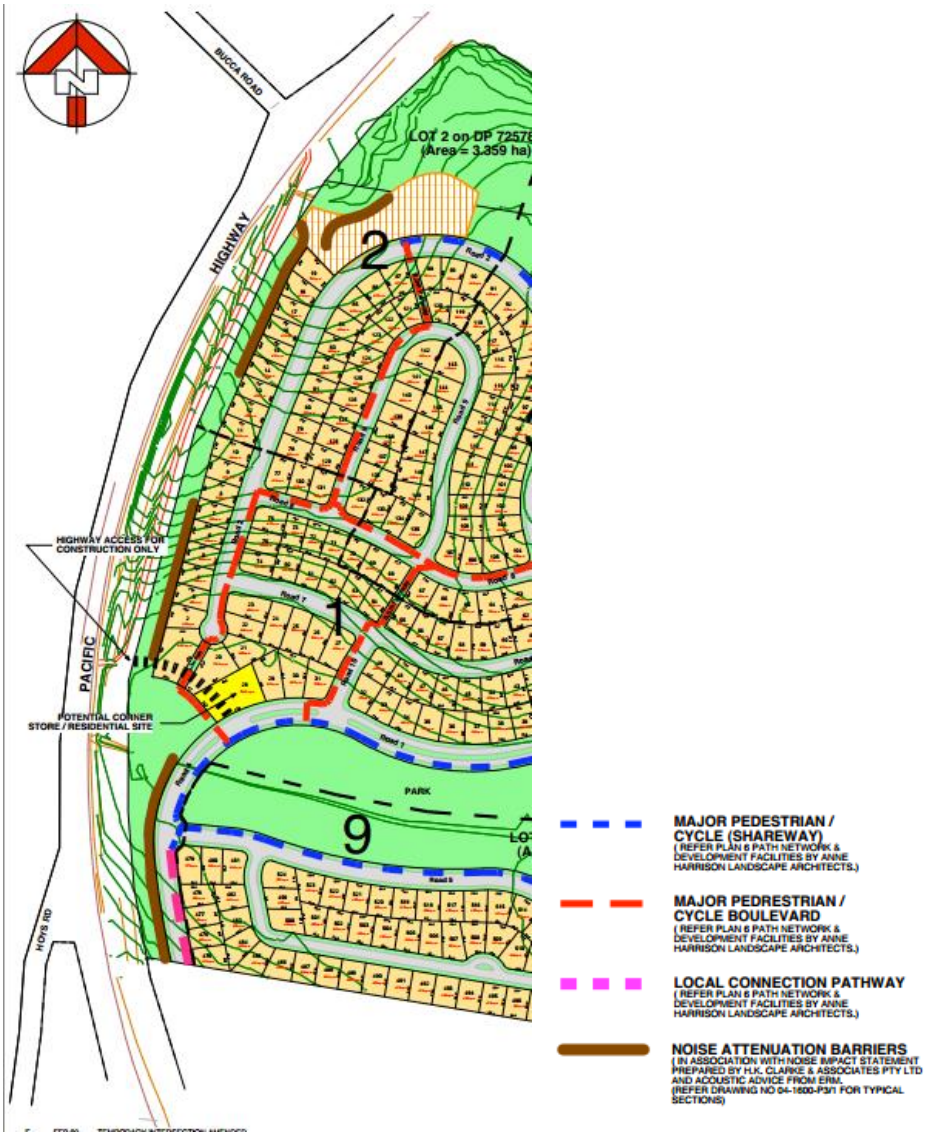


Figure 4 shows the sub-divided lots bordering on the Pacific Highway that would require architectural treatment to meet the SEPP noise criteria in the bedrooms and habitable rooms other than laundries and kitchens. Two zones have been considered. Table 1 and Table 2 show the required architectural treatments required for the zones identified in Figure 4. Only the facades facing the Pacific Highway would require the noise treatments.

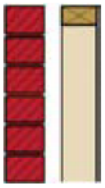
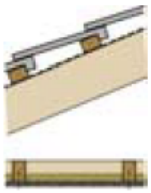
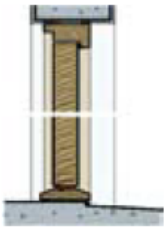
Figure 4 Areas where noise mitigation is required

NOISE MITIGATION

Green Mitigation Zone

- The houses in this zone can be single storey or double storey. In the case of double storey, both floors will need to be treated.
- The following table sets out standard treatment for the sleeping areas and other habitable areas of the single story house located in the identified zone.

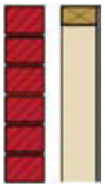
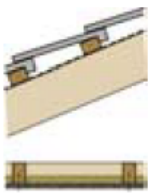
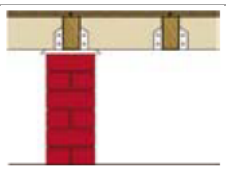
Table 1 Required Architectural Mitigation Measures for Green Zone

Building Element	Standard Constructions	Example
Windows/Sliding doors	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
Frontage facade	brick veneer construction: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
	or Double brick cavity construction: 2 leaves of 110mm brickwork separated by 50mm gap	
Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity	
Entry door	45mm solid core timber door fitted with full perimeter acoustic seals	
Floor	Concrete slab floor on ground	

Blue Mitigation Zone

- Houses in this area can have two stories. The ground floor does not need any special acoustic treatment as it will be shielded by the houses in front.
- The following table sets out standard treatment for the sleeping areas and other habitable areas for the first floor located in the identified zone.

Table 2 Required Architectural Mitigation Measures for Blue Zone

Building Element	Standard Constructions	Example
Windows/Sliding doors	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
Frontage facade	brick veneer construction: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
	or Double brick cavity construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	or Timber frame or cladding construction. 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity	
Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity	
Floor	1 layer of 19mm structural floor boards, timber joist on piers	
	Concrete slab floor on ground	

Ventilation

In order to fully comply with the Infrastructure SEPP requirements, it is necessary to provide alternative ventilation so that windows can be kept closed. In this way, the indoor noise goals can be met while providing room ventilation that meets the Building Code of Australia. Three typical ways to achieve this are:

1. Ducted Air-Conditioning System where the Fan Coil Units also provide Outside Air mixed with the Return Air. Air-conditioning ductwork and plenums must be acoustically treated such that the acoustic rating of the ceiling is not de-rated.
2. A device similar to the Aeropac Room Ventilator and Air-Filter is fitted to the required rooms. (Available from Acoustica – ph: 1300 722 825).
3. Silenceair external wall vents, together with upgraded toilet and laundry fans to provide forced flow-through ventilation. The fans in this case must be operating whenever external doors/windows are closed (available from www.silenceair.com).

CONCLUSION

Wilkinson Murray has conducted an acoustic assessment for the proposed 'the Glades' sub-division on the Pacific Highway. The noise assessment was carried out in accordance with NSW Infrastructure SEPP.

The key findings of this assessment are as follows:

- Road traffic on the Pacific Highway will generate noise levels intruding on the proposed sub-division.
- Improved architectural treatments are required to meet internal noise criteria presented in the SEPP.
- Ventilation will be required in bedrooms and habitable rooms to allow windows to be shut to meet Infrastructure SEPP requirements.

I trust this information is sufficient. Please contact us if you have any further queries.

Yours faithfully
WILKINSON MURRAY

Tom Dufty
Engineer

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AAAC
This firm is a member firm of the Association of Australasian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Appendix G – Acid Sulfate Soils Assessment

CH1173/1-AI DJB
3 December 2004

Winten Property Group Pty Ltd
PO Box 2578
SOUTHPORT QLD 4215

Attention: Doug Aird

Dear Sir,

RE: MOONEE SUBDIVISION, PACIFIC HIGHWAY MOONEE BEACH
GEOTECHNICAL ASSESSMENT

1. INTRODUCTION

This report presents the results of a geotechnical assessment carried out by Coffey Geosciences Pty Ltd (Coffey) for the proposed subdivision development located off the Pacific Highway at Moonee Beach.

The development is understood to comprise a residential subdivision including residential allotments and access roads. A concept plan provided by Resource Design & Management Pty Ltd, and showing the proposed layout of the subdivision, is attached.

The scope of work for the geotechnical assessment included providing recommendations on:

- Surface and subsurface conditions;
- Excavation conditions;
- General comments on the suitability of the site for residential development;
- Acid sulfate soils.

The following report presents a preliminary discussion of geotechnical conditions at the site with respect to the above scope of work.

2. FIELD WORK

Field work for the geotechnical assessment was carried out on 2 March 2004 and consisted of the excavation of nine test pits (TP1 to TP9) to depths of about 2m or prior refusal. The test pits were excavated in the full time presence of a Geotechnical Engineer from Coffey who located the pits, took samples, and produced engineering logs of the pits. The engineering logs of the pits are attached, together with explanation sheets defining the terms and symbols used in their preparation.

The test pit locations are shown on Figure 1.

The proposed drilling of boreholes and installation of groundwater level monitors at the site have not been conducted at this stage due to the waiting time for monitoring equipment from overseas.

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Harbour
NSW 2450 Australia
PO Box 704 Coffs Harbour
NSW 2450 Australia
Telephone +61 2 6651 3213
Facsimile +61 2 6651 5194
Email coffs@coffey.com.au

Samples obtained during test pitting were taken to Coffey's Coffs Harbour laboratory for the acid sulfate soils assessment. This testing has not been completed at this stage. We envisage that some additional testing by an external laboratory will be necessary also.

3. SITE CONDITIONS

3.1 Surface Conditions

The site is located on the eastern side of the Pacific Highway across from the intersection of the Pacific Highway and Bucca Road, and is in an area of low density rural development.

The site is located in an area of gently to moderately undulating topography and flatter low lying alluvial plains associated with Moonee Creek. Site slopes are generally even grades of about 5^{O} to 10^{O}, with lower lying areas observed to be relatively flat.

Drainage of the site was judged to be good in the more elevated undulating slopes and to occur by overland flow. The low lying alluvial plains were judged to be poorly drained, as surface water was observed in parts of this area.

Trafficability over the majority of the site was judged to be good in the more elevated areas and fair to poor in the lower lying alluvial plains. A 4WD Backhoe generally trafficked over the alluvial plains relatively easily in most areas, though wet and boggy ground was encountered in some areas.

Vegetation on the site comprised mainly short grasses and scattered trees over the majority of the site proposed for development. Areas with more dense trees were observed over a significant area of the site, though it is understood that these areas are not to be developed at this stage.

3.2 Subsurface Conditions

The 1:250,000 Geological Map of Dorrigo/Coffs Harbour indicates the site to be on the boundary of the Coramba Beds comprising mudstone, siltstone and greywacke with minor intervals of volcanic rocks and Quaternary Alluvium.

The subsurface conditions can be separated into two distinct geological units as follows:

- Unit 1 – Topsoil overlying residual soils and weathered rock.
- Unit 2 – Topsoil and alluvial soils overlying residual soils.

The Unit 1 subsurface conditions, in which TP1 to TP5 and TP7 were excavated can be summarised as comprising sand and clay topsoil and colluvial soils up to about 0.2m thick, overlying very stiff to hard, high plasticity residual clay, grading to XW Claystone in TP4, TP5 and TP7. Near backhoe refusal was encountered in TP4 and TP7 at depths of 1.7m and 1m respectively.

The Unit 2 subsurface conditions, in which TP6, TP8 and TP9 were excavated can be summarised as comprising sand and clay topsoil about 0.2m to 0.3m thick, overlying very stiff sandy clay alluvial soils in TP6 and TP9 to about 0.5m to 0.6m depth and moist to wet and wet sand in TP8 to about 1.3m depth, overlying very stiff residual clay to beyond the limit of investigation.

Water inflow was observed in TP6, TP8 and TP9 at about 0.5m, 0.7m and 0.4m depth respectively. It should be noted that groundwater conditions can change depending on rainfall, temperature and other factors.

The approximate areas of Unit 1 and Unit 2 soils are shown on Figure 1.

4. DISCUSSION OF GEOTECHNICAL FACTORS FOR DEVELOPMENT

4.1 General

Based on the results of the geotechnical investigations carried out to date, the site is considered to be generally suitable for a residential subdivision development with respect to geotechnical engineering aspects. A more detailed geotechnical assessment to address site specific issues is recommended prior to final subdivision design and construction. Details of the recommended scope of this further work can be provided once additional information relating to the proposed development is available.

Coffey has been engaged to install six groundwater monitoring wells at the site for the monitoring of groundwater level variation over a 12 month period to assess seasonal variations in groundwater levels. The groundwater monitoring is understood to be required for assessment and detailed design of the subdivision and stormwater treatment systems at a later date.

4.2 Road Construction

Based on the anticipated subsurface conditions, subgrade soils exposed during road construction are anticipated to consist of clay residual soils in Unit 1 areas over much of the site, with some clay and sand alluvial and colluvial soils in Unit 2 areas and in natural drainage lines which may be over wet. It is presumed that some site filling will be required in lower areas of the site.

Design CBR values recommended for preliminary pavement design are expected to be as follows:

- 3% to 5% for clay residual soils;
- 3% for clay alluvial soils, with possibly the need for thicker pavement and/or geofabric in areas of poor or wet subgrade soils;

Subgrade moisture conditions can change depending on rainfall, temperature and other factors. In general, it is recommended that subsoil drainage is required along the high side of all roads aligned across site slopes and on both sides of roads aligned down slopes. Additional drainage requirements may be required in low lying Unit 2 areas or areas identified during a more detailed geotechnical assessment.

4.3 Footings and Founding Conditions

Based on our preliminary site assessment, we anticipate that most of the proposed residential allotments will be located in areas of residual soils and weathered rock. High level footings designed in accordance with AS2870-1996 are likely to be suitable for residential dwellings.

High level footings are likely to be suitable for developments located in the Unit 2 areas of the site, though this area is likely to be more variable and thus so will founding conditions. Suitable footings will be dependant on the strength properties of clay soils and the density profile for sand soils where encountered. Use of piles to support footings or ground modification (i.e. additional compaction) may be required in some areas. Filling in Unit 2 areas will affect the recommended founding conditions for buildings.

4.4 Excavation Conditions

Where excavation is required, it is anticipated that soil strength materials could be excavated by conventional dozer blade or backhoe bucket. Refusal may be encountered on weathered rock in Unit 1 areas, though this

will depend on the location and depth of the excavation.

Excavation below the depths of backhoe refusal may be possible by the use of larger and more powerful excavators or bull dozers. Heavy ripping may be required in deeper excavations. The use of hydraulic rock hammers may be required in areas of stronger or shallower rock.

Excavations may experience water inflow, particularly in the Unit 2 areas, although it is also possible for water to collect over bedrock in the Unit 1 areas.

4.5 ACID SULFATE SOILS

4.5.1 Formation and Potential Impacts

Acid Sulfate Soils (ASS) are soils which contain significant concentrations of pyrite which, when exposed to oxygen, in the presence of sufficient moisture, oxidises, resulting in the generation of sulfuric acid. Unoxidised pyritic soils are referred to as potential ASS (PASS). When the soils are exposed, the oxidation of pyrite occurs and sulfuric acids are generated, the soils are said to be actual ASS (AASS).

Pyritic soils typically form in waterlogged, saline sediments rich in iron and sulfate. Typical environments for the formation of these soils include tidal flats, salt marshes and mangrove swamps below about RL 5m AHD. They can also form as bottom sediments in coastal rives and creeks.

Pyritic soils of concern on low lying NSW and coastal lands have mostly formed in the Holocene period, (i.e. 10,000 years ago to present day) predominantly in the 7,000 years since the last rise in sea level. It is generally considered that pyritic soils which formed prior to the Holocene period would already have oxidised and leached during periods of low sea level which occurred during ice ages, exposing pyritic coastal sediments to oxygen.

Disturbance or poorly managed development and use of acid sulfate soils can generate significant amounts of sulfuric acid, which can lower soil and water pH to extreme levels (generally <4) and produce acid and salts, resulting in high salinity.

The low pH, high salinity soils can reduce or altogether preclude vegetation growth and can produce aggressive soil conditions which may be detrimental to concrete and steel components of structures, foundations, pipelines and other engineering works.

Generation of the acid conditions often releases aluminium, iron and other naturally occurring elements from the otherwise stable soil matrices. High concentrations of such elements, coupled with low pH and alterations to salinity can be detrimental to aquatic life. In severe cases, affected waters flowing off-site can have detrimental effect on aquatic ecosystems.

4.5.2 Discussion of Acid Sulfate Soils

The 1:250,000 scale Moonee Beach acid sulfate soils risk map indicates that the majority of areas to be developed are not within areas with known acid sulfate soils, which agrees with our assessment that much of the site is underlain by residual soils and weathered rock which do not have acid generating potential. These are assumed to be in the Unit 1 areas identified on Figure 1.

Areas within gullies and lower lying areas (Unit 2) of about 2m to 4m elevation to AHD were indicated to have a low probability of the presence of acid sulfate soils within 1m to 3m below the ground surface.

Therefore, based on acid sulfate risk maps and our walk over assessment, we would anticipate that acid

sulfate soils may be encountered in the Unit 2 areas of the site, though these areas are likely to be relatively small and the scale and amount of treatment required relatively minor. We would anticipate that treatment may comprise mixing disturbed soils with a reasonably small amount of lime if required. It will be necessary to develop an acid sulfate soil management plan prior to construction.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

IAN SHIPWAY

ATTACHMENTS:

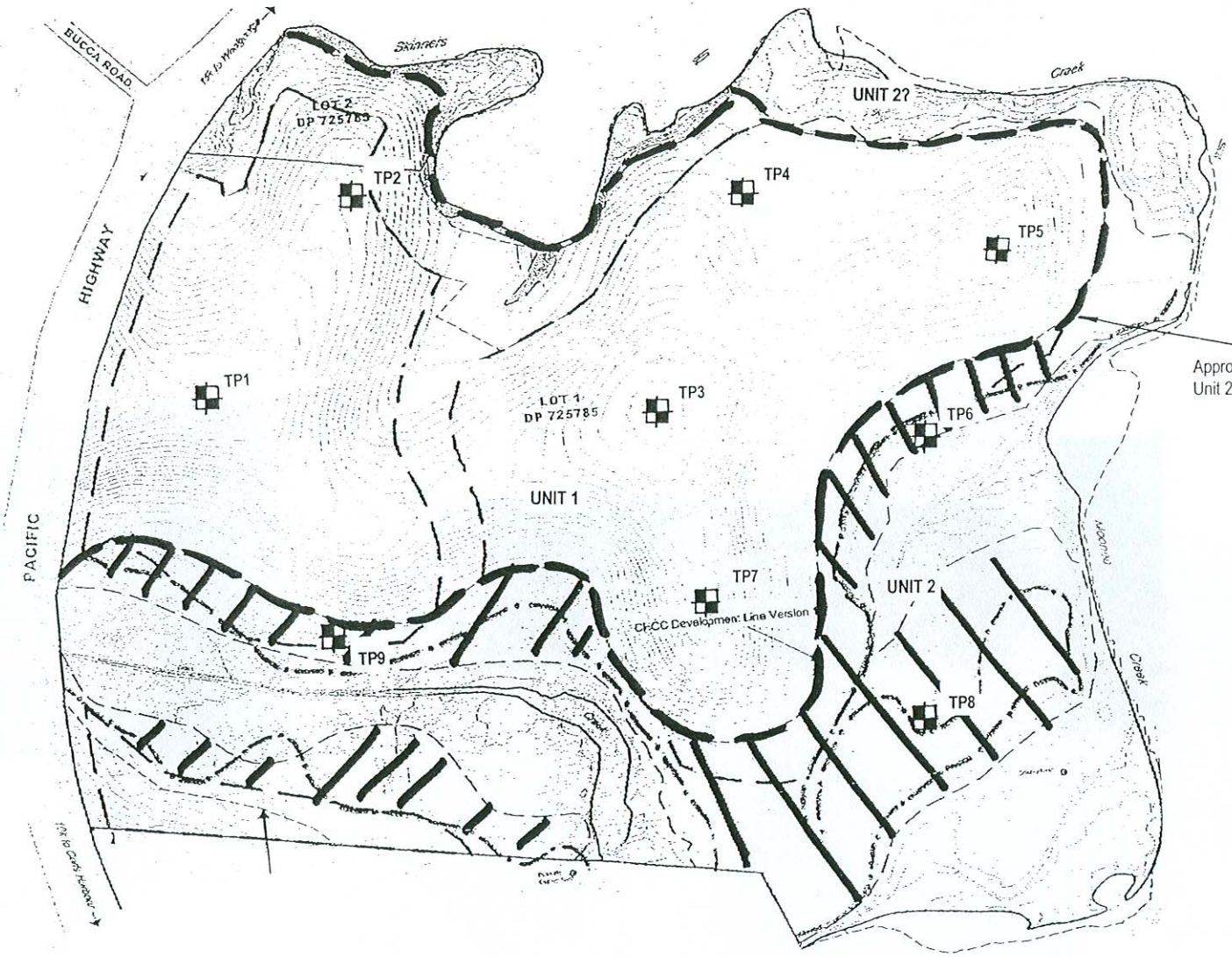
Figure 1

Drawing C1 – Concept Plan (provided by Resource Design & Management Pty Ltd)

Engineering Logs and Explanation Sheets

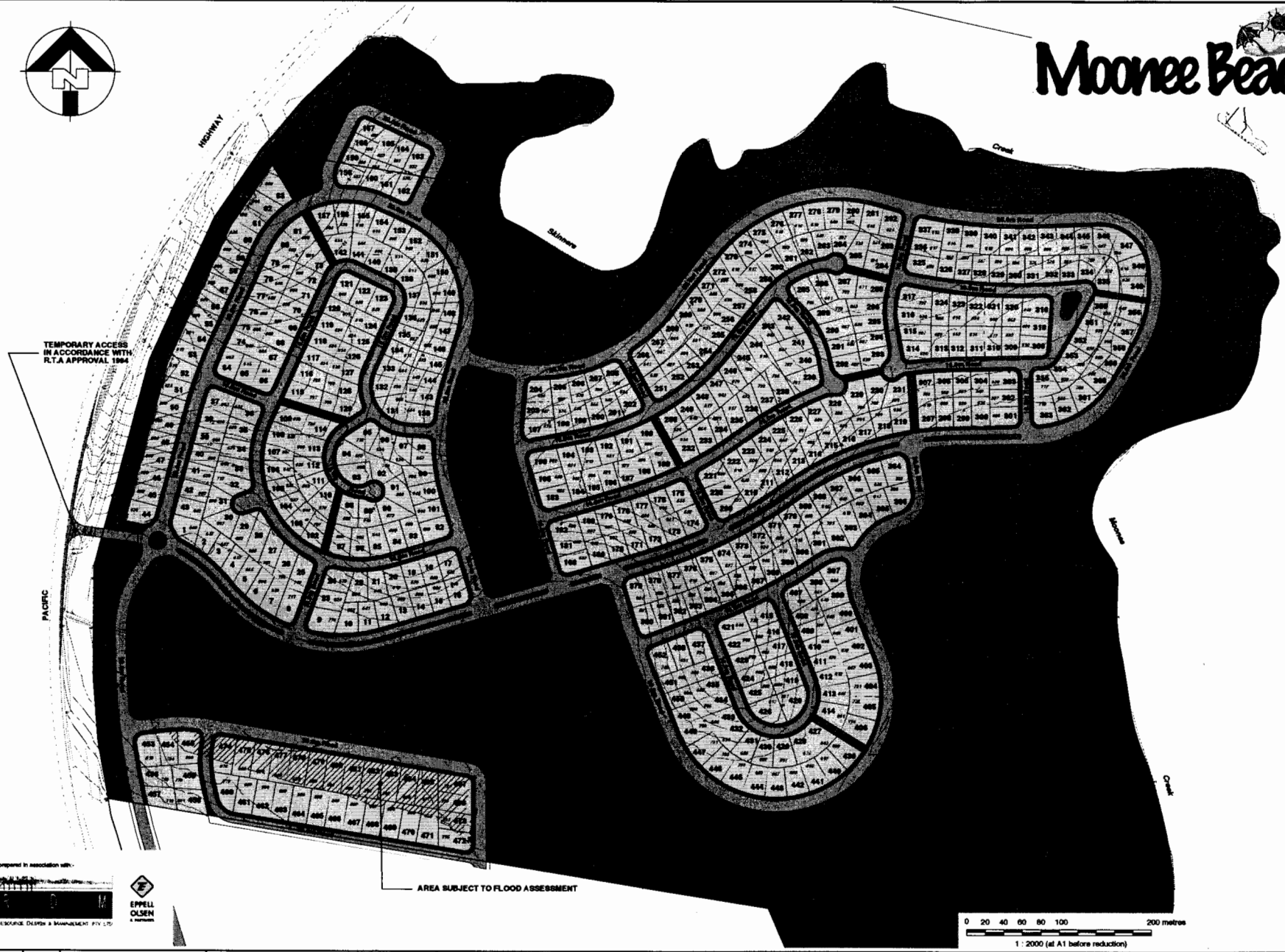
Important Information about your Coffey Report

Distribution:	Original held by	Coffey Geosciences Pty Ltd
	1 copy	Resource Design & Management Pty Ltd



Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical I Resources I Environmental I Technical I Project Management	
Drawn	DJB	WINTEN PROPERTY GROUP PTY LTD PROPOSED SUBDIVISION PACIFIC HIGHWAY MOONEE BEACH GEOTECHNICAL ASSESSMENT	Drawing no FIGURE 1
Approved			
Date	8/3/2004		
Scale	1:5000		Job no CH1173/1-AC

Moonee Beach North



prepared in association with:-

RESOURCE DESIGN & MANAGEMENT PTY LTD

EPPELL OLSEN & PARTNERS

prepared for:-

WINTEN PROPERTY GROUP

smdt no.	date	amendment

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CONCEPT PLAN

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scales	AS SHOWN		
design	RKH	drawn	RKH
date	SEPT 2004	signed	

client	WINTEN PROPERTIES PTY LTD	project no.	04-1600
project	PROPOSED RESIDENTIAL SUBDIVISION MOONEE BEACH COFFS HARBOUR	dwg no.	C1
		amendment	3/11/04

Engineering Log - Borehole

Borehole No. **BH1**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **5.4.2004**

Principal:

Date completed: **5.4.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **AGG/ELC**

Borehole Location: **REFER TO FIGURE 1**

Checked by:

Coffey

drill model and mounting: MD200 | Easting: | slope: -90° | R.L. Surface:

hole diameter: 100 mm | Northing | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV		C				0		CH	**SANDY CLAY:** brown, high plasticity,	M			
								CH	**CLAY:** grey, high plasticity, some sand.		St-VSt	×	
						1							
								CH	**CLAY:** grey to pale brown, high plasticity, some sand.	D		×	
						2							
						3		CH	**CLAY:** grey to brown , high plasticity, some sand.	M			
						4							Water level at time of drilling about 3.8m
						5			Borehole BH1 continued as cored hole				
						6							
						7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering Log - Borehole

Borehole No. **BH2**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: ***WINTEN PROPERTY GROUP***

Date started: ***5.4.2004***

Principal:

Date completed: ***5.4.2004***

Project: ***PROPOSED DEVELOPMENT***

Logged by: ***AGG/ELC***

Borehole Location: ***REFER TO FIGURE 1***

Checked by:

Coffey

drill model and mounting: MD200 | Easting: | slope: -90° | R.L. Surface:

hole diameter: 100 mm | Northing | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa (100 200 300 400)	structure and additional observations
ADV		C	▶			1		CH	**SANDY CLAY:** grey/orange/red, high plasticity.	D-M / W	St-VSt	×	
						2		CH	**CLAY:** grey/red, medium to high plasticity, some sand.		VSt	×	Water level at time of drilling about 1.8m
						3		CH	**CLAY:** grey, high plasticity.		H	×	Drill rate increase
						4							Drill rate decrease
						5							
						6			Borehole BH2 continued as cored hole				
						7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description
based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering Log - Borehole

Borehole No. **BH3**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **5.4.2004**

Principal:

Date completed: **5.4.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **AGG/ELC**

Borehole Location: **REFER TO FIGURE 1**

Checked by:

Coffey

drill model and mounting: MD200 | Easting: | slope: -90° | R.L. Surface:

hole diameter: 100 mm | Northing | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV		C	▶			1		SP	**SAND:** fine to medium grained, black, organic content about 50%.	M			TOPSOIL
								SP	**SAND:** fine to medium grained, grey.				ALLUVIAL
								SP	**SAND:** dark brown, indurated sand.				
								SP	**SAND:** fine to medium grained, brown.	W			
						2		CH	**CLAY:** high plasticity, grey/brown.	M	St	×	RESIDUAL?
						3							
						4							
						5			Borehole BH3 continued as cored hole				
						6							
						7							
						8							

BOREHOLE CH1173-1.GPJ COFFEY.GDT 12.08.04

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Borehole No. **BH4**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Engineering Log - Borehole

Client: ***WINTEN PROPERTY GROUP***

Date started: ***5.4.2004***

Principal:

Date completed: ***5.4.2004***

Project: ***PROPOSED DEVELOPMENT***

Logged by: ***AGG/ELC***

Borehole Location: ***REFER TO FIGURE 1***

Checked by:

Coffey

drill model and mounting: MD200 | Easting: | slope: -90° | R.L. Surface:

hole diameter: 100 mm | Northing | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV		C				0		CH	**CLAYEY SAND:** fine to medium grained, dark brown.	M			TOPSOIL
								SP	**SAND:** fine to medium grained, brown/orange				ALLUVIAL
								SP	**SAND:** fine to medium grained, brown.	M-W			
						1		SP	**SAND:** fine to medium grained, pale brown, some clay.	W			
								CH	**CLAY:** high plasticity, grey, some fine to medium grained sand.	M	St		RESIDUAL?
						2							Water level at time of drilling about 2m.
						3							
						4			Borehole BH4 continued as cored hole				
						5							
						6							
						7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering Log - Borehole

Borehole No. **BH5**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **5.4.2004**

Principal:

Date completed: **5.4.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **AGG/ELC**

Borehole Location: **REFER TO FIGURE 1**

Checked by:

Coffey

drill model and mounting: MD200 | Easting: | slope: -90° | R.L. Surface:

hole diameter: 100 mm | Northing | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
ADV		C				0		CL	**SANDY CLAY:** low plasticity, black/dark brown.	W	S-F		TOPSOIL
								CL	**SANDY CLAY:** medium plasticity, yellow/orange/red/grey.	M			ALLUVIAL
						1							
								CH	**CLAY:** grey, high plasticity.	D	H		Increase torque RESIDUAL?
						2							
						3			Colour change to red/purple.				
						4							
								CH	**SANDY CLAY:** high plastcity, grey.	M	VSt-H		
						5			Borehole BH5 continued as cored hole				
						6							
						7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Borehole No. **BH6**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Engineering Log - Borehole

Client: ***WINTEN PROPERTY GROUP***

Date started: ***5.4.2004***

Principal:

Date completed: ***5.4.2004***

Project: ***PROPOSED DEVELOPMENT***

Logged by: ***AGG/ELC***

Borehole Location: ***REFER TO FIGURE 1***

Checked by:

Coffey

drill model and mounting: MD200 | Easting: | slope: -90° | R.L. Surface:

hole diameter: 100 mm | Northing | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
ADV		C						CH	**SANDY CLAY:** high plasticity, grey.	M			TOPSOIL
								CH	**SANDY CLAY:** high plasticity, brown.				ALLUVIAL
						1		CH	**CLAY:** high plasticity, grey.		VSt-H		
						2			Colour change to brown/grey.				
						3			Colour change to grey/brown/yellow				
						4			Some fine gravel.				
						5			Borehole BH6 continued as cored hole				
						6							
						7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP1**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	None Observed			0.5		CL	**TOPSOIL:** Silty Clayey Sand, fine to coarse grained, dark brown, low plasticity fines	D			TOPSOIL
									Sandy CLAY: medium plasticity, pale brown, sand is fine to coarse grained	D/M			RESIDUAL SOIL
						1.0		CH	**CLAY:** high plasticity, orange-pale brown, trace of sand fine to medium grained	M	VSt	× ×	
						1.5					Fb		
						2.0			Test pit TP1 terminated at 2m				
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP2**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N	None Observed			0.5		CL	**TOPSOIL:** Sandy Silty clay, low plasticity, dark brown, sand is fine to coarse grained	M		×	TOPSOIL
								CH	**Sandy CLAY:** medium plasticity, brown, sand is fine to coarse grained				COLLUVIAL/RESIDUAL SOIL
						1.0			**CLAY:** high plasticity, red-orange-brown, trace of sand fine to medium grained			×	RESIDUAL SOIL
						1.5			Colour change grey/red.			×	
						2.0			Test pit TP2 terminated at 1.9m				
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP3**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	None Observed			0.5		CL	**TOPSOIL:** Silty Clayey Sand, fine to coarse grained, dark brown, low plasticity fines	M			TOPSOIL
								CH	**Sandy CLAY:** medium plasticity, pale brown, sand is fine to coarse grained		VSt		RESIDUAL SOIL
						1.0			**CLAY:** high plasticity, red/orange/brown		H	×	
						1.5			Colour change grey/red.			×	
						2.0			Gradual Colour change to pale grey-mottled change				
						2.5			Test pit TP3 terminated at 2m				
						3.0							
						3.5							
						4.0							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP4**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	None Observed			0.0			**TOPSOIL:** Sandy Silty Clay, low plasticity, dark brown, sand is fine to coarse grained	M			TOPSOIL
								CL	**Sandy CLAY:** medium plasticity, pale brown, sand is fine to medium grained		VSt		
						0.5		CH	**CLAY:** high plasticity, orange-brown	M>Wp		×	
									Change to grey/red.			×	
						1.0			Colour change to grey mottled orange				
						1.5			**CLAYSTONE:** pale grey mottled orange, highly weathered				HIGHLY WEATHERED CLAYSTONE
									Near backhoe refusal at 1.7 m depth. Test pit TP4 terminated at 1.7m				
						2.0							
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP5**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	None Observed			0.5		CL	**Silty Sandy CLAY:** medium plasticity, pale brown, sand is fine to coarse grained	D		×	RESIDUAL SOIL, ROOT AFFECTED TO 50 MM
								CH	**CLAY:** high plasticity, red-orange-brown	M	VSt	×	
						1.0			Colour change to grey/red				
						1.5			Colour change grey mottled orange				
						2.0			Grading to extremely weathered claystone.				
									Test pit TP5 terminated at 2.1m				
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP6**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N							**TOPSOIL:** Clayey Sand, low plasticity, dark brown, some silt	M			TOPSOIL
				D				CL	**Sandy CLAY:** medium plasticity, brown, sand is fine to medium grained	M>Wp	St/VSt		ALLUVIAL SOIL
			▶	D		0.5		CH	**Sandy CLAY:** high plasticity, grey/red, sand is fine to medium grained		VSt	×	RESIDUAL SOIL
				D		1.0			Colour change to grye mottled red and orange				
				D		1.5							
						2.0			Test pit TP6 terminated at 2m				
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 — no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP7**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: ***WINTEN PROPERTY GROUP***

Date started: ***3.2.2004***

Principal:

Date completed: ***3.2.2004***

Project: ***PROPOSED DEVELOPMENT***

Logged by: ***DJB***

Test pit location: ***REFER TO FIGURE 1***

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N	None Observed			0.5		CH	**Gravelly Sandy CLAY:** medium plasticity, pale brown, sand is fine to coarse grained, gravel is fine to medium grained **CLAY:** high plasticity, red	D M	VSt/H	×	COLLUVIAL SOIL RESIDUAL SOIL
						1.0		GC	**Silty CLAY:** fine to coarse grained, grey/orange, medium plasticity fines Grading to highly weathered claystone				EXTREMEMLY WEATHERED CLAYSTONE
						1.5			Near backhoe refusal. Test pit TP7 terminated at 1m				
						2.0							
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP8**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: ***WINTEN PROPERTY GROUP***

Date started: ***3.2.2004***

Principal:

Date completed: ***3.2.2004***

Project: ***PROPOSED DEVELOPMENT***

Logged by: ***DJB***

Test pit location: ***REFER TO FIGURE 1***

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	depth RL / metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N		D	0.0			**TOPSOIL:** sand, fine to medium grained, grey, some low plasticity fines	M			TOPSOIL
				D			SP	**SAND:** fine to medium grained, grey mottled orange, some low plasticity fines Changing to a sand/clayey sand.	W			ALLUVIAL SOIL
			▶	D	0.5			Some test pit collapse.				
				D	1.0							
				D	1.5		CH	**Sandy CLAY:** high plasticity, grey, sand is fine to medium grained	M			RESIDUAL SOIL?
							CH	**CLAY:** high plasticity, grey/red, a trace of sand fine grained				
					2.0			Test pit TP8 terminated at 1.9m				
					2.5							
					3.0							
					3.5							
					4.0							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Engineering log - Excavation

Excavation No. **TP9**

Sheet 1 of 1

Office Job No.: **CH1173/1**

Client: **WINTEN PROPERTY GROUP**

Date started: **3.2.2004**

Principal:

Date completed: **3.2.2004**

Project: **PROPOSED DEVELOPMENT**

Logged by: **DJB**

Test pit location: **REFER TO FIGURE 1**

Checked by:

Coffey

equipment type and model: 4WD BACKHOE | Pit Orientation: | Easting: m | R.L. Surface: Not Measured

excavation dimensions: 2m long 0.45m wide | Northing: m | datum:

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
BH		N		D					**TOPSOIL:** Sandy Silty Clay, low plasticity, dark brown, sand is fine to medium grained	M			TOPSOIL
			▶	D		0.5		CH	**Sandy CLAY:** low plasticity, brown, sand is fine to medium grained	M>Wp	VSt		ALLUVIAL SOIL
				D		1.0		CH	**Sandy CLAY:** high plasticity, grey/orange-brown, sand is fine to medium grained				RESIDUAL SOIL
						1.5							
						2.0			Test pit TP9 terminated at 1.8m				
						2.5							
						3.0							
						3.5							
						4.0							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration

1 2 3 4 no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Soil Description

Explanation Sheet

Coffey

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil.

Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (USC) as shown in the table on the following page.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200mm
Cobbles		63mm to 200mm
Gravel	coarse	20mm to 63mm
	medium	6mm to 20mm
	fine	2.36mm to 6mm
Sand	coarse	600μm to 2.36mm
	medium	200μm to 600μm
	fine	75μm to 200μm

MOISTURE CONDITION

Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
Moist	Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH su (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 - 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	-	Crumbles or powders when scraped by thumb nail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very Loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:	
		Coarse grained	Fine grained
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	<5%	<15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	5% - 12%	15% - 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous across exposure or sample	Weakly cemented	Easily broken up by hand in air or water
Lenses	Discontinuous layers of lenticular shape	Moderately cemented	Effort is required to break up the soil by hand in air or water
Pockets	Irregular inclusions of differential material		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material	Structure and fabric of parent rock visible
Residual soil	Structure and fabric of parent rock not visible

TRANSPORTED SOILS

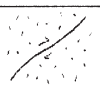
Aeolian soil	Deposited by wind
Alluvial soil	Deposited by stream and rivers
Colluvial soil	Deposited on slopes (transported downslope by gravity)
Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.
Lacustrine soil	Deposited by lakes
Marine soil	Deposited in ocean basins, bays, beaches and estuaries

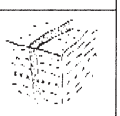
SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)						USC	PRIMARY NAME
COARSE GRAINED SOILS More than 50% of material less than 63mm is larger than 0.075mm	(A 0.075mm particle is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.0mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	GRAVEL
				Predominantly one size or a range of sizes with more intermediate sizes missing.		GP	GRAVEL
			GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)		GM	SILTY GRAVEL
				Plastic fines (for identification procedures see CL below).		GC	CLAYEY GRAVEL
		SANDS More than half of coarse fraction is smaller than 2.0mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes missing.		SW	SAND
				Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	SAND
			SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	SILTY SAND
				Plastic fines (for identification procedures see CL below).		SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% of material less than 63mm is smaller than 0.075mm			IDENTIFICATION PROCEDURES ON FRACTIONS <0.2mm				
			DRY STRENGTH	DILATANCY	TOUGHNESS		
		SILTS AND CLAYS Liquid limit less than 50	None to Low	Quick to slow	None	ML	SILT
			Medium to high	None	Medium	CL	CLAY
			Low to medium	Slow to very slow	Low	OL	ORGANIC SILT
		SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium	MH	SILT
			High	None	High	CH	CLAY
			Medium to high	None	Low to medium	OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			Pt	PEAT

* Low plasticity - Liquid Limit W_L less than 35%. Medium plasticity - W_L between 35% and 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2m in length	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.	

TERM	DEFINITION	DIAGRAM
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter.	
TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planer to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	

Rock Description

Explanation Sheet

Coffey

AS1726-1993 – The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.

DEFINITIONS: Rock substance, defect and mass are defined as follows:

Substance	Effectively homogeneous material, may be isotropic or anisotropic.
Defect	Discontinuity or break in the continuity of a substance or substances.
Mass	Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects. In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or in water. Other material is described using soil descriptive terms.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME – Simple rock names are used rather than precise geological classification.

PARTICLE SIZE – Grain size terms for sandstone are:

Coarse grained	0.6mm to 2mm
Medium grained	0.2mm to 0.6mm
Fine grained	0.6mm (just visible) to 0.2mm

FABRIC – Terms for layering or penetrative fabric (eg. bedding, cleavage) are:

Massive	No layering or penetrative fabric
Poorly developed	Layering or fabric just visible. Little effect on properties.
Well developed	Layering or fabric distinct. Rock breaks more easily parallel to layering or fabic.

CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
Residual Soil	**RS**	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered	**XW**	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded, in water. Fabric of original rock still visible.
Distinctly Weathered	**DW**	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly Weathered	**SW**	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	**FR**	Rock shows no sign of decomposition or staining.

Note: *Where physical and chemical changes were caused by hot gases and liquids associated with igneous rocks the terms slightly altered (SA), distinctly altered (DA) and extremely altered (XA) may be used.*

ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, I_S50 (MPa)	Field Guide to Strength
Very Low	**VL**	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low	**L**	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	**M**	0.3 to 1	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	**H**	1 to 3	A piece of core 150mm long by 50mm diameter can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	**VH**	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	**EH**	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

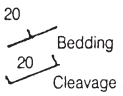
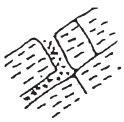
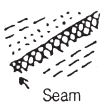
Notes:

1. *In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.*
2. *The term extremely low is not used as a rock substance strength term. The term is used in AS1726-1993 but the field guide to strength makes it clear that it is a soil in engineering terms.*
3. *The unconfined compressive strength to isotropic rocks and anisotropic rocks which do not fail parallel to the planar anisotropy is typically 10 to 25 times the point load index. The ratio may vary for different rock types and lower strength rocks often have lower ratios than higher strength rocks.*

Coffey

Rock Description Explanation Sheet

COMMON DEFECTS IN ROCK MASSES

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.			(Note 2)
Joint	A surface or crack across which the rock has little or no tensile strength but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.			(Note 2)
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.			
Crushed Seam (Note 3)	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.			
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint. Infilled seams less than 1mm thick may be described as veneer or coating on joint surface.			
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formed by weathering of the rock substance in places.			

Notes on defects:

1. *Borehole logs show the true dip of defects and face sketches and sections the apparent dip.*
2. *Partings and joints are not usually shown on the graphic log unless considered significant.*
3. *Sheared zones, sheared surfaces and crushed seams are faults in geological terms.*

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes in orientation

Note:
The assessment of defect shape is partly influenced by the scale of observation.

ROUGHNESS TERMS

Slickensided	Grooved or striated surface; usually polished
Polished	Shiny smooth surface
Smooth	Smooth to touch; few or no surface irregularities
Rough	Many small surfaxce irregularities (amplitude generally less than 1mm); feels like fine to coarse sand paper
Very rough	Many large surface irregularities (amplitude generally more than 1mm); feels like, or coarser than, very coarse sand paper

COATING TERMS

Clean	No visible coating
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral too thin to measure; may be patchy
Coating	A visible coating up to 1mm thick . Thicker soil material is described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein

BLOCK SHAPE TERMS

Blocky	Approximately equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greater than cross section

Information

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Coffey Geosciences Pty Ltd ABN 057 056 335 516

Coffey

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design toward construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

** For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, National Headquarters, Canberra, 1987.*

Appendix H – Traffic Assessment

The Glades, Moonee Beach
LOTS 1 & 2 DP 725785.
SECTION 75W MODIFICATION

Traffic Impact Assessment

January 2018

Contents

1. INTRODUCTION 3

1.1 SCOPE

2. EXISTING CONDITIONS 3

2.1 LOCATION
2.2 ROAD NETWORK
2.3 MOONEE DEVELOPMENT CONTRIBUTIONS PLAN 2017
2.4 PACIFIC HIGHWAY/MOONEE BEACH ROAD INTERCHANGE

3. PROPOSED DEVELOPMENT MODIFICATION 6

3.1 DEVELOPMENT LAYOUT
3.2 TRAFFIC GENERATION

4. TRAFFIC ASSESSMENT 6

4.1 LOCAL ROADS
4.2 NORTHERN COLLECTOR ROAD
4.3 MOONEE BEACH ROAD INTERSECTION
4.4 PACIFIC HIGHWAY/MOONEE BEACH ROAD INTERCHANGE
4.5 PUBLIC TRANSPORT
4.6 FOOTPATHS AND CYCLEWAYS

5. CONCLUSION 8

6. REFERENCES 8

Appendix A The Glades Estate – Overall Site Plan

1 Introduction

1.1 Scope

This report has been prepared following a request from Resource Design & Management Pty Ltd for a traffic impact assessment on a proposed section 75W modification to The Glades residential development, Moonee Beach. The proposed modification would see an additional 31 allotments to the 524 approved residential Lots.

This report will assess the likely traffic impacts of the additional lots on the internal and external road network and make recommendations in relation to any modifications to traffic and transport infrastructure required for the development.

2 Existing Conditions

2.1 Location

The proposed development is located on Lots 1 & 2 DP 725785.Moonee Beach.

2.2 Road Network

Primary access to the development is via the Pacific Highway/Moonee Beach Road interchange which also provides access to Solitary Islands Way.

Solitary Islands Way and Moonee Beach Road provide local road access to the Moonee Beach residential and commercial areas. Direct road access to the development is proposed through the extension of Estuary Drive (Northern Collector Road) which is a collector road already partially constructed in accordance with the Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017. The Northern Collector Road extension is approved under a separate development consent.

Pacific Highway/Moonee Beach Road interchange and Moonee Beach Road/Northern Collector Road roundabout.

2.3 Moonee Release Area Development Contributions Plan 2017

Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017 includes the following sections on design population and traffic and transport infrastructure;

5. FORECAST DEVELOPMENT AND POPULATION GROWTH

5.1 The forecast yield of subdivided residential lots and the related population growth are based upon: -

a) ***The development yields enabled by development consents granted by the Department of Planning and Environment to the date of adoption of this Plan (under Part 3A of the Environmental Planning and Assessment Act (as amended) 1979*** *and Coffs Harbour City Council based upon preceding Developer Contributions Plans for this Release Area; and*

b) The forecast yield of lots and dwellings from land zoned for residential development purposes are based on current approvals and projected lot yields included in Moonee Development Control Plan 2004.

5.2 The consequent ultimate future lot yield is forecast to be 1,153 lots.

17. TRANSPORT AND TRAFFIC MANAGEMENT

17.1 The strategy for the movement of people within and through the Moonee area recognises the dependence on the motor vehicle, yet provides for an efficient and convenient network of pedestrian and bicycle routes. The strategy also provides the infrastructure needed for an efficient bus service.

17.2 ***The Moonee Release Area is bisected by the Pacific Highway. Access to the east is provided by Moonee Beach Road and to the west by Hoys Road / Old Bucca Road via the recently completed grade separated intersection constructed in conjunction with the Pacific Highway upgrade.***

17.3 The transport demands within the release area are categorised in terms of the road network, public transport and pedestrian / bicycle network.

17.4 ***Construction of a collector road north of Moonee Beach has commenced. The cost of this road including land acquisition up to the southern boundary of Lot 1 DP 725785 is funded under this contributions plan. This includes a bridge over Cunninghams Creek, and a culvert over the watercourse in lot 6 DP 1140702****. A collector road is also proposed from Moonee Beach Road south to the boundary of lot 66 DP 551005. This road is to be of a 9 metre standard, with 1/9th of the cost, being the difference between a local road and a collector road, is funded by contributions. It is proposed to upgrade Hoys Road / Old Bucca Road to service this urban area, including access to the school site and future playing fields.*

17.5 To provide for a safe, comfortable and efficient bus service, certain basic facilities are required, including bus shelters, seats and bus bays. Bus bays are to be included in the cost estimates for a Collector Road. It is proposed to provide bus shelters / seats at each stop. A total of 9 shelters will be provided and funded by contributions, as shown in Map 4.

17.6 Contributions for the works described at points 17.4 and 17.5 above will be levied on all development occurring within the northern precinct as shown at Map 1.

17.7 ***Certain transport and traffic facilities are being provided to accommodate the future needs of the entire Moonee Release area.***

17.8 ***Moonee Beach Road has been upgraded, and a roundabout constructed to provide for increased levels of traffic and ease of movement around the release area and to the shopping centre. The cost of these works is to be recouped via contributions from all future development within the Moonee Release Area as shown in Map 1.***

17.9 The provision of a district network of pedestrian and bicycle facilities in residential areas can provide an important alternative transport route for both recreation and functional journeys. The proposed routes are identified Map 4 and have been designed to relate to the need for access to the school site, recreation facilities and shops. These facilities will also provide a link for the Coastal Walk. Contributions towards these works will be levied on all development within the Moonee Release area as shown in Map 1

The extension of Estuary Drive (Northern Collector Road) is a collector road partially constructed in accordance with the Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017, and as noted in the plan, designed to cater for the approved development. Similarly, Moonee Beach Road and the collector road intersection roundabout have been constructed in accordance with planning for traffic generation from the approved development.

2.4 Pacific Highway/Moonee Beach Road interchange

The Pacific Highway Sapphire to Woolgoolga Upgrade project opened fully to traffic in July 2014. Where the current development consent for 'The Glades' project refers to access to the Pacific Highway via an 'at grade' intersection, the Sapphire to Woolgoolga Highway Upgrade project has resulted in construction of a Motorway standard grade separated interchange connecting Moonee Beach Road to the Pacific Highway and to Solitary Islands Way. Solitary Islands Way provides a local access road parallel to the Pacific Highway connecting Moonee Beach and other Northern Beaches Coastal villages.

The RMS (then RTA) Coffs Harbour Highway Planning Sapphire to Woolgoolga Section Environmental Assessment Report November 2007 confirms that the planning and design for the Moonee Beach Road interchange made allowance for traffic growth on the Pacific Highway and local traffic generation due to residential development.

Sapphire to Woolgoolga Section Environmental Assessment Report, page 10-7;

10.2.3 Predicted traffic volumes
Increase in local traffic
Due to the large increase in population expected to be housed within the Coffs Harbour local government area, there is also expected to be a large increase in the amount of local traffic. Data on future development from the ***Coffs Harbour Land Capacity Assessment 2004 (Coffs Harbour City Council 2004) was utilised to predict the level of traffic generation from each of the proposed***
developments.

3 Proposed Development Modification

3.1 Development layout

The proposed development layout and additional Lots is described in the Resource Design & Management, The Glades Estate – Overall site plan (appendix A). The proposed modification provides for an additional 31 allotments to the 524 approved Lots. The additional lots are located central to the residential development with road access from a number of local roads consistent with the approved development.

3.2 Traffic Generation

The proposed modification provides for an additional 31 allotments to the 524 approved Lots.

RMS Guide to Traffic Generating Developments	**Approved Lots**	**Development Traffic generation**
Daily movements 9.0 / dwelling	524	4716 v.p.d.
Peak movements 0.85 / dwelling	524	445 v.p.h
	Additional Lots	**Development Traffic generation**
Daily movements 9.0 / dwelling	31	279 v.p.d.
Peak movements 0.85 / dwelling	31	26 v.p.h

4 Traffic Impact Assessment

4.1 Local Roads

The additional residential lots are located central to the approved development layout with road access from a number of local roads consistent with the existing consent.

Local roads will be designed in accordance with Coffs Harbour City Council Development Design Specification with no amendment required to road layout, bus routes or service vehicle access.

4.2 Northern Collector Road

The extension of Estuary Drive (Northern Collector Road) is partially constructed in accordance with the Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017, and as noted in the plan, designed to cater for the approved development. Similarly, Moonee Beach Road and the collector road intersection roundabout have been constructed in accordance with planning for traffic generation from the approved development.

Coffs Harbour City Council Development Specifications provide indicative limits to design daily traffic volumes with a Collector Street (with access to residential allotments) having maximum traffic volume of 6,000 v.p.d. and roads with restricted access 10,000 v.p.d.

With the Northern Collector Road designed in accordance with Coffs Harbour City Council Development specifications the nominal increase in traffic generation as a result of the additional 31 Lots from 4716 v.p.d to 4995 v.p.d (Section 3.2) will have no impact on road safety, amenity or levels of service.

4.3 Moonee Beach Road Intersection

The Moonee Beach Road/Estuary Drive roundabout was forward funded and constructed as part of the Moonee Shopping Centre development. The roundabout was part of the Moonee Development Control Plan and Moonee Developer Contributions Plan and was designed to cater for all residential and commercial development traffic from land zoned in the Moonee DCP at the time. This plan included an extension of the southern collector road (Sullivan's Road) to the south to provide a local road link to the Sapphire Beach development area,

The Pacific Highway Sapphire to Woolgoolga Upgrade project has subsequently provided this local road connection via Solitary Islands Way and Coffs Harbour City Council has amended the Moonee Release Area Development Contributions Plan 2017 terminating the southern collector road north of the Sapphire Beach development.

This amendment and consequent reduction in design traffic for the southern collector road results in significant increase in the capacity of the local road network, and particularly the Moonee Beach Road roundabout, to cater for additional future traffic growth.

Notwithstanding this, section 3.2 of this report shows that the additional traffic generation from the proposed additional 31 Lots will result in a less than 6% increase in peak hour traffic volumes which will have a negligible impact on roundabout peak hour levels of service.

4.4 Pacific Highway/Moonee Beach Road interchange

The Pacific Highway Sapphire to Woolgoolga Upgrade project has provided a Motorway standard grade separated interchange connecting Moonee Beach Road to the Pacific Highway and to Solitary Islands Way. Solitary Islands Way provides a local access road parallel to the Pacific Highway connecting Moonee Beach and other Northern Beaches Coastal villages.

Planning and design for the Moonee Beach Road interchange made allowance for traffic growth on the Pacific Highway and local traffic generation due to residential development. As traffic generation resulting from 'The Glades' residential development has been taken into account in the design of the Pacific Highway Interchange the minor increase in traffic generation for the additional 31 Lots will have insignificant impact on the interchange levels of service.

4.5 Public Transport

Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017 specifies defined bus routes and provides for bus shelter infrastructure to service new development. The approved development concept is designed to accord with the Contributions Plan requirements. The location of the proposed additional 31 Lots provides adequate travel distance to the bus service bus route and will have no impact on bus service or infrastructure requirements and represents minimal variation to the approved plan.

4.6 Footpaths and Cycleways

Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017 provides for footpath and cycleway connections throughout road reserve and public reserve areas in new residential areas. The approved development concept is designed to accord with the Contributions

Plan requirements. The location of the proposed additional 31 Lots provides good access to footpaths and cycleways and represents minimal variation to the approved plan.

5 Conclusion

The Pacific Highway Sapphire to Woolgoolga Upgrade project has provided a Motorway standard grade separated interchange connecting Moonee Beach Road to the Pacific Highway and to Solitary Islands Way. Solitary Islands Way provides a local access road parallel to the Pacific Highway connecting Moonee Beach and other Northern Beaches Coastal villages. As traffic generation resulting from 'The Glades' residential development has been taken into account in the design of the Pacific Highway Interchange the minor increase in traffic generation for the additional 31 Lots will have insignificant impact on the interchange levels of service.

Moonee Beach Road and the Northern Collector Road servicing 'The Glades' residential development have been designed in accordance with Coffs Harbour City Council Development specifications and Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017. Traffic Generation from the approved 'The Glades' residential development has been taken into account in the planning and design of the road network infrastructure. The nominal increase in traffic generation as a result of the additional 31 Lots will have no impact on road safety, amenity or levels of service on the road network.

The location of the proposed additional 31 Lots provides adequate travel distance to the bus service bus route and will have no impact on bus service or infrastructure requirements and represents minimal variation to the approved plan.

Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017 provides footpath and cycleway connections throughout the road reserve and public reserve areas. The location of the proposed additional 31 Lots provides good access to footpaths and cycleways and will have no impact on infrastructure requirements.

6 References

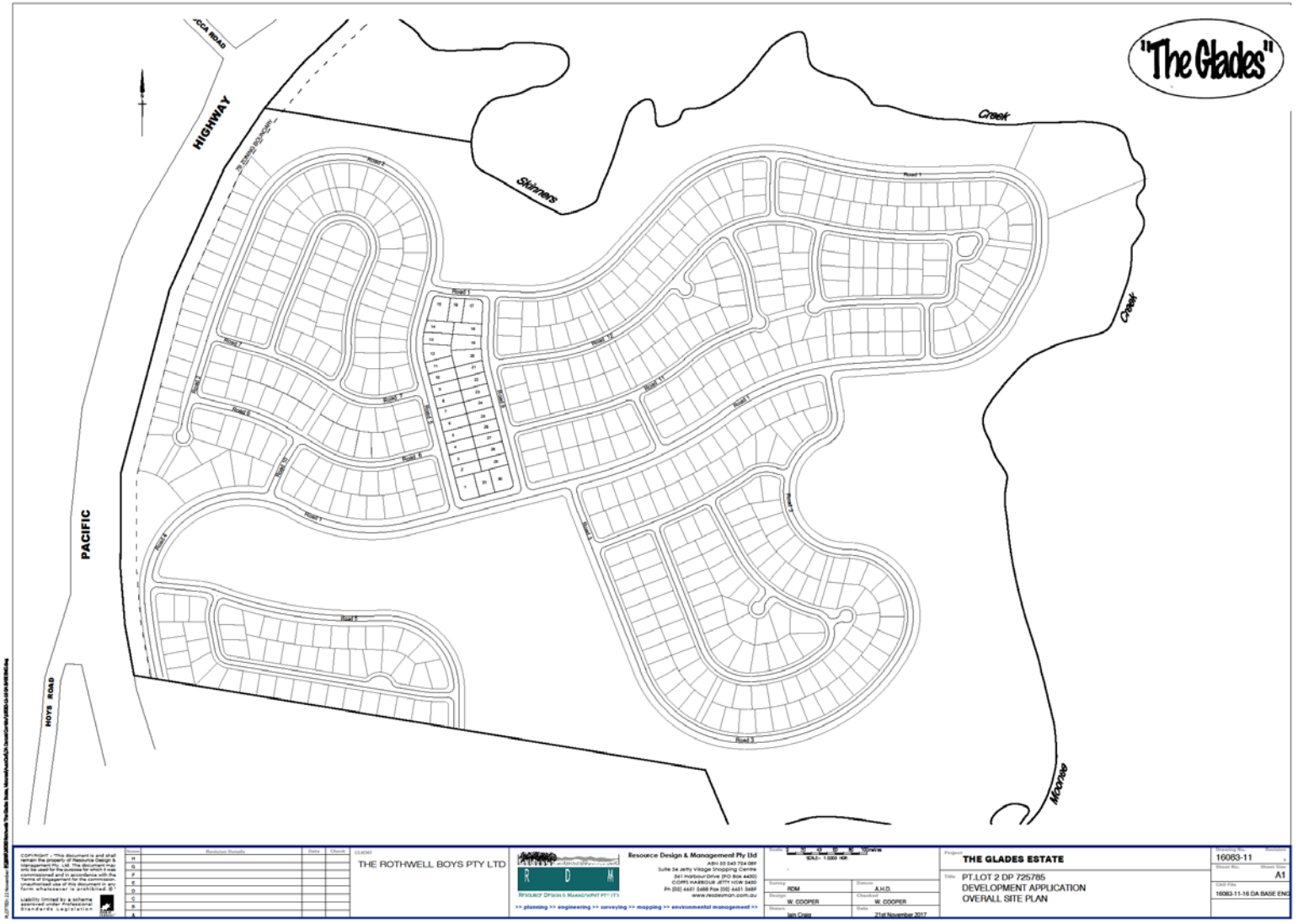
Coffs Harbour City Council Development Control Plan 2015

Coffs Harbour City Council Moonee Release Area Development Contributions Plan 2017

Coffs Harbour City Council Development Specification Design

Roads and Maritime Services Guide to Traffic Engineering Developments

Appendix A – The Glades Estate – Overall Site Plan



George Stulle

23/1/18

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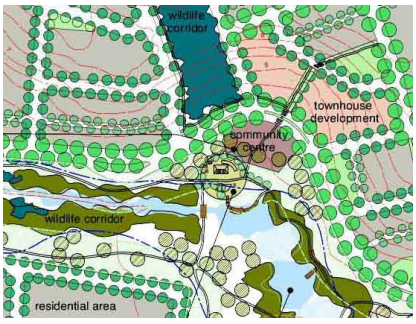
Appendix I – Bushfire Risk Assessment

Proposed Subdivision

Lots 1 & 2 DP725785

The Glades Estate

North Moonee Beach



Bushfire Risk Assessment

November 2017

RESOURCE DESIGN & MANAGEMENT PTY LTD

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Contents

1. Introduction 1

1.1 Background 1
1.2 Proposed Development 2
1.3 Purpose of Bushfire Assessment Report 3
1.4 Bushfire Assessment Requirements 3
1.5 Identification of Bushfire Prone Land 3

2. Clause 44 Matters 4

2.1 Site Location and Description 4
2.2 Vegetation classification 5
2.3 Slope and topography 5
2.4 Significant environmental features 6
2.5 Detail and location of any aboriginal relic or place 6

3. Bushfire Risk Assessment 7

3.1 Vegetation and Slope Assessment 7
3.2 Water Supply 9
3.3 Capacity of Public Road 9
3.4 Public Roads and Fire Trail Network 9
3.5 Access and Egress 9
3.6 Bushfire Maintenance & Emergency Procedures 10
3.7 Construction Standards 10
3.8 Fire Protection Measures 10
3.9 Chapter 4 - Assessment of Performance Based Controls 10

4. Assessment Recommendations 12

4.1 Asset Protection Zone and Grounds 12
4.2 Construction Requirements 12
4.3 Site Access 12
4.4 Service Supply 12

5. Conclusion 13

Figures

1. Locality
2. Overall Development Site
3. Proposed Development
4. Bushfire Prone Land Mapping
5. Aerial View
6. CHCC Fine Scale Vegetation Mapping
7. Site Contours
8. APZ & BAL Ratings

1. Introduction

This report has been prepared by Resource Design & Management Pty Ltd (RDM) on behalf of The Rothwell Boys Pty Ltd in support of a modification to the existing project approval for the proposed subdivision of Lots 1 & 2 DP752785, Parish of Moonee, County of Fitzroy.

1.1 Background

The proposed development forms part of the North Moonee Beach residential precinct stretching from Moonee Beach Road through to Skinners Creek as shown below in **Figure 1**.

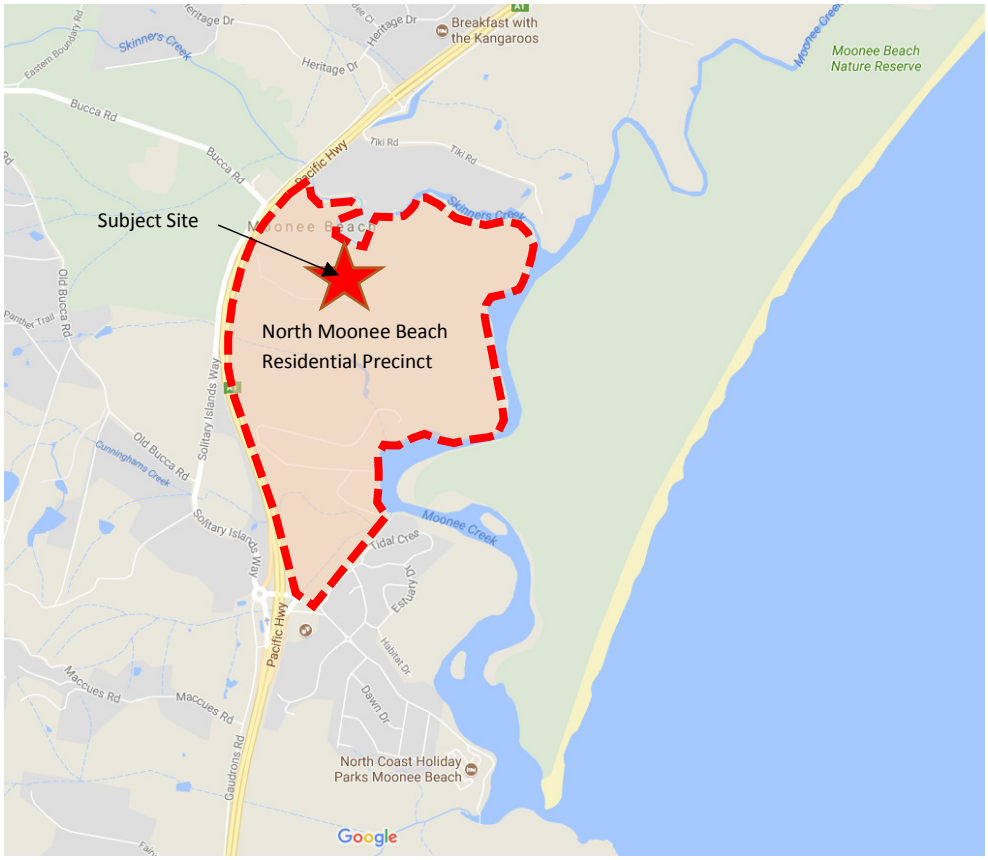

Figure 1 – Locality (Source: Google Maps)

1.2 Proposed Development

The development involves the subdivision and development of the site to create thirty one (31) residential allotments within an already approved residential estate containing approximately 550 allotments together with various internal roads, subdivision infrastructure and foreshore reserves as illustrated below in **Figures 2 & 3**.

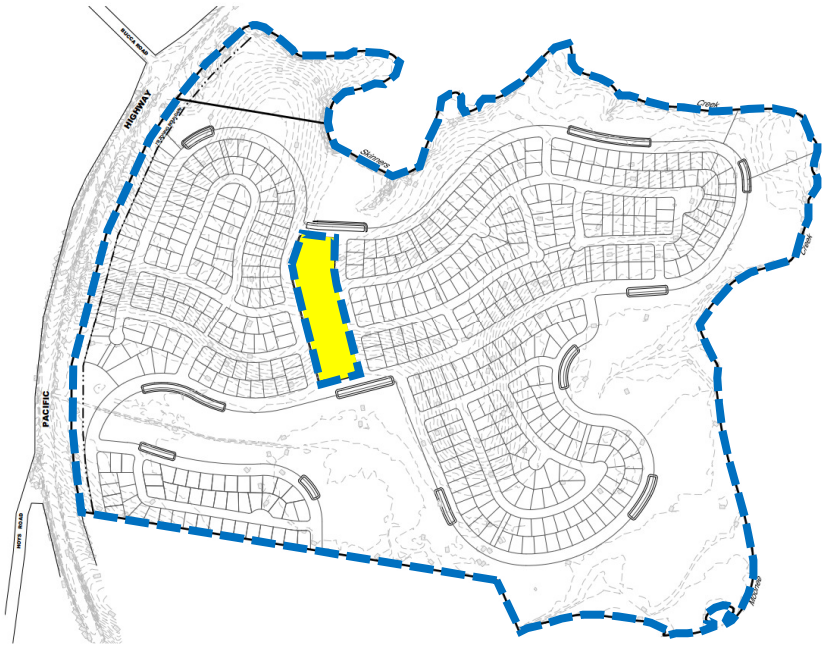

Figure 2 – Overall Development Site

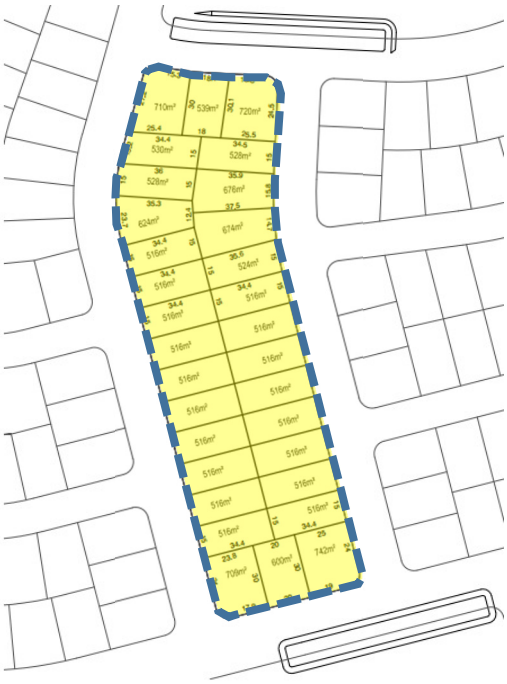

Figure 3 – Proposed Development

1.3 Purpose of Bushfire Assessment Report

The purpose of the report is to address bushfire protection and management issues relative to the proposed residential subdivision as prescribed by "Planning for Bushfire Protection" published by the NSW Rural Fire Service in December, 2006.

