ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Landcom Holding
Attention: Alexander Seal

Via Email: Aseal@landcom.nsw.gov.au

Our Ref: 3043.01

16 March 2023

Dear Alex,

EPBC Referral 2014/7217 – Preliminary Documentation Package

82, 69, 9A Myall Road Residential Subdivision, Hillsborough, NSW.

As requested, Anderson Environment & Planning (AEP) herewith provide a letter of response with the required Preliminary Documentation to accompany the assessment of Referral No. 2014/7217 under the *Environmental Protection and Biodiversity Conservation Act* (1999), associated with the proposed residential subdivision at 82, 69, 9A Myall Road, Hillsborough, NSW.

It should be noted that prior documentation has been provided under this referral by Conacher Consulting in September 2014, as specified in the Request for Preliminary Documentation (PD) dated 15 July 2014. The Conacher Consulting PD document is attached in **Appendix A**, and is referred to where relevant throughout this package. AEP have also provided further information in this package to address any information gaps from the 2014 Conacher package, and additional information as requested following Comments on Preliminary Documentation dated 3 March 2015.

An updated referral document is provided in **Appendix C** incorporating the most up to date information with regards to the project.

The information provided in this document have been compiled using the relevant information including;

- Ecological Information Report for Preliminary Documentation Package prepared by Conacher Consulting, provided as part of the original referral in 2014 (refer **Appendix A**);
- The original referral (refer **Appendix B**);
- Documents associated with the DA including Conditions of Consent, Statement of Environmental Effects, Biodiversity Assessment Report, and BSSAR (currently in review with the BCT without submission) and a significant Impact assessment for *Rhodamnia rubescens*.

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Study Certification and Licensing

The information provided in this letter has been prepared and reviewed by staff identified below from Anderson Environment & Planning.

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Craig Anderson	Managing Director; Principal Ecologist BAppSc (EAM) BAAS: 17002
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Tim Mouton	Senior Ecologist BEnvSc MEnvSc BAAS: 19083
Kelly Drysdale	Ecology Project Manager AssDipAppSc, Grad Cert BA, TAE

Request for Preliminary Documentation (EPBC 2014/7217) – July 2014

In order to adequately assess the likely scale and potential impacts of the proposed action, the Department has requested the following additional information, as per the Request Preliminary Documentation letter dated 15 July 2014 (**Table 1**), and Comments on Preliminary Documentation letter dated 3 March 2015 (**Table 2**).

Table 1 – EPBC – Request for Preliminary Documentation (EPBC 2014/7217)

Additional Information Required			Response	Document Reference
1. Description of the Existing Environment	A1	Location and area of mine subsidence area	Additional information for these items is provided in Appendix A - Part II Section 1 Further to the information provided in Appendix A, AEP ecologists undertook non-target surveys (BAM plot surveys, vegetation mapping, weed surveys) within the Study Area (proposed BSA / development lands) during November 2022. *Tetratheca juncea* was opportunistically observed in abundance throughout the site.	App A (1.A.1)
	A2	Details and justification of the alternative methods used to approximate *Tetratheca juncea* individuals in mine subsidence affected areas		App A (1.A.2)
	B1	Details of surveys undertaken for *Cryptostylis hunteriana* and *Diuris praecox*.		App A (1.B.1)
	B2	Account of the survey effort and methodology used in the surveys undertaken for *Cryptostylis hunteriana* and *Diuris praecox*.		App A (1.B.2)
	B3	Description of the distribution and abundance of *Cryptostylis hunteriana* and *Diuris praecox* including population size, density and location of occurrences on-site and in the region		App A (1.B.3)
	B4	Quantification and description of the extent of suitable habitat on-site and in the region (including whether the habitat is critical to the survival of the species)		App A (1.B.4)
	B5	Maps displaying the above information (points 1, 3 & 4)		App A (1.B.5)
			Additionally, AEP completed a significant impact assessment in February 2023 for *Rhodamnia rubescens* refer Appendix G.	App G
2. Relevant impacts	A. Additional Information to Determine Direct and Indirect Impacts to *Tetratheca juncea* Onsite			
	A1	The total amount of *Tetratheca juncea* habitat (in hectares) on the site, both in the impact area and the area proposed to be retained	Additional information for this item is provided in Appendix A - Part II Section 2	App A (2.A.1)
	A2. An assessment and quantification of the indirect impacts to the area of habitat proposed to be retained on site during both the construction and operational phases of the project including those resulting from:			
	a)	Urban edge effects (including changes to microclimate, altered hydrology, invasion by exotic species, alteration of soil conditions such as sedimentation and nutrient availability, trampling, rubbish dumping etc.)	Additional information for this item is provided in Appendix A - Part II Section 2 With regards to Item A3, the information in Appendix A (2.A.3)	App A (2.A.2a)

Additional Information Required			Response	Document Reference
	b)	Fragmentation and the loss of connectivity	detailing conservation management requirements is outdated. A Biodiversity Stewardship Agreement (BSA) is to be established over the residue lands, which includes offsetting requirements of the Biodiversity Assessment Method 2020 (BAM) established under Section 6.7 of the Biodiversity Conservation Act 2016 (NSW). Biodiversity credits generated from the BSA site would be voluntarily retired utilising the Savings and Transitional Regulation 2017 of the BC Act 2016. Once the BSA has been established the site will be managed and funded in perpetuity under the BSA via the Management Plan and Total Fund Deposit. Therefore, ensuring the long-term viability of the remaining individuals onsite.	App A (2.A.2b)
	A3	Discussion of the potential impact to the long-term viability and survival of the remaining individuals onsite		App A (S2.A.3)
	A4	Analysis of the scale of the impacts relative to the local and regional occurrences of the threatened species surrounding the site		App A (S2.A.4)
	B. Should the Leafless Tongue-orchid and Newcastle Doubletail be found during additional surveys please provide the following:			
	B1	Additional Information to Determine Potential Direct and Indirect Impacts to *Cryptostylis hunteriana, Diuris praecox* and *Rhodamnia rubescens*	NA – these species were not found on site. Significant Impact assessment was completed in February 2023 for *Rhodamnia rubescens.*	App A (S2.B) App G
3. Proposed avoidance, safeguards and mitigation measures	A	Description of avoidance and mitigation measures to reduce fragmentation impacts to *Tetratheca juncea* to ensure ongoing viability of the population to be retained onsite with regard to mitigating impacts to pollination and dispersal mechanisms and habitat conditions	Additional information for this item is provided in Appendix A - Part II Section 3.	App A (S3.A)
	B. Further information regarding mitigation measures that will be undertaken to prevent or minimise potential direct or indirect impacts to *Tetratheca juncea* including:			
	B1	A description of the proposed mitigation measures for all phases of the action (construction and operation) to reduce impacts including for each measure, the environmental objectives, performance criteria, monitoring, reporting (by whom, to whom, how often), corrective actions (including thresholds for actions), responsibility and timing for proposed mitigation measures	Three levels of avoidance and mitigation have been considered to manage actual and potential impacts to *T.juncea* on site. 1. As detailed in Section 3 of the Conacher PD, avoidance of impacts was considered during project design. The final development footprint has been refined to minimise direct impacts based on ecological constraints following biodiversity surveys.	App A (S3.B.1)

Additional Information Required			Response	Document Reference
			2. Construction environmental management will mitigate potential indirect impacts to native vegetation and *T.juncea* habitat within the adjacent BSA site, including: - maintaining exclusion fencing around vegetation that adjoins the construction area to minimise damage to vegetation that shall be retained; - prohibiting compaction and the placement of fill within five metres of trees and native vegetation that shall be retained; - keeping all vehicles, construction materials and refuse within areas approved for buildings, structures, access ways and car parks; - limiting the number of access points; - salvaging useable trees and shrubs which are felled for re-use, either in log form, or as woodchip mulch for erosion control and/or site rehabilitation. Nonsalvageable material such as roots and stumps shall only be disposed of at an approved site; - notifying all contractors, sub-contractors, and personnel of vegetation protection requirements In addition, a Construction Environmental Management Plan will be prepared prior to the development further detailing these measures. These mitigation measures are to be implemented as per the Conditions of Consent (S34, S54), which are provided in **Appendix F**. 3. Offsetting and management under a BSA will mitigate direct and indirect impacts to *T.juncea*. by providing protection and management in-perpetuity of a large local population from future development impacts, and	