The document has been introduced to provide effective planning guidelines to Councils, Planners, Fire Authorities, developers and home owners. The document describes the necessary planning considerations when developing areas for residential use where development sites are located in close proximity to areas with the potential to be affected by bushfire events.

1.4 Bushfire Assessment Requirements

Section 100B of the Rural Fires Act 1997 requires a Bushfire Safety Authority from the NSW Rural Fire Service for the development of bushfire prone land where such land is intended to be developed for residential and rural residential subdivision or for a special fire protection purpose.

Properties affected by bushfire prone land within the Coffs Harbour City Council Local Government area are identified on Council's bushfire prone land maps.

Development proposals for residential, rural residential purposes (including boundary re-alignments) or for a special fire protection purpose that are affected by bushfire prone land are required to be assessed in accordance with the matters describes under Section 44 of the Rural Fires Regulation 2013.

1.5 Identification of Bushfire Prone Land

Each Local Council is required to produce a Bush Fire Risk Management Plan (BFRMP) under the Rural Fires Act 1997. The plan is to include a bushfire hazard map identifying areas of high, medium, low and no hazard.

Land which is identified by the mapping as being bushfire prone requires a Bushfire Risk Assessment to accompany the Development Application. As shown below in **Figure 4**, the site is deemed to be affected.

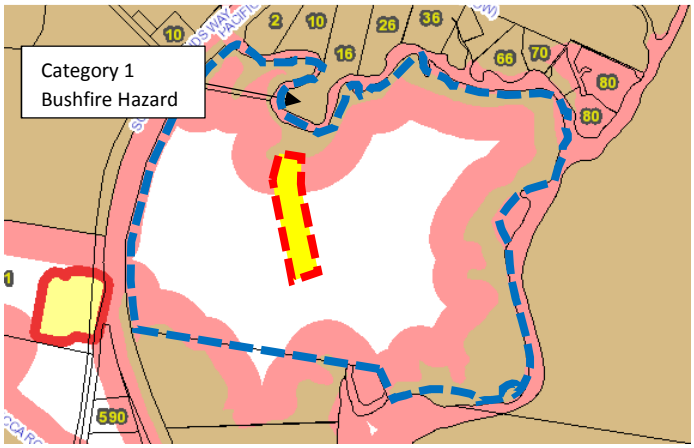

Figure 4 – Bushfire Prone Land Mapping (Source: CHCC)

2. Clause 44 Matters

The following matters address the issues requiring consideration under Clause 44 of the Rural Fires Regulation 2013. More specifically, the matters addressed below correspond to those described under sub-clauses 1(a) – 1(f).

2.1 Site Location and Description

The site is located on undulating land situated north of the village of Moonee Beach. The site is bordered east and west by managed vacant land earmarked for future residential development as shown in **Figures 2 & 3** above. North of the site is riparian vegetation bordering Skinners Creek. South of the site is managed vacant land earmarked to form part of the future public reserve system. The site is currently forested vacant land as seen in **Figure 5** below.

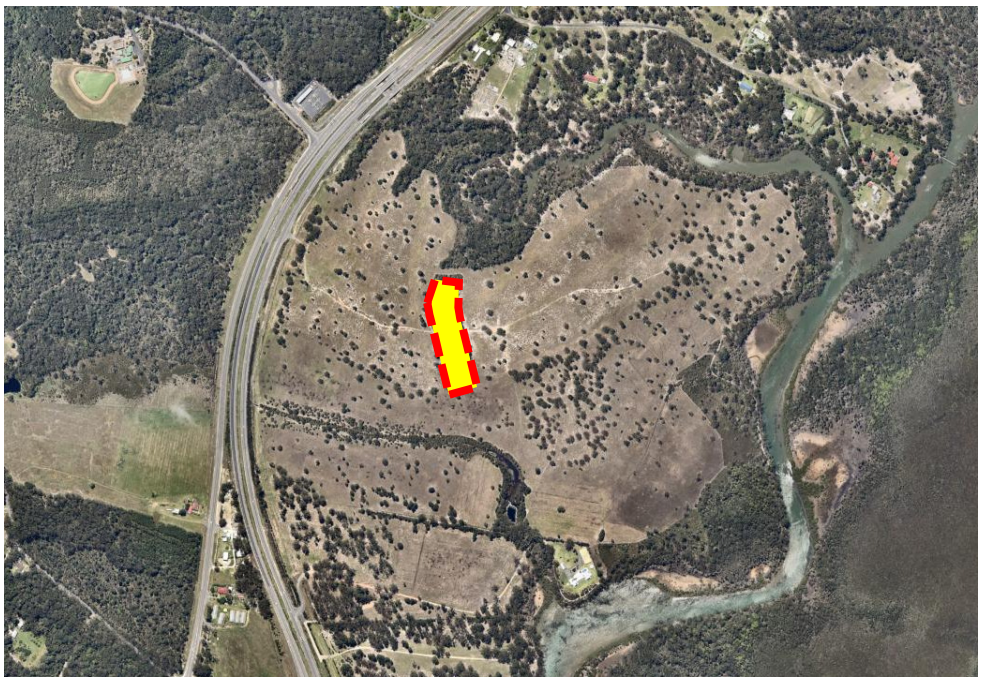

Figure 5 – Aerial View (Source: Nearmaps)

2.2 Vegetation classification

Classification of vegetation has been determined for a distance of 140m from the proposed development and has been determined having regard to the identification key in Keith D (2004) and PfBP.

The predominant vegetation is managed grasslands with a forested riparian corridor along Skinners Creek to the north of the site as shown in **Figure 6** below.

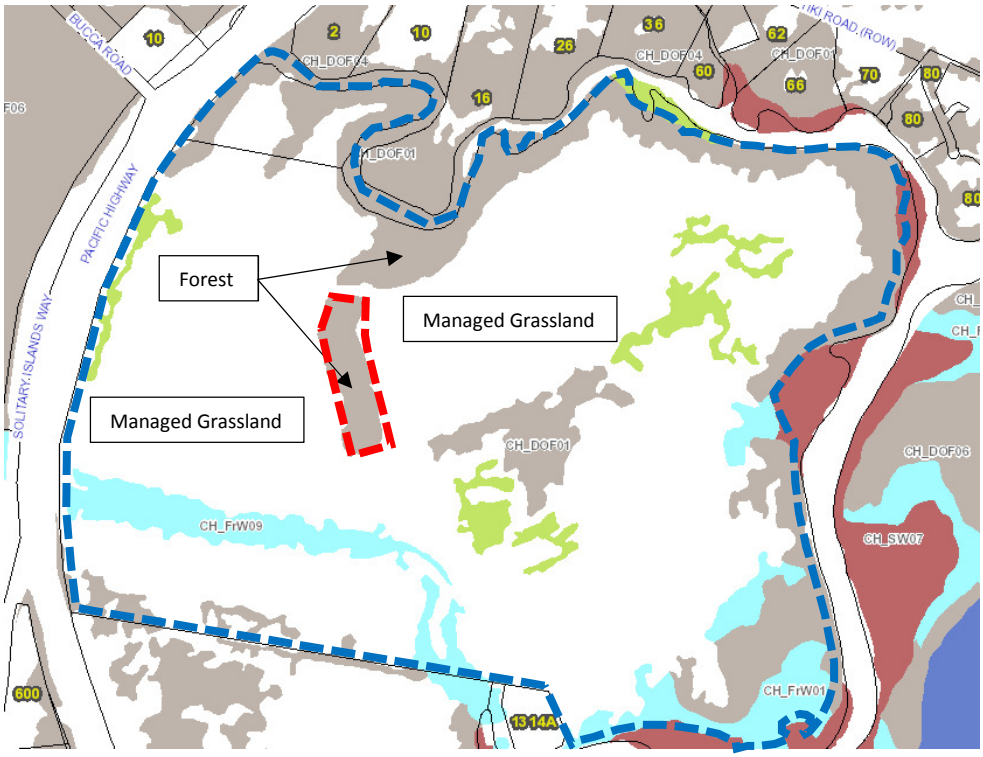

Figure 6 – CHCC Fine Scale Vegetation Mapping (Source: CHCC)

2.3 Slope and topography

The site contains slightly undulating land comprising of slopes in the range of 0° to 5° other than within the immediate vicinity of the creek banks. Such areas are minor in extent and have minimal influence on the overall effective slope of the site. Elevations relevant to the site and adjacent land are shown in **Figure 7,** below.

Figure 7 - Site Contours (Source: CHCC)

2.4 Significant environmental features

The subject site consists mostly of managed grasslands and riparian forests along Skinners Creek as shown in **Figure 7** above. Council's mapping also indicates that part of the site is considered secondary koala habitat particularly along the riparian corridor of Skinners Creek.

The majority of the development site has been highly modified. Outside of the proposed development area, it is not proposed to remove any significant vegetation communities and therefore impacts to threatened species are not anticipated.

2.5 Detail and location of any aboriginal relic or place

The subject land is not listed in Schedule 5 of the Coffs Harbour Local Environmental Plan 2013.

A preliminary assessment of the site was undertaken by ERM. The assessment identified areas of likely cultural significance. The identified areas are predominantly contained within the proposed foreshore reserve and are not impacted by the proposed development.

3. Bushfire Risk Assessment

The following matters address the issues requiring consideration under Clause 44 of the Rural Fires Regulation 2013. More specifically, the matters addressed below correspond to those described under sub-clauses 1(g)(i-viii).

3.1 Vegetation and Slope Assessment

The assessment of vegetation and slope in this instance has been undertaken having regard to the following:

- The structural description of each vegetation group in accordance with the identification key in Keith D (2004);
- The effective slope refers to the slope under the classified vegetation in relation to the building site which has been determined having regard to Appendix 2 of PfBP 2000 and AS 3959.

With respect to the vegetation and slope assessment relative to the subject site reference is made to **Figures 6 & 7** above.

The following table sets out the appropriate Asset Protection Zone and applicable BAL ratings.

Aspect	Predominant Vegetation Type within 140m	Effective Slope (degrees)	Up-slope / Flat or Down-slope	APZ width (m)	BAL Rating AS3959
North	Future Foreshore Reserve	5° to 10°	Down-slope	33m.	BAL 29
East	Future residential development	Flat	Flat	N/A	BAL 12.5
South	Future Foreshore Reserve	0° to 5°	Down-slope	27m.	BAL 29
West	Future residential development	0° to 5°	Down-slope	N/A	BAL 12.5

Refer to **Figure 8** on the following page for a graphical representation of the APZ & BAL rating.

Figure 8 – APZ & BAL Ratings

3.2 Water Supply

Issue:

'the siting and adequacy of water supplies for fire fighting'

Comment:

The proposed development will be serviced by a reticulated water main constructed to Council's standard within the various road reserves. Each lot will be serviced and hydrants will be placed at appropriate intervals.

3.3 Capacity of Public Road

Issue:

'the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency'.

Response:

Access to the site will be gained from the approved internal road network all of which will be constructed to Council's specifications. All roads will be dedicated public roads under the control of Council. The key dimensions of such roads is provided in the following table.

Road	Dimensions
Moonee Creek Drive and perimeter roads	Min. 8m kerb to kerb
Internal Service Roads	Min. 7m. kerb to kerb

3.4 Public Roads and Fire Trail Network

Issue:

'whether or not public roads in the vicinity that link with the fire trail network have two-way access'.

Response:

The proposed development does not contain any fire trails.

3.5 Access and Egress

Issue:

'the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response'.

Response:

The proposed road reserve and corresponding road pavements are of sufficient width to allow for the timely access and egress of vehicles in an emergency.

3.6 Bushfire Maintenance & Emergency Procedures

Issue:

'the adequacy of bush fire maintenance plans and fire emergency procedures for the development site'

Response:

All lots affected by an APZ will have an appropriate positive covenant registered on their title. The proposed public foreshore reserve and stormwater management facility will be dedicated to and managed by Council.

3.7 Construction Standards

Issue:

'the construction standards to be used for building elements in the development'.

Response:

Each proposed lot with direct exposure to bushfire prone land has an appropriate Asset Protection Zone (APZ) to achieve a Bushfire Attack Level (BAL) of no greater than 29.

3.8 Fire Protection Measures

Issue:

'the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development'.

Response:

The proposed development is not of a type which requires the implementation of specific fire protection measures.

3.9 Chapter 4 - Assessment of Performance Based Controls

The following section provides an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of Planning for Bush Fire Protection.

3.9.1 Asset Protection Zones

Intent of Measures:

To provide sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels at buildings are below critical limits and to prevent direct flame contact with a building.

Comment:

Having regard to Section 3.1 above, it is apparent that the subject land can provide the necessary APZ's to achieve a maximum BAL rating of no greater than 29.

3.9.2 Access (1) ~ Public Roads

Intent of Measures:

To provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from the area.

Comment:

All roads within the development will be constructed to achieve the dimensions shown in Section 3.3 above. A reticulated water supply will be available along all roads with appropriately spaced hydrants.

3.9.3 Access (2) ~ Property Access

Intent of Measures:

To provide safe access to/from the public road system for fire-fighters providing property protection during a bush fire and for occupants faced with evacuation.

Comment:

The proposed development will be serviced by a public road system constructed to the dimensions set out in section 3.3 above.

3.9.4 Access (3) ~ Fire Trails

Intent of Measures:

To provide suitable access for fire management purposes and maintenance of APZ's.

Comment:

The proposed development does not contain any fire trails. .

3.9.5 Services ~ Water, Gas & Electricity

Intent of Measures:

To provide adequate services of water for the protection of buildings during and after the passage of a bushfire, and to locate gas and electricity so as not to contribute to the risk of a fire to a building.

Comment:

The proposed development will form part of the urban development area of North Moonee Beach which will be serviced by reticulated water and underground electricity. There is no reticulated gas supply in this locale.

4. Assessment Recommendations

Having regard to Section 3, the following recommendations are made as a means of providing an appropriate level of bushfire protection to the development of the land for residential purposes.

4.1 Asset Protection Zone and Grounds

The proposed development is directly exposed to bushfire prone land on its northern and southern boundaries. With respect to the northern boundary it is recommended that an APZ of at least 33 metres applies to achieve a BAL rating of 29 in accordance with AS3959. The actual APZ is 36 metres comprising of the 6m. building line, 20m. wide road reserve and 10m. wide stormwater management facility.

With respect to the southern boundary it is recommended that an APZ of at least 37m. applies to achieve a BAL rating of 19 in accordance with AS3959. The actual APZ is 41 metres comprising of the 6m. building line, 25m. wide road reserve and 10m. wide stormwater management facility.

4.2 Construction Requirements

The proposed development does not seek approval for building construction. Accordingly, building construction standards which are to be applied to any future dwelling house within the development should be considered at the Development Application stage for same.

Notwithstanding, due to the distances which separates the proposed lot from the bushfire prone land, it is RDM's opinion that each proposed lot and /or building envelope should support a building constructed to a BAL of no greater than 29.

4.3 Site Access

Each proposed allotment has direct access to the public road network.

4.4 Service Supply

Water:
Each proposed allotment will be connected to a reticulated water supply system. Accordingly, a supplementary water supply for firefighting purposes is not required.

Electricity
Each proposed allotment will be connected to an underground electricity supply.

Gas
The proposed development does not seek approval for building construction. Accordingly, the gas supply and protection measures should be considered at the development application stage for same.

5. Conclusion

The preceding assessment has been undertaken in accordance with the relevant sections of the Environmental Planning Act 1979, the Rural Fires Regulation 2013 and Planning for Bushfire Protection 2006.

Having regard to the assessment provided herein, it is Resource Design and Management's opinion that the proposed subdivision may be approved without further requirement for site specific bushfire protection requirements.

Appendix J – Cultural Heritage Assessment

The Glades Estate, Moonee – Proposed Project Modification

Aboriginal Cultural Heritage Assessment Report

Rothwell Boys Pty Ltd (Winten Property Group)

9 January 2019

Project No.: 0473042

The business of sustainability

ERM

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Version	Final 01
Author	Stephanie Moore, Dr Robin Twaddle
Client Name	Rothwell Boys Pty Ltd (Winten Property Group)

Document history

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Signature Page

9 January 2019

The Glades Estate, Moonee – Proposed Project Modification

Aboriginal Cultural Heritage Assessment Report

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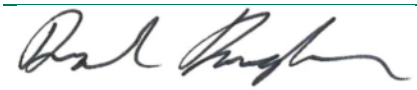
Project Manager



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CONTENTS

1. INTRODUCTION 1
1.1 Objectives 1
1.2 Description of Proposed Development 1
1.3 Authorship 2
2. RELEVANT LEGISLATION 4
2.1 State Legislation 4
2.1.1 NSW Environmental Planning and Assessment Act 1979 4
2.1.2 NSW National Parks and Wildlife Act 1974 4
2.1.3 NSW Heritage Act 1977 4
3. ABORIGINAL COMMUNITY CONSULTATION 6
3.1 Stage 1: Notification of Project Proposal and Registration of Interest 6
3.2 Stage 2: Presentation of Information about the Proposed Project 7
3.3 Stage 3: Gathering Information about the Proposed Project 7
3.4 Stage 4: Review of Draft Cultural Heritage Assessment Report 8
4. ENVIRONMENTAL CONTEXT 9
4.1 The NSW North Coast Bioregion 9
4.2 Topography and Landforms 10
4.3 Geology and Soils 10
4.4 Hydrology 10
4.5 Flora and Fauna 10
4.6 Land Use and Disturbance 11
5. ARCHAEOLOGICAL BACKGROUND 15
5.1 Ethno-history 15
5.2 Regional Archaeological Context 16
5.3 Local Archaeological Context 16
5.3.1 Proposed Rural Residential Subdivision at Moonee, N.S.W. North Coast: Archaeological Survey for Aboriginal Sites (Collins, 1994a) 16
5.3.2 Coffs Harbour Highway Planning - Sapphire to Woolgoolga Aboriginal Heritage Assessment (Collins, 2002) 17
5.3.3 Archaeological Assessment of Lot 211 DP 1044292 Moonee Beach NSW (BCA 2005) 17
5.3.4 Aboriginal Heritage Assessment: Lot 1 DP 1097743 and Lot 6 DP 2552223 Pacific Highway, Moonee beach, NSW (Myall Coast Archaeological Services 2013) 17
5.4 Previous Assessments within the Project Area 17
5.4.1 The Glades Estate Aboriginal Cultural Heritage Assessment (Collins, 1994b) 17
5.4.2 The archaeological re-investigation of an open artefact scatter, Site No. #22-1-0027, “DH 2:Moonee” (Appleton, 2003) 18
5.4.3 The Glades Residential Development, Moonee Beach NSW Aboriginal Cultural Heritage Assessment (ERM, 2007) 18
5.5 OEH AHIMS Register Search Results 19
5.6 Predictive Model 19
6. SURVEY METHODOLOGY AND RESULTS 21
6.1 Field Survey Methodology 21
6.2 Field Survey Results 21
6.2.1 Description of Project Area 21
6.2.2 Survey Coverage 22
6.2.3 Survey Results 22
7. SIGNIFICANCE ASSESSMENT 24

7.1 Assessment of Aboriginal Cultural Significance 24
7.1.1 Social Significance 24
7.1.2 Historic Significance 24
7.1.3 Scientific Significance 24
7.1.4 Aesthetic Significance 24
7.2 Aboriginal Heritage Statement of Significance 24

8. IMPACT ASSESSMENT 25
8.1 Proposed Impact 25
8.2 Assessment of on Aboriginal Cultural Heritage Values 25

9. CONCLUSIONS AND RECOMMENDATIONS 26
9.1 Conclusions 26
9.2 Recommendations 26

REFERENCES 27

APPENDIX A AHIMS EXTENSIVE SEARCH RESULTS
APPENDIX B AHIMS EXTENSIVE SEARCH RESULTS
APPENDIX C ABORIGINAL STAKEHOLDER CONSULTATION – PUBLIC ADVERTISEMENT
APPENDIX D ABORIGINAL STAKEHOLDER CONSULTATION – AGENCY LETTERS
APPENDIX E ABORIGINAL STAKEHOLDER CONSULTATION – AGENCY RESPONSES
APPENDIX F ABORIGINAL STAKEHOLDER CONSULTATION – INVITATION TO REGISTER
APPENDIX G ABORIGINAL STAKEHOLDER CONSULTATION – PROJECT METHODOLOGY
APPENDIX H ABORIGINAL STAKEHOLDER CONSULTATION – COMMENTS ON METHODOLOGY
APPENDIX I ABORIGINAL STAKEHOLDER COMMENTS ON DRAFT REPORT

List of Tables

Table 3.1 Registered Aboriginal Parties 7
Table 3.2 Comments on proposed methodology 7
Table 4.1 NSW North Coast Bioregion Attributes 9
Table 5.1 AHIMS Registered Site Types 19
Table 6.1 Field Survey Participants 21
Table 6.2 Survey Coverage Results 22

List of Figures

Figure 1.1 Project Location 3
Figure 4.1 Topography of the Project Area 12
Figure 4.2 Geology of the Project Area 13
Figure 4.3 Soils of the Project Area 14
Figure 5.1 AHIMS Site Locations 20
Figure 6.1 Survey Coverage 23

Acronyms and Abbreviations

Name	Description
ACHA	Aboriginal Cultural Heritage Management Plan
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
Australia ICOMOS	Australia International Council on Monuments and Sites
The Burra Charter	*The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*
DA	Development Application
EP&A Act	*Environmental Planning and Assessment Act* 1979
EP&A Regulation	*Environmental Planning and Assessment Regulation* 2000
ERM	Environmental Resources Management Australia Pty Ltd
IHO	Interim Heritage Orders
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
LLS	Local Land Services
NNTT	Nation Native Title Tribunal
NP&W Act	*National Parks and Wildlife Act 1974*
NPWS	NSW National Parks and Wildlife Services
NTS Corp	Native Title Services Corporation
OEH	NSW Office of Environment and Heritage
PAD	Potential Archaeological Deposit
RAPs	Registered Aboriginal Party
SHR	State Heritage Register
SHI	State Heritage Inventory

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Rothwell Boys Property Pty Ltd (Winten Property Group) to undertake an Aboriginal Cultural Heritage Assessment (ACHA) associated with a proposed modification to the existing Project Approval for The Glades Estate, Pacific Highway, Moonee, NSW granted by the then Minister of Planning on 5 March 2009 (06_0143). The proposed modification is being prepared under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and adds an additional area of 1.8 hectares (ha) comprising 31 additional lots, within the central portion of the site (currently described as Lot 1 in DP725785) and forms the basis of ACHA.

The ACHA determines if the proposal is likely to harm Aboriginal objects (as defined by the *NSW National Parks and Wildlife Act 1974*). It provides mitigation and management measures to avoid or minimise harm to Aboriginal objects. These measures are presented in *Section 9* of this report.

1.1 Objectives

This ACHA assesses the potential impacts of the Project on Aboriginal Cultural Heritage values, and prepares strategies to manage risks to any identified heritage values during the course of the Project.

This report documents:

- the consultation process undertaken with Aboriginal communities and their involvement in the Project;
- the landscape and natural resources of the Project Area (PA);
- a synthesis of local and regional Aboriginal archaeological research to develop a contextual basis for predictive models;
- a review of archaeological and relevant literature and heritage listings on the NSW Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) database;
- a predictive model for Aboriginal site types and location relevant to the PA;
- a review of the PA's non-Aboriginal history to gain an understanding and appreciation of past land uses and associated historical ground disturbance;
- the archaeological methodology implemented during the study;
- the cultural and archaeological sensitivity of landforms that may be subject to impacts;
- the field survey results;
- the significance of any located Aboriginal objects and places;
- a description of the Project and whether or not it has the potential to result in impacts to Aboriginal cultural heritage and historic heritage items; and
- provision of management and mitigation measures based on the results of the investigation.

1.2 Description of Proposed Development

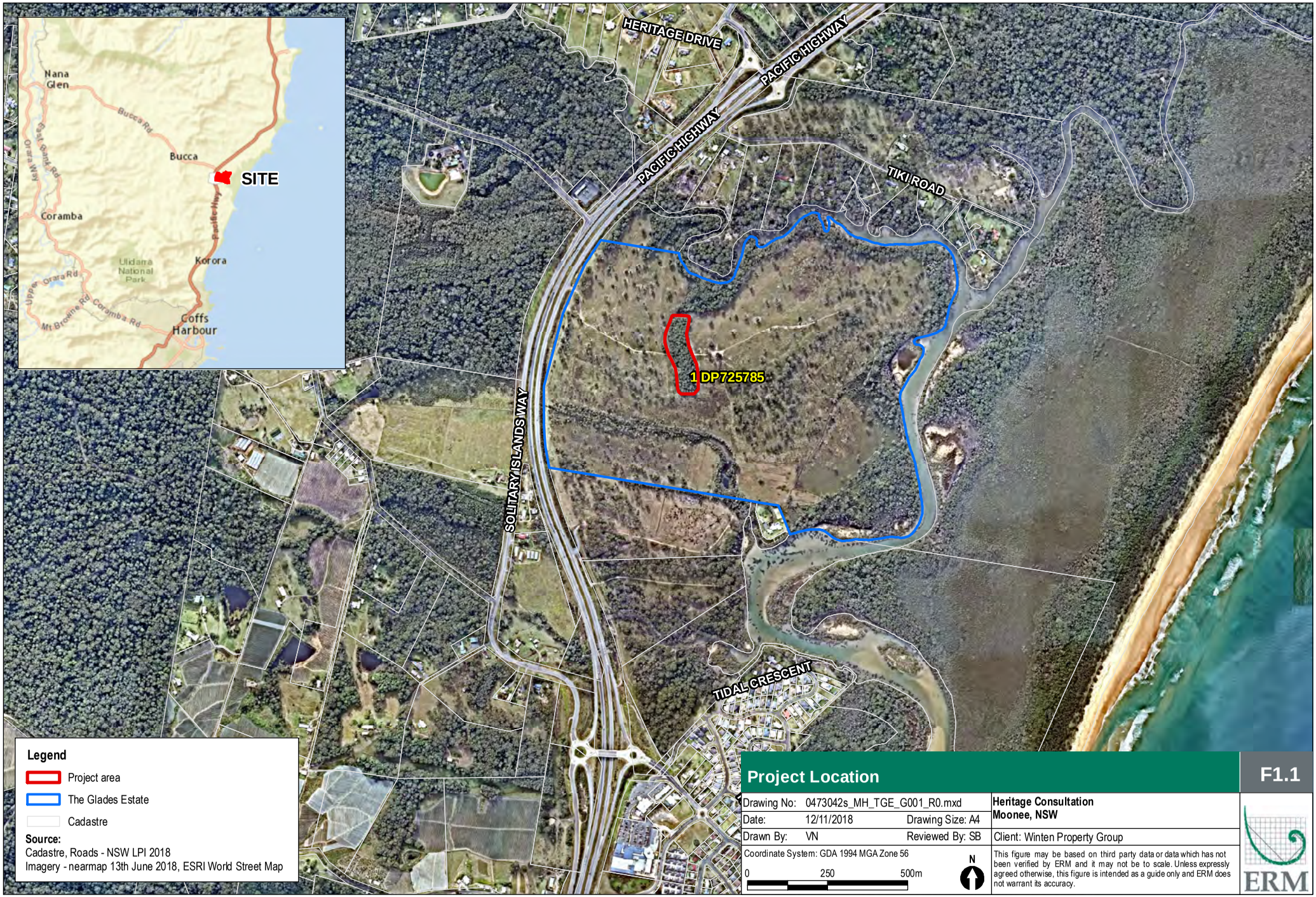
The current proposed development involves an area of 1.8 hectares (ha). The Project Area is located within the North Coast region of NSW and specifically situated in the City of Coffs Harbour Local Government Area (LGA), approximately 11.5 km north of Coffs Harbour. The development is located to the east of the Pacific Highway. The location of the Project Area is shown in *Figure 1.1*.

The proposed development adds an additional area of 1.8 hectares (ha) comprising 31 additional lots, within the central portion of the already approved 524 lot residential development (currently described

as Lot 1 in DP725785). This will be facilitated by vegetation clearing and bulk earthworks in preparation for future residential development.

1.3 Authorship

Stephanie Moore and Dr Robin Twaddle (ERM Heritage Consultants) authored the report. Joanne Woodhouse (ERM Project Manager) undertook technical review of the report and Paul Douglass (ERM Partner) undertook quality assurance (QA) review of the report.


Nana Glen
Bucca Rd
Bucca
SITE
Coramba
Pacific Hwy
Ulidarra National Park
Korora
Upper Orara Rd
Mt Browne Rd
Coramba Rd
Coffs Harbour
HERITAGE DRIVE
PACIFIC HIGHWAY
PACIFIC HIGHWAY
TIKI ROAD
1 DP725785
SOLITARY ISLANDS WAY
TIDAL CRESCENT
Legend
Project area
The Glades Estate
Cadastre
Source:
Cadastre, Roads - NSW LPI 2018
Imagery - nearmap 13th June 2018, ESRI World Street Map
Project Location
F1.1
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Date: 12/11/2018
Drawing Size: A4
Drawn By: VN
Reviewed By: SB
Coordinate System: GDA 1994 MGA Zone 56
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Heritage Consultation
Moonee, NSW
Client: Winten Property Group
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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2. RELEVANT LEGISLATION

Aboriginal cultural heritage in NSW is protected by the *National Parks and Wildlife Act 1974* (NP&W Act). Land managers are required to consider the effects of their activities, or proposed development, on the environment under several pieces of legislation, principally the *Environmental Planning and Assessment Act* 1979 (EP&A Act). Cultural heritage, which includes Aboriginal and historical heritage, is subsumed within the definition of "environment". In certain circumstances, Commonwealth legislation protecting Aboriginal heritage may also apply to Aboriginal heritage places in NSW. The key Commonwealth legislation applying to the Project is summarised below in Section 2.1.

2.1 State Legislation

2.1.1 NSW Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act* 1979 (as amended 2018) (EP&A Act) and the *Environmental Planning and Assessment Regulation* 2000 (EP&A Regulation) provide the statutory framework for the assessment of the activity. Section 4.15 of the EP&A Act requires the consent authority to take into consideration a range of matters when undertaking an assessment of a DA. The EP&A Act requires that environmental impacts are considered in land use planning, including impacts on Aboriginal and non-Aboriginal heritage. Various planning instruments prepared under the Act identify permissible land use and development constraints.

The NSW National Parks and Wildlife Services (NPWS) provide guidelines for Aboriginal heritage assessment, including those conducted under the EP&A Act. Where Aboriginal heritage assessment is conducted under the Integrated Development Approval process, a more detailed set of NPWS guidelines applies.

2.1.2 NSW National Parks and Wildlife Act 1974

All Aboriginal objects within the State of New South Wales are protected under Part 6, and particularly Section 90, of the NPW Act.

Under Section 5 of the Act, "Aboriginal Object" means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Indigenous habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

Sites of traditional significance that do not necessarily contain archaeological materials may be gazetted as 'Aboriginal places' and are protected under Section 84 of the Act. This protection applies to all sites, regardless of their significance or land tenure. Under Section 90, a person who, without first obtaining the consent of the Director-General, knowingly destroys, defaces or damages, or knowingly causes or permits the destruction or defacement of or damage to, an Aboriginal object or Aboriginal place is guilty of an offence.

It is required that an Aboriginal Heritage Impact Permit (AHIP) be obtained for any impact to an Aboriginal object or place. The OEH is the responsible authority, with the Director General of that department the consent authority.

2.1.3 NSW Heritage Act 1977

The NSW *Heritage Act 1977* establishes the NSW Heritage Council and the State Heritage Register (SHR). The aim of the Act is to conserve the heritage of New South Wales. The aim of heritage management is not to prevent change and development, but to ensure that the heritage significance of recognised heritage items is not harmed by changes.

The SHR is a separate listing to the State Heritage Inventory and includes items which are accorded SHR listing through gazettal in the NSW Government Gazette. Nominated items are considered by

the NSW Heritage Council which then makes a recommendation to the Minister for Heritage. The Minister is empowered to place Interim Heritage Orders (IHO) on an item of potential State significance on the basis of advice received from the Heritage Council:

a) An item is important in the course, or pattern, of NSW's cultural or natural history.

b) An item has strong or special association with the life or works of a person, or group of persons of importance in NSW's cultural or natural history.

c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW.

d) An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons.

e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history.

f) An item possesses uncommon, rare, or endangered, aspects of NSW's cultural or natural history.

g) An item is important in demonstrating the principal characteristics of a class of NSW's a) cultural or natural places: or b) cultural or natural environments.

3. ABORIGINAL COMMUNITY CONSULTATION

This chapter contains details of the Aboriginal community consultation undertaken regarding the Aboriginal cultural heritage of the Project Area. In accordance with the guideline *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), consultation with Aboriginal people is an essential part of the heritage assessment process to:

- determine potential harm on Aboriginal cultural heritage from proposed activities; and
- inform decision making for any application for an AHIP where it is determined that harm cannot be avoided.

The guideline also sets out four stages of consultation requirements. Fulfilment of these requirements is outlined below.

3.1 Stage 1: Notification of Project Proposal and Registration of Interest

The aim of Stage 1 of the consultation process is *to identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the area of the proposed project*.

On behalf of the Proponent, ERM has actively sought to fulfil this aim and identify stakeholder groups or people wishing to be consulted about the Project, and invite them to register their interest. After determining that there was no approved determination of Native Title over the project area (per 4.1.1 of the guidelines), ERM reached out to additional resources for information about interested parties.

In order to identify people with a potential interest in the project (as per 4.1.2 of the guidelines), letters containing the location and nature of the project (dated 14 August 2018) were sent to the following bodies:

- Coffs Harbour Local Aboriginal Land Council (CHLALC);
- Coffs Harbour Local Land Services;
- National Native Title Tribunal;
- Native Title Services Corporation (NTS Corp);
- NSW OEH Regional Operations North East Branch;
- Office of the Registrar, *Aboriginal Land Rights Act* (1983); and
- Coffs Harbour City Council.

Responses to these letters identified 17 Aboriginal people or organisations with a potential interest in the Project. A Project notification and invitation to register letter (as per 4.1.3 of the guidelines) was sent to each of the identified parties on 20 September 2018. Each of the identified parties was given two consecutive weeks in which to register their interest in the project. Three registrations were received in response to the project notification letters.

In addition to the agency contacts, a local press advertisement requesting Aboriginal party participation was placed in the Coffs Coast Advocate on 17 August 2018. The response period for Aboriginal stakeholders to register an interest in the Project was open for two consecutive weeks. Two registrations were received in response to the public advertisement.

A total of six Aboriginal people or organisations have registered their interest in the project, identified in *Table 3.1*.

Table 3.1 Registered Aboriginal Parties

Individual/Organisation
Coffs Harbour Local Aboriginal Land Council
Jagun Aged and Community Care
Norman Archibald
Merrigarn Indigenous Corporation
Murra Bidgee Mullangari Aboriginal Corporation
Garby Elders

3.2 Stage 2: Presentation of Information about the Proposed Project

The aim of Stage 2 of the consultation process is *to provide registered Aboriginal parties with information about the scope of the proposed project and the proposed cultural heritage assessment process.*

A proposed assessment methodology was sent to each of the Registered Aboriginal Parties (RAPs) (dated 5 October 2018). The letter included:

- an outline of proposed works;
- the proposed methodology and dates for pedestrian survey; and
- a request for Aboriginal parties to identify any particular areas of interest within the Project Area to survey.

3.3 Stage 3: Gathering Information about the Proposed Project

ERM received three return emails regarding the project methodology. The responses received are summarised in *Table 3.2* below.

Table 3.2 Comments on proposed methodology

Organisation	Comments
Murra Bidgee Mullangari Aboriginal Corporation	Representative had read and understood the methodology and endorsed ERM's recommendations
Merrigarn Indigenous Corporation	Representative had read and understood the methodology and endorsed ERM's recommendations
Jagun Aged and Community Care	■ Estimated survey for three study areas, one day for each location ■ Jagun Elders are not happy with timeframes put on studies of Aboriginal Cultural & Heritage ■ This creates a rushed job, if areas of: significants, storylines, spiritual pathways, water holes are identified, which is highly likely ■ Jagun recommends a more flexible approach minimum three days, with extension if needed ■ Site officers to determine sensitive areas and pad locations ■ Storyline and high significance areas will be discussed on the day of commencement

ERM considered the comments provided by the RAPs and incorporated these into field inspection arrangements where possible. Additional feedback from RAPs was incorporated into the report

3.4 Stage 4: Review of Draft Cultural Heritage Assessment Report

ERM provided a copy of the completed draft ACHA report to the RAPs on 29 November 2018. The report was provided for the purpose of review and comment, with comments from the RAPs to be incorporated into the final document.

Comments were received from two of the six registered organisations, being:

- Murra Bidgee Mullangari Aboriginal Corporation; and
- Jagun Aged and Community Care.

Merrigarn and Murra Bidgee Mullangari both provided brief responses indicating that the groups endorsed the recommendations made by ERM. Jagun provided a more formal response, reporting a short list of concerns. The concerns raised by Jagun have been addressed below.

Jagun noted that the project location is surrounded by highly significant cultural areas. This information, provided by Uncle Tony Perkins during the site inspection, has been incorporated in *Section* ***Error! Reference source not found.*** of this report and considered in the significance assessments presented for the site. ERM acknowledges the presence of significant story lines within the region, but notes that no cultural site are known to exist within the study area.

Jagun felt that a 'high degree' of monitoring should be undertaken along ridges and creek lines during the course of works. ERM has taken this recommendation into consideration in preparing the conclusions and recommendations for this report.

Additionally, Jagun enquired as to the locations where cutting and filling will occur during the bulk earthworks phase. ERM understands why this request has been made; however, as this detail is not yet available it cannot be provided at this time. ERM also feels that the results of the ACHA (see *Section* ***Error! Reference source not found.****,* particularly that no areas of archaeological sensitivity have been identified, indicate that there is a low likelihood of identifying additional cultural information during cut and fill activities. This suggests that the provision of cut and fill drawings will have no bearing on the overall assessment of the study area.

Finally, Jagun made several comments (both in their written response, and via phone) about the registration of persons and organisations considered to be 'out of area'. Uncle Tony Perkins voiced his concern about the registration of organisations that he did not recognise as being local, and stated that he feels these groups do not have the appropriate cultural knowledge to be included in the assessment of the study area. ERM has noted this concern however all registrations are accepted in accordance with the legislation.

4. ENVIRONMENTAL CONTEXT

Human behaviour is directly and indirectly influenced by the environmental setting in which people live. This is particularly true for hunter-gatherer societies, in which availability and abundance of local recourses influences movement within the landscape. Environmental factors may also influence the potential that archaeological sites will be preserved and visible. The physical setting of the Glades Estate and the proposed modification area is therefore discussed in terms of geology and landforms, and past land use and disturbance.

A determination of the former environmental context is essential to develop accurate models of cultural activity, site distribution patterns and the archaeological potential of any given area. The environmental setting of Glades Estate and the proposed modification area is discussed below.

4.1 The NSW North Coast Bioregion

Bioregions and sub-bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities. The Interim Biogeographic Regionalisation for Australia (IBRA) provides a regional and national planning framework for the systematic development of a comprehensive, adequate and representative National Reserve System. Bioregions delineate salient environmental characteristics which can highlight patterns in Aboriginal site patterning.

The Project Area is located within the NSW North Coast Bioregion, which extends from just north of Newcastle to just inside the Queensland border. The bioregion is bordered to the south by the Sydney Basin Bioregion and to the west by the Nadewar and New England Tablelands bioregions. The total area of the bioregion is 5,924,130 hectares, with the NSW portion measuring 5,692,351.6 hectares (approximately 7.11% of NSW) (NSW NPWS, 2003). The general attributes of the NSW North Coast Bioregion are outlined in *Table 4.1* below.

Table 4.1 NSW North Coast Bioregion Attributes

Characteristic	Description
Climate	The climate within this bioregion is generally subtropical on the coast, sub-humid on the slopes and temperate in the uplands and western portions. The subtropical coastal climate has generally hot summers, while the sub-humid and temperate climates experience warm summers and no dry season.
Landforms	The landform sequence (east to west) of the bioregion generally consist of coastal sand barriers, moving through low foothills and ranges, to steep slopes and gorges within the Great Escarpment. Rainfall generally increases as you move westward along these landforms.
Geology	The bioregion overlays part of the New England Fold Belt and represents one of the most geologically diverse in NSW. Bedrocks are Devonian and Permian, having been faulted as they were thrust over the northern margin of the Sydney Basin.
Soils	The geological diversity and topographic variation of this bioregion have created a complex soil pattern. Along the basalt substrates, soils are generally red friable loams or clay loams, which have good structure and water-holding capacity and are thus the most fertile. On granites and quartz rich sedimentary rocks, the soils are generally shallow yellow earths (hillcrests), yellow and brown texture contrasts (slopes) and organic loams (alluvial plains). In the coastal dunes, deep siliceous sands and well-developed podsols can be found.
Vegetation	Vegetation across this bioregion is diverse and generally dictated by the soils, with variation between basalt based sub-regions and granite based sub-regions. Sub-tropical and warm temperate rainforests or wet sclerophyll forests are found on the basalt soils. Granite soils largely support eucalypt forests consisting of blackbutt, spotted gum and brush box. Coastal dunes generally support smaller eucalypt and acacia species.

4.2 Topography and Landforms

The topography of the proposed modification area is gently sloping, located between two low ridges. Gentle slopes, open depressions, flats and ridges (refer to Speight 1990) are present across the broader Glades Estate Project Area (refer to *Figure 4.1*). The ridges are a maximum of 15 metres above sea level and are surrounded by gentle slopes that border flats along Moonee Creek and Skinners Creek.

4.3 Geology and Soils

The Glades Estate is situated on Quaternary alluvial, paludal and estuarine deposits associated with Moonee Creek. These deposits overlie the Upper Palaeozoic Coramba Beds, which contain greywacke, slate and siliceous argillite (Geological Survey of NSW 1969). Other stone types present in the area surrounding Coffs Harbour include high-grade siltstones and cherts (Appleton 2003:5). Rock types such as argillite, chert and greywacke are suitable for the manufacture of stone artefacts. Soils belong to the Newport soil landscape, which consists of Yellow Podzolic Soils and Humic Gleys on low, level to gently undulating coastal back barrier floodplains. These soils are deep, poorly drained and strongly acidic (DLWC 1999).

The subsurface conditions interpreted from a test pit (TP104) undertaken at the southern boundary of the proposed modification area by Coffey Geotechnics in 2007 (Coffey 2007) show:

- **Topsoil**: 0 – 0.2 m. Silty clay, low plasticity, dark brown;
- **Estuarine/Alluvial Soil**: 0.2 – 0.9 m. Silty clay, low to medium plasticity, grey;
- **Residual Soil**: 0.9 – 1.7 m. Silty gravelly clay and gravelly clay, low to medium plasticity, grey, with some orange brown mottling, gravel is fine to coarse grained; and
- **Extremely Weathered Siltstone**: >2 m. Clayey gravel, fine to coarse grained, white with orange mottle, clay is low plasticity.

Generally, groundwater was observed to be at the surface in most test pit locations and soils were found to be acidic (Coffey 2007). The nature of this area is reflected in the dominance of alluvial soils, with less stable, waterlogged soils occurring on the alluvial plains and low-lying areas.

The general situation of the underlying and surrounding geology and soils is shown in *Figure 4.1* and *Figure 4.2* respectively.

4.4 Hydrology

The Project Area is bound by Moonee Creek and Skinners Creek in the east and north respectively, the major watercourses in the local area. Both creeks are tidal and fresh water may have been obtained from Skinners Creek during periods of high rainfall only. Moonee Creek would have provided a range of estuarine food resources. Prior to draining of the area, freshwater may also have been available in low-lying areas to the south of the proposed modification area.

4.5 Flora and Fauna

As reported by ERM (2007), ethnohistoric accounts describe the use of a broad variety of animal resources including kangaroo, possum, snake, lizard, a variety of birds, echidna, flying foxes, fish (marine, estuarine and saltwater species) and shellfish. Plants were also used for food and medical purposes and as a source of raw materials for the manufacture of items such as string, fishing line, canoes, shelters, weapons and storage implements (Ryan 1964:142-147). Stone artefacts are occasionally mentioned in the early accounts and early explorer Dawson referred to the use of stone artefacts in the pre-contact period as follows:

> With such inefficient implements as stone tomahawks, flint knives, shell scrapers and pointed sticks, imagine the infinite patience required to cut most of their living out of hardwood trees and logs, to strip bark for their

shelters, and to shape and fashion their weapons of war and for the chase (Dawson (in Ryan 1964:162)).

The Project Area is dominated by dry sclerophyll species including eucalypts and scrubby undergrowth. Much of this community is regenerated and does not represent the historic floral landscape of the area.

4.6 Land Use and Disturbance

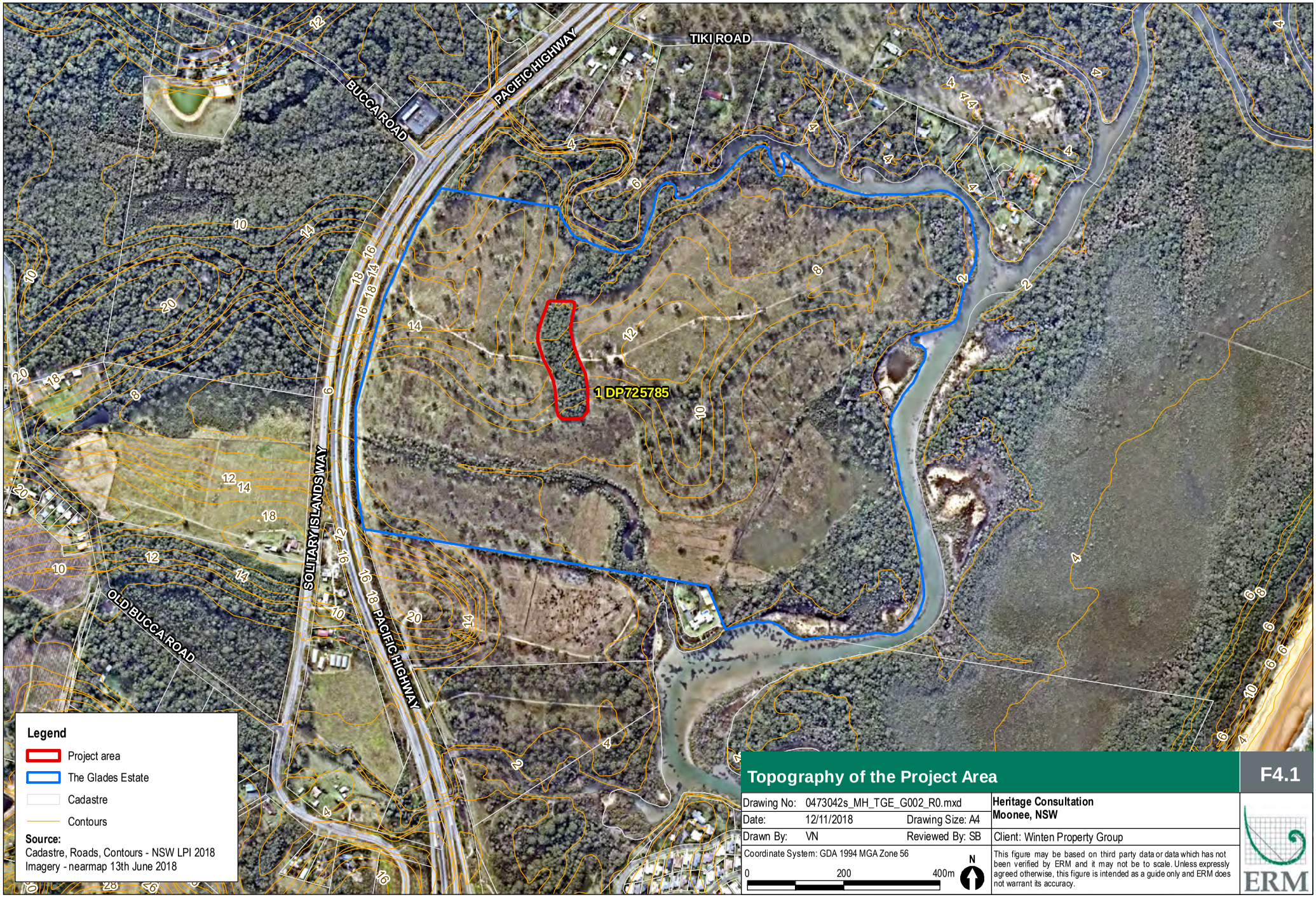
Past land use and associated disturbances impact upon the archaeological record in terms of both the presence or absence of cultural materials and the integrity of any remaining deposits.

As reported by ERM (2007) and Collins (1974), the majority of the broader Glades Estate Project Area has been significantly impacted by vegetation clearance and historical logging. This has involved the removal of mature trees and associated undergrowth and has resulted in significant disturbance within the upper soil unit. The felling and removal of large trees would have caused the exposure and dispersal of upper soil deposits and the potential relocation of any artefacts that may have been present.

The proposed modification area now forms a small patch of regenerating vegetation in the centre of the Glades Estate Project Area. The historic felling and removal of large trees is clearly evident (refer to *Photograph 4.1*) and has resulted in significant disturbance within the upper soil unit and impact damage to the trees that have been retained. A vehicle access track crosses the proposed modification area and cattle grazing occurs across the entire Glades Estate Project Area, both of which typically increases rates of erosion (refer to *Photograph 4.2)*.

Photograph 4.1 Evidence of felling (ERM, 2018)

Photograph 4.2 Formed track through the Project Area (ERM, 2018)



Topography of the Project Area

F4.1

Drawing No:	0473042s_MH_TGE_G002_R0.mxd		Heritage Consultation Moonee, NSW
Date:	12/11/2018	Drawing Size: A4	
Drawn By:	VN	Reviewed By: SB	Client: Winten Property Group

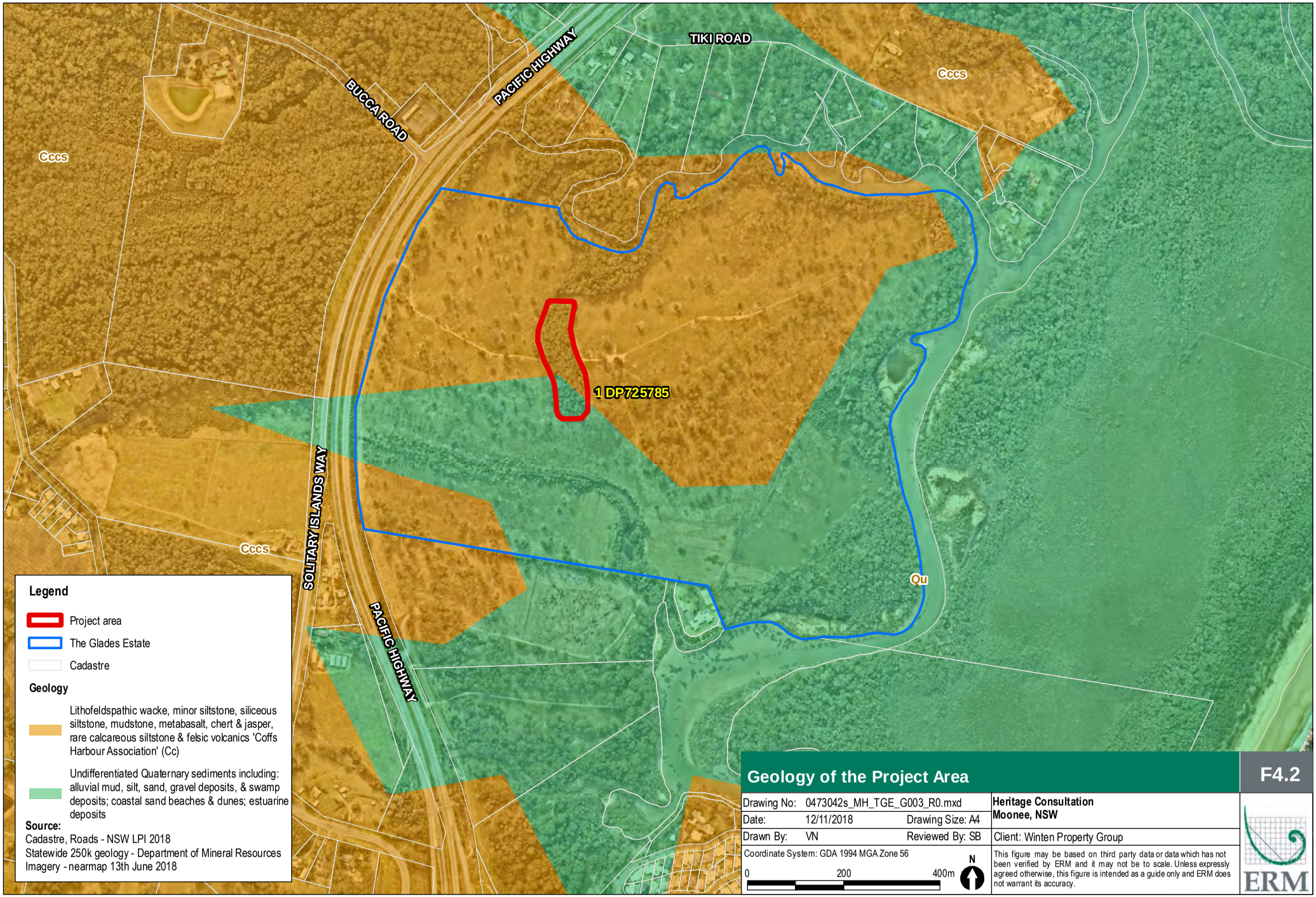
Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM


BUCCA ROAD
PACIFIC HIGHWAY
TIKI ROAD
Cccs
Cccs
Cccs
1 DP725785
SOLITARY ISLANDS WAY
PACIFIC HIGHWAY
Qu
Legend
Project area
The Glades Estate
Cadastre
Geology
Lithofeldspathic wacke, minor siltstone, siliceous siltstone, mudstone, metabasalt, chert & jasper, rare calcareous siltstone & felsic volcanics 'Coffs Harbour Association' (Cc)
Undifferentiated Quaternary sediments including: alluvial mud, silt, sand, gravel deposits, & swamp deposits; coastal sand beaches & dunes; estuarine deposits
Source:
Cadastre, Roads - NSW LPI 2018
Statewide 250k geology - Department of Mineral Resources
Imagery - nearmap 13th June 2018
Geology of the Project Area
F4.2
Drawing No: 0473042s_MH_TGE_G003_R0.mxd
Date: 12/11/2018
Drawing Size: A4
Drawn By: VN
Reviewed By: SB
Coordinate System: GDA 1994 MGA Zone 56
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Heritage Consultation
Moonee, NSW
Client: Winten Property Group
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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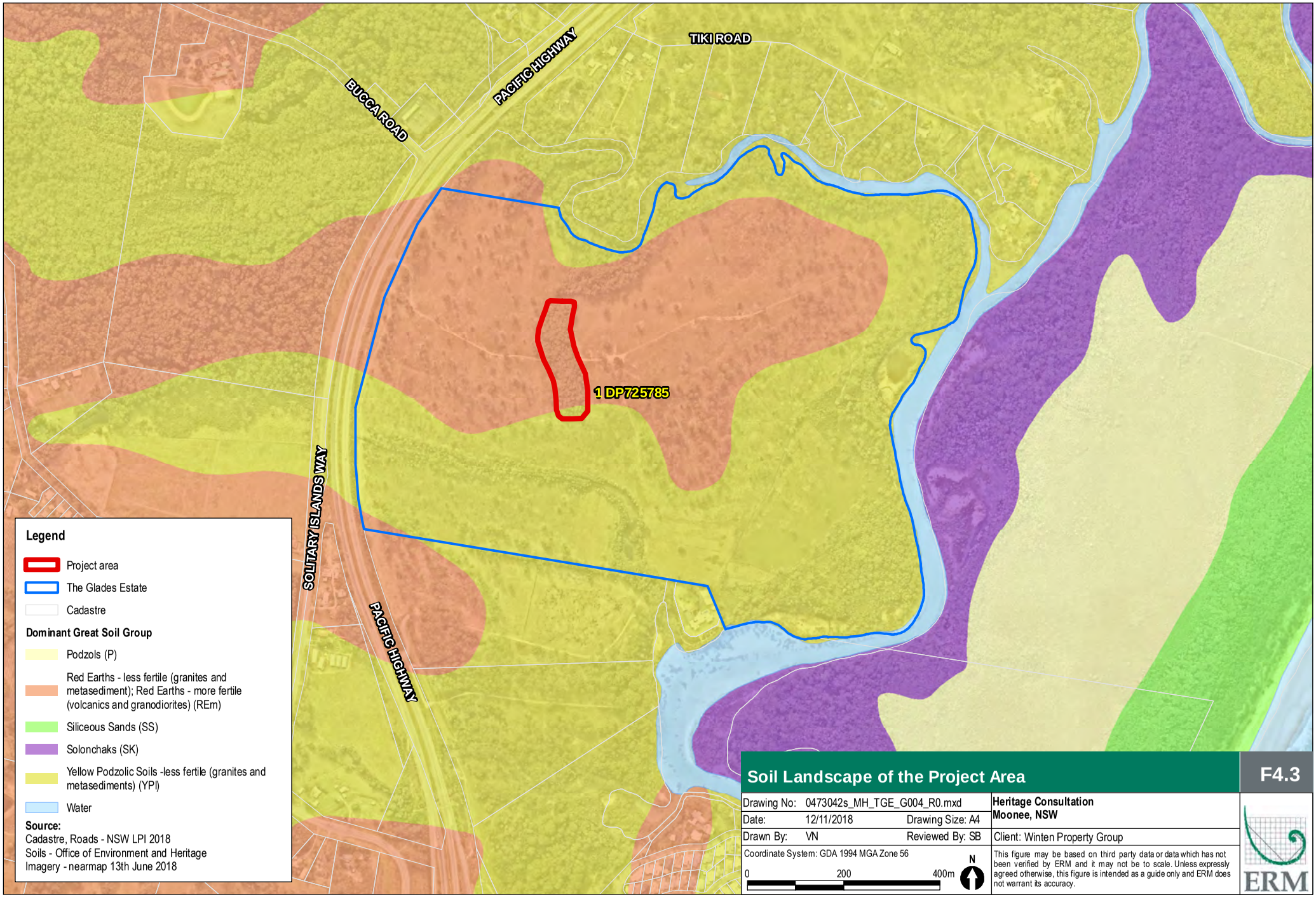
TIKI ROAD
PACIFIC HIGHWAY
BUCCA ROAD
1 DP725785
SOLITARY ISLANDS WAY
PACIFIC HIGHWAY
Legend
Project area
The Glades Estate
Cadastre
Dominant Great Soil Group
Podzols (P)
Red Earths - less fertile (granites and metasediment); Red Earths - more fertile (volcanics and granodiorites) (REm)
Siliceous Sands (SS)
Solonchaks (SK)
Yellow Podzolic Soils -less fertile (granites and metasediments) (YPl)
Water
Source:
Cadastre, Roads - NSW LPI 2018
Soils - Office of Environment and Heritage
Imagery - nearmap 13th June 2018
Soil Landscape of the Project Area
F4.3
Drawing No: 0473042s_MH_TGE_G004_R0.mxd
Date: 12/11/2018
Drawing Size: A4
Drawn By: VN
Reviewed By: SB
Coordinate System: GDA 1994 MGA Zone 56
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Heritage Consultation
Moonee, NSW
Client: Winten Property Group
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

5. ARCHAEOLOGICAL BACKGROUND

The Glades Estate is situated in a region rich in Aboriginal cultural heritage. Numerous archaeological sites have been recorded within the Glades Estate Project Area and in the surrounding areas. These sites are of particular value to the local Aboriginal community as well as to the broader community (ERM 2007).

The following information provides the context in which Aboriginal cultural heritage in the proposed modification area can be understood. It includes a review of early historic records relating to Aboriginal people within the region.

5.1 Ethno-history

As reported by ERM (2007) early historic records provide information about the Coffs Harbour region during the period of early European settlement. These records include ethnohistoric accounts that can be used to obtain information about the way in which Aboriginal people in the area lived at the time of early European contact, and may be used to make inferences regarding the pre-contact period.

Ethnohistoric records indicate that the Coffs Harbour region was part of the territory of the Kumbainggiri or Gumbaynggir language group. The Gumbaynggir lands extended southeast from the lower Nymboida River to Urunga and Bellingen, along the coast from Nambucca Heads to Woolgoolga and inland to South Grafton (Tindale 1974). Populations were comparatively dense on the coast, with reference made to gatherings of up to 500 men (Bellshaw 1978:72). Inland riverine and 'rainforest' areas were reportedly less densely occupied due to lower resource availability (Bellshaw 1978:74). Ethnohistoric records describe a population already significantly affected by the introduction of European diseases and therefore population estimates are likely to considerably under represent the numbers of Aboriginal people in the region prior to 1788 (Butlin 1982).

There were quite a number of Aboriginal people camping in the Moonee area during early European settlement, where they had built shelters near the sand dunes on the north end of Moonee Beach. Their main camps were back towards the hills. One camp was near where the Coffs Harbour Gun Club is now (2 km north of the Glades Estate Project Area), which is typical of the low hills and slopes used for main camps. Many other sites are known in the Moonee Creek area. Soon after the European settlement of Moonee, the Aboriginal people slowly began fading out of the area, and by the 1890's stopped returning altogether, except for the odd short stay of two or three families at various times (Thomas 2013).

Thomas (2013) presents an Aboriginal history of the Coffs Harbour region and notes that the Gumbaynggirr people had it 'pretty good' around the Moonee area. During the winter months huge schools of sea mullet moved along the coast. Sharks drove them close to the shore where they were easily speared by men and boys. Pipis in countless thousands could be found in the sand of the beaches, while along the rocky headlands many kinds of shellfish could be obtained easily by good swimmers (Dawn and New Dawn magazine 1952-1975, cited in Thomas 2013).

Ethnographic sources suggest that Kangaroos, Pademelons and Wallabies were easily trapped by being driven into the triangle formed by the creek and the surf. At high tide Moonee Creek presented a long swim for those animals which tried to escape by swimming across. While a few youths patrolled the far side of the creek, any animals which attempted to escape by swimming could be cut off and killed while still in deep water as their swimming movements were slow. The animals were driven into the stream near the entrance of the creek where they were killed and a good supply of food obtained (Dawn and New Dawn magazine 1952-1975, cited in Thomas 2013).

In the sandy soils along the bank of the creek, a number of corkwood trees attracted large numbers of pigeons in the autumn when the berries were ripe. By waiting beneath the low branching trees the hunters were able to kill the pigeons as they fed a few feet above them. The seed pods of the mangrove trees also provided much food in the winter-spring period. These cotyledons were cooked

in a pit in which stones had been heated. The berries were covered with bark and soil and after half an hour or so they were ready to eat. In lesser quantities were lillipillies, pigface, strawberries, and the native plum (Dawn and New Dawn magazine 1952-1975, cited in Thomas 2013).

5.2 Regional Archaeological Context

No regional syntheses of archaeological findings within the broader Coffs Harbour region have been undertaken. However, assessments undertaken as part of extensive development and construction programs, such as the Pacific Highway Sapphire to Woolgoolga Upgrade project (refer Collins 2010; Collins 2007) that stretched over approximately 25 km along the coast, provide summaries of archaeological sites throughout the region. When considered in combination with information from additional targeted studies, a broad regional perspective can be reached.

Studies undertaken at Arrawarra Beach (16 km north of the Project area) located a number of sites, including middens containing fish bone and shell material, isolated finds, artefact scatters, PADs, subsurface material, and a stone arrangement (Smith 1998; see Collins 2010). Analysis of archaeological material indicated people were utilising nearby coastal resources and utilising local sedimentary stone to manufacture tools (Vale 1998, 2000; see Collins 2010).

Further assessment of the area between Arrawarra and Moonee, undertaken as party of the Sapphire to Woolgoolga Upgrade project located four scatters of stone artefacts (S2W-2, 4, 7 and 12) and three isolated artefact finds (S2W-3, 5 and 6). The study also identified a potential historic Burial near Moonee (Portion 41). Whilst the overall sample (number) of recorded sites was small, the results provide an indication of the types of sites which would be expected within the landscape: open stone artefact scatters and open campsites on elevated landform.

Smith and Beck (2003) assessed post-contact Aboriginal camps in the area referred to as “No man’s land” located behind the dunes at Corindi Beach. Archaeological surveys and excavations located a midden, subsurface deposits (containing shellfish, flaked glass and ceramics, and building materials), artefactual scatters of glass, iron, ceramics, tins, and other objects, and the remains of camp structures. While not reflective of traditional life, these sites are important examples of post-contact life for Aboriginal groups and suggest that similar sites may be found throughout the broader Coffs Harbour region.

5.3 Local Archaeological Context

A number of archaeological investigations have been undertaken in the local Moonee Beach area. The results of these investigations provide an indication of the range, nature and distribution of archaeological sites within the local area and therefore provide essential background information for the present study. The Project Area, including the proposed modification area, has also been previously assessed in its entirety by Collins (1994b) and ERM (2007). Appleton (2003) also undertook targeted investigations within the broader Glades Estate Project Area.

5.3.1 Proposed Rural Residential Subdivision at Moonee, N.S.W. North Coast: Archaeological Survey for Aboriginal Sites (Collins, 1994a)

This survey involved the assessment of a 10 per cent sample of a proposed rural residential subdivision of a 156-hectare development area located on the northern side of Skinners Creek (The Glades Estate Project Area, including proposed modification area). Four sites were located in the study area and consisted of one isolated find and three artefact scatters. The two larger artefact scatters (35 and 15 artefacts) may be a continuous site and were located on a ridgeline that passes from the coastal lowlands to the inland ranges and is approximately 150 metres from the nearest permanent creek.

As there were no notable resources within the study area, Collins (1994a:27) suggested that the recorded sites represent transitory and itinerant use of the area. These recorded sites are located outside the proposed modification area (the Project Area).

5.3.2 Coffs Harbour Highway Planning - Sapphire to Woolgoolga Aboriginal Heritage Assessment (Collins, 2002)

This study involved the assessment of four options for the proposed upgrade to the Pacific Highway, situated to the north of the Project Area. Four artefact scatters were identified in close proximity to the study area. All were situated in elevated locations and contained artefacts composed of chert, siltstone and greywacke.

Collins (2002:14) also reported that Yellow Waterholes is an unmodified women's site linked to other women's sites within the area and is a significant cultural site for local Aboriginal people. The Archaeological Re-Investigation of an Open Artefact Scatter, Site No. #22-1-0027, "DH 2:Moonee" (Appleton, 2003)

Appleton (2003) conducted a re-investigation of Site 2, previously recorded by Collins (1994b), which overlooks Skinners Creek. With the exception of an area of remnant vegetation, Site 2 had been cleared and the ground surface had been graded or 'levelled' resulting in the removal of part of the upper soil horizon and significant disturbance to the archaeological material visible on the surface (Appleton 2003:7). Five artefacts were found in four separate exposures within the ridge and slopes in which Site 2 was originally recorded. Appleton (2003) argued that the artefacts identified during the survey were in a disturbed context and that it was unlikely that test excavations would result in the recovery of significant numbers of artefacts. He defined an area of archaeological sensitivity surrounding Site 2 to include the area of remnant vegetation along Skinners Creek and a portion of the ridge and slope to the west of the remnant vegetation.

No sites or areas of sensitivity were reported within the proposed modification area.

5.3.3 Archaeological Assessment of Lot 211 DP 1044292 Moonee Beach NSW (BCA 2005)

BCA (2005) undertook a cultural heritage assessment of Lot 211 DP 1044292, 1 km south of the Project area. While no archaeological material was located during the site survey, consultation with the Coffs Harbour Local Aboriginal Land Council (CHLALC) indicated that sites were known to be present along the ridge crest north of the study area. CHLALC members indicated that the ridge would have overlooked an extensive wetland, which would have provided a range of resources.

5.3.4 Aboriginal Heritage Assessment: Lot 1 DP 1097743 and Lot 6 DP 2552223 Pacific Highway, Moonee beach, NSW (Myall Coast Archaeological Services 2013)

Despite its title MCAS (2013) undertook assessment of only Lot 1 DP 1097743, 500 m north of the Project area. The study identified an artefact scatter consisting of greywacke, baked greywacke flakes and a quartz core on a gravel driveway. No *in situ* material was located. The small number of located during this survey may be due to the disturbed nature of the lot, which appears to have undergone a significant amount of clearing owing to agricultural activities and use of unsealed tracks.

Importantly, this study highlights the importance of Moonee Creek to local Aboriginal heritage as a substantial occupation area for Aboriginal people.

5.4 Previous Assessments within the Project Area

5.4.1 The Glades Estate Aboriginal Cultural Heritage Assessment (Collins, 1994b)

The Glades Estate Project Area, including the proposed modification area, has been previously assessed in its entirety by Collins (1994b). Collins' (1994b) study was conducted when the Glades Estate Project Area was heavily vegetated and focussed on areas of exposure, namely logging tracks

and dumps. Seven sites were recorded within the Glades Estate, although despite numerous, extensive surveys, no sites have been recorded within the proposed modification area.