Additional Information Required			Response	Document Reference
			exercising a no net loss standard. The Vegetation Management Plan contained in the BSSAR (Appendix E) details management actions that will mitigate indirect impacts through actions such as management of tracks / trails, erosion, weed control, and public access.	
	B2	An assessment of the expected or predicted effectiveness of the mitigation measures in reducing impacts on *Tetratheca juncea*, including supporting evidence	The primary mitigation measure to reduce impacts on *Tetratheca juncea* is the in-perpetuity conservation of approximately 74% of the local population within the proposed BSA site. Active management actions proposed in the BSSAR Management Plan would be undertaken over a 20 year period, with ongoing maintenance of the site in-perpetuity.	App A (S3.B.2)
	B3	Any statutory or policy basis for the mitigation measures	The policy underpinning the in-perpetuity conservation of approximately 74% of the *Tetratheca juncea* local population is the application of the Biodiversity Offsets Scheme (BOS), under Section 6.7 of the Biodiversity Conservation Act 2016 (NSW).	App A (S3.B.3)
	B4	The cost of the mitigation measures, including how measures will be funded in perpetuity (and by whom)	The BSSAR (Appendix E) contains costings associated with implementing offset management actions over the life of the BSA. A full breakdown of the management actions and associated costs are detailed in the Total Fund Deposit.	App E BSSAR
	C. Consolidated list of mitigation measures to be undertaken to prevent or minimise potential direct and indirect impacts for *Cryptostylis hunteriana* and *Diuris praecox* including:			
	C1	description of the proposed mitigation measures for all phases of the action (construction and operation) to reduce impacts including for each measure, the environmental objectives, performance criteria, monitoring, reporting (by whom, to whom, how often), corrective actions (including thresholds for actions), responsibility and timing for proposed mitigation measures	*Cryptostylis hunteriana* and *Diuris praecox* have not been observed within the subject site, therefore mitigation measures are considered not necessary for the proposed development.	App A (S3.C.1-4)
	C2	An assessment of the expected or predicted effectiveness		

Additional Information Required			Response	Document Reference
		of the mitigation measures in reducing impacts, including supporting evidence		
	C3	Any statutory or policy basis for the mitigation measures		
	C4	The cost of the mitigation measures, including how measures will be funded in perpetuity (and by whom)		
4. Offsets	A	Provision of an Offset Package for *Tetratheca juncea* in accordance with the EPBC Act Offset Assessment Guide and Policy in accordance with the requirements of Addendum A	It should be noted that information contained within Section 4 of Appendix A detailing conservation management requirements is outdated. In March 2020, the Commonwealth endorsed the NSW Biodiversity Offsets Scheme (BOS) for all controlled actions under the EPBC Act (i.e., including those outside of the amending agreement). As such, for EPBC Act approvals that are made on or after 24 March 2020, proponents can meet their offset obligations in accordance with the BOS including: a) Purchasing and retiring like-for-like ecosystem or species credits from the Biodiversity Credits Register; b) Funding a Biodiversity Conservation Action, and c) Paying an amount equivalent to the cost of acquiring like-for-like ecosystem credits into the Biodiversity Conservation Fund (BCF). A Biodiversity Stewardship Agreement (BSA) is to be established over the residue lands, which includes offsetting requirements in accordance with the BOS. Biodiversity credits generated from the BSA site would be voluntarily retired utilising the Savings and Transitional Regulation 2017 of the BC Act 2016. A Biodiversity Stewardship Site Assessment Report has been prepared detailing the proposed offset package, including biodiversity credit requirements and management actions for the site. This is contained in	App E BSSAR

Additional Information Required			Response	Document Reference
			Appendix E.	
	B. Additional details of Vegetation Management Plan			
	B1	Details on closing of existing tracks / trails, soil, water and erosion management, rehabilitation, vegetation buffers, bushfire management and weed and feral management.	The BSSAR Management Plan (Appendix E) supersedes the Vegetation Management Plan Retained Bushland Areas (Conacher 2013). The Vegetation Management Plan contained in the BSSAR details management actions to improve the vegetation integrity of the BSA site, including management of tracks / trails, erosion, ecological burns, and weed / vertebrate pest control.	App E BSSAR
	B2	Details of objectives, performance measures, performance indicators and thresholds for corrective actions which align with the SMART (specific, measurable, achievable, results-based and time-based) principles	The Vegetation Management Plan contained in the BSSAR (Appendix E) details management actions based on SMART principals, required to meet objectives and performance measures for the BSA site.	App E BSSAR
	B3	Description of consistency of the proposed offset package with the Department's Environmental Offsets Policy and the Offset Assessment Guide	As stated above a Biodiversity Stewardship Agreement (BSA) is to be established over the residue lands, including offsetting requirements in accordance with the NSW Biodiversity Offsets Scheme, which is endorsed by the Commonwealth.	App E BSSAR
	B4	Costing of proposed offsets package	The BSSAR (Appendix E) contains costings associated with implementing offset management actions over the life of the BSA. A full breakdown of the management actions and associated costs are detailed in the Total Fund Deposit.	App E BSSAR
	C	Should the Leafless Tongue-orchid and Newcastle Doubletail be found during additional surveys and impacts to these species are determined to be significant, offsets must be provided	NA – these species were not found on site.	App A (S4.C)
5. Economic and Social Matters	A. An analysis of the economic and social impacts of the action, both positive and negative should be provided. Matters of interest may include:			
	A1	Details of any public consultation activities undertaken and their outcomes	Public consultation for the proposal was undertaken by Landcom in July 2012 whereby a community consultation and feedback session was held. Feedback from this session was compiled and considered in a Site Consultation Outcomes Report, which is contained within the approved Statement of	App D SEE (S6.16)

Additional Information Required			Response	Document Reference
			Environmental Effects.	
	A2	Projected economic costs and benefits of the project, including the basis for their estimation through cost/benefit analysis or similar studies	A Social Impact Considerations Desktop Review was completed by Community Dimensions Pty Ltd. The report determined that the development is not significant in terms of size and does not generate sufficient demand to warrant provision of discrete facilities. The proposed development will support the patronage and use of existing facilities and services. The proposal is considered to offer the existing and future communities positive social and economic benefits. The positive economic benefits for the local community would be the potential of employment opportunities through the construction of the proposed allotments and the future housing, and also for local shops and facilities. The proposed subdivision would also provide additional housing choices for families and smaller households who would like to live in the area	App D SEE (S6.12)
	A3	Employment opportunities expected to be generated by the project (including construction and operational phases)	As stated above the proposal would generate employment opportunities during the construction phase, and for local shops and facilities.	App D SEE (S6.12)

Table 2 – EPBC – Comments on Preliminary Documentation (EPBC 2014/7217)

Additional Information Required			Response	Document Reference
1. Accounting for impacts on *Tetratheca juncea*	A	There are a number of inconsistencies in the figures and percentages used to describe the quantum of direct impact and onsite offsets throughout the document (Conacher PD 2014). For example, Ecological Information Report p12 and table 2.1, and Offset Package Addendum A. Please clarify these and amend the figures accordingly.	Under the proposed new offsetting package as part of the BSSAR preparation, the quantum of direct and indirect impacts has been reassessed. As per the Biodiversity Assessment Methodology (BAM) *Tetratheca juncea* is assessed based on the Area unit of measurement rather than a count. This means that all areas within the site containing suitable habitat for this species are included in the area calculation or Species Polygon. Given the vegetation types present and the large extent of the population throughout the site, all vegetation present is considered to for part of the Species Polygon, excluding existing cleared tracks and trails. A total of 36.29ha of vegetation is present within the Study Area (BSA site + Development Area), which constitutes important habitat for *T.juncea*. The breakdown of vegetation areas are as follows: - The direct impact from the Development Area constitutes 10.59ha. - A 30m buffer around the Development Area takes into account indirect impacts, which constitutes 3.4ha. - The *T.juncea* Species Polygon accounts for 20.96ha, representing 57.77% important habitat of the local population retained within the BSA site. These areas are shown in **Appendix D** of this document and the BSSAR.	App A App E BSSAR
	B	The Department requests clarification of how occupancy polygons were used to calculate habitat area. Additionally, please explain how the methodology aligns with methods in the Department's	AEP are unsure how Conacher Consulting derived the regional area of occupancy polygons. As such, AEP has provided updated mapping to show this in **Appendix D** of this document. Polygons were derived by determining	