The sites recorded by Collins were concentrated on the northerly slope above Skinners Creek and on the banks of Skinners Creek and Moonee Creek. Collins (1994b:26) argued that this was not a factor of the survey strategy as all landform units were surveyed (including the proposed modification area) and visibility was greater than 30 percent on the ridge and southerly slopes. She therefore proposed that Aboriginal people focussed their activities along Skinners Creek.

The artefacts were all made of locally available raw materials and a comparatively high proportion of cores and cortex-bearing artefacts were present. Collins (1994b:26) therefore suggested that raw materials were plentiful and that primary manufacture of artefacts occurred on site. However, none of the sites were extensive or concentrated and it was suggested that the occupation of the area may have been on an itinerant basis and focussed on the area surrounding Site 2.

Collins (1994b:16) also noted that whilst the Aboriginal community did not feel that the Glades Estate Project Area had any particular significance, it is known as a traditional travel route. Bucca Road was described as part of 'a traditional Dreaming route connecting with the Kangaroo Flat area further northwest, and that Aboriginal people from inland areas used this route to travel to Look-At-Me-Now Headland for seafood.' (Collins 1994b:16).

No sites or areas of sensitivity were reported within the proposed modification area.

5.4.2 The archaeological re-investigation of an open artefact scatter, Site No. #22-1-0027, "DH 2:Moonee" (Appleton, 2003)

Appleton (2003) conducted a re-investigation of Site 2, previously recorded by Collins (1994b), which overlooks Skinners Creek. With the exception of an area of remnant vegetation, Site 2 had been cleared and the ground surface had been graded or 'levelled' resulting in the removal of part of the upper soil horizon and significant disturbance to the archaeological material visible on the surface (Appleton 2003:7). Five artefacts were found in four separate exposures within the ridge and slopes in which Site 2 was originally recorded. Appleton (2003) argued that the artefacts identified during the survey were in a disturbed context and that it was unlikely that test excavations would result in the recovery of significant numbers of artefacts. He defined an area of archaeological sensitivity surrounding Site 2 to include the area of remnant vegetation along Skinners Creek and a portion of the ridge and slope to the west of the remnant vegetation.

No sites or areas of sensitivity were reported within the proposed modification area.

5.4.3 The Glades Residential Development, Moonee Beach NSW Aboriginal Cultural Heritage Assessment (ERM, 2007)

Seven sites were recorded by ERM 2007 (one scarred tree, four artefact scatters and two isolated finds) and all were concluded to have been previously recorded by Collins 1994b. The most common artefact raw material recorded by ERM was mudstone, followed by coarse-grained igneous stone. Siltstone and quartzite were also present in the assemblage. The most common artefact types recorded were flakes and broken flakes with some retouched artefacts present. In addition to the surface evidence, four areas of PAD and one area of cultural sensitivity were identified on the northern and north-eastern margins of the Glades Estate project area.

It was recommended that where possible all impacts to sites, PADs and the area of cultural sensitivity recorded during the survey be avoided especially where remnant vegetation remained. It was further recommended that all sites outside the impact footprint should be protected during construction and the two sites with surface evidence inside the impact area undergo surface collection by an archaeologist and the Aboriginal stakeholders prior to construction.

No sites or areas of sensitivity were recorded within the proposed modification area.

5.5 OEH AHIMS Register Search Results

An extensive search of the OEH Aboriginal Heritage Information Management System (AHIMS) database was conducted on 16 October 2018, using the following details:

Client Service ID: 376666
Latitude: -30.1679 to -30.2200 **Longitude:** 153.1102 to 153.1925
Buffer: 50m
Number of Sites: 68

A total of 68 sites were identified within the search area. Of these, the majority are recorded as Artefact sites, with Shell material also contributing largely to the types of recorded sites. The results of the AHIMS search are summarised in *Table 5.1*.

Table 5.1 AHIMS Registered Site Types

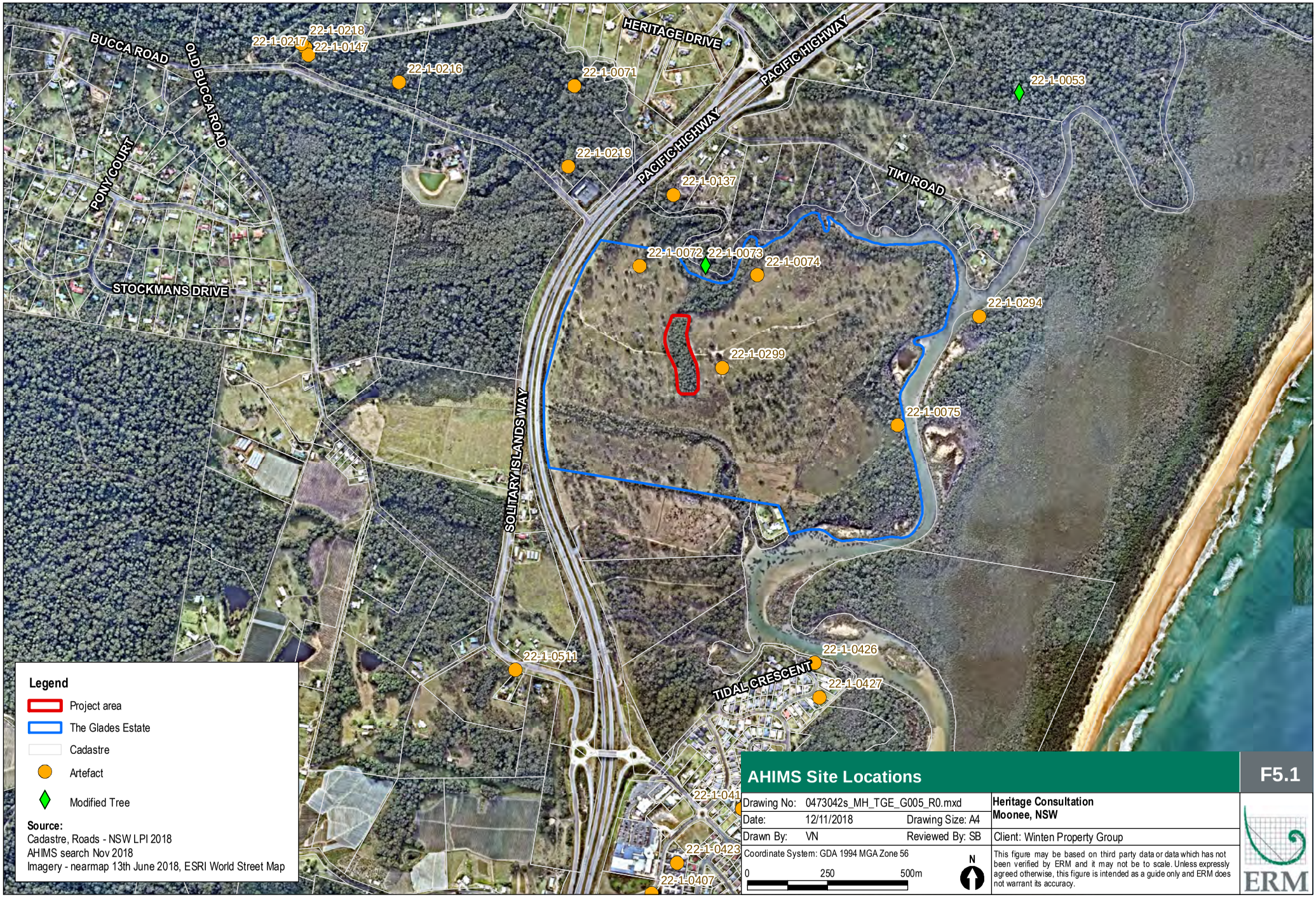
Site Type	Number
Artefact	51
Artefact, Shell	6
Shell	2
Artefact, Aboriginal Resource and Gathering	2
Modified Tree (Carved or Scarred)	2
Aboriginal Ceremony and Dreaming	1
Artefact, Art (Pigment or Engraved)	1
Artefact, Potential Archaeological Deposit (PAD)	1
Artefact, Shell, Aboriginal Ceremony and Dreaming	1
Potential Archaeological Deposit (PAD)	1

5.6 Predictive Model

The knowledge gained from examining landforms, geology, archaeological patterning, and prior archaeological reports have enabled a set of parameters to be stablished to predict the potential location of Aboriginal sites within the Project Area. The background results suggest that:

- Aboriginal sites are most likely to be stone artefact sites;
- archaeological sites are most likely to occur in close proximity to permanent water sources, although smaller creek margins may also display scatters of stone artefacts;
- elevated areas that afford views of the surrounding landscape, such as ridgelines, are likely to contain archaeological material;
- scarred trees may occur in association with permanent water sources;
- common stone materials used in the manufacture of artefacts within the local region of the Project Area are mudstone, quartzite, and siltstone; and
- post-contact Aboriginal sites may occur within the area with material such as flaked glass, ceramics, metals, and the remains of camp structures.

Much of the material used by Aboriginal people to produce survival equipment (such as wood, bone, shell and fibre material) are highly perishable and do not often survive in the archaeological record. Material culture that has survived, often found in locations where Aboriginal people camped, are generally stone artefacts and scarred trees. Stone artefacts, and to a lesser extent scarred trees, are the most likely artefact types to be located within the Project Area. Aboriginal archaeological sites within the Project Area are likely to have been impacted upon (disturbed) due to past European farming practices, the development of transport infrastructure (such as rail and road constructions) and trenching for utility services.


BUCCA ROAD
OLD BUCCA ROAD
PONY COURT
STOCKMANS DRIVE
HERITAGE DRIVE
PACIFIC HIGHWAY
PACIFIC HIGHWAY
TIKI ROAD
SOLITARY ISLANDS WAY
TIDAL CRESCENT
22-1-0217
22-1-0218
22-1-0147
22-1-0216
22-1-0071
22-1-0053
22-1-0219
22-1-0137
22-1-0072
22-1-0073
22-1-0074
22-1-0294
22-1-0299
22-1-0075
22-1-0511
22-1-0426
22-1-0427
22-1-041
22-1-0423
22-1-0407
Legend
Project area
The Glades Estate
Cadastre
Artefact
Modified Tree
Source:
Cadastre, Roads - NSW LPI 2018
AHIMS search Nov 2018
Imagery - nearmap 13th June 2018, ESRI World Street Map
AHIMS Site Locations
F5.1
Drawing No: 0473042s_MH_TGE_G005_R0.mxd
Date: 12/11/2018
Drawing Size: A4
Drawn By: VN
Reviewed By: SB
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Heritage Consultation
Moonee, NSW
Client: Winten Property Group
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

6. SURVEY METHODOLOGY AND RESULTS

6.1 Field Survey Methodology

A comprehensive pedestrian field survey of the project area was undertaken on 12 November 2018, by Stephanie Moore (ERM Archaeologist) and representatives from the RAP groups. The field survey participants are identified in *Table 6.1* below. The pedestrian survey was undertaken field transit with the participants walking at approximately 5m spacing along the transited routes. Transects were walked south to north through the vegetated project area, beginning at the central access road and then working along the outside of the area. Exposures and mature trees were targeted where noted.

Table 6.1 Field Survey Participants

Organisation	Field Officer
Merrigarn Indigenous Corporation	Paul Boyd
Jagun Aged and Community Care	Andrew Taylor
Jagun Aged and Community Care	Tony Perkins
Murra Bidgee Mullangari	Chad Gowan
Garby Elders	Ricky Cain
Garby Elders	Milton Duroux
Coffs Harbour and District LALC	Ian Brown

Uncle Tony Perkins (Jagun) did not participate in the field survey, but attended to provide information about storylines which relate to this area. This information has provided valuable insights into how the area was used by past Aboriginal communities and how landforms tie into cultural understanding and expression. This information has been incorporated into the significance assessment for the project area.

Access to the project area was through the broader Glades Estate Site, from the west along a formed track leading from a gate off the Pacific Highway. The field team undertook the survey in two parts, assessing everything north of the access road before moving to the south of the access road. Ground visibility within the vegetation was near zero, due to think leaf litter and fallen branches.

6.2 Field Survey Results

6.2.1 Description of Project Area

The project area is densely vegetated, dominated by young trees and varied underbrush. Leaf litter and grasses obscured view of the substrate and ground surface visibility was effectively zero. Very few mature trees were noted within the project area, and those noted were generally dead or felled. The project area is bordered by pastoral land on all sides (consisting of the approved Glades Estate development area).

Photograph 6.1 dense vegetation and leaf litter (ERM, 2018)

Photograph 6.2 dense vegetation and grass covering ground surface (ERM, 2018)

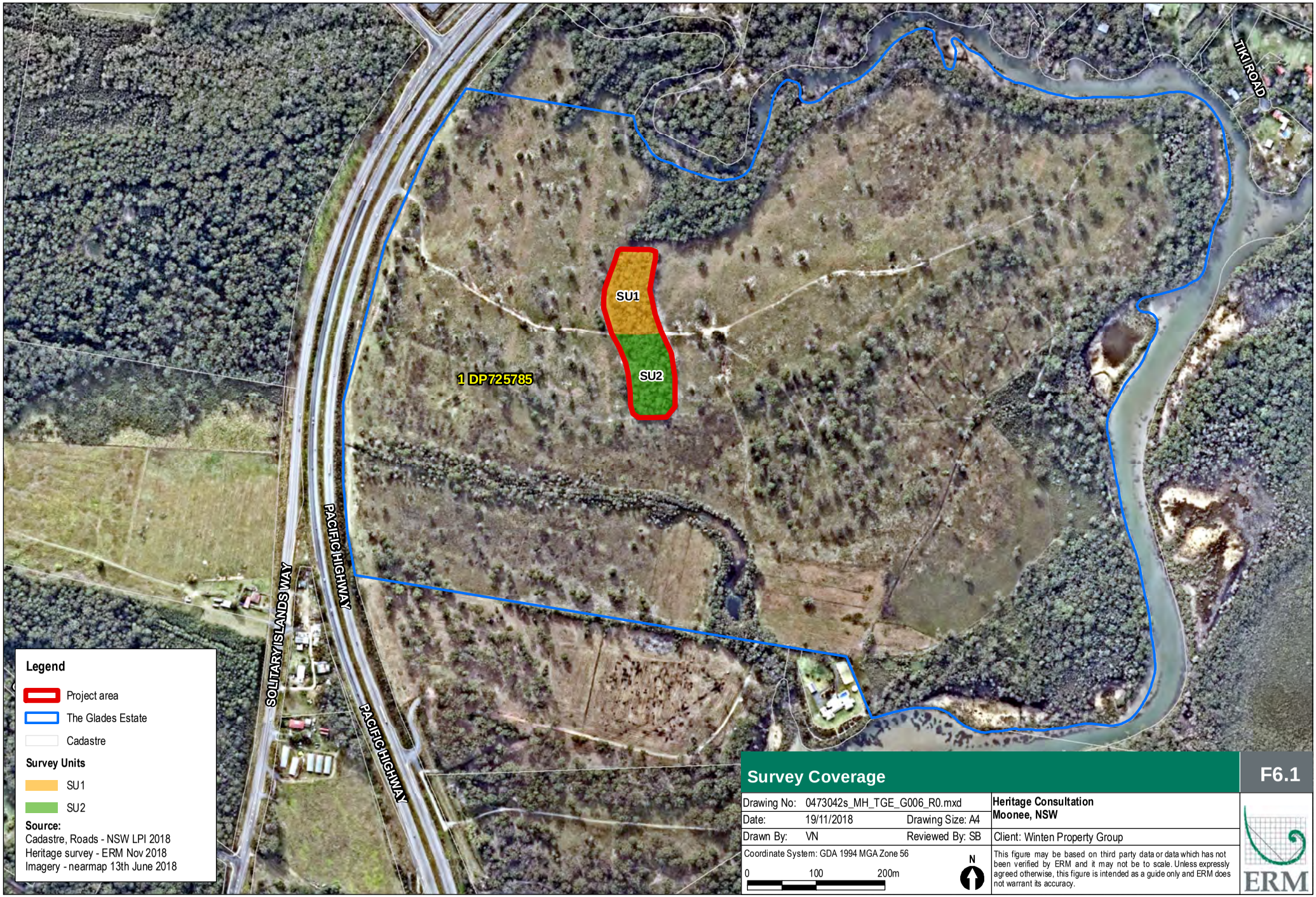
6.2.2 Survey Coverage

Table 6.2 Survey Coverage Results

Survey Unit	Landform	Survey Unit Area (sqm)	Visibility (%)	Exposure (%)	Effective Coverage (sqm)	Effective Coverage (%)
SU1	Ridge	8,245	5%	5%	20.61	0.25%
SU2	Ridge	8,099	5%	5%	20.25	0.25%

6.2.3 Survey Results

No Aboriginal sites were identified during the field survey.



Survey Coverage

F6.1

Drawing No:	0473042s_MH_TGE_G006_R0.mxd		Heritage Consultation Moonee, NSW
Date:	19/11/2018	Drawing Size: A4	
Drawn By:	VN	Reviewed By: SB	Client: Winten Property Group

Coordinate System: GDA 1994 MGA Zone 56

0 100 200m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

7. SIGNIFICANCE ASSESSMENT

7.1 Assessment of Aboriginal Cultural Significance

The following section provides an assessment of the overall Aboriginal cultural heritage significance of the project area. The project area has been assessed for social, historical, scientific and aesthetic values, contributing to the overall significance of the area.

7.1.1 Social Significance

At the commencement of the field survey, Uncle Tony Perkins (Jagun Aged and Community Care) took time to discuss the cultural landscape surrounding the project area with the archaeologist. Uncle Tony highlighted men's and women's areas located along the coast and further inland, and the cultural storyline which links these important spiritual places. Sites such as the Diamond Tree, the yellow water holes and a local stone factory all feature in the cultural narrative of the area and create meaning for the local community. The important sites which feature in these narratives are located to the north of the project area; however, their location in proximity provides an understanding of how and why the lands could have been used in the past.

In addition to these traditional storylines, Uncle Ian Brown indicated a spot to the south of the project area where he used to make his was from the highway across to Moonee Creek to go crabbing. Uncle Ian indicated that they had permission from the land owners to use the track to access the creek and would regularly use this area to gather crab and yabbies.

Based on the information provided by the RAPs and observations made on site, the project area is assessed as demonstrating social significance values.

7.1.2 Historic Significance

There is no evidence to suggest that the project area holds any historical significance.

7.1.3 Scientific Significance

No Aboriginal heritage sites were identified within the project area. As such, the project area has no scientific significance.

7.1.4 Aesthetic Significance

There are no features of the project area which indicate aesthetic significance.

7.2 Aboriginal Heritage Statement of Significance

Investigation into the Aboriginal heritage value of the project area has indicated that the land and surrounding region has social significance, both historic and contemporary, for the local Aboriginal community. In addition, the project area contains no known archaeological sites or objects and has no scientific significance. The project area does not demonstrate significance under the historical or aesthetic criteria.

Based on this assessment, the project area demonstrates low Aboriginal Heritage Significance.

8. IMPACT ASSESSMENT

8.1 Proposed Impact

The proposed works will involve the subdivision of the project area into 31 residential lots. This will be facilitated by vegetation clearing and bulk earthworks in preparation for future residential development as per the existing approved Glades Estate Subdivision and associated conditions of approval (06_0143).

8.2 Assessment of on Aboriginal Cultural Heritage Values

The proposed works will result in impacts to the ground surface within the project area, through land clearing and preparation activities. In addition, the proposal will radically transform the landscape, which will have an impact on the cultural value of the location to the local Aboriginal community, who have utilised the region throughout many generations for subsistence and recreation.

Based on the available information, it is determined that the proposed works will not have a major direct impact to identified Aboriginal heritage values within the project area.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

No Aboriginal cultural heritage objects were located within the Project Area. The area holds social significance to the local Aboriginal groups with surrounding sites playing a role in cultural narratives that span the region, including storylines and men's and women's places. Moreover, modern connections between local Aboriginal people and the Project Area are evident, including use as a corridor to access estuarine resources such as yabbies and crabs.

Despite these broader connections, the Project Area itself is of low Aboriginal Heritage Significance owing to ground disturbance from clearing as well as the construction and use of unsealed tracks. Moreover, no historic, scientific, or aesthetic values were identified.

Previous management processes have been enacted for the Project Area as part of ERM (2007). These should continue to be utilised as part of the development.

9.2 Recommendations

As no Aboriginal objects were identified within the Project Area, there are no additional constraints placed on development within the proposed modification area. Based on these results, and the position of the Project Area within the larger approved Glades Estate Subdivision, the following recommendations are made:

- Management of lands within the Project Area during development should be in accordance with Conditions of Approval (CoA) D12 and D13 of the existing project approval, under Part3A of the EP&A Act;
- All works should be undertaken in accordance with the established unexpected finds procedure, as recorded in CoA D12(1); and
- Management protocol for Aboriginal and non-Aboriginal objects should be included in the Construction Management Plan to be prepared for the development, with a minimum requirement that the unexpected finds procedure is reproduced in this document.

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APPENDIX A AHIMS EXTENSIVE SEARCH RESULTS

October 2018

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 0473042 Moonee ACHAs

Client Service ID : 376666

Environmental Resources Management

Level 6 99 King Street
Melbourne Victoria 3000

Attention: Stephanie Moore

Email: stephanie.moore@erm.com

Date: 16 October 2018

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.22, 153.1102 - Lat, Long To : -30.1679, 153.1925 with a Buffer of 50 meters, conducted by Stephanie Moore on 16 October 2018.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

68	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 0473042 Moonee ACHAs

Client Service ID : 376666

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
22-1-0117	Crown reserve	AGD	56	518080	6662050	Open site	Valid	Artefact : -, Shell : -	Midden,Open Camp Site	
	Contact	**Recorders**	Deidre Murphy					**Permits**		
22-1-0118	Moonee Caravan Park 2	AGD	56	514780	6657550	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Unknown Author,Deidre Murphy					**Permits**		
22-1-0119	Moonee Caravan Park 3	AGD	56	514900	6657880	Open site	Valid	Artefact : -	Isolated Find	
	Contact	**Recorders**	Unknown Author					**Permits**		
22-1-0051	Moonee Beach Midden	GDA	56	515221	6657649	Open site	Valid	Shell : -, Artefact : -	Midden	103890
	Contact	**Recorders**	Pamela O'Neill					**Permits**	1142,4151,4162	
22-1-0053	Moonee Creek 1;Moonee;	AGD	56	515500	6660520	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1981
	Contact	**Recorders**	Kerry Navin					**Permits**		
22-1-0069	MS 1	AGD	56	514440	6661510	Open site	Valid	Artefact : -	Open Camp Site	2809
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0070	MS 2	AGD	56	514325	6661520	Open site	Valid	Artefact : -	Open Camp Site	2809
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0071	MS 3	AGD	56	514110	6660540	Open site	Valid	Artefact : -	Open Camp Site	2809
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0072	DH 2;Moonee (Site 2)	AGD	56	514314	6659977	Open site	Valid	Artefact : -	Open Camp Site	100810
	Contact	**Recorders**	Ms.Jacqueline Collins,Miss.Nicola Roche					**Permits**		
22-1-0073	DH 4;Moonee;	AGD	56	514520	6659980	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0074	DH 4;Moonee (Site 5)	AGD	56	514682	6659949	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Ms.Jacqueline Collins,Miss.Nicola Roche					**Permits**		
22-1-0075	DH 6;Moonee;	AGD	56	515120	6659480	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0078	MS 4;	AGD	56	514570	6661680	Open site	Valid	Artefact : -	Isolated Find	
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0083	Moonee Beach Workshop;	AGD	56	514960	6657940	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Mrs.Lisa Southgate					**Permits**		
22-1-0019	Moonee Beach Site 1;Rocky Bluff;	AGD	56	517300	6661500	Open site	Valid	Shell : -, Artefact : -, Aboriginal Ceremony and Dreaming : -	Midden,Natural Mythological (Ritual)	1478
	Contact	**Recorders**	Isabel McBryde					**Permits**		

Report generated by AHIMS Web Service on 16/10/2018 for Stephanie Moore for the following area at Lat, Long From : -30.22, 153.1102 - Lat, Long To : -30.1679, 153.1925 with a Buffer of 50 meters. Additional Info : Aboriginal Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 68

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
22-1-0020	Moonee Beach;Rocky Bluff;	AGD	56	518000	6661700	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	
	Contact	**Recorders**	J.A Starling					**Permits**		
22-1-0137	CHSS-12	AGD	56	514420	6660200	Open site	Valid	Artefact : 5		103091
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0138	CHSS-11	AGD	56	516554	6662063	Open site	Partially Destroyed	Artefact : 16, Art (Pigment or Engraved) : 1		103091
	Contact	**Recorders**	ADISE Pty Ltd,Ms.Jacqueline Collins					**Permits**	3778	
22-1-0143	CHSS-2	AGD	56	513800	6657190	Open site	Valid	Artefact : 3		103091
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0130	Moonee Caravan Park 1	AGD	56	514880	6657750	Open site	Valid	Artefact : 2, Shell : -		
	Contact	**Recorders**	Deidre Murphy					**Permits**	3724	
22-1-0131	Moonee Reserve Car Park	AGD	56	515050	6657550	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Yarrawarra Aboriginal Corporation					**Permits**	1936,2028	
22-1-0147	A1_ Bucca Rd	AGD	56	513270	6660660	Open site	Valid	Artefact : 12		
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0148	A2_Bucca Rd	AGD	56	512990	6661080	Open site	Valid	Artefact : 4, Aboriginal Resource and Gathering : -		
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0166	ISF 2 + PAD	AGD	56	514435	6656700	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		99028,99032,100149,101089
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**	1809,2014	
22-1-0170	Moonee Beach 03	AGD	56	517770	6661410	Open site	Valid	Shell : -, Artefact : -		
	Contact	**Recorders**	Ms.Rebecca Edwards-Booth,Claude McDermott					**Permits**	1801	
22-1-0215	MBI	AGD	56	514363	6657942	Open site	Valid	Artefact : 6		
	Contact T Russell	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**	4053	
22-1-0198	Moonee Beach_03	AGD	56	514434	6657029	Open site	Valid	Aboriginal Resource and Gathering : -, Artefact : -		
	Contact T Russell	**Recorders**	Miss.Nicky Owner					**Permits**		
22-1-0216	MBS1	AGD	56	513563	6660551	Open site	Valid	Artefact : 2		
	Contact T Russell	**Recorders**	ERM Australia Pty Ltd- Sydney CBD					**Permits**		
22-1-0217	MBS2	AGD	56	513279	6660637	Open site	Valid	Artefact : 5		

Report generated by AHIMS Web Service on 16/10/2018 for Stephanie Moore for the following area at Lat, Long From : -30.22, 153.1102 - Lat, Long To : -30.1679, 153.1925 with a Buffer of 50 meters. Additional Info : Aboriginal Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 68

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact T Russell	**Recorders**	ERM Australia Pty Ltd- Sydney CBD					**Permits**		
22-1-0218	MBS3	AGD	56	513258	6660672	Open site	Valid	Artefact : 2		
	Contact T Russell	**Recorders**	ERM Australia Pty Ltd- Sydney CBD					**Permits**		
22-1-0219	MBS4	AGD	56	514091	6660288	Open site	Valid	Artefact : 1		
	Contact T Russell	**Recorders**	ERM Australia Pty Ltd- Sydney CBD					**Permits**		
22-1-0220	Emerald Beach 1	AGD	56	517277	6662464	Open site	Destroyed	Artefact : 5		100223
	Contact Searle	**Recorders**	Ian Brown					**Permits**	2587	
18-1-0024	Sugar Mill Creek 1 (SMC1)	AGD	56	515188	6657552	Open site	Valid	Artefact : 20		100424
	Contact Searle	**Recorders**	Umwelt (Australia) Pty Limited					**Permits**		
22-1-0296	Sugar Mill Creek 2 (SMC 2)	AGD	56	514526	6656631	Open site	Valid	Artefact : 20		100424
	Contact S Scanlon	**Recorders**	Umwelt (Australia) Pty Limited					**Permits**		
22-1-0297	Pad 2 Sugar Mill Creek	AGD	56	515188	6657552	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		100424
	Contact S Scanlon	**Recorders**	Umwelt (Australia) Pty Limited					**Permits**		
22-1-0299	Site 1 Rothwell Boys	AGD	56	514573	6659660	Open site	Valid	Artefact : 9		
	Contact Searle	**Recorders**	Miss.Nicola Roche					**Permits**		
22-1-0294	Site6	GDA	56	515480	6660008	Open site	Valid	Artefact : 2		
	Contact Searle	**Recorders**	Miss.Nicola Roche					**Permits**		
22-1-0374	S2W-15	GDA	56	514167	6657059	Open site	Valid	Artefact : 1		103091
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0383	S2W-19	GDA	56	516465	6662125	Open site	Partially Destroyed	Artefact : 1		103091
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**	3778	
22-1-0407	S2W 23	GDA	56	514457	6658206	Open site	Destroyed	Artefact : 1		103091
	Contact	**Recorders**	ADISE Pty Ltd,Ms.Jacqueline Collins					**Permits**		
22-1-0426	Moonee Beach Tidal Cresc Res	GDA	56	514966	6658926	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Mr.Chris Spencer					**Permits**		
22-1-0427	House Lots - Lot 60 DP 1168248	GDA	56	514981	6658819	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Mr.Chris Spencer					**Permits**		
22-1-0413	Moonee Beach Road Seddon 2	GDA	56	514817	6658405	Open site	Partially Destroyed	Artefact : 3		
	Contact Mr.Mark Flanders	**Recorders**	Mr.Mark Flanders					**Permits**	3576	
22-1-0414	Moonee Beach Road Seddon 3	GDA	56	514850	6658346	Open site	Partially Destroyed	Artefact : 1		
	Contact Mr.Mark Flanders	**Recorders**	Mr.Mark Flanders					**Permits**	3576	

Report generated by AHIMS Web Service on 16/10/2018 for Stephanie Moore for the following area at Lat, Long From : -30.22, 153.1102 - Lat, Long To : -30.1679, 153.1925 with a Buffer of 50 meters. Additional Info : Aboriginal Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 68

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
22-1-0415	Moonee Beach Road Seddon 4	GDA	56	514888	6658298	Open site	Partially Destroyed	Artefact : 2		
	Contact Mr.Mark Flanders	**Recorders**	Mr.Mark Flanders					**Permits**	3576	
22-1-0416	Moonee Beach Road Seddon_1	GDA	56	514740	6658471	Open site	Partially Destroyed	Artefact : 1		
	Contact Mr.Mark Flanders	**Recorders**	Mr.Mark Flanders					**Permits**	3576	
22-1-0419	S2W-19 Re-deposit	GDA	56	516515	6662116	Open site	Valid	Artefact : -		103091
	Contact	**Recorders**	ADISE Pty Ltd					**Permits**		
22-1-0420	S2W-24	GDA	56	516360	6661890	Open site	Valid	Artefact : -		103091
	Contact	**Recorders**	ADISE Pty Ltd					**Permits**		
22-1-0423	Sullivans Road Moonee	GDA	56	514537	6658302	Open site	Partially Destroyed	Artefact : 10		
	Contact Mr.Ian Brown	**Recorders**	Mr.Mark Flanders,Everick Heritage Consultants Pty Ltd,Mr.Tim Hill					**Permits**	3738	
22-4-0138	Moonee Beach RD Seddon1	GDA	56	514740	6658471	Open site	Partially Destroyed	Artefact : -		
	Contact Mr.Mark Flanders	**Recorders**	Mr.Mark Flanders					**Permits**	3576	
22-1-0438	S2W-4 Redeposit	GDA	56	516591	6662091	Open site	Valid	Artefact : -		103091
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
22-1-0430	MB Midden 5	GDA	56	517752	6661586	Open site	Valid	Shell : 25, Artefact : 20		
	Contact	**Recorders**	Mr.EJ Williams					**Permits**		
22-1-0431	MB Midden 6	GDA	56	517752	6661594	Open site	Valid	Artefact : 20, Shell : 40		
	Contact	**Recorders**	Mr.EJ Williams					**Permits**		
22-1-0455	Pacific Highway Site 2	GDA	56	515360	6661207	Open site	Partially Destroyed	Artefact : -		103429
	Contact	**Recorders**	Ms.nat redman					**Permits**	3778	
22-1-0456	Pacific Highway Site 3	GDA	56	515896	6661642	Open site	Partially Destroyed	Artefact : -		103429
	Contact	**Recorders**	Ms.nat redman					**Permits**	3778	
22-1-0428	MB Midden 3	GDA	56	517756	6661619	Open site	Valid	Shell : 20		
	Contact	**Recorders**	Mr.Emmanuel Fewquandie					**Permits**	3680	
22-1-0429	MB Midden 4	GDA	56	517742	6661615	Open site	Valid	Shell : 7		
	Contact	**Recorders**	Mr.Emmanuel Fewquandie					**Permits**	3680	
22-1-0442	Emerald Headland Temperary Track	GDA	56	517727	6661622	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.EJ Williams					**Permits**		
22-1-0433	S2W-23 Redeposit	GDA	56	514253	6658148	Open site	Valid	Artefact : -		103091
	Contact Mr.Mark Flanders	**Recorders**	Ms.Jacqueline Collins					**Permits**		

Report generated by AHIMS Web Service on 16/10/2018 for Stephanie Moore for the following area at Lat, Long From : -30.22, 153.1102 - Lat, Long To : -30.1679, 153.1925 with a Buffer of 50 meters. Additional Info : Aboriginal Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 68

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 0473042 Moonee ACHAs

Client Service ID : 376666

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
22-1-0464	AHMPCP01	GDA	56	515014	6658039	Open site	Partially Destroyed	Artefact : 1		
	Contact	**Recorders**	Everick Heritage Consultants Pty Ltd,Everick Heritage Consultants Pty Ltd,Mr.Matt					**Permits**		
22-1-0465	AHMBPC02	GDA	56	515080	6657753	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Mr.Matt Alexander					**Permits**		
22-1-0466	AHMBCP03	GDA	56	515096	6657752	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Mr.Matt Alexander					**Permits**		
22-1-0467	AHMBCP04	GDA	56	515136	6657794	Open site	Valid	Artefact : 4		
	Contact	**Recorders**	Mr.Matt Alexander					**Permits**		
22-1-0468	AHMBCP05	GDA	56	515129	6657857	Open site	Valid	Artefact : 4		
	Contact	**Recorders**	Mr.Matt Alexander					**Permits**		
22-1-0497	Heritage Drive_Sullivans Road Moonee Reburial site	GDA	56	514176	6661039	Closed site	Valid	Artefact : -		
	Contact	**Recorders**	Everick Heritage Consultants Pty Ltd,Mr.Tim Hill					**Permits**		
18-1-0029	SRM2	GDA	56	514433	6658177	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	Everick Heritage Consultants Pty Ltd,Everick Heritage Consultants Pty Ltd,Mr.Tim					**Permits**	4053	
22-1-0511	651 Solitary Island Way Stone Axes	GDA	56	514031	6658905	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Everick Heritage Consultants Pty Ltd,Mr.Tim Hill					**Permits**		
22-1-0510	41 Sullivans Road Moonee Reburial	GDA	56	514479	6658125	Closed site	Valid	Artefact : -		
	Contact	**Recorders**	Everick Heritage Consultants Pty Ltd,Mr.Tim Hill					**Permits**		