Additional Information Required			Response	Document Reference
		Environmental Protection and Biodiversity Conservation Act referral guidelines for the vulnerable black-eyed susan.	which Plant Community Types (PCTs) are known to be associated with the presence of *T.juncea*, as shown in the NSW Bionet Threatened Species Data Collection. The State Vegetation Map was then filtered to only show the relevant *T.juncea* PCT associations, within Lake Macquarie, Newcastle, and Port Stephens LGAs.	
	C	The PD (Conacher 2014) currently does not include any quantification of indirect impacts due to edge effects from the proposed development, as originally requested. Research suggests that indirect impacts will occur from the outside edge of the development footprint (including APZs) and up to approximately 100m. In light of this please provide a quantification of the indirect impacts of the proposal.	As stated above, a 30m buffer has been placed from the edge of the development footprint into the proposed BSA site (as shown in **Appendix D**), to account for indirect edge effects to *T.juncea* important habitat. This accounts for approximately 3.4ha and has not been included in Biodiversity Credit offset calculations for *T.juncea*. This buffer area will still be managed under the BSA.	App D App E BSSAR
	D	The Department notes that the remnant north of Myall Road (0.77ha) will be bordered by residential development as a result of the action and considers that indirect impacts on the remnant, including continued disturbance by weed encroachment, edge effects, nutrient enrichment and altered fire regimes cannot be mitigated. As such, please include this area in the quantification of impacts of the proposal and remove it from the offset proposal.	*T.juncea* important habitat north of Myall road has been removed offsetting considerations due to potential fragmentation and edge effects rendering this area unviable for future management under a BSA.	App D App E BSSAR
2. Mitigation measures for *Tetratheca juncea*	A	In the discussion of the avoidance and mitigation measures applicable to *T.juncea* (Section- 3, p17) there appears to be some misclassification regarding what are considered avoidance of impacts, mitigation of impacts and offsetting of impacts. Although there will naturally be some overlap, the management actions to be carried out in perpetuity from the construction of the subdivision. Please note that management actions to	Three levels of avoidance and mitigation have been considered to manage actual and potential impacts to *T.juncea* on site. 4. As detailed in Section 3 of the Conacher PD, avoidance of impacts was considered during project design. The final development footprint has been refined to minimise direct impacts based on ecological constraints following biodiversity surveys.	App A Conacher PD (2014) – S3 App F COC S34, S54

Additional Information Required			Response	Document Reference
		maintain or improve the proposed offset in perpetuity are also required but should be accounted for separately.	5. Construction environmental management will mitigate potential indirect impacts to native vegetation and *T.juncea* habitat within the adjacent BSA site, including: - maintaining exclusion fencing around vegetation that adjoins the construction area to minimise damage to vegetation that shall be retained; - prohibiting compaction and the placement of fill within five metres of trees and native vegetation that shall be retained; - keeping all vehicles, construction materials and refuse within areas approved for buildings, structures, access ways and car parks; - limiting the number of access points; - salvaging useable trees and shrubs which are felled for re-use, either in log form, or as woodchip mulch for erosion control and/or site rehabilitation. Nonsalvageable material such as roots and stumps shall only be disposed of at an approved site; - notifying all contractors, sub-contractors, and personnel of vegetation protection requirements In addition, a Construction Environmental Management Plan will be prepared prior to the development further detailing these measures. These mitigation measures are to be implemented as per the Conditions of Consent (S34, S54), which are provided in **Appendix F**.	

Additional Information Required			Response	Document Reference
			6. Offsetting and management under a BSA will mitigate direct and indirect impacts to *T.juncea*. by providing protection and management in-perpetuity of a large local population from future development impacts, and exercising a no net loss standard.	
	B	In light of point 2A above, the Department requests additional detail regarding mitigation measures to prevent or minimise impacts to *T.juncea* during construction. Therefore, please provide the information requested in point 3B of the request for preliminary documentation provided on 4 July 2014.	As 2.A above.	
	C	As outlined in the Department's referral guidelines, a buffer zone of native vegetation greater than 30m around retained habitat should be used to mitigate impacts to retained plants. Please demonstrate how a 30m buffer has been adopted.	Refer to Appendix D and response to 1.A above.	S1A App D
	D	In the description of mitigation measures to avoid fragmentation effects, the PD suggests that seed dispersal is possible across a road reserve (p18 Ecological Information Report). Please note that the Department's view that there is a low probability of being able to disperse seed more than a few metres from the parent plant. Therefore, fragmentation of the population is considered likely and these impacts will be considered in the assessment of the proposal.	*T.juncea* important habitat north of Myall road has been removed offsetting considerations due to potential fragmentation and edge effects rendering this area unviable for future management under a BSA.	App D App E BSSAR
3. Offsets	A. Adequacy	At present the Department considers the proposed offset does not meet the requirements of the EPBC Offsets Policy. The Department requests the following clarifications so the adequacy of the offset can be determined.		
	I.	Please revise the impact figure (in hectares) to reflect all the direct and indirect impacts of the proposal	Refer to Appendix D and BSSAR (Appendix E).	App D App E

Additional Information Required			Response	Document Reference
				BSSAR
	II.	The Department considers that the area east of the Newcastle Inner City Bypass is small, fragmented and isolated with a six lane road separating the area from the main offset site. This area is lower quality as an offset as it provides poorer long term conservation outcomes. Additionally it appears the site is currently zoned for Public Recreation, which is not compatible for conservation. Therefore, please account for these when revising your offset calculations.	This area has been removed offsetting considerations due to potential fragmentation and edge effects, and incompatible land use zoning, rendering this area unviable for future management under a BSA.	
	III.	The PD states that there is a potential for future development applications on the offset site, such as State Significant Infrastructure.	Once a BSA has been established and biodiversity credits retired, it offers in-perpetuity on title protection. A BSA can only be terminated under exceptional circumstances by the BCT or the Minister.	
	IV.	The initial site condition of the offset is described as being subject to weed invasion and traversed by walking tracks but with high stocking rates of *T.juncea.* The Department considers it unlikely there will be an improvement in quality of the offset site to a pristine habitat.	Under a BSA it is intended to return the site to a future Vegetation Integrity (VI) defined by the BAM Calculator, ideally which is close to benchmark conditions. However, the level of site disturbance and management effort required, such as control of unmanageable High Threat Weeds, can lower the VI weighting. The BSSAR and Management Plan details the future VI required to satisfy the generation of biodiversity credits over the course of active management (20 years).	App E BSSAR
	V.	Please note that the time until ecological benefit is unlikely to be realised in 5 years as proposed as one generation lives between 20-50 years. Management such as rehabilitation works, weed control and revegetation generally need to occur over longer timeframes to determine their success. The Department considers 20 years a more realistic	Under a BSA the site will be actively managed for a period of 20 years in accordance with the Total Fund Deposit and Management Plan.	App E BSSAR

Additional Information Required			Response	Document Reference
		timeframe.		
	B. Protection			
	I.	The proposed mechanism for legal protection of the offset site is a Voluntary Planning Agreement (VPA). At this time the Department considers VPAs are not an effective protection mechanism.	The offset site will be managed under a Biodiversity Stewardship Agreement (BSA), which includes offsetting requirements of the Biodiversity Assessment Method 2020 (BAM) established under Section 6.7 of the Biodiversity Conservation Act 2016 (NSW).	App E BSSAR
	II.	Therefore the Department recommends another mechanism, such as Biobanking be considered for the offset sites.		
	C. Management			
	I.	The PD commits to five years of management in the offset area. In order for the proposed offsets to meet the Offsets Policy, the legal protection and ongoing financing for the management must be provided. Please provide further information.	Under a BSA the site will be actively managed for a period of 20 years in accordance with the Total Fund Deposit and Management Plan.	App E BSSAR
	II.	Please provide additional information regarding management that will be undertaken to improve or maintain the quality of the proposed offset in response to threats.	Refer to the Management Plan contained within the BSSAR (Appendix E).	App E BSSAR
	III.	Management actions should attempt to address the key threatening processes for *T.juncea* which include habitat degradation, weed invasion and inappropriate fire regimes.		
	IV.	The PD states fire will be used to manage bushfire risk. Please provide clarification regarding the proposed offset fire management, noting that any fire regime must be for the benefit of the species and ecological management.		
	V.	As outlined above the Department does not support public use/access offset sites as public access is likely to result in further impacts to species in the proposed	Public access will be restricted to designated existing walking trails within the BSA site.	App E BSSAR

Additional Information Required			Response	Document Reference
		offset.		
	D. Monitoring program			
	I.	Objectives, performance criteria, thresholds for corrective actions are required in accordance with SMART.	Refer to the Management Plan contained within the BSSAR (Appendix E).	App E BSSAR
	II.	Please ensure the goals of the monitoring program are specific to what the management activities are trying to achieve.		
	III.	Please ensure all timing/monitoring periods proposed for the monitoring program are long enough to determine the management measures will be effective.		
	IV.	Please detail the performance and contingency measures, actions and reporting that will be implemented in the event that management is not achieving an increase in quality.		

AEP

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Appendix A – Conacher Preliminary Documentation (2014)

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ECOLOGICAL INFORMATION REPORT
FOR
PRELIMINARY DOCUMENTATION PACKAGE

PROPOSED MYALL ROAD
RESIDENTIAL SUBDIVISION

EP&BC ACT REFERRAL 2014/7217

SEPTEMBER 2014
REF: 4055

ECOLOGICAL INFORMATION REPORT
FOR
PRELIMINARY DOCUMENTATION PACKAGE

PROPOSED MYALL ROAD
RESIDENTIAL SUBDIVISION

EP&BC ACT REFERRAL 2014/7217

Conacher Consulting Pty Ltd

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PREFACE

This Ecological Information Report has been prepared by *Conacher Consulting* as part of the Preliminary Documentation Package for the proposed Myall Road Residential Subdivision to enable the assessment of Referral No. 2014/7217 under the *Environment Protection and Biodiversity Conservation Act* (1999).

PROJECT TEAM

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PART I
INTRODUCTION AND BACKGROUND INFORMATION

This Ecological Information Report has been prepared by *Conacher Consulting Pty Ltd* as part of the Preliminary Documentation Package for the proposed Myall Road Residential Subdivision to enable the assessment of Referral No. 2014/7217 under the *Environment Protection and Biodiversity Conservation Act* (1999).

This additional information has been provided for inclusion within the Preliminary Documentation Package to enable interested stakeholders and the Minister to understand the environmental consequences of the proposed development. The information provided is objective, clear succinct and is supported where appropriate by relevant maps, plans and other descriptive detail.

The additional information provided has been prepared to address the content, format and style requirements identified by the Department of the Environment in their correspondence dated 4 July 2014.

The level of analysis and detail provided reflects the level of expected impacts on the environment and assumptions and/or limitations made in the assessment have been discussed.

The text information provided has been produced in A4 size will all maps produced in colour as either A4 or A3 size.

PART II

SECTION 1
DESCRIPTION OF THE EXISTING ENVIRONMENT

1.A.1 *Location and area of mine subsidence area*

Mine subsidence mapping for the site indicated that the eastern and central portions of the site were potentially affected by mine subsidence. Preliminary ecological site surveys undertaken by RPS (2010) observed that 2.75 hectares of land within the eastern sections of the site contained large holes and was unstable and not safe for access during surveys due to possible mine subsidence impacts. These areas were assessed by Conacher Environmental Group during initial site inspections to determine the maximum possible extent of the site which could be safely surveyed. Areas determined to have potential to be affected by mine subsidence were also not accessed or surveyed by Conacher Environmental Group (2013) for safety reasons.

The location of the land impacted by mine subsidence which was not subject to detailed surveys by Conacher Environmental Group (2013) is shown in Figure 1, this area is not likely to be impacted by the proposed development.

1.A.2 *Details and justification of the alternative methods used to approximate Tetratheca juncea individuals in mine subsidence affected areas*

Concentrated numbers of *T.juncea* clumps have been observed by Conacher Consulting during surveys to both the north and south of the mine subsidence affected area and field observations with binoculars during the *T.juncea* flowering season have confirmed that the mine subsidence area does contain *T.juncea* specimens.

The number of *T. juncea* clumps within the area of the site affected by mine subsidence was estimated by RPS (2010) at 85 clumps per hectare.

The estimate was based on:

- An average recorded clump density for occupied and surveyed *T. juncea* habitats of 136 clumps per hectare; and
- Approximately 62.5% (less than 2/3) of the mine subsidence area being estimated to contain occupied *T. juncea* habitat.

It is considered that the estimation of the quantity of *T. juncea* clumps within the mine subsidence area by RPS (2010) was a conservative estimate and is appropriately justified based on the detailed surveys undertaken within the areas of occupied *T. juncea* habitat elsewhere within the site.

1.B.1 Details of surveys undertaken for *Cryptostylis hunteriana* and *Diuris praecox*

***Cryptostylis hunteriana* Surveys**
Targeted site surveys for *C. hunteriana* were undertaken by RPS (2010) on 9 November 2009 and by Conacher Environmental Group (2013) on 26 February 2013.

***Diuris praecox* Surveys**
A total of ten (10) targeted surveys for *D. praecox* have been conducted across the site.

The site was surveyed for this species by RPS (2010) during three (3) surveys conducted on the following dates:

- 1 September 2009
- 2 September 2009; and
- 9 September 2009.

The site was surveyed for this species by Conacher Environmental Group (2013) during four (4) surveys conducted on the following dates:

- 3 September 2012

- 17 September 2012
- 26 September 2012
- 27 September 2012

Three targeted surveys for *D. praecox* were undertaken across the site by Conacher Consulting on the following dates:

- 29 July 2014 (2 person hrs approx.)
- 15 August 2014 (3 person hrs approx.)
- 1 September 2014 (8 person hrs approx.)

In addition to these three specific surveys several site random walk-over surveys were completed by Mr Phil Conacher (Conacher Consulting) to look for the presence of *Diuris praecox*. These site walk-over surveys were conducted on the following dates:

- 17 July 2014 2hrs
- 14 September 2014 3hrs

1.B.2 Account of the survey effort and methodology used in the surveys undertaken for *Cryptostylis hunteriana* and *Diuris praecox*

***Cryptostylis hunteriana* Surveys**
Targeted surveys for *C. hunteriana* undertaken by RPS (2010), consisted of an intensive search by two ecologists who traversed the site, walking along parallel transects approximately 10 metres apart.

Targeted surveys for *C. hunteriana* undertaken by Conacher Environmental Group (2013), consisted of an intensive site search which was conducted by two ecologists who traversed belt transects of 5-10 m width across proposed future development areas, and conducted meander traverses across the other areas of the site proposed for retention.

The searches were undertaken during the previously recorded flowering period for this species within the Central Coast Lower-Lake Macquarie area (Nov. - Feb.). No specimens of *C. hunteriana* were detected during surveys.

***Diuris praecox* Surveys**

Previous Surveys (pre-2014)
Pre-2014 searches across the site for this species were undertaken in conjunction with surveys for *Tetratheca juncea*.

Surveys consisted of two ecologists walking along parallel transects approximately 10m apart across the site during the species flowering period on seven (7) occasions.