Report generated by AHIMS Web Service on 16/10/2018 for Stephanie Moore for the following area at Lat, Long From : -30.22, 153.1102 - Lat, Long To : -30.1679, 153.1925 with a Buffer of 50 meters. Additional Info : Aboriginal Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 68

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APPENDIX B AHIMS EXTENSIVE SEARCH RESULTS

November 2018

Date	To Person	To Organisation	From Person	From Organisation	Method	Details
14/08/2018		Office of Environment and Heritage	Stephanie Moore	ERM	Post	Sent Stage 1 Project Notification - Agency Letter requesting information about Aboriginal people who may have interest in project
14/08/2018		Office of the Registrar (ALRA)	Stephanie Moore	ERM	Email	Sent Stage 1 Project Notification - Agency Letter requesting information about Aboriginal people who may have interest in project
14/08/2018		Coffs Harbour City Council	Stephanie Moore	ERM	Email	Sent Stage 1 Project Notification - Agency Letter requesting information about Aboriginal people who may have interest in project
14/08/2018		Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	Sent Stage 1 Project Notification - Agency Letter requesting information about Aboriginal people who may have interest in project
14/08/2018		Coffs Harbour Local Land Services	Stephanie Moore	ERM	Post	Sent Stage 1 Project Notification - Agency Letter requesting information about Aboriginal people who may have interest in project
14/08/2018		NTS Corp	Stephanie Moore	ERM	Email	Sent Stage 1 Project Notification - Agency Letter requesting information about Aboriginal people who may have interest in project
16/08/2018	Stephanie Moore	ERM	Jodi Rikiti	Office of the Registrar (ALRA)	Email	Response to request to search the register. Register returned no search results and ALRA suggested we contact Coffs LALC.
20/08/2018	Stephanie Moore	ERM	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Email	Email expressing interest in "Aboriginal Consultation - Moonee NSW".
21/08/2018	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	Return email to confirm which projects Coffs LALC are registering for.
21/08/2018	Stephanie Moore	ERM	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Email	Confirmed that Coffs LALC were registering for all three projects.
26/08/2018	Joanne Woodhouse	ERM	Simone Perkins	Jagun Aged and Community Care	Email	registration of interest for the project, naming Elder Uncle Tony Perkins as key knowledge holder for this area.
29/08/2018	Joanne Woodhouse	ERM	Rosalie Neve	Office of Environment and Heritage	Email	Response to agency search request with list of potentially interested parties.
21/09/2018	Anthony Dootson	Garby Elders	Stephanie Moore	ERM	Email	Invitation to Register interest in the project

21/09/2018	Chairperson	Garlambirla Guuyu-girrwaa Aboriginal Corporation	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Cultural Heritage Officer	Mudjay Elders	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Susan Hoskins		Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Gurehlgam Corporation Ltd T/A Yarrawarra		Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Marcia Hillery	Miimi Mothers Aboriginal Corporation	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Gary Williams	Muurrbay Aboriginal Language and Cultural Co-Operative Ltd	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Cultural Heritage Officer	Gumbaynggir Native Title Group	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Cultural Heritage Officer	Gumbaynggir Elders	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Derrick Vale Sr	DFTV Enterprises	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Natalene Mercy		Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Tony Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Norm Archibald		Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Danial Carriage	Yanggaay	Stephanie Moore	ERM	Email	Invitation to Register interest in the project

21/09/2018	Marcelle and Anthony Tonkin	Yurrandgi	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	Invitation to Register interest in the project
21/09/2018	Stephanie Moore	ERM	Norman Archibald		Email	Registration of interest in all three projects.
21/09/2018	Stephanie Moore	ERM	Shaun Carroll	Merrigarn Indigenous Corporation	Email	Registration of interest in all three projects.
21/09/2018	Stephanie Moore	ERM	Ryan Johnson	Murra Bidgee Mullangari	Email	Registration of interest in all three projects.
5/10/2018	Norman Archibald		Stephanie Moore	ERM	Email	Sent Project Methodology for review
5/10/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	Sent Project Methodology for review
5/10/2018	Ryan Johnson	Murra Bidgee Mullangari	Stephanie Moore	ERM	Email	Sent Project Methodology for review
5/10/2018	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	Sent Project Methodology for review
5/10/2018	Tony Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	Sent Project Methodology for review
5/10/2018	Stephanie Moore	ERM	Ryan Johnson	Murra Bidgee Mullangari	Email	Return email stating agreement with project methodology and recommendations.
13/10/2018	Stephanie Moore	ERM	Shaun Carroll	Merrigarn Indigenous Corporation	Email	Return email stating agreement with project methodology and recommendations.
21/10/2018	Stephanie Moore	ERM	Simone Perkins	Jagun Aged and Community Care	Email	return email providing comment on the methodology and feedback regarding the proposed fieldwork timeline.
22/10/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	return email thanking Simone for the comments on the methodology.
2/11/2018	Stephanie Moore	ERM	Deborah Dootson	Garby Elders	Email	Registration of interest for Garby Elders.
5/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	Accepted registration and provided a copy of the project methodology

6/11/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	Requested information about rates and travel costs relating to field survey
6/11/2018	Ryan Johnson	Murra Bidgee Mullangari	Stephanie Moore	ERM	Email	Requested information about rates and travel costs relating to field survey
6/11/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	Requested information about rates and travel costs relating to field survey
6/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	Requested information about rates and travel costs relating to field survey
6/11/2018	Norman Archibald		Stephanie Moore	ERM	Email	Requested information about rates and travel costs relating to field survey
6/11/2018	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	Requested information about rates and travel costs relating to field survey
6/11/2018	Stephanie Moore	ERM	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Email	reply to request for fieldwork information, providing details of AJ Perkins, who is responsible for programming.
6/11/2018	Stephanie Moore	ERM	Ryan Johnson	Murra Bidgee Mullangari	Email	reponse providing schedule of rates and insurances
7/11/2018	Stephanie Moore	ERM	Simone Perkins	Jagun Aged and Community Care	Email	reponse providing schedule of rates and insurances
7/11/2018	Stephanie Moore	ERM	Shaun Carroll	Merrigarn Indigenous Corporation	Email	reponse providing schedule of rates and insurances
7/11/2018	Stephanie Moore	ERM	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Email	response to enquiry affirming ability to attend fieldwork
8/11/2018	Stephanie Moore	ERM	Deborah Dootson	Garby Elders	Email	reponse providing schedule of rates and insurances
9/11/2018	Stephanie Moore	ERM	Ryan Johnson	Murra Bidgee Mullangari	Email	email providing insurances
9/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	provision of fieldwork information
9/11/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	provision of fieldwork information
9/11/2018	Ryan Johnson	Murra Bidgee Mullangari	Stephanie Moore	ERM	Email	provision of fieldwork information

9/11/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	provision of fieldwork information
9/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	provision of fieldwork information
9/11/2018	Norman Archibald		Stephanie Moore	ERM	Email	provision of fieldwork information
9/11/2018	Nathan Brennan	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	provision of fieldwork information
9/11/2018	Stephanie Moore	ERM	Ryan Johnson	Murra Bidgee Mullangari	Email	returning signed copy of WHS documentation
9/11/2018	Stephanie Moore	ERM	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Email	returning insurances and information regarding available personnel for fieldwork
9/11/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	email to Aj regarding fieldwork dates, understanding that these cannot be shifted and that we would accommodate CHLALC staff on site when they were available
9/11/2018	Stephanie Moore	ERM	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Email	confirmation that there would be a CHLALC person available for all fieldwork days
15/11/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	signed CHLALC engagement agreement returned
15/11/2018	Stephanie Moore	ERM	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Email	email to all groups regarding invoicing
15/11/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	email to all groups regarding invoicing
15/11/2018	Ryan Johnson	Murra Bidgee Mullangari	Stephanie Moore	ERM	Email	email to all groups regarding invoicing
15/11/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	email to all groups regarding invoicing
15/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	email to all groups regarding invoicing
15/11/2018	Norman Archibald		Stephanie Moore	ERM	Email	email to all groups regarding invoicing

15/11/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	email to all groups regarding invoicing
16/11/2018	Stephanie Moore	ERM	Simone Perkins	Jagun Aged and Community Care	email	email regarding costs for RAPs in attendance
28/11/2018	Stephanie Moore	ERM	Deborah Dootson	Garby Elders	email	email regarding costs for RAPs in attendance
28/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	email clarifying issue with costs
28/11/2018	Stephanie Moore	erm	Deborah Dootson	Garby Elders	Email	return email and thanks
29/11/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	email providing copy of the draft report for review
29/11/2018	Ryan Johnson	Murra Bidgee Mullangari	Stephanie Moore	ERM	Email	email providing copy of the draft report for review
29/11/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	email providing copy of the draft report for review
29/11/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	email providing copy of the draft report for review
29/11/2018	Norman Archibald		Stephanie Moore	ERM	Email	email providing copy of the draft report for review
29/11/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	email providing copy of the draft report for review
29/11/2018	Stephanie Moore	ERM	Simone Perkins	Jagun Aged and Community Care	Email	email requesting hard copies of the documents
29/11/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	email confirming if all three Moonee beach reports required in hard copy
29/11/2018	Stephanie Moore	ERM	Simone Perkins	Jagun Aged and Community Care	Email	confirmation that all three required
30/11/2018	Stephanie Moore	ERM	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Email	email requesting attachments of email rather than dropbox, due to issues retrieving. Resolution to be made, as attachments too large for CHLALC servers
30/11/2018	Stephanie Moore	ERM	Ryan Johnson	Murra Bidgee Mullangari	Email	email comments on draft report, endorsing all recommendations
7/12/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	copies of draft report (without appendices)

7/12/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	sent draft report appendices as separate email
17/12/2018	Simone Perkins	Jagun Aged and Community Care	Stephanie Moore	ERM	Email	email enquiring following up on comments on the draft reports
17/12/2018	Ryan Johnson	Murra Bidgee Mullangari	Stephanie Moore	ERM	Email	email enquiring following up on comments on the draft reports
17/12/2018	Shaun Carroll	Merrigarn Indigenous Corporation	Stephanie Moore	ERM	Email	email enquiring following up on comments on the draft reports
17/12/2018	Deborah Dootson	Garby Elders	Stephanie Moore	ERM	Email	email enquiring following up on comments on the draft reports
17/12/2018	Norman Archibald		Stephanie Moore	ERM	Email	email enquiring following up on comments on the draft reports
17/12/2018	Aj Perkins	Coffs Harbour Local Aboriginal Land Council	Stephanie Moore	ERM	Email	email enquiring following up on comments on the draft reports
20/12/2018	Stephanie Moore	ERM	Tony Perkins	Jagun Aged and Community Care	Phone	phone call with some comments on draft report. Comments related largely to the involvement of two out of area groups in the assessment process. Tony was concerned that these people did not hold cultural knowledge of the area and questioned why they were involved. Steph explained that the legislative process had been followed. Steph asked for a written copy of the comments.
21/12/2018	Stephanie Moore	ERM	Simone Perkins	Jagun Aged and Community Care	Email	copy of comments on the draft report

APPENDIX C ABORIGINAL STAKEHOLDER CONSULTATION – PUBLIC ADVERTISEMENT

October 2018

Notice of Aboriginal Consultation – Moonee NSW

Environmental Resources Management Pty Ltd, on behalf of Rothwell Boys Pty Ltd (Winten Property Group), is proposing to undertake an Aboriginal Cultural Heritage Assessment to support a proposed modification to the existing Project Approval for The Glades Estate, Pacific Highway, Moonee, NSW. The proposed modification is being prepared under Section 75W of the EP&A Act subsequent to project approval granted by the then Minister for Planning on 5 March 2009 (06_0143). Following revision of the development boundary, an additional area of 1.8 hectares (ha) comprising 31 additional lots, within the central portion of the site (currently described as Lot 1 in DP725785) has been added to the development footprint.

LOCALITY MAP

Local Aboriginal parties wishing to be consulted for this assessment are invited to register a written expression of their interest by 31 August 2018.

Please respond in writing to:
Stephanie Moore
Environmental Resources Management Australia
Locked Bag 3012
Australia Square, NSW
Or email to stephanie.moore@erm.com

APPENDIX D ABORIGINAL STAKEHOLDER CONSULTATION – AGENCY LETTERS

October 2018

Environmental Resources Management Australia

Level 4, Watt Street
Commercial Centre
45 Watt Street,
Newcastle NSW 2300
AUSTRALIA

PO Box 803,
Newcastle NSW 2300
AUSTRALIA

Telephone +61 2 4903 5500
Facsimile +61 2 4929 5363

www.erm.com

14 August, 2018

Office of the Registrar
Aboriginal Land Rights Act 1983 (NSW)
PO Box 5068
Parramatta NSW
adminofficer@oralra.nsw.gov.au

Our Reference: 0446641 'The Glades' Residential Development Modification

To Whom it may Concern,

RE: 'THE GLADES' RESIDENTIAL DEVELOPMENT MODIFICATION, MOONEE BEACH, NSW

In accordance with the NSW Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (the Consultation Guidelines), and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW 2010* (Code of Practice), Environmental Resources Management Australia (ERM) wishes to inform you that we have been engaged by Rothwell Boys Pty Ltd (Winten Property Group) to prepare an Aboriginal Cultural Heritage Assessment (ACHA) associated with the proposed modification to the existing Project Approval for The Glades Estate, Pacific Highway, Moonee, NSW (*Figure 1).*

The proposed modification is being prepared under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) subsequent to project approval for the 524 lot residential development granted by the then Minister for Planning on 5 March 2009 (06_0143). Following revision of the development boundary, an additional area of 1.8 hectares (ha) comprising 31 additional lots, within the central portion of the site (currently described as Lot 1 in DP725785) has been added to the development footprint and forms the basis of ACHA (refer to *Figure 1.2*).

A preliminary due diligence assessment was undertaken by ERM in February 2018. This preliminary assessment recognised that due diligence is not an assessment of Aboriginal cultural heritage values although it did confirm that the Aboriginal archaeology record of the Glades Estate Project Area is well represented within previous studies undertaken to support the existing project approval and that identified heritage values have been protected along Moonee and Skinners Creeks.

The preliminary assessment supports the previous studies already undertaken within the Glades Estate Project Area and the mitigation measures contained in the

existing project approval and statement of commitments. This includes ongoing consultation with the projects Aboriginal stakeholders.

ERM is writing to fulfil Stage 1 of the consultation requirements - project notification and identification of stakeholders. As part of this step, ERM would like to obtain a list of Aboriginal people who may have interest in this project and hold relevant knowledge about the cultural significance of the area. Relevant stakeholder lists can be returned to Joanne Woodhouse (Project Manager) or Stephanie Moore (Project Archaeologist) at the below details.

Joanne Woodhouse
joanne.woodhouse@erm.com
PO Box 803
Newcastle NSW 2300
02 4903 5521
0429 311 798

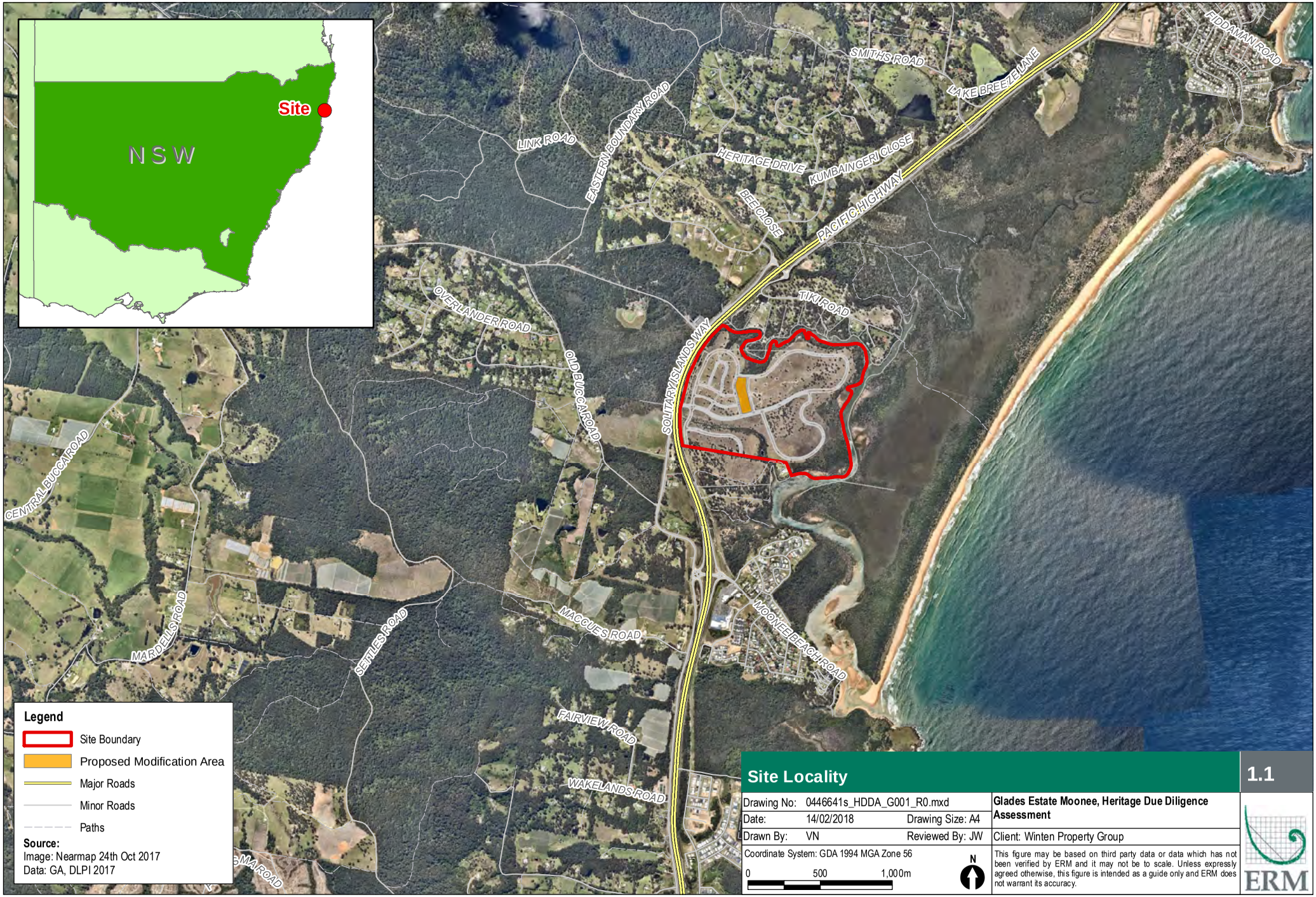
Stephanie Moore
stephanie.moore@erm.com
Locked Bag 3012
Australia Square NSW 2000
02 8584 8868
0439 720 041

Yours sincerely,

for Environmental Resources Management Australia Pty Ltd

Joanne Woodhouse
Project Manager

Paul Douglass
Partner


NSW
Site
SMITHS ROAD
LAKE BREEZE LANE
FIDDAMAN ROAD
LINK ROAD
EASTERN BOUNDARY ROAD
HERITAGE DRIVE
KUMBAINGERI CLOSE
BEE CLOSE
PACIFIC HIGHWAY
OVERLANDER ROAD
TIKI ROAD
SOLITARY ISLANDS WAY
OLD BUCCA ROAD
CENTRAL BUCCA ROAD
MARDELLS ROAD
SETTLES ROAD
MAGGIES ROAD
MOONEE BEACH ROAD
FAIRVIEW ROAD
WAKELANDS ROAD
Legend
Site Boundary
Proposed Modification Area
Major Roads
Minor Roads
Paths
Source:
Image: Nearmap 24th Oct 2017
Data: GA, DLPI 2017
Site Locality
1.1
Drawing No: 0446641s_HDDA_G001_R0.mxd
Date: 14/02/2018
Drawing Size: A4
Drawn By: VN
Reviewed By: JW
Coordinate System: GDA 1994 MGA Zone 56
0
500
1,000m
N
Glades Estate Moonee, Heritage Due Diligence Assessment
Client: Winten Property Group
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Stage	No of Lots
1	67
2	40
3	59
4	61
5	51
6	61
7	48
8	48
9	50
10	42
11	28
TOTAL	555

Legend

Proposed Modification Area

Source:

Auspacific Engineers, January 2018.

Proposed Modification

1.2

Drawing No:	0446641s_HDDA_C001_R0.cdr	**Glades Estate Moonee Heritage Due Diligence Assessment**
Date:	13/02/2018 Drawing size: A4	
Drawn by:	GC Reviewed by: JP	Client: Winten Property Group

0 50 100m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Environmental Resources Management Australia

Level 4, Watt Street
Commercial Centre
45 Watt Street,
Newcastle NSW 2300
AUSTRALIA

PO Box 803,
Newcastle NSW 2300
AUSTRALIA

Telephone +61 2 4903 5500
Facsimile +61 2 4929 5363

www.erm.com

14 August, 2018

Coffs Harbour City Council
Locked Bag 155
Coffs Harbour NSW 2450
coffs.council@chcc.nsw.gov.au

Our Reference: 0446641 'The Glades' Residential Development Modification

To Whom it may Concern,

RE: 'THE GLADES' RESIDENTIAL DEVELOPMENT MODIFICATION, MOONEE BEACH, NSW

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02 4903 5521
0429 311 798

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stephanie.moore@erm.com
Locked Bag 3012
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Yours sincerely,

for Environmental Resources Management Australia Pty Ltd

Joanne Woodhouse
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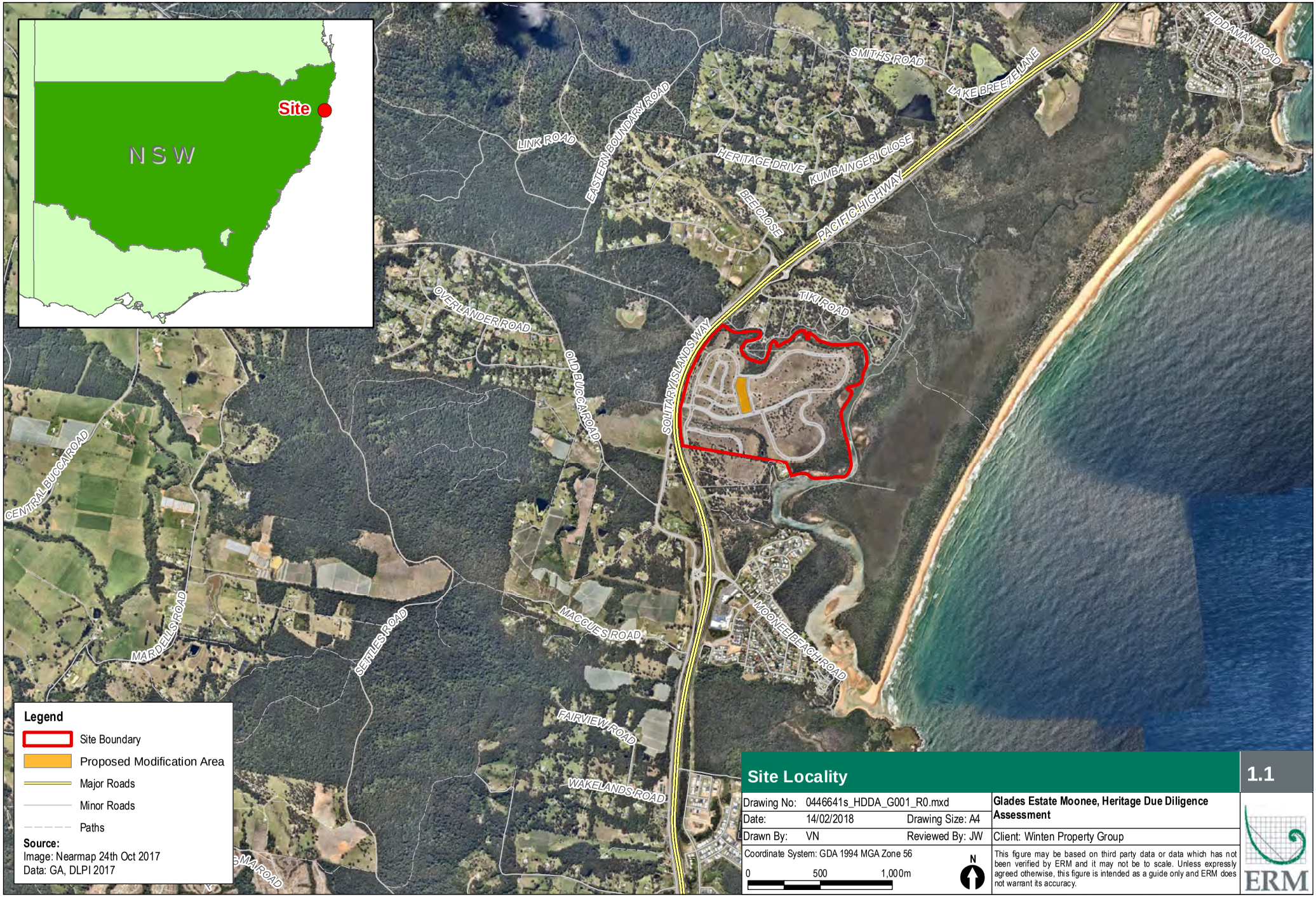
Partner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Legend

Proposed Modification Area

Source:

Auspacific Engineers, January 2018.

Proposed Modification

1.2

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14 August, 2018

Coffs Harbour Local Aboriginal Land Council
PO Box 6150
Coffs Harbour NSW 2450
admin@coffsharbourlalc.com.au

Our Reference: 0446641 'The Glades' Residential Development Modification

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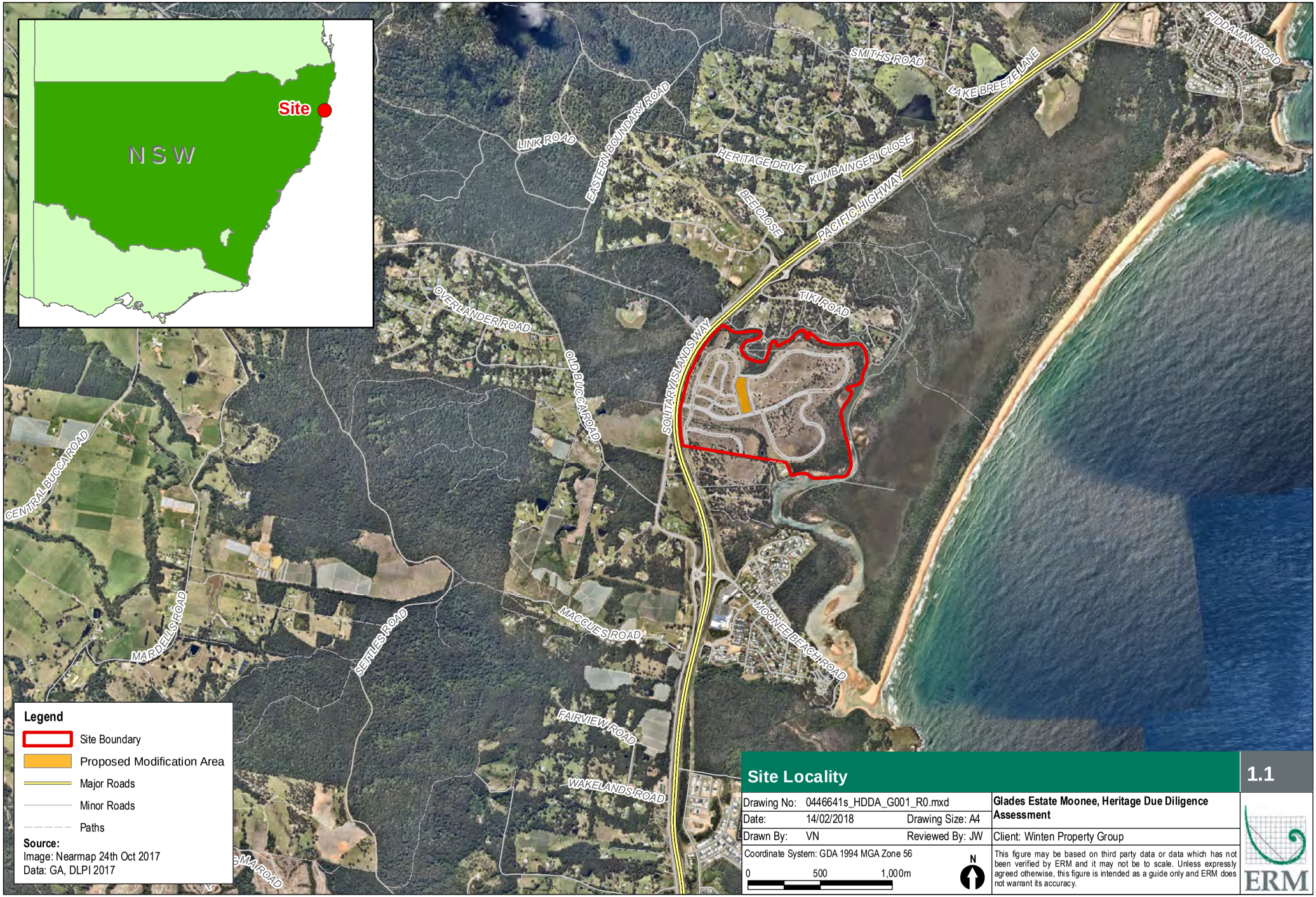
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14 August, 2018