Additional Site and Reference Population Surveys (2014)
No specimens of *D. praecox* were observed within the subject site during surveys undertaken within the 2014 flowering period. The 2014 detailed surveys conducted for this species were undertaken across the site on three separate dates with other site walk-over surveys completed on 2 separate dates.

The first survey was undertaken by one ecologist (Mr Jacob Manners) on 29 July 2014 and consisted of parallel transect searches spaced approximately 10m apart, undertaken throughout the areas of proposed development, and random meander searches throughout the remaining areas of the site. The known population of *D. praecox* within Glenrock State Conservation Area was inspected on the same day as this survey, and no flowering plants were observed. Site surveys were undertaken regardless to account for potential early flowering specimens of this species.

The second survey was undertaken by one ecologist (Mr Jacob Manners) on 15 August 2014 and consisted of parallel transect searches spaced approximately 10m apart undertaken throughout the areas of proposed development and random meander searches throughout the remaining areas of the site. The known population of *D. praecox* within Glenrock State Conservation Area was inspected

on the same day as this survey and approximately 20 flowering *D. praecox* specimens were observed within the Glenrock State Conservation Area.

The third survey was undertaken by two ecologists (Mr Jacob Manners and Mr Barry Collier) and consisted of parallel transect searches spaced approximately 10m apart undertaken throughout the areas of proposed development. Extensive random meander searches were also undertaken throughout the remaining areas of the site. The known populations of *D. praecox* within Glenrock State Conservation Area, Lake Munmorah State Conservation Area and Crangan Bay were inspected on the same day as this survey. In total 8, 37 and 40 flowering *D. praecox* plants were observed respectively at each of the reference sites.

1.B.3 Description of the distribution and abundance of *Cryptostylis hunteriana* and *Diuris praecox, including population size, density and location of occurrences on-site and in the region*

***Cryptostylis hunteriana* Distribution and Abundance within the Site**
C. hunteriana has not been observed within the subject site.

***Cryptostylis hunteriana* Distribution and Abundance within the Region**
The subject site is located within the Sydney Basin Bioregion which lies on the central east coast of New South Wales. Within the Sydney Basin Bioregion the majority of recorded populations of this species occur within the northern section of the Wyong Local Government Area and the southern section of the Lake Macquarie Local Government Area (NSW OEH 2014). Known population locations are mapped in Figure 2 with details on distribution and abundance provided in Table 1.1.

TABLE 1.1
AVAILABLE INFORMATION ON THE DISTRIBUTION AND ABUNDANCE OF *CRYPTOSTYLIS HUNTERIANA* POPULATIONS IN THE REGION

Population Location	Number of Individuals	Habitat Associations		Record Date	Approximate Distance from Site	Data Source
		Vegetation	Soil Landscape			
West Head (Ku-ring-gai Chase National Park)	Unknown	Dwarf Apple/ Banksia Scrub	Not known	1955 (not recorded in recent times)	77.25 km (min estimate)	Bell (2001)
Charmhaven	30 plants	Coastal Plains Scribbly Gum Woodland	Gorokan (Erosional Landscape)	1979	35 km	Bell (2001)
Charmhaven	2 plants	Coastal Plains Scribbly Gum Woodland	Gorokan (Erosional Landscape)	1990	35 km	Bell (2001)
Chain Valley Bay	1 plant	Coastal Plains Scribbly Gum Woodland	Doyalson (Erosional Landscape)	1996-97	27 km	Bell (2001)
Vales Point-Wyee	3 plants	Coastal Plains Scribbly Gum Woodland	Doyalson (Erosional Landscape)	27/11/1995	27.9 km	Bell (2001)
Freemans Waterhole	15 plants	Freemans Peppermint Apple Bloodwood Forest	Doyalson (Erosional Landscape)	1998	17.9 km	Bell (2001)
Wyee (Wyee Road)	1 plant	Coastal Plains Scribbly Gum Woodland	Gorokan (Erosional Landscape)	29/11/1999	31 km	Bell (2001)
Catherine Hill Bay	56 plants	Narrabeen Doyalson Coastal Woodland	Awaba (Erosional Landscape)	2008	23.5 km	RPS / HSO (2007)
Kanangra Drive Gwandalan	1 plant	Coastal Plains Scribbly Gum Woodland	Doyalson (Erosional Landscape)	1/12/2013	23 km	Travers Bushfire and Ecology (2013)
Murrays Beach	1 plant	Coastal Plains Smooth-barked Apple Woodland	Awaba (Erosional Landscape)	2003	19 km	Conacher Travers (2005)

TABLE 1.1
AVAILABLE INFORMATION ON THE DISTRIBUTION AND ABUNDANCE OF *CRYPTOSTYLIS HUNTERIANA* POPULATIONS IN THE REGION

Population Location	Number of Individuals	Habitat Associations		Record Date	Approximate Distance from Site	Data Source
		Vegetation	Soil Landscape			
Tooheys Road Bushells Ridge	1 plant	Coastal Plains Scribbly Gum Woodland	Gorokan (Erosional Landscape)	2006	34 km	Cumberland Ecology (2013)

Diuris praecox Distribution and Abundance within the Site

D. praecox has not been observed within the subject site.

Diuris praecox Distribution and Abundance within the Region

Within the Sydney Basin Bioregion the majority of recorded populations of this species occur within the Wyong Local Government Area and the Lake Macquarie Local Government Area. Records are also present within the Port Stephens Local Government Area of the North Coast Bioregion, however have not been assessed as part of this report (NSW OEH 2014). Known population locations within the Sydney Basin Bioregion are mapped in Figure 3 with details on distribution and abundance provided in Table 1.2.

TABLE 1.2
AVAILABLE INFORMATION ON THE DISTRIBUTION AND ABUNDANCE OF *DIURIS PRAECOX* POPULATIONS IN THE REGION

Population Location	Number of Individuals	Habitat Associations			Record Date	Approx. Distance from Site	Data Source
		Vegetation	Soil Landscape	Other Notes			
Glenrock State Conservation Area	20 plants observed within the northern section of the SCA on 15/08/14 Estimated to be up to 300 individuals	Disturbed track edges within Coastal Plains Smooth-barked Apple Woodland (exposed to ocean sea breeze with stunted canopy)	Cedar Hill (Colluvial Landscape)	Habitat has coastal exposure	Not Known	5.5 km E	Site inspection (NSW OEH 2014)
Lake Munmorah State Conservation Area	37 observed within SCA at multiple locations on 1/09/14 Estimated to be up to 100 individuals (NSW OEH 2014)	Disturbed roadside habitat adjoining Coastal Headland Complex & Narabeen Impeded Wet heath vegetation	Awaba (Erosional Landscape)	All habitats have coastal exposure	Pers. Obs. From 2010 OEH observation date not known	28 km SSW	NSW OEH Site Inspection (NSW OEH 2014)
Wyrrabalong National Park (near Crackneck Point Lookout)	200-300	Disturbed track edges within Coastal Headland Complex vegetation	Watagan (Colluvial Landscape)	Habitat is on a coastal headland with significant coastal exposure	Not known	52.3 km SSW	NSW NPWS (2013) Wyong Shire Council
Wallarah Peninsula	30 Plants	Disturbed track edges within Coastal Headland Complex / Smooth-barked Apple Woodland / Coastal Clay Heath vegetation	Awaba (Erosional Landscape)	All habitats present have coastal or estuarine exposure	2003	19 km SSW	Conacher Travers (2005) / Bell and Driscoll (2014)

1.B.4 Quantification and description of the extent of suitable habitat on-site and in the region (including whether the habitat is critical to the survival of the species)

***Cryptostylis hunteriana* Quantification and Description of Suitable Habitat within the Region**
Within the region this species is rare and associated within the following vegetation types:

- Dwarf Apple/ Banksia Scrub (1 location)
- Coastal Plains Scribbly Gum Woodland (7 locations)
- Freemans Peppermint Apple Bloodwood Forest (1 location)
- Narrabeen Doyalson Coastal Woodland (1 location)
- Coastal Plains Smooth-barked Apple Woodland (1 location)

Reported vegetation structure at known sites comprises low (8-12m high) open woodland vegetation with heathy understorey.

The habitats of this species within the Sydney Basin Bioregion are concentrated within the northern section of the Wyong Shire and the southern section of the Lake Macquarie local government areas.

***Cryptostylis hunteriana* Quantification and Description of Suitable Habitat within the Site**

Despite the undertaking of targeted searches, this species has not been observed within the subject site.

The site is mapped as occurring on the Gateshead and Killingworth erosional soil landscapes. All of the known populations of this species within the region occur on the Gorokan, Doyalson and Awaba erosional soil landscapes.

Conacher Environmental Group (2013) identified that the subject site contains the following vegetation community types:

- Coastal Plains Forest (*Angophora costata* / *Corymbia gummifera*) / Variant 1 Open Forest with Woody Shrub Understorey;
- Coastal Plains Forest (*Angophora costata* / *Corymbia gummifera*) / Variant 2 Open Woodland with Heath Understorey; and
- Sheltered Open Forest (*Eucalyptus piperita / Angophora costata*).

Based on analysis of the regional occurrences of *C. hunteriana*, it is considered that there is potential for this species to occur within the areas of the site which support Coastal Plains Forest (*Angophora costata* / *Corymbia gummifera*) / Variant 2 Open Woodland with Heath Understorey.

Areas of Coastal Plains Forest (*Angophora costata* / *Corymbia gummifera*) / Variant 1 Open Forest with Woody Shrub Understorey vegetation do not exhibit the low open woodland structure or have the characteristic heathy understorey of other known habitats within the region and are therefore considered as not likely to provide suitable habitat for this species.

The Sheltered Open Forest (*Eucalyptus piperita / Angophora costata*) vegetation community is not known be associated with this species and is also considered to not provide suitable habitat for this species.

***Diuris praecox* Quantification and Description of Suitable Habitat within the Region**

Within the region this species occurs in heathy vegetation and open heathy forests in near coastal locations. The majority of the known sites for this species occur within the following habitat types:

- Disturbed edge habitat adjoining Coastal Headland Complex vegetation (3 locations);
- Disturbed edge habitat adjoining adjoining Narabeen Impeded Wet Heath vegetation (1 location);
- Disturbed edge habitat within Coastal Plains Smooth-barked Apple Woodland (2 locations);
- Coastal Clay Heath vegetation (1 location).

Based on assessment of the known locations for this species throughout the district and region it is evident that all previously recorded locations consist of disturbed edge habitats and occur in locations within 2 km of the sea. Where this species was associated with woodland vegetation the structure was low forest <15m in height. The subject site does not contain the soil types or coastal locations where this species has been previously recorded.

***Diuris praecox* Quantification and Description of Suitable Habitat within the Site**

Despite the undertaking of targeted searches, this species has not been observed within the subject site during surveys.

The site is mapped as occurring on the Gateshead and Killingworth erosional soil landscapes. All of the known populations of this species within the region occur on the Cedar Hill and Watagan Colluvial soil landscapes and the Awaba erosional soil landscape.

The subject site contains the following vegetation community types:

- Coastal Plains Forest (*Angophora costata* / *Corymbia gummifera*) / Variant 1 Open Forest with Woody Shrub Understorey;
- Coastal Plains Forest (*Angophora costata* / *Corymbia gummifera*) / Variant 2 Open Woodland with Heath Understorey; and
- Sheltered Open Forest (*Eucalyptus piperita / Angophora costata*).

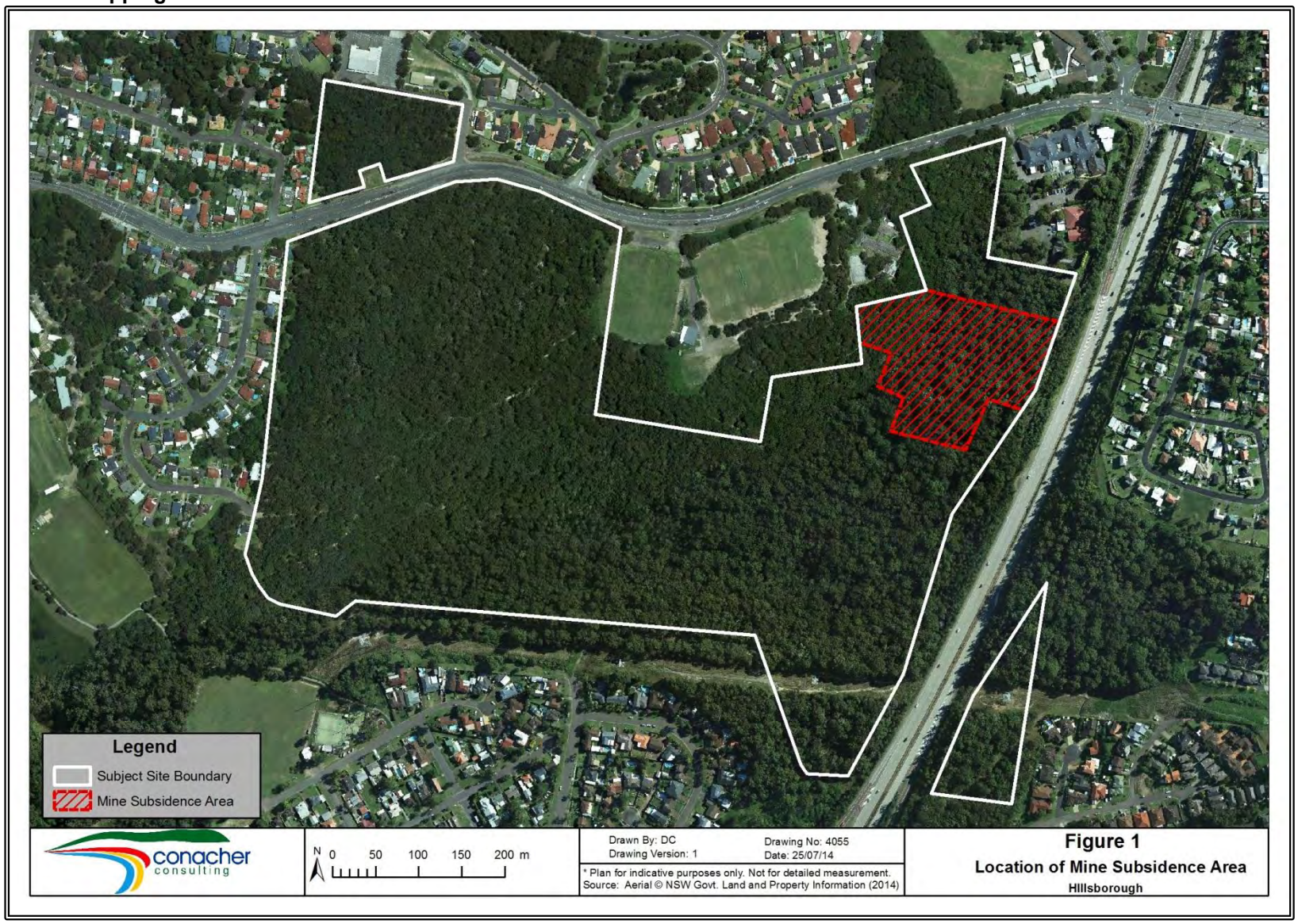
The subject site supports Coastal Plains Open Forest (*Angophora costata* / *Corymbia gummifera*) vegetation. Within the region *D. praecox* has been previously recorded within Coastal Plains Smooth-barked Apple Woodland on the Wallarah Peninsula.