Coffs Harbour Local Land Services
PO Box 1417
Coffs Harbour NSW 2450

Our Reference: 0446641 'The Glades' Residential Development Modification

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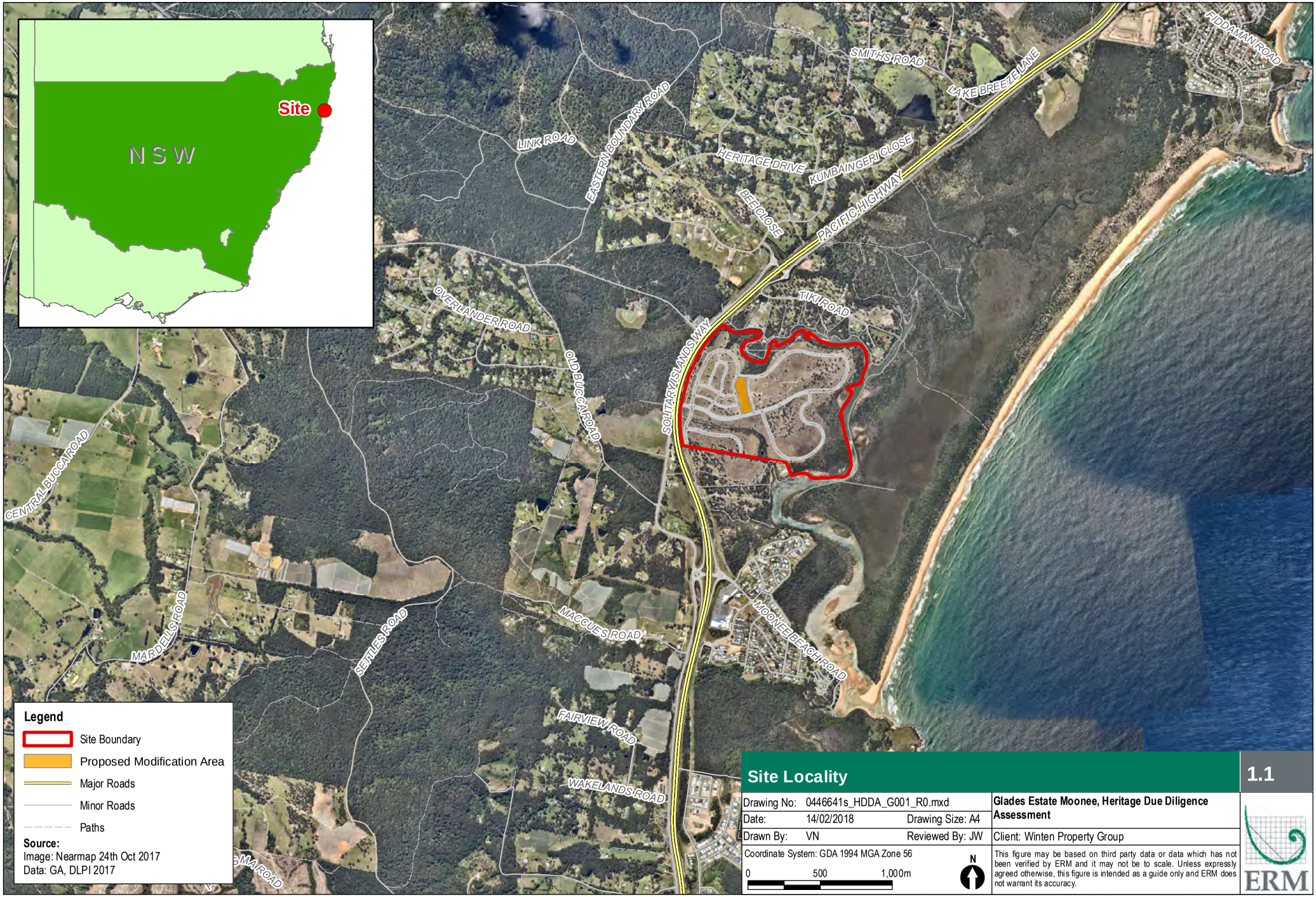
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NTS Corp
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Strawberry Hills NSW 2012
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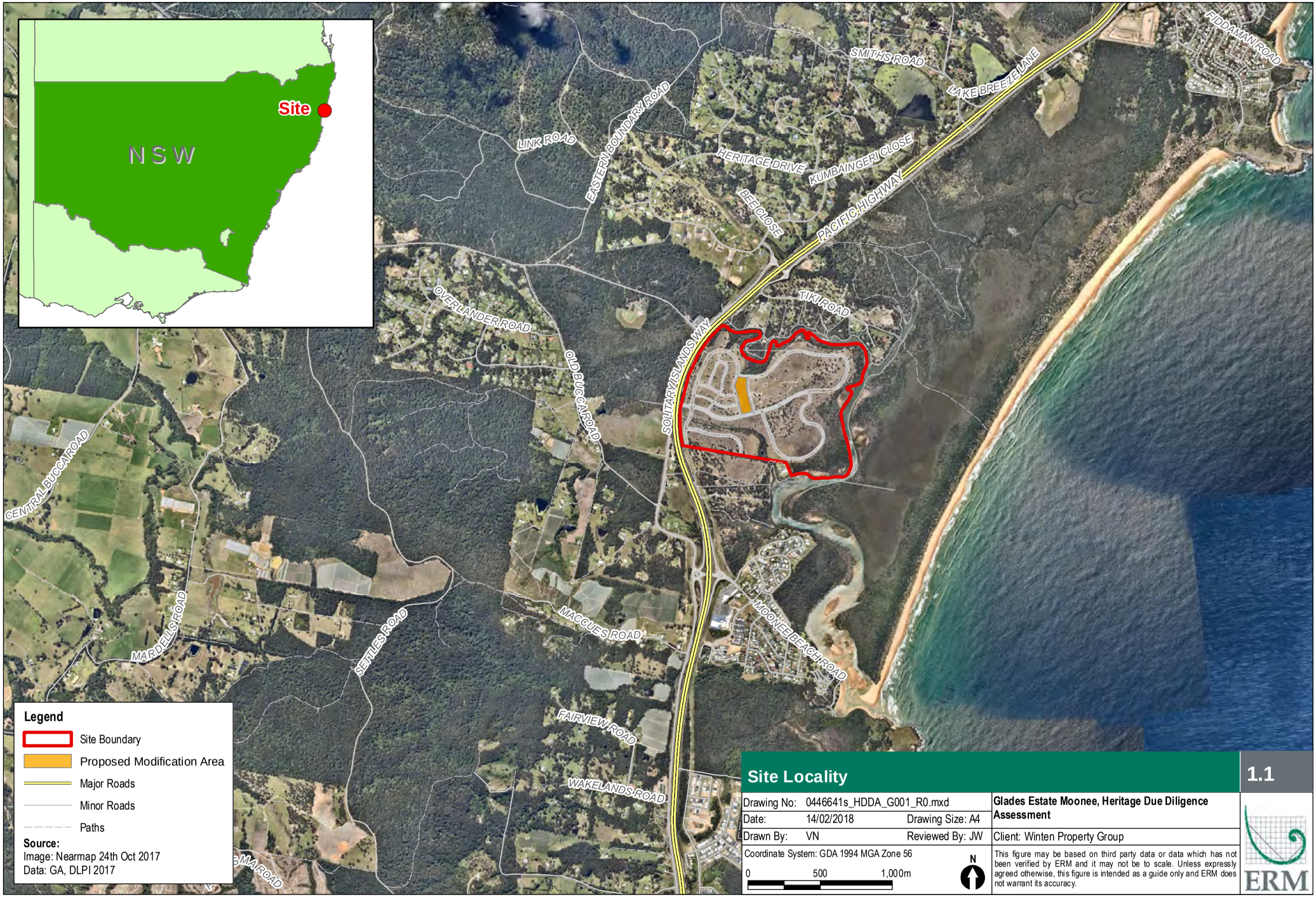
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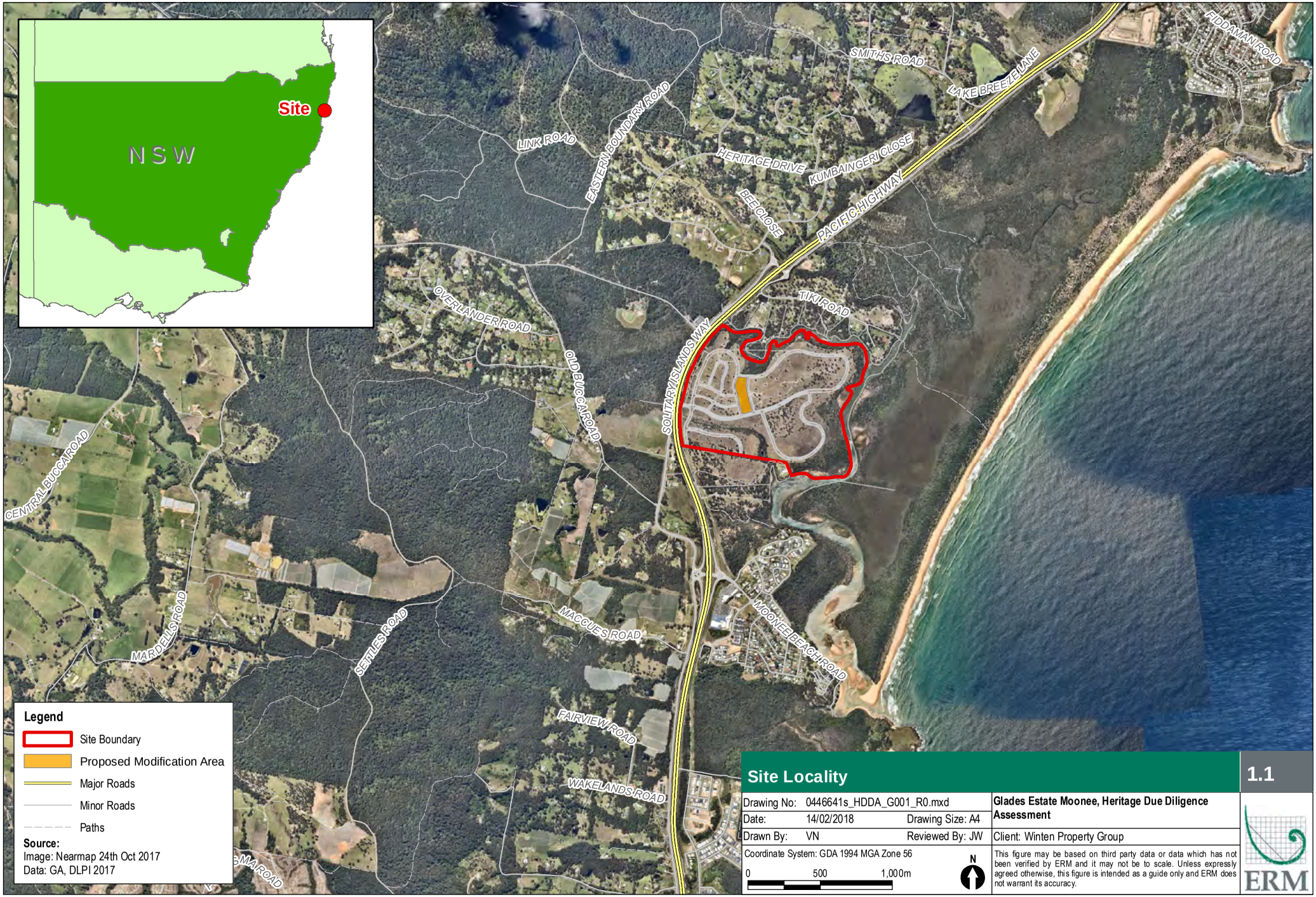
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APPENDIX E ABORIGINAL STAKEHOLDER CONSULTATION – AGENCY RESPONSES

October 2018

NSW GOVERNMENT | Office of Environment & Heritage

Our Ref: DOC18/603638
Your Ref: 0446641 "The Glades" residential Development Modification

Ms Joanne Woodhouse
Project Manager
Environmental Resources Management Australia
PO Box 803
Newcastle NSW 2300

Attention: Ms Stephanie Moore

Dear Ms Woodhouse

Re: "The Glades" residential Development Modification, Moonee Beach, NSW, request for OEH Known Aboriginal parties

Thank you for your letter dated 14 August 2018 to the Office of Environment and Heritage (OEH) about Aboriginal cultural heritage consultation for the proposed assessment of the abovementioned property which lies in the Coffs Harbour local government area. I appreciate the opportunity to provide input.

Please find enclosed a list of known Aboriginal parties for the Coffs Harbour local government area (Attachment A) that we consider likely to have an interest in the proposal. Note this is not an exhaustive list of all interested Aboriginal parties and does not include the relevant Local Aboriginal Land Council, which should be contacted independently. Receipt of this list does not remove the requirement for a proponent/consultant to advertise the proposal in the local print media and contact other bodies and community groups seeking interested Aboriginal parties, in accordance with the OEH 'Aboriginal cultural heritage consultation requirements for proponents 2010' (the CRs).

- Ensure the project documents the full consultation process in the Aboriginal Cultural Heritage Assessment Report and to include copies of all correspondence sent to or received from all relevant stakeholders (including Aboriginal stakeholders and the agencies listed in section 4.1.2 of the CRs). Omission of these records in the final report may cause delays in the assessment of the Aboriginal Heritage Impact Permit application or require parts of the consultation process to be repeated if the evidence provided to us does not demonstrate that the consultation process has been fair, equitable and transparent.

- Ensure we are provided with evidence that reasonable attempts have been made to contact the relevant parties associated with the CRs. If this is not provided then we will deem that the consultation process has not complied with the CRs. We consider evidence of reasonable efforts to contact relevant parties would include, but not be limited to, multiple forms of communication; faxes (with confirmation slips demonstrating successful transmission), an e-mail log, registered post details, copies of letters and a phone call log.

Locked Bag 914 Coffs Harbour NSW 2450
Federation House, Level 8, 24 Moonee Street
Coffs Harbour NSW 2450
Tel: (02) 6659 8200 Fax: (02) 6659 8281
ABN 30 841 387 271
www.environment.nsw.gov.au

- Note that Appendix A of the CRs contains a map illustrating which Regional Office of the OEH should be contacted regarding the AHIP application based on the local government area in which the project is located. Full details of the consultation requirements and the relevant Fact Sheets can be located on our website at: www.environment.nsw.gov.au/licences/consultation.htm.

- Forward to us any changes to the contact details of interested Aboriginal parties, or information regarding additional parties, so that we can update its records.

- Ensure that consultation is fair, equitable and transparent. If the Aboriginal parties express concern or are opposed to parts of or the entire project, we expect that evidence will be provided to demonstrate the efforts made to find common ground between the opponents and the proponent.

If you have any further questions about this issue, Ms Rosalie Neve, Aboriginal Heritage Planning Officer, Conservation and Regional Delivery, OEH, can be contacted on 6659 8221 or at rosalie.neve@environment.nsw.gov.au.

Yours sincerely

29 August 2018

DIMITRI YOUNG
Senior Team Leader Planning, North East
Conservation and Regional Delivery

Contact officer: ROSALIE NEVE
6659 8221

Enclosure: Attachment 1 – OEH Known Aboriginal Parties for "The Glades" Residential Development Modification, Moonee Beach project area in the Coffs Harbour Local Government Area

cc: Click here to enter Ccs.

Attachment 1: OEH Known Aboriginal Parties for the Coffs Harbour Local Government Area

1. Garby Elders
   Anthony Dootson
   11 Kelly Street,
   Corindi Beach NSW 2465
   0405 708 865
   gaargulgoyas@outlook.com
   or
   Deborah Dootson
   21 Knox Street
   WOOLGOOLGA NSW 2456
   0499 684 400
   deb@ngurrala.com

2. Coffs Harbour and District Local Aboriginal Land Council
   PO Box 6150
   COFFS HARBOUR NSW 2450
   (02) 6652 8740
   ceo@coffsharbourlalc.com.au

3. Garlambirla Guuyu-girrwaa Aboriginal Corporation
   Chairperson
   PO Box 6904
   PARK BEACH NSW 2450
   0408 254 152
   aboriginalelders.coffsharbour@hotmail.com

4. Mudjay Elders
   Cultural Heritage Officer
   11 Anderton Street
   COFFS HARBOUR NSW 2450

5. Susan Hoskins
   31 Soren Larson Cres.
   BOAMBEE EAST NSW 2452

6. Gurehlgam Corporation Ltd T/A Yarrawarra
   Kenn Payne
   PO Box 1676
   GRAFTON NSW 2460
   (02) 6642 8677
   manager@gurehlgam.com.au
   manager@yarrawarra.com.au

7. Mimi Mothers Aboriginal Corporation
Marcia Hillery
90 High Street
BOWRAVILLE NSW 2449
(02) 6564 8855
(02) 6564 8844
manager@miimi.org.au

8. Muurrbay Aboriginal Language and Cultural Co-operative Ltd
Gary Williams
14 Belwood Rd
Via NAMBUCCA HEADS NSW 2448
(02) 6569 4294
(02) 6569 4295
gary.williams@muurrbay.org.au

9. Gumbaynggirr Native Title Group
Cultural Heritage Officer
14 Belwood Road
NAMBUCCA HEADS NSW 2448

10. Gumbaynggirr Elders
Cultural Heritage Officer
PO Box 400
NAMBUCCA HEADS NSW 2448

11. D F T V Enterprises
Derrick Vale Sr
5 Mountbatten Close
RUTHERFORD NSW 2320
0438 812 197
deckavale@hotmail.com

12. Aaron Talbott & Natalene Mercy
Natalene Mercy
6 Bando street
GUNNEDAH NSW 2380
0457 617 117
atgomilaroi@hotmail.com

13. Jagun Elders
Tony Perkins
PO Box 649
WOOLGOOLGA NSW 2456
0417 049 962
simone@jagunagedcare.com.au

14. Norm Archibald
17 Flobern Ave
WAUCHOPE NSW 2446
jtmanagement@live.com.au

15. Yanggaay
Danial Carriage
369 Old Coast
Korora NSW 2450
0402833073
yanggaay@gmail.com

16 Yurrandgi
Marcelle Tonkin
Anthony Tonkin
4 Bream Place
SEELANDS NSW 2460
Ph: 0414 790 706
Ph: 0431 033 310
yurrandgi@hotmail.com

17. Merrigarn Indigenous Corporation
Shaun Carroll
PO Box 246
Seven Hills NSW 2147
0400 637 554
merrigarn@hotmail.com

APPENDIX F ABORIGINAL STAKEHOLDER CONSULTATION – INVITATION TO REGISTER

October 2018

ERM

Level 4, Watt Street Commercial Centre
45 Watt Street
Newcastle NSW 2300
AUSTRALIA

Telephone: +61 2 4903 5500
Fax: +61 2 4929 5363

www.erm.com

Garby Elders
Anthony Dootson
11 Kelly Street
Corindi Beach NSW 2465
0405 708 865

20 September 2018

Reference: 0473042_Winten Property Group_Registration Letter_Anthony Dootson.DOCX

Dear Anthony

Subject: Proposed Developments – Lot 101, Lot 102, and The Glades Estate, Moonee NSW

In accordance with the NSW Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (the Consultation Guidelines) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW 2010* (Code of Practice), Environmental Resources Management Australia (ERM) wishes to inform you that we have been engaged by Rothwell Boys Pty Ltd (Winten Property Group) and Resource & Design Group (RDA) to undertake three (3) Aboriginal Cultural Heritage Assessments associated with:

- the proposed modification to the existing Project Approval for The Glades Estate, Pacific Highway, Moonee, NSW, and
- development applications (DA 0456/18DA & DA 0457/18DA) for the proposed subdivision of Lot 101 and Lot 102 in Moonee, NSW.

1 Proposed Development - The Glades Estate

The proponent of the proposed works is the Rothwell Boys Pty Ltd (Winten Property Group).

The proposed modification is being prepared under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) subsequent to project approval for the 524 lot residential development granted by the then Minister for Planning on 5 March 2009 (06_0143). Following revision of the development boundary, an additional area of 1.8 hectares (ha) comprising 31 additional lots, within the central portion of the site (currently described as Lot 1 in DP725785) has been added to the development footprint and forms the basis of this assessment *(Figure 1*).

The project area has been previously assessed by Collins (1994), Appleton (2003) and ERM (2007). A preliminary due diligence assessment was also undertaken by ERM in February 2018. This preliminary assessment recognised that due diligence is not an assessment of Aboriginal cultural heritage values although it did confirm that the Aboriginal archaeology record of the Glades Estate Project Area is well represented within previous studies undertaken to support the existing project approval and that identified heritage values have been protected along Moonee and Skinners Creeks.

The preliminary assessment supports the previous studies already undertaken within the Glades Estate Project Area and the mitigation measures contained in the existing project approval and statement of commitments. This includes ongoing consultation with the projects Aboriginal stakeholders.

Registered office
ERM Australia Pty Ltd
Level 15, 309 Kent Street
Sydney, NSW Australia 2000

ABN: 12 002 773 248
ACN: 002 773 248

Offices worldwide

A member of the ERM Group

2 Proposed Subdivision – Lot 101

The proponent of the proposed works is Rothwell Boys Pty Ltd (Winten Property Group).

An ACHA is being prepared to support the existing development application (DA 0456/18DA) currently being assessed by Coffs Harbour Council for proposed boundary alteration (between Lot 6 DP 252223 & Lot 6 DP 1140702) creating Lots 101 (8.8 hectare) & 102 (11.2 hectares). The subsequent residential subdivision on the newly formed Lot 101 will create 31 lots and reserve area (*Figure 1*).

Previous assessments of this lot undertaken by John Appleton and BCA in 2009 found no cultural heritage sites and determined that the likely occurrence of material would be low to moderate. However, given the extended period since these surveys, ERM is undertaking updated assessments and consultation with Aboriginal stakeholders.

3 Proposed Subdivision – Lot 102

The proponent of the proposed works is Rothwell Boys Pty Ltd (Winten Property Group).

An ACHA is being prepared to support the existing development application (DA 0457/18DA) currently being assessed by Coffs Harbour Council for proposed boundary alteration (between Lot 6 DP 252223 & Lot 6 DP 1140702) creating Lots 101 (8.8 hectare) & 102 (11.2 hectares). The subsequent residential subdivision on the newly formed Lot 102 will create 65 lots and reserve area (*Figure 1*).

Previous assessments of this lot undertaken by John Appleton and BCA in 2009 found no cultural heritage sites and determined that the likely occurrence of material would be low to moderate. However, given the extended period since these surveys, ERM is undertaking updated assessments and consultation with Aboriginal stakeholders.

4 Registration

If you wish to formally register for future consultation regarding any of these cultural heritage assessments can you please contact Joanne Woodhouse (Project Manager) or Stephanie Moore (Project Archaeologist) by ***4 October 2018*** at the below details.

Joanne Woodhouse

joanne.woodhouse@erm.com
PO Box 803
Newcastle NSW 2300
02 4903 5521
0429 311 798

Stephanie Moore

stephanie.moore@erm.com
Locked Bag 3012
Australia Square NSW 2000
02 8584 8868
0439 720 041

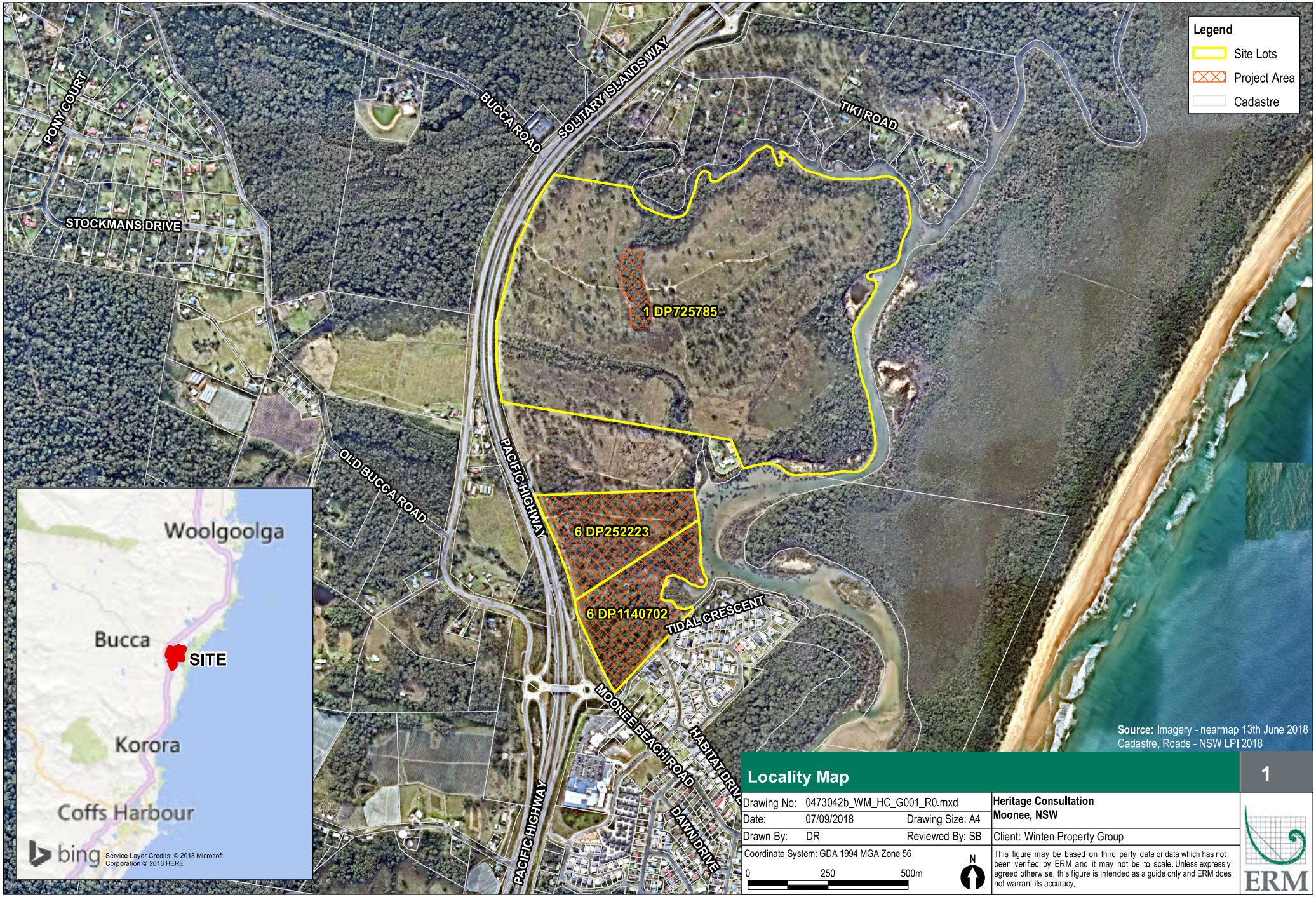
If you have any specific information concerning the cultural values of the project areas, we would also be grateful if you could let us know. Any cultural knowledge provided will be treated in confidence and the information will be distributed according to the wishes of the Aboriginal stakeholders.

Yours sincerely,

For Environmental Resources Management Australia Pty Ltd

Stephanie Moore
Heritage Consultant

Paul Douglass
Partner



Locality Map

1

Drawing No:	0473042b_WM_HC_G001_R0.mxd		**Heritage Consultation Moonee, NSW**
Date:	07/09/2018	Drawing Size: A4	
Drawn By:	DR	Reviewed By: SB	Client: Winten Property Group

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

APPENDIX G ABORIGINAL STAKEHOLDER CONSULTATION – PROJECT METHODOLOGY

October 2018

Rothwell Boys Pty Ltd (Winten Property Group)

The Glades Estate Residential Modification and Proposed Subdivision of Lot 101 and Lot 102, Moonee Beach NSW

Project Methodology

5 October 2018

Project No.: 0473042

The business of sustainability

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Document details	
Document title	The Glades Estate Residential Modification and Proposed Subdivision of Lot 101 and Lot 102, Moonee Beach NSW
Document subtitle	Project Methodology
Project No.	0473042
Date	5 October 2018
Version	1.0
Author	Stephanie Moore
Client Name	Rothwell Boys Pty Ltd (Winten Property Group)

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	01	Stephanie Moore	Paul Douglass	Paul Douglass	05.10.2018	

Signature Page

5 October 2018

The Glades Estate Residential Modification and Proposed Subdivision of Lot 101 and Lot 102, Moonee Beach NSW

Project Methodology

Stephanie Moore
Heritage Consultant

Paul Douglass
Partner

ERM Australia Pty Ltd

Level 15 309 Kent Street

Sydney NSW 2000

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CONTENTS

1. INTRODUCTION 1
2. SITE LOCATION 2
2.1 The Glades Estate 2
2.2 Lot 101 2
2.3 Lot 102 2
3. PROPOSED DEVELOPMENT 4
3.1 The Glades Estate 4
3.2 Lot 101 4
3.3 Lot 102 4
4. HERITAGE BACKGROUND 5
5. FIELDWORK METHODOLOGY 6
6. FEEDBACK 7

APPENDIX A APPENDIX TITLE

List of Tables

No table of figures entries found.

List of Figures

No table of figures entries found.

Acronyms and Abbreviations

Name Description

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) have been commissioned by Rothwell Boys Pty Ltd (Winten Property Group) to prepare Aboriginal Cultural Heritage Assessments (ACHAs) of three properties located in Moonee, NSW. The properties are identified as:

- The Glades Estate Modification (Lot 1 DP725785);
- Lot 101 (Lot 6 DP 252223 & Lot 6 DP 1140702); and
- Lot 102 (Lot 6 DP 252223 & Lot 6 DP 1140702).

The ACHAs will be prepared in accordance with the NSW Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (the Guidelines), and *the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW 2010* (Code of Practice) and will include Indigenous community consultation, field investigations and associated data analysis and reporting. The ACHAs are being prepared to support Development Applications (DAs) for the proposed works, being submitted to Coffs Harbour Council (CHC), as outlined in *Section 3.*

This document provides details of the proposed assessment methodologies for the three sites. This document will be provided to all Registered Aboriginal Parties (RAPs) who have registered interest in the project for their review and comment. Any comments received will be considered and incorporated into the assessment methodologies where practicable.

2. SITE LOCATION

This methodology document relates to field investigations and the preparation of an ACHA report for each of the three proposed developments, being undertaken as sites identified as 'The Glades Estate', 'Lot 101' and 'Lot 102' (Figure 2.1). The location of each of this sites is provided below.

2.1 The Glades Estate

The Glades Estate is located in Moonee, NSW, approximately 12 km northeast of Coffs Harbour within the Coffs Harbour Local Government Area. The Project area encompasses 1.8 hectare (ha) within the central portion of Lot 1 DP725785, which abuts the eastern verge of the Pacific Highway. Moonee Creek runs along the eastern boundary of Lot 1 DP725785, approximately 760 m east of the Project area.

2.2 Lot 101

Lot 101 is located in Moonee, NSW, approximately 12 km northeast of Coffs Harbour within the Coffs Harbour Local Government Area (LGA). The Project area encompasses a 1.6 ha portion of Lot 6 DP252223 and a 7.2 ha portion of Lot 6 DP1140702. The Pacific Highway runs adjacent to the north-western extent of the Project area. Cunninghams Creek abuts the northern boundary of the Project area, while Moonee Creek abuts the north-eastern boundary.

2.3 Lot 102

Lot 101 is located in Moonee, NSW, approximately 12 km northeast of Coffs Harbour within the Coffs Harbour Local Government Area (LGA). The Project are encompasses an 8.6 ha portion of Lot 6 DP252223 and a 2.6 ha portion of Lot 6 DP1140702. The Pacific Highway runs adjacent to the western extent of the Project area. Cunninghams Creek abuts the southern boundary of the Project area, while Moonee Creek abuts the eastern boundary.

Insert

Figure 2.1 Locality map showing the three sites

3. PROPOSED DEVELOPMENT

With specific reference to Aboriginal cultural heritage and the assessment of potential impacts to the heritage values of the Project Areas (PAs), proposed subdivisions will result in no direct impacts to the ground surface; however, it is identified that the subdivision is being undertaken to facilitate the construction of residential premises.

It is noted that construction works will result in impacts to the ground surface within the proposal area; however, the construction works are not being assessed as part of these ACHAs.

3.1 The Glades Estate

The proponent for the proposed works is Rothwell Boys Pty Ltd (Winten Property Group).

The proposed modification is being prepared under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) subsequent to project approval for the 524 lot residential development granted by the then Minister for Planning on 5 March 2009 (06_0143). Following revision of the development boundary, an additional area of 1.8 hectares (ha) comprising 31 additional lots, within the central portion of the site (currently described as Lot 1 in DP725785) has been added to the development footprint and forms the basis of the ACHA (refer to *Figure 2.1*).

3.2 Lot 101

The proponent for the proposed works is Rothwell Boys Pty Ltd (Winten Property Group).

The ACHA is being prepared to support an existing development application (DA 0456/18DA) currently being assessed by Coffs Harbour Council for proposed boundary alteration creating Lots 101 (8.8 hectare) & 102 (11.2 hectares) and subsequent residential subdivision on the newly formed Lot 101 creating 31 lots and reserve area.

3.3 Lot 102

The proponent for the proposed works is Rothwell Boys Pty Ltd (Winten Property Group).

The ACHA is being prepared to support an existing development application (DA 0457/18DA) currently being assessed by Coffs Harbour Council for proposed boundary alteration creating Lots 101 (8.8 hectare) & 102 (11.2 hectares) and subsequent residential subdivision on the newly formed Lot 102 creating 65 lots and reserve area.

4. HERITAGE BACKGROUND

A preliminary due diligence assessment was undertaken by ERM in February 2018 for the Glades Estate Project Area. The preliminary assessment recognised that a due diligence assessment is not a comprehensive assessment of Aboriginal cultural heritage values. However, the due diligence assessmentconfirmed that the Aboriginal archaeological record of the Glades Estate Project Area is well represented within previous studies undertaken to support the existing project approval and that identified heritage values have been protected along Moonee and Skinners Creeks.

This preliminary assessment supports the previous studies already undertaken within the Glades Estate Project Area and the mitigation measures detailed in the existing project approval and statement of commitments. This includes ongoing consultation with the project's Aboriginal stakeholders.

5. FIELDWORK METHODOLOGY

Archaeological surveys of all three study areas will be undertaken, with one day allocated for each location. The surveys will aim to identify all Aboriginal sites present within the proposed impact area including the identification of any PADs.

The proposed methodology for the archaeological survey includes:

- the survey will be undertaken on foot with up to four Registered Aboriginal Parties in attendance;
- the survey will consist of all participants traversing each Project area using walking transects approximately 5 m apart to ensure the entire survey area is covered (subject to surface visibility and accessibility);
- the survey will target each landform in the study area;
- areas of potential such as raised landforms in close proximity to a semi- permanent water source will also be targeted;
- areas of exposure and ground visibility will be targeted;
- any areas of interest to the Registered Aboriginal Parties will be targeted; and
- any cultural heritage information for the study area held by Aboriginal parties will be recorded during the field survey. Any cultural knowledge provided by Aboriginal Stakeholders will be treated in confidence and the information will be distributed according to their wishes.

6. FEEDBACK

ERM requests that you respond to this information package and advise of your availability to attend the fieldwork prior to **Friday 2 November 2018**.

Please provide feedback to **Stephanie Moore** at the following contact details:

Post: PO Box 4160, Kingston, ACT 2604

Phone: 02 8584 8868

Email: stephanie.moore@erm.com

ERM also ask if you hold any knowledge of sites within or near the study area or have any specific information concerning the cultural values of the study area, we would be grateful if you could let us know. Our contact details are listed above. Any cultural knowledge provided by Aboriginal Stakeholders will be treated in confidence and the information will be distributed according to their wishes.

Yours faithfully,

For Environmental Resources Management Australia Pty Ltd

Stephanie Moore
ERM Heritage Consultant

Paul Douglass
ERM Partner

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Myanmar
The Netherlands
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Norway
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APPENDIX H ABORIGINAL STAKEHOLDER CONSULTATION – COMMENTS ON METHODOLOGY

October 2018

Stephanie Moore

From: Simone Perkins <simone@jagunagedcare.com.au>
Sent: Sunday, 21 October 2018 1:13 PM
To: Stephanie Moore
Subject: Re: Project Methodology - The Glades Estate, Lot 101 and Lot 102, Moonee NSW

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Stephanie

Generally meeting is held with all parties prior to commencement of works to discuss Methodology, I'd be guessing this will take place on the morning of fieldwork commencing, need to discuss fees, site officer numbers, payment terms, invoice details and any other items?

Jagun recommendations are:

- Jagun sites officer will be available for commencement
- Estimated survey for three study areas, one day for each location
- Jagun Elders are not happy with timeframes, put on studies of Aboriginal Cultural & Heritage
- This creates a rushed job, if areas of: significants, storylines, spiritual pathways, water holes are identified, which is highly likely
- Jagun recommends a more flexible approach minimum three days, with extension if needed
- Sites officers to determine sensitive areas and pad locations
- Storyline and high significant areas will be discussed on the day of commencement

I can be reached on m: 0429 811 742 or Tony Perkins m: 0417 049 962 and email simone@jagunagedcare.com.au.

Simone Perkins
Program Manager

From: Stephanie Moore <Stephanie.Moore@erm.com>
Sent: Friday, 5 October 2018 4:47 PM
To: Stephanie Moore
Subject: FW: Project Methodology - The Glades Estate, Lot 101 and Lot 102, Moonee NSW

Good Afternoon,

Please find attached the Project Methodology for the proposed subdivisions at The Glades Estate, Lot 101 and Lot 102, Moonee NSW.

If you have any comments or queries regarding the attached methodology, please do not hesitate to contact Stephanie Moore at the contact details below:

T +612 8584 8868 | **E** stephanie.moore@erm.com |

Please provide any feedback before COB on **Friday 2 November 2018.**

Fieldwork is being tentatively organised for the week commencing 5 November 2018; however, ERM will be in touch prior to this date to make arrangements.

We look forward to working with you on this project.

Kind Regards,

Stephanie Moore
Heritage Consultant

M.ICOMOS

ERM
Level 15, 309 Kent Street|Sydney, NSW 2000|Australia
T +612 8584 8868 |**M** +614 39 720 041
E stephanie.moore@erm.com | **W** www.erm.com

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Stephanie Moore

From: Shaun Carroll <Merrigarn@hotmail.com>
Sent: Saturday, 13 October 2018 6:00 PM
To: Stephanie Moore
Subject: Re: Project Methodology - The Glades Estate, Lot 101 and Lot 102, Moonee NSW

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Stephanie,
I have read the project information and recommendations made by ERM. I endorse the recommendations made, if you require further details please contact me on 0400637554
Kind regards
Shaun Carroll

From: Stephanie Moore <Stephanie.Moore@erm.com>
Sent: Friday, 5 October 2018 4:47 PM
To: Stephanie Moore
Subject: FW: Project Methodology - The Glades Estate, Lot 101 and Lot 102, Moonee NSW

Good Afternoon,

Please find attached the Project Methodology for the proposed subdivisions at The Glades Estate, Lot 101 and Lot 102, Moonee NSW.

If you have any comments or queries regarding the attached methodology, please do not hesitate to contact Stephanie Moore at the contact details below:

T +612 8584 8868 | **E** stephanie.moore@erm.com |

Please provide any feedback before COB on **Friday 2 November 2018.**

Fieldwork is being tentatively organised for the week commencing 5 November 2018; however, ERM will be in touch prior to this date to make arrangements.

We look forward to working with you on this project.