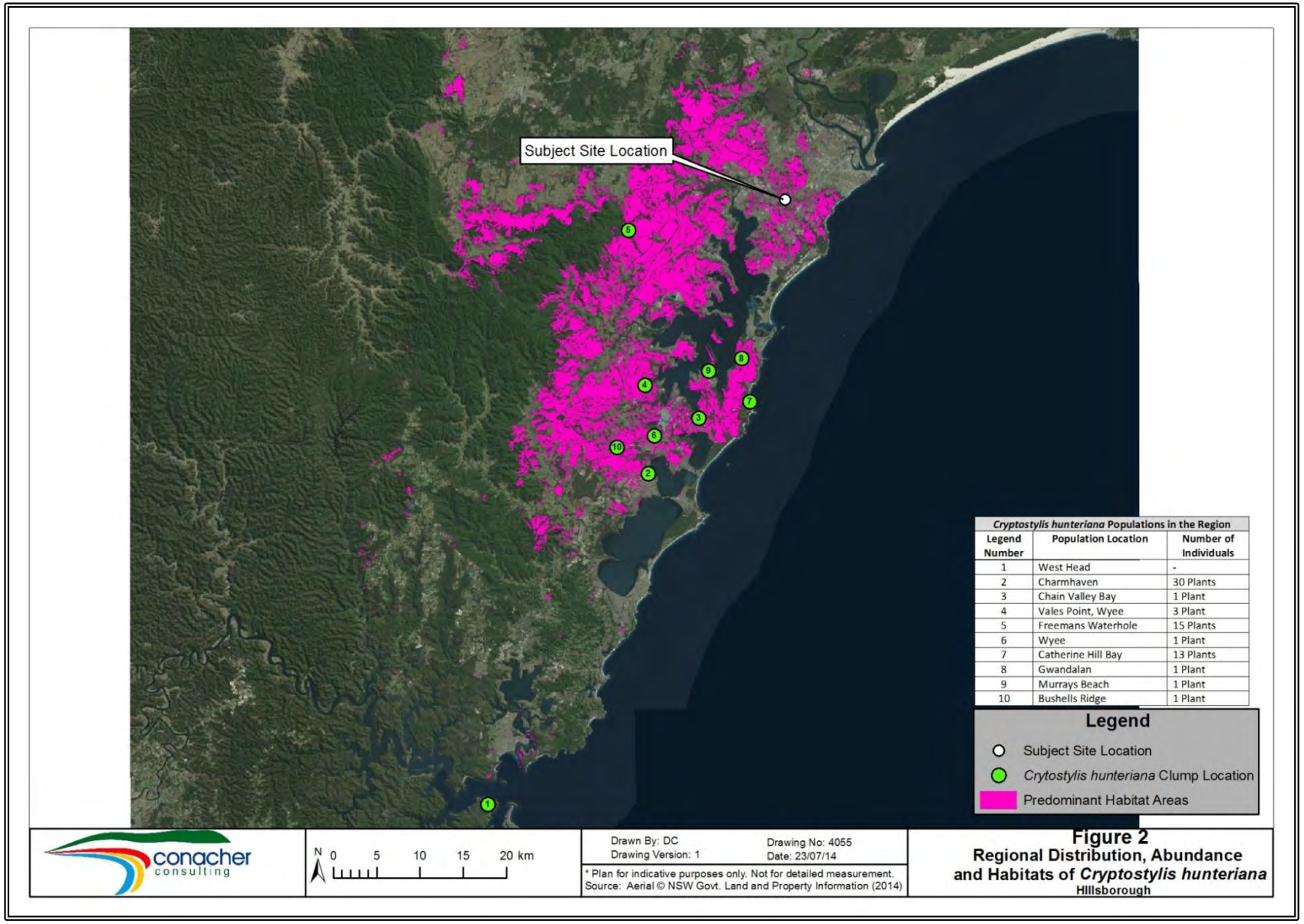
Although the vegetation contained within the site is similar to known habitat on the Wallarah Peninsula it is considered that known habitats for this species within the region differ substantially from those contained within the subject site due to the following reasons:

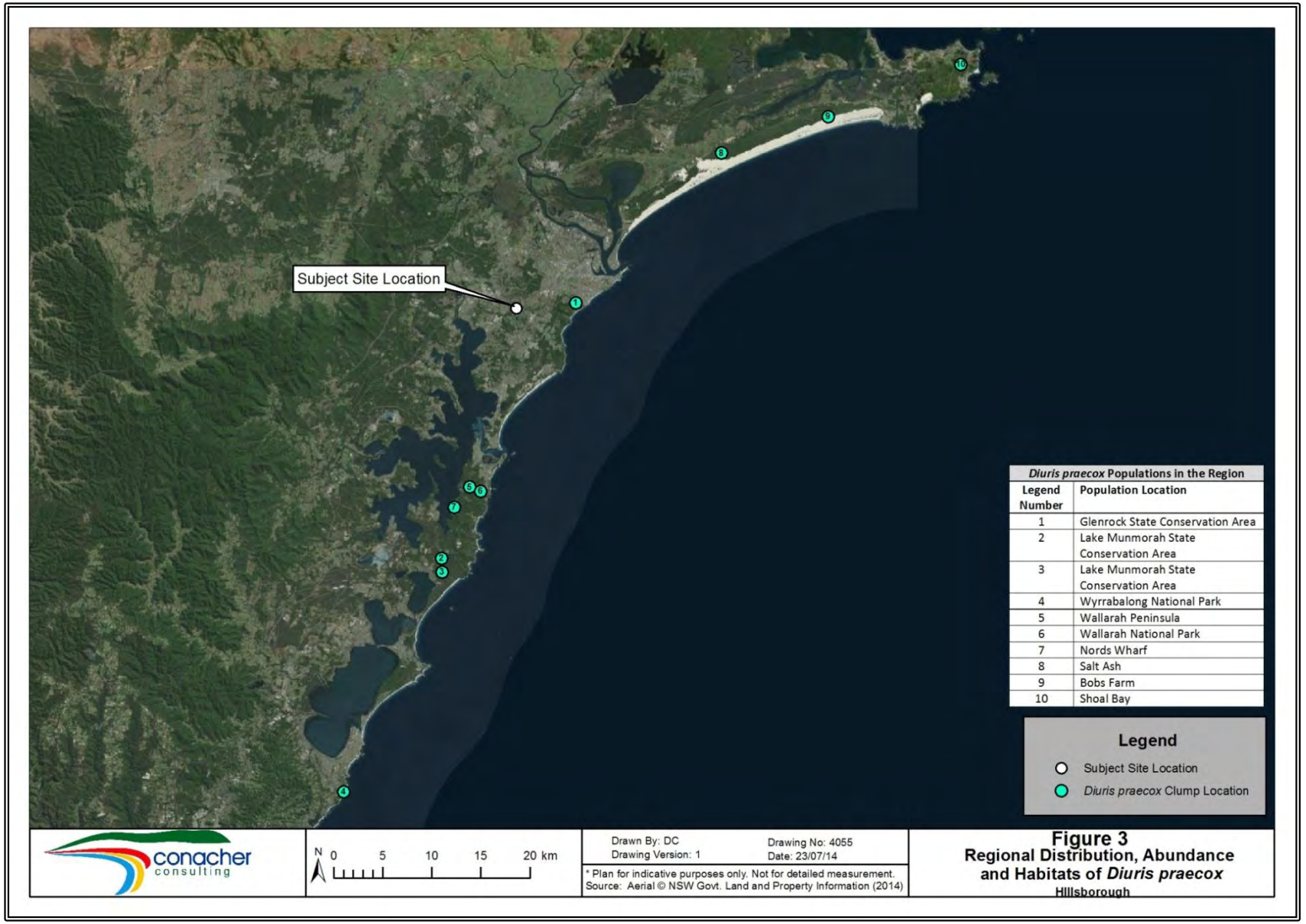
- The Coastal Plains *(Angophora costata / Corymbia gummifera*) vegetation within the area of the proposed action is of tall open forest structure (Height: to 30m; PFC: to 70%) in comparison to the other known habitat locations within the region, which when inspected mostly did not have a eucalypt canopy or contained a low canopy to <15m in height.
- The site is located an additional 3 km further from the sea than all other know records for this species. The site is considered to not constitute near coastal habitat (<2 km from the sea) in which all other recorded populations within the region have been recorded within.
- The topographic surrounds are such that the site is not likely to experience coastal exposure typical of other known locations.