Kind Regards,

Stephanie Moore
Heritage Consultant

M.ICOMOS

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T +612 8584 8868 | **M** +614 39 720 041
E stephanie.moore@erm.com | **W** www.erm.com

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Stephanie Moore

From: Ryan Johnson <murrabidgeemullangari@yahoo.com.au>
Sent: Friday, 5 October 2018 5:27 PM
To: Stephanie Moore
Subject: Re: Project Methodology - The Glades Estate, Lot 101 and Lot 102, Moonee NSW

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Stephanie
I have read the methodology, project information for the above project and endorse the recommendations made by ERM
Kind regards
Ryan Johnson

On 5 Oct 2018, at 4:47 pm, Stephanie Moore <Stephanie.Moore@erm.com> wrote:

> Good Afternoon,
>
> Please find attached the Project Methodology for the proposed subdivisions at The Glades Estate, Lot 101 and Lot 102, Moonee NSW.
>
> If you have any comments or queries regarding the attached methodology, please do not hesitate to contact Stephanie Moore at the contact details below:
>
> **T** +612 8584 8868 | **E** stephanie.moore@erm.com |
>
> Please provide any feedback before COB on **Friday 2 November 2018.**
>
> Fieldwork is being tentatively organised for the week commencing 5 November 2018; however, ERM will be in touch prior to this date to make arrangements.
>
> We look forward to working with you on this project.
>
> Kind Regards,
>
> Stephanie Moore
> Heritage Consultant
>
> M.ICOMOS
>
> **ERM**
> Level 15, 309 Kent Street | Sydney, NSW 2000 | Australia
> **T** +612 8584 8868 | **M** +614 39 720 041
> **E** stephanie.moore@erm.com | **W** www.erm.com
>
> *<image001.png>*

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<0473042 Glades Estate Lot 101 Lot 102 Project Methodology.pdf>

APPENDIX I ABORIGINAL STAKEHOLDER COMMENTS ON DRAFT REPORT

October 2018

Stephanie Moore

From: Ryan Johnson <murrabidgeemullangari@yahoo.com.au>
Sent: Friday, 30 November 2018 2:18 PM
To: Stephanie Moore
Subject: Re: 0473042 - The Glades Estate, Moonee Beach - Draft ACHA for Review

Dear Stephanie
I have read the draft ACHA report for the above project, I endorse the recommendations made by ERM, if require further details please contact me on 0475565517.
Kind regards
Ryan Johnson

Sent from my iPhone

On 29 Nov 2018, at 9:45 am, Stephanie Moore <Stephanie.Moore@erm.com> wrote:

> Good Morning,
>
> Please find attached the draft Aboriginal Cultural Heritage Assessment Report relating to The Glades Estate Modification Area, Moonee Beach NSW for your review and comment.
>
> Please provide comments in the form of written feedback, to:
> Stephanie.moore@erm.com
> Or
> Environmental Resources Management
> Attn: Stephanie Moore
> Locked Bag 3012
> Australia Square NSW 1215
>
> The consultation review period for this report will close on **27 December 2018**.
> However, the proponent is seeking to finalise the reports prior to Christmas and ERM would appreciate your assistance in returning comments as soon as possible.
>
> If you have any questions regarding this project, please don't hesitate to get in touch.
>
> Kind Regards,
> Steph
>
> Stephanie Moore
> Heritage Consultant
>
> M.ICOMOS
>
> **ERM**
> Level 15, 309 Kent Street | Sydney, NSW 2000 | Australia
> **T** +612 8584 8868 | **M** +614 39 720 041
> **E** stephanie.moore@erm.com | **W** www.erm.com
>
> *<image001.png>*

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<0473042 The Glades Estate Moonee_DRAFT_ACHA RAP Review.pdf>

Jagun Aged & Community Care

ABN: 73 116 306 346
Phone: 0417 806 239
PO Box 649 Woolgoolga NSW 2456

ERM

Level 15, 309 Kent Street

Sydney NSW 2000

Hi Stephanie,

Reports on Lot 101 & 102 and proposed project modifications have been read.

Jagun has a few concerns to report:

- The project location is surrounded by highly cultural significant areas
- High degree of monitoring will be required in ridge and creek areas
- Gummbaingirr community members and Elders concerns must be fore filled
- Will need to know were and location fill will be removed from
- Registration of Interested Parties and Selection should be discussed by Gummbaingirr Elders/Knowledge Holders, Local Aboriginal Lands Council, needs to be done before any further works

Tony Perkins
Gumbaingirr Elder/Knowledge Holder
21 December 2018

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Appendix K – Correspondence from OEH

NSW GOVERNMENT | Office of Environment & Heritage

Our Ref: DOC17/600434
Your Ref: MP 06_0143 MOD 4

Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Attention: Ms Jane Flanagan

Dear Ms Flanagan

Re: Proposed Modification - The Glades Estate, Moonee Beach

Thank you for your email dated 30 November 2017 about a proposed modification to the Part 3A Glades Estate development at Moonee Beach in the Coffs Harbor City Council local government area, seeking comments from the Office of Environment and Heritage (OEH). I appreciate the opportunity to provide input.

The Department of Planning and Environment (DPE) in its Director General's Environmental Assessment Report (DGEAR – Feb 2009) provides a detailed summary justifying its original approval for the Glades Development on the subject land at Moonee Beach (in particular see DGEAR p. 33 section 6.3.4).

However, we are advised of a possible modification to the existing development that primarily includes provision of additional housing in place of the approved central north-south wildlife corridor.

Generally, the OEH has not deviated from its original view that:

1. a central north-south corridor is important and should be retained; and

2. riparian buffers along Moonee and Skinners Creek should be as wide as possible to provide habitat linkages, as well as sustained water quality and protection of the lower estuary.

We understand the council is also in general agreement with this position however, as the ultimate landowner and manager of any open space areas, the council should be consulted by the DPE on the proposed modification.

When commenting on the original proposal, the OEH sought to achieve a central 100m wide north-south wildlife corridor that logically incorporated a large patch of remnant native vegetation in good condition (see DGEAR p.24). The DPE ultimately made concession on our preferred corridor width and only a 50m wide corridor was approved. Other conditions of approval, ostensibly to improve habitat and connectivity values of the retained corridor, were also applied.

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The modification under consideration would result in a loss of this central corridor, the habitat, provided by that area of existing native vegetation, and an overall weakening of wildlife connectivity options in the locality.

At the time of the original determination, the DGEAR summarised the comments from several agencies including the OEH and the council, and one of the common issues raised was an application of the appropriate level of riparian zone buffers (see DGEAR pp 22-25). However, concessions were made on this matter as well, and the approved riparian buffer zones are less than those required by the Moonee Development Control Plan in several locations (see DGEAR p.32 section 6.3.2).

Hence, if the DPE is considering accepting the modification to the existing development, then the OEH would be seeking appropriate offsets to bolster north-south habitat connectivity, and other habitat value losses, in an equivalent and meaningful way in the same locality and preferably on site. This may be partly achieved in the east of the development area where a wider riparian buffer could be established to better address water quality protection objectives and at the same time improve north-south habitat linkages.

If you have any further questions about this issue, Mr Ross Wellington, Senior Conservation Planning Officer, Regional Operations, OEH, can be contacted on 6640 2511 or at ross.wellington@environment.nsw.gov.au.

Yours sincerely

Dimitri Young 14 December 2017

DIMITRI YOUNG
Senior Team Leader Planning, North East
Regional Operations

Contact officer: ROSS WELLINGTON
6640 2511

NSW GOVERNMENT | Office of Environment & Heritage

Our Ref: DOC/18229508
Your Ref: MP 06_0143 Mod 4

Department of Planning
Received
21 MAY 2018
Scanning Room

Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Attention: Ms Jane Flanagan

Dear Ms Flanagan

Re: Advice on revised Environmental Assessment for proposed modification 4 to the Glades Estate development at Moonee Beach, NSW

Thank you for your email dated 5 April 2018 about the revised Environmental Assessment (EA) report for the Glades Estate MOD 4 seeking confirmation of the proponent's consultation with the Office of Environment and Heritage (OEH) during its formulation. I appreciate the opportunity to provide input.

The OEH in our earlier comments on proposed MOD 4 dated 14 December 2017, did not support the removal of the central corridor. We noted that the proposed modification would remove an area of existing high-quality vegetation that currently provides a functional north-south connectivity option in the locality. We have maintained a position of seeking to maximise corridor connectivity values for the locality, as this has been strategically identified within NPWS Key Habitat and Corridor mapping.

The outcome approved by the Department of Planning and Environment (DPE) was ostensibly a negotiated outcome that achieved some, but not all, of the conservation benefits envisaged by the OEH. The approved layout included a narrower central corridor that facilitated a greater (22) lot yield for the proponent at the expense of a more functional corridor, and included a riparian buffer zone to Moonee Creek that was narrower than specified within the Development Control Plan (DCP).

The OEH preferred position was for a central corridor, 25m wider either side to reduce edge effects and other impacts and providing linkage between Skinners Creek and the southern boundary creek. According to the Preferred Project Report (DPE 2009 p.14 dot point 8) there is a requirement for the provision of fauna underpasses and rehabilitation of vegetation at either end of the corridor to maintain its functionality post development. However, at apparent odds with DPE (2009), the updated EA consultant report states that no fauna diversions are required as part of the approval (JWA 2018 dot point 1, p. 48 and again at dot point 6 p. 58).

In our most recent comments on the proposal the OEH indicated that if the DPE were to approve the current modification then we would expect that further compensation for this corridor loss would be provided. For instance, the more eastern riparian corridor should be bolstered by at least an equivalent area or more as it would become the only connectivity option in the locality. Widening of

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the riparian buffer would also add protection for the high quality environmental values of the Moonee Creek estuary.

It is our understanding that in response to our earlier comments on the proposed modification, the DPE requested that the proponent consult with us in the formulation of a revised EA and address the proposed central corridor loss and other OEH issues.

Please be advised that the revised EA has been prepared without further consultation with the OEH and includes text justifying the loss of the central corridor that provides for an additional 31 Lots on the site. The revised EA concludes that the central corridor values are compromised due to its narrowness and impacts from bushfire asset protection zones and edge effects. These are the very issues OEH originally sought to address through provision of a wider corridor coupled with underpasses and habitat rehabilitation at either end.

Notwithstanding the fact that we were not consulted by the proponent as was requested by the DPE, the main issue OEH has with the modified proposal relates to corridor connectivity options and their functionality in the locality. These are values intrinsic to the Moonee Creek locality and would not be provided by a biodiversity offset approach that may result in offsets being delivered elsewhere.

The OEH recommends that:

1. The central corridor along with design details outlined in the DPE Preferred Project Report relating to corridor connectivity (i.e. underpasses at either end, rehabilitation of connecting vegetation at either end and ongoing management), should be retained.

2. Should the DPE consider approving the modification then:

    a. the layout design of the eastern riparian corridor should also be modified to increase its area by at least the same surface area to be lost from the central corridor area, but preferably by a larger area, to bolster the consequent single corridor that would remain in the locality.

    b. rehabilitation and ongoing management of an expanded eastern riparian corridor should be required to be funded at a level that ensures that a single eastern corridor option is retained in perpetuity. Required funding should be discussed with the Coffs Harbour City Council, as the proposed future owners of the open space area

If you have any further questions about this issue, Mr Ross Wellington, Senior Conservation Planning Officer, Regional Operations, OEH, can be contacted on 6640 2514 or at ross.wellington@environment.nsw.gov.au.

Yours sincerely

Dimitri Young 15 May 2018

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Regional Operations

Office of Environment & Heritage

NSW GOVERNMENT

Our Ref: DOC18/744102
Your Ref: MP06_0143 MOD 4

Winten Property Group Pty Ltd
Level 20, 100 Arthur Street
North Sydney, NSW 2060

Attention: Mr Jim Punch

Dear Mr Punch

Re: Outcome of meeting re Glades Estate development at Moonee Beach – MOD 4

Thank you for the opportunity to meet with yourself and Mr Clyde Treadwell on 3 October 2018 regarding the *Rothwell Boys Pty Ltd* Glades Estate Development at Moonee Beach to discuss with the Office of Environment and Heritage (OEH) matters relating to the MOD 4 proposal. We appreciated the opportunity to give further input, and we provide a summary of the meeting below , from our understanding, and the actions arising.

At the meeting we advised that the Department of Environment and Planning (DPE) had contacted the OEH with an initial request for a response to the MOD 4 proposal. The OEH had been provided with a Statement of Environmental Effects (SEE) prepared by *Resource Design and Management Pty Ltd* and dated November 2017. We responded to the DPE on 14 December 2017 in which we outlined our preference for the retention of the central corridor and our rationale in supporting that position.

On 22 December 2017 the DPE then wrote to the proponent outlining the matters requiring further assessment or updating in support of the MOD 4 application. The DPE included, amongst a list of matters, a requirement for the proponent to consult with the OEH for the development of a new flora and fauna assessment, specifically addressing the issues outlined in the OEH letter of 14 December 2017. The DPE cc'd this advice to the OEH at the same time.

On 5 April 2018 the DPE requested clarification from us as to whether the proponent had consulted with the OEH in the formulation of the revised Environmental Assessment. The DPE provided us with a copy of a flora and fauna assessment report prepared by *James Warren and Associates Pty Ltd* (JWA) dated February 2018. This may have been the hard copy document brought by Mr Treadwell at our meeting.

On 15 May 2018 we advised the DPE that no further consultation had occurred between us and the consultants preparing the revised Environmental Assessment (EA) and at the same time reviewed the flora and fauna assessment provided. Our review concluded on face value, that there was insufficient justification for the loss of the central corridor and hence we reiterated our earlier advice,

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including other scenarios that might possibly be considered to compensate for the loss of the central corridor, such as bolstering the riparian corridor to Moonee Creek accordingly.

Following our meeting, there is now hopefully a better understanding of each other's position. We understand that, whilst recognising that the central corridor is not an ideal conservation outcome, your position is that adjusting the approved development footprint by widening the riparian corridor along Moonee Creek is unlikely to be supported by the Winten Property Group as an option to accommodate the proposed central corridor loss.

We indicated that our advice and position had been based in some part on the original DPE approval. This approval identified the matters requiring consideration particularly relating to areas considered to be corridor, connectivity and habitat areas, namely:

- condition B5 – (7) *Roads, causeways, culverts and bridges*;
- condition B15 – (1), (2) and (3) (i to x) *Vegetation Management Plan*; and
- condition E11 (part) *Embellishment and Maintenance of Open Space Areas*, (2) & (3)

You further advised that a NSW Land and Environment Court matter had handed down further conditions of approval for a component of the proposal overall, but which we indicated had not been sighted by the OEH. You offered to provide these court-imposed conditions to the OEH to assist us with further deliberations on the proposal.

At the time of writing, we had not yet sourced the Map figures/plans identified in the conditions of approval – *Open Space Category 1 'Natural Areas'* (as identified in the approval plan prepared by ERM 'Broad Scale Open Space Types' dated December 2008 and *Staging of Open Space dedication to Council December 2008*, Annexure E of the Post Preferred Project Submission, December 2008> We have since requested these from the DPE.

During the meeting, the OEH also mentioned the advice that had been provided by the Coffs Harbour City Council about dedication of 'Open Space' lands and that, irrespective of any conditions of approval, discussions with the council regarding this proposed and/or conditioned dedication to the council had not yet taken place. This may be at odds with indications elsewhere within the approval.

In summary, the OEH agreed that we would review the latest version of the Flora and Fauna Assessment (F&F) Report to give further consideration to your additional representations at the meeting, as well as consider the additional court-imposed conditions of approval, where relevant, and the Map Figures (identified above) in the DPE approval.

We look forward to receiving from you the documents indicated (Court conditions and latest Flora and Fauna Report) and we will then undertake a re-appraisal of the MOD 4 proposal considering the additional information indicated.

If you have any further questions about this issue please do not hesitate to contact, Mr Ross Wellington, Senior Conservation Planning Officer, Conservation and Regional Delivery, OEH, who can be contacted on 6640 2514 or at Ross.Wellington@environment.nsw.gov.au.

Yours sincerely

Dimitri Young 9 October 2018

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Conservation and Regional Delivery

NSW GOVERNMENT | Office of Environment & Heritage

Our Ref: DOC18/768290
Your Ref: E-mail dated 10 October 2018

Winten Property Group Pty Ltd
Level 20, 100 Arthur Street
North Sydney NSW 2060

Attention: Mr Jim Punch

Dear Mr Punch

Further Review - Flora and Fauna Assessment Report - Glades Estate MOD 4

Thank you for your email dated 10 October 2018 about the proposed Modification 4 to the Glades Estate Residential subdivision seeking additional comments from the Office of Environment and Heritage (OEH). I appreciate the opportunity to provide further input.

As outlined in our previous letter dated 9 October 2018, the OEH has agreed to review the additional information prepared by James Warren and Associates (JWA) dated 29 October 2018 provided in support of an application to modify the Major Project approval (MP 06_0143 MOD 4) by removing an open space area located between residential precincts 1, 3 and 4 for an additional 31 residential lots.

The JWA advice states that the proposed habitat enhancement works are over and above the vegetation management works required by the original development approval and represent a more than adequate offset for the removal of an isolated patch of vegetation from the central area of the site. This assertion is based on an assessment using the Biobanking Assessment Methodology (BBAM) in February 2018 as the consultant states this was the only applicable methodology at the time.

The BBAM calculations are not provided and there is no detail given on the vegetation community that has been assessed. Further, this claim is not substantiated by any analysis of the rehabilitation works that will be undertaken under the required Vegetation Management Plans (VMPs).

The one-page document titled Plan 4 Vegetation Management falls far short of the requirements for VMPs as prescribed under Condition B15 of the approval. It provides insufficient details of the current requirements for rehabilitation for the open space areas that provide the baseline from which additional 'significant habitat enhancement works' are proposed.

The contention that embellishment of areas already required to be rehabilitated as part of the original MP approval over and above what was required is not justified by any adequate analysis or information and cannot be supported by the OEH.

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We consider the proposal to offset the loss of 1.37 ha of land set aside as a corridor area with additional rehabilitation works in areas that are already required to be rehabilitated is not a sound or appropriate offset approach.

Retention of the 'Central Wildlife Corridor' was required as part of a network of open space intended to connect northern and southern buffer zones and habitat areas and which form part of a regional corridor that was mapped by the OEH (NPWS Key Habitats and Corridors database). Together with conditions such as B5 (7) to consider fauna crossings & B15 (3) (vii) that specified the VMP consider the retention and rehabilitation of wildlife corridors and wildlife crossings, the Major Project approval clearly intended that the central corridor was part of a comprehensive strategy to retain, protect and rehabilitate wildlife corridors and habitat.

The OEH has also considered the Land and Environment Court (LEC) Ruling 1152, which refers to various matters relating primarily to the access roadway and its creek crossings. The LEC Ruling clearly outlines the Minister's position with respect to riparian zones/buffers, their value, the need for them to be fenced to exclude/minimise ongoing human impacts on rehabilitation/conservation values, and the standard and form that rehabilitation of these riparian zones and corridors should take.

The LEC Ruling upheld the Minister's position and included conditions for that part of the subject development to that effect. This does not appear to have any negative implications for the retention of the central corridor as part of a network of open space and its function as a wildlife corridor.

In summary, the OEH does not support the loss of the central corridor to be offset through enhanced rehabilitation outcomes. The rehabilitation outcomes will not provide any significant habitat or connectivity enhancement in addition to what is already required by the Major Project Approval conditions and do not justify the loss of the central corridor land.

We therefore reiterate that:

1. The central corridor along with design details outlined in the Preferred Project Report relating to corridor connectivity (i.e. underpasses at either end, rehabilitation of connecting vegetation at either end and ongoing management), should be retained.

2. Should the consent authority consider approving the proposed modification, then:

    a. the layout of the eastern riparian corridor should be significantly increased by a width commensurate with the width of the current central corridor to bolster the consequent single corridor that would remain in the locality.

    b. rehabilitation and ongoing management of an expanded eastern riparian corridor should be required to be funded at a level that ensures that a single eastern corridor option is retained and managed in perpetuity. Required funding should be discussed with the Coffs Harbour City Council, as the proposed future owners of this open space area.

If you have any further questions about this issue, Ms Rachel Lonie, Senior Conservation Planning Officer, Conservation and Regional Delivery, OEH, can be contacted on 6650 7130 or at rachel.lonie@environment.nsw.gov.au.

Yours sincerely

Dimitri Young 13 November 2018

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Conservation and Regional Delivery

cc: Emma Butcher via email at emma.butcher@planning.nsw.gov.au.

Appendix L – JWA Letter dated 29 October

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

REPLY TO: BALLINA OFFICE

Ref: AM/N02066/Lw1

29th October 2018

Winten Property Group Pty Ltd
Level 20, 100 Arthur Street
North Sydney, NSW 2060

Attention: Jim Punch

Dear Jim,

RE: THE GLADES ESTATE DEVELOPMENT AT MOONEE BEACH – MAJOR PROJECT APPROVAL 06-0143 (MOD 4)

I refer to the 'Glades Estate' development at Moonee Beach proposed by The Rothwell Boys Pty Ltd, and in particular to the current Section 75W modification application (referred to as MOD 4). The application proposed to modify the Major Project Approval 06-0143 to remove an open space area located between residential precincts 1, 3 and 4, which covers a total of 1.747 ha (of which 1.37 ha is comprised of native vegetation), in order to create an additional thirty-one (31) residential allotments.

It is understood that the NSW Office of Environment and Heritage (OEH) in correspondence addressed to the NSW Department of Planning and Environment (DPE) dated 14th December 2017 and 15th May 2018, and more recently addressed to Winten Property Group and dated 9th October 2018, have indicated that they do not support the removal of the central corridor area without adequate compensation through appropriate offsets to bolster north-south habitat connectivity in the same locality, and preferably on site. They have also indicated that their preference would be a revised development layout to allow for an increase in width of the eastern riparian corridor.

JWA Pty Ltd were engaged to assess offsetting options for the removal of the central corridor as part of the Ecological Assessment report submitted with the MOD 4 application i.e. JWA February 2018 (RW6 13/02/2018). An assessment of the impact site and potential revegetation/offset sites was completed utilising the BioBanking Assessment Methodology (BBAM) (the applicable methodology at the time). The JWA February 2018 assessment (pg. 60) determined that 74 ecosystem credits would be required to offset the loss of 1.37 ha of native vegetation from the central open space area proposed to be removed. The results also

indicated that rehabilitation of existing vegetation to be retained within open space areas on site would create 112 ecosystem credits and the revegetation of 3.87 ha of currently cleared land over the development site would potentially create an additional 38 credits.

It is noted that existing vegetation within the open space areas of the site was to be retained and a Vegetation Management Plan prepared (including general rehabilitation and revegetation works) in accordance with Condition B15 of the original development approval. Condition B15 requires that the Vegetation Management Plan include weed control, creation and management of Wallum froglet habitat, riparian rehabilitation works and planting of replacement Koala food trees. In this regard, a Vegetation Management Plan (ERM, 2008 – **ATTACHMENT 1**) and Broad Scale Open Space Types Plan (ERM, 2008 – **ATTACHMENT 2**) were approved as part of the development approval.

To offset the loss of 1.37 ha of vegetation from the central corridor (requiring 74 credits as calculated by the BBAM) significant habitat enhancement works are now proposed over and above that required by the original development approval. These areas of proposed habitat enhancement works are shown as 'proposed offset areas' in **ATTACHMENT 3** and cover a total of 17.58 ha**.** All rehabilitation works within these areas of the site should be the subject of a detailed Offsets and Habitat Enhancement Strategy (prepared in consultation with OEH) and be undertaken with the aim of reinstating fully structured and functioning ecosystems. It is recommended that these works include as a minimum:

1. Assisted natural regeneration and/or planting of native shrubs and groundcovers (where necessary) in addition to required Koala food trees;
2. Implementation of measures to suitably monitor and control weeds and pest animals;
3. Installation of a variety nest boxes (e.g. bat boxes, glider boxes, owl boxes etc.) within retained vegetation to provide offsets for the permanent loss of habitat removed and to provide alternative, immediate habitat for fauna displaced during clearing activities. Nest boxes will be prescribed on a proportional basis to offset the loss of particular hollow resources.
4. Salvage of habitat features such as bush rock, hollow logs and woody debris (from the development site) for reuse/relocation as ground habitat within rehabilitation areas;
5. Installation of fauna exclusion fencing (where appropriate) to prevent native fauna species from accessing the development footprint, and to prevent cattle from accessing retained and rehabilitated vegetation areas in the short to medium term;
6. Implementation of measures to control existing erosion and restabilise banks (where necessary);
7. Implementation of measures to minimise light spill from the development into habitat corridors;
8. Monitoring of progress towards applicable Plant Community Type (PCT) benchmarks prior to handover of open space areas to Council. The maintenance and monitoring of retained and rehabilitated habitat areas at the Glades Estate site will generally occur for a minimum of 5 years prior to handover to Council. The target PCT benchmarks for monitoring and maintenance must achieve the following Vegetation Integrity Benchmark levels for primary attributes of biodiversity for relevant PCTs:

- Composition – 100%;
- Structure – 50%; and
- Function – 25%.

In summary, it is considered that the proposed habitat enhancement works discussed above are over and above the vegetation management works required by the original development approval. These works will result in fully structured and functioning ecosystems and a significant improvement in the corridor values of the open space areas on the site. Furthermore, it is my opinion that these works represent a more than adequate offset for the removal of an isolated patch of vegetation from central area of the site, and will adequately bolster north-south habitat connectivity in the locality as requested by OEH.

Please do not hesitate to contact us if you require further information.

Yours faithfully,
JWA Pty Ltd

Adam McArthur
Director / Principal Ecologist

Attachment 1 - Vegetation Management Plan (ERM, 2008)

Landscape Features

Open space comprises over 40% of the total development parcel. The natural landscape and its enhancement will play a key role in defining the over all natural coastal character of this subdivision.

Built areas are logically placed to cause minimal disturbance to vegetation and be well away from sensitive low lying areas.

Native species are to be used in all areas to be maintained for natural vegetation. Biodiversity of the site should increase as remnant vegetation is strengthened.

All green open space areas are multi purpose; filtering stormwater, recreation, visual amenity and sustaining the environmental integrity of the site

All work outlined on this plan will commence following consent of the plan. The strengthening of vegetation within buffer zones will be a priority so that plants are established prior to occupancy

Legend

Existing forest, swamp and mangrove communities protected and enhanced. Grazing removed and recreation contained to structured path ways These areas will be fenced to allow rehabilitation to occur

Rehabilitation of indigenous forest communities. Natural buffer enhanced. Revegetation utilises existing seed source and fencing to aid re-establishment

Rehabilitation of existing wetland, sedgeland, swamp sclerophyll and heath communities. Revegetation utilises existing seed source and fencing to aid re-establishment

Revegetation of indigenous heath community. Slashing is to cease to allow natural recovery of plant species. The majority of this area will also be fenced to aid re-establishment

Intensive landscape management within this zone. Recreation facilities are contained within areas of grassed open space with feature planting and interconnected via pathways. Area will be regularily mown and monitored to ensure quality of all landscape and recreation features

Proposed grouped indigenous tree planting (no understorey)

connecting laneway or median strip, will be intensively managed and contain pathway, trees and grass

* Any area shown white internal to the site will be mown and operate with dual primary purposes of storm water filtration and secondly as open space suitable for a variety of recreation uses

Asset Protection Zone (APZ)

This zone has been identified for bushfire protection and complies with requirements recommended by the NSW Rural Fire Service. This zone also acts as an effective buffer between urban dwellings and natural vegetation. The APZ is part of the open space network and is characterised or may contain:

recreation nodes
perimeter roads
block setbacks
walking / cycle tracks
playground / picnic facilities
trees with no understorey
will be slashed or mown regularily
will operate as storm water filtering areas

The Glades

Winten Property Group

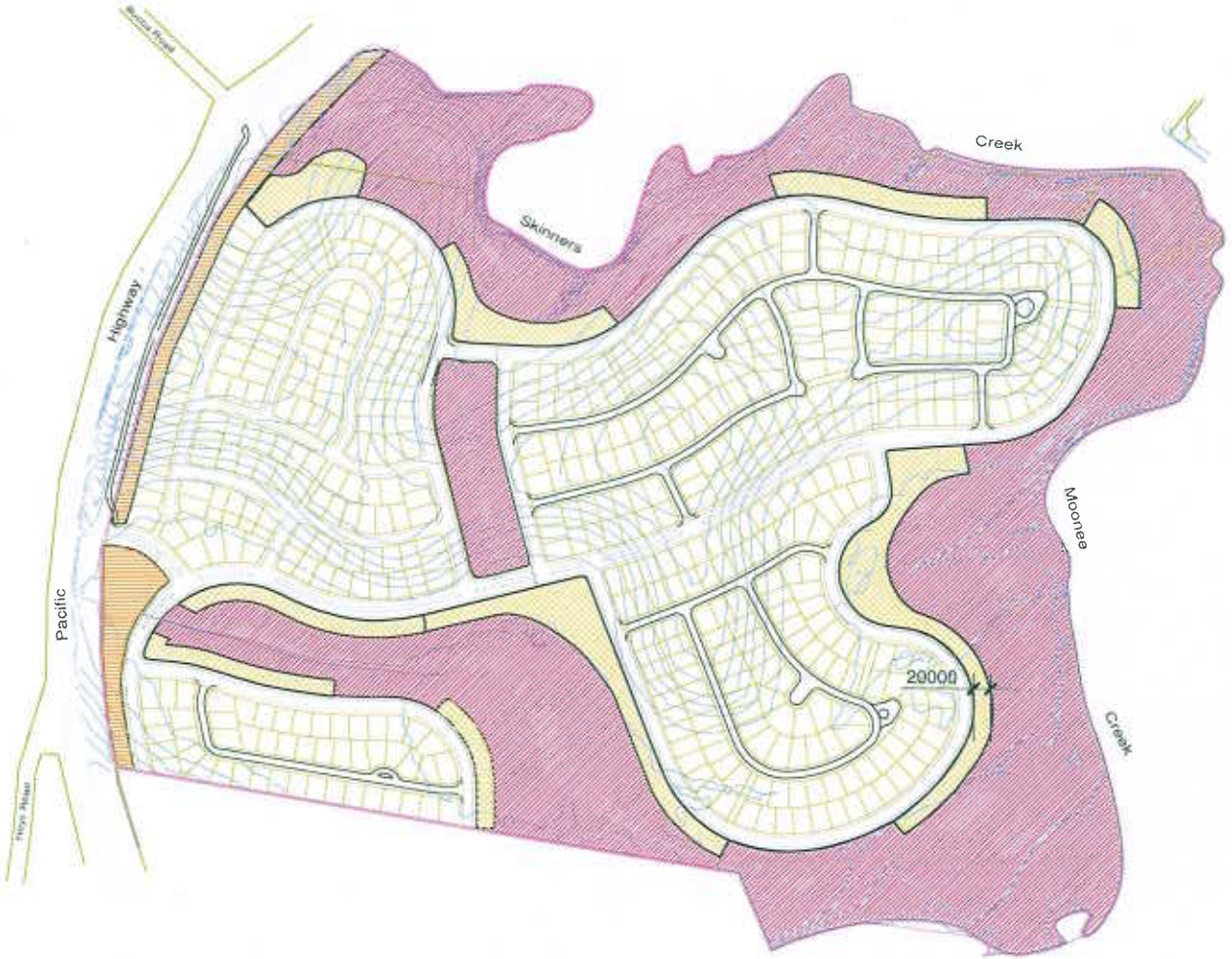
Rothwell Boys Pty Ltd

Plan 4 Vegetation Management

N

Anne Harrison
Landscape Architect
Ph: 02 6656 2711

Attachment 2 - Broad Scale Open Space Types Plan (ERM, 2008)



Open Space - Category 1 Natural Areas

Development and management of open space is directed at environmental protection, vegetation rehabilitation and improving habitat ecology

Open Space - Category 2 Residential and Recreation Areas

Development and management of open space is focussed on providing appropriate recreation facilities, asset protection and enhancing existing vegetation

Open Space - Category 3 Environmental Scenic Highway Buffer

Emphasis of development and management of open space is on screening, noise abatement and providing a connecting pedestrain / cycle route to access areas north and south of the site

Note: Open Space makes up over 40% of the total site area

The Glades

Winten Property Group

Rothwell Boys Pty Ltd

Plan 3 Broad Scale Open Space Type

N

Anne Harrison
Landscape Architect
Ph: 02 6656 2711

Attachment 3 - Proposed Offset Areas (JWA 2018)

LEGEND

- Possible Fauna Movements to Habitat Corridors After Development
- Additional Impact Area Subject to Mod Application
- Subject Site
- The Glades Development Site

Proposed Offset Areas

- Proposed Rehabilitation / Offset Areas (13.71ha)
- Proposed Revegetation / Offset Areas (3.87ha)

Vegetation Management Plan

- Existing forest, swamp and mangrove communities protected and enhanced. Grazing removed and recreation contained to structured path ways. These areas will be fenced to allow rehabilitation to occur.
- Rehabilitation of indigenous forest communities. Natural buffer enhanced. Revegetation utilises existing seed source and fencing to aid re-establishment
- Rehabilitation of existing wetland, sedgeland, swamp sclerophyll and heath communities. Revegetation utilises existing seed source and fencing to aid re-establishment
- Revegetation of indigenous heath community. Slasing is to cease to allow natural recovery of plant species. The majority of this area will also be fenced to aid re-establishment
- Intensive landscape management within this zone. Recreation facilities are contained within areas of grassed open space with feature planting and interconnected via pathways. Area will be regularly mown and monitored to ensure quality of all landscape ad recreation features
- Proposed grouped indigenous tree planting (no understorey)
- Connecting laneway or medium strip, will be intensively managed and contain pathway, trees and grass
- * Any area shown white internal to the site will be mown and operate with dual primary purposes of storm water filtration and secondary as open space suitable for a variety of recreation uses
- Asset Protection Zone (APZ)

This zone has been identified for bushfire protection and complies with requirements recommended by the NSW Rural Fire Services. This zone also acts as an effective buffer between urban dwellings and natural vegetation. The APZ is part of the open space network and is characterised or may contain:

- recreation nodes
- perimeter roads
- block setbacks
- walking / cycle tracks
- playground / picnic facilities
- trees with no understorey
- will be slashed or mown regularly
- will operate as storm water filtering areas

0 150m

1 : 5000

SOURCE: JWA 2004 & 2017; ERM Annex H Plan 4 Veg Mgt (Jan 2018) (Ref: 20180206093044348.pdf)
SCALE: 1 : 5000 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Winten Property Group Pty Ltd

PROJECT
Flora & Fauna Assessment
Lots 1 & 2 DP725785
Pacific Highway, Moonee NSW
Coffs Harbour City Council LGA

FIGURE 16

PREPARED: BW
DATE: 22 February 2018
FILE: N02066_Fauna Mvt.cdr

TITLE
PROPOSED OFFSET AREAS & POSSIBLE FAUNA MOVEMENTS AFTER DEVELOPMENT