Based on the additional assessment undertaken as part of this report it is considered that the subject site of the proposed action does not contain any suitable habitat for this species.

1.B.5 Mapping of information utilised for assessment




Subject Site Location
6
9
8
4
7
3
5
10
2
1
Cryptostylis hunteriana Populations in the Region
Legend Number | Population Location | Number of Individuals
1 | West Head | -
2 | Charmhaven | 30 Plants
3 | Chain Valley Bay | 1 Plant
4 | Vales Point, Wyee | 3 Plant
5 | Freemans Waterhole | 15 Plants
6 | Wyee | 1 Plant
7 | Catherine Hill Bay | 13 Plants
8 | Gwandalan | 1 Plant
9 | Murrays Beach | 1 Plant
10 | Bushells Ridge | 1 Plant
Legend
Subject Site Location
Crytostylis hunteriana Clump Location
Predominant Habitat Areas
conacher consulting
N 0 5 10 15 20 km
Drawn By: DC
Drawing No: 4055
Drawing Version: 1
Date: 23/07/14
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © NSW Govt. Land and Property Information (2014)
Figure 2
Regional Distribution, Abundance and Habitats of *Cryptostylis hunteriana*
Hillsborough


Subject Site Location
Diuris praecox Populations in the Region
Legend Number | Population Location
1 | Glenrock State Conservation Area
2 | Lake Munmorah State Conservation Area
3 | Lake Munmorah State Conservation Area
4 | Wyrrabalong National Park
5 | Wallarah Peninsula
6 | Wallarah National Park
7 | Nords Wharf
8 | Salt Ash
9 | Bobs Farm
10 | Shoal Bay
Legend
Subject Site Location
Diuris praecox Clump Location
conacher consulting
N 0 5 10 15 20 km
Drawn By: DC
Drawing Version: 1
Drawing No: 4055
Date: 23/07/14
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © NSW Govt. Land and Property Information (2014)
Figure 3
Regional Distribution, Abundance and Habitats of *Diuris praecox*
Hillsborough

SECTION 2
RELEVANT IMPACTS

2.A Additional Information to Determine Direct and Indirect Impacts to *Tetratheca Juncea* Onsite

2.A.1 The total amount of *Tetratheca juncea* habitat (in hectares) on the site, both in the impact area and the area proposed to be retained.

An assessment of the amount of *Tetratheca juncea* habitat on the site (in hectares) is listed in Table 2.1. These areas are mapped in Figure 4.

TABLE 2.1
AREAS OF OCCUPIED *TETRATHECA JUNCEA* HABITAT ON THE SITE

Total Area	21.33 ha
Area to be Retained	13.75 ha*
Area to be Removed	7.58 ha

*includes 1.72 hectares (ie. 62.5%) of mine subsidence area.

2.A.2 An assessment and quantification of the indirect impacts to the area of habitat proposed to be retained on site during both the construction and operational phases of the project including those resulting from:

a) Urban edge effects (including changes to microclimate, altered hydrology, invasion by exotic species, alteration of soil conditions such as sedimentation and nutrient availability, trampling, rubbish dumping etc.).

Detailed assessment of the proposal in accordance with the EPBC Act (1999) Referral Guidelines for the Vulnerable Black-eyed Susan (SEWPAC 2011), *Tetratheca juncea*, determined that the proposal is not likely to cause a high risk of significant impacts on this species, but rather an uncertain risk level of significant impact. The information provided in this assessment is required to further document the potential risk to this species as a whole resulting from the proposed development.

It is considered that potential urban edge effects will be mitigated through the following future management actions, best practice engineering design and environmental avoidance and mitigation measures:

- Conservation and rehabilitation of non-development areas of the site as a biodiversity offset in accordance with the EPBC Act Biodiversity Offsets Policy.
- Provision of a perimeter access road around the outside of the development footprint as a buffer between areas of retained vegetation and future residential subdivision.
- Incorporation of bushfire asset protection zones within the development footprint and the perimeter access road, not within the retained conservation areas.
- Provision of services within the development footprint (no new services easements proposed through areas of retained bushland); and
- Retention of a portion of the occupied *T. juncea* habitat areas as large area patches with minimised edge to area ratios along the western boundary and within the eastern sections of the site to enable 74% retention of the plant clumps present and 62.7 ha of occupied habitats.
- Avoidance of potential significant impacts to *T. juncea* and other threatened species in accordance with local Council advice and assessment under the NSW Environmental Planning and Assessment Act (1979) and NSW Threatened Species Conservation Act (1995).
- Transfer of proposed biodiversity offset areas on the site to Local Council ownership as Community Land for conservation of natural features, bushland and threatened species habitats in perpetuity with a developer funded vegetation management plan which will cover ongoing management requirements under the NSW Local Government Act (1993).

b) Fragmentation and the loss of connectivity.

The management of urban edge effects will be undertaken through implementation of the following key strategies:

- Maintenance of habitat function through provision of a reduced width development footprint within southern section of the development layout in order to maintain site connectivity by potential *T. juncea* pollinators such as bees. Furthermore this area will only include roads and stormwater management infrastructure with no buildings in order to ensure pollinator connectivity between the eastern and western habitat retention areas.

- Maintenance of habitat function through retention of all potential habitat connection points between the subject site and adjoining lands within the locality.

2.A.3 Discussion of the potential impact to the long-term viability and survival of the remaining individuals onsite.

The subject site is zoned for residential development and not subject to any conservation management requirements in addition to existing legislative requirements under the current zoning. The current proposal seeks to recognise the development potential of the site, while ensuring a sustainable environmental outcome through the retention of strategic habitat areas and provision of biodiversity offsets.

Potential adverse impacts to the long-term viability and survival of the remaining *T. juncea* individuals within the conservation areas will be mitigated through the implementation of the following measures:

- Retention of the habitats containing retained *T. juncea* as biodiversity offsets under the *EP&BC Act* (1999) in perpetuity with management through a developer funded management plan.

- Transfer of the habitats to be retained as biodiversity offsets to Council ownership through the provision of a voluntary planning agreement.

- Configuration of the proposed habitat retention areas to minimise future habitat edge to area ratio increases.

- Maintenance of habitat function through the retention of pollinator connectivity both through the site and between the site and surrounding habitats.

- Exclusion of bushfire asset protection zones from retained areas of *T. juncea* habitat.

2.A.4 Analysis of the scale of the impacts relative to the local and regional occurrences of the threatened species surrounding the site.

Mapping of the regional distribution, abundance and habitats of *T. juncea* is provided in Figure 5. An assessment of impacts and conservation outcomes of selected previous and ongoing major developments within the region involving *T. juncea* is provided in Table 2.2. This information has been sourced from The Lake Macquarie *Tetratheca juncea* Planning and Management Guidelines (Lake Macquarie City Council 2014) and information on the EPBC Act Referral search webpage (AGDE 2014). Details of EPBC Act Referral reference numbers are provided where relevant.

TABLE 2.2
ANALYSIS OF SELECTED PREVIOUS AND ONGOING DEVELOPMENT OUTCOMES FOR *TETRATHECA JUNCEA*

Major Development Proposals	Identified Impact on *Tetratheca juncea*	Likley Conservation Outcome	Controlled Action Status
Northlakes Residential Development (Precincts 2-4)	249 plant clumps removed	1787 plant clumps retained	Not a controlled action (Referral No. 2009/5111)
Cameron Park / Pambulong	91 plant clumps removed	1540 plant clumps retained	-
West Wallsend	0 plant clumps removed	74 plant clumps retained	-
Coal and Allied (Minmi and Black Hill)	10 plant clumps removed	352 plant clumps retained	Not a controlled action (Referral No. 2008/4603)
Coal and Allied (Middle Camp and Nords Wharf)	1282 plant clumps removed	13,529 plant clumps retained	Approved with conditions (Referral No. 2008/4419)
Rosecorp (Catherine Hill Bay)	189 plant clumps removed	1000+ plant clumps retained	Approved with conditions (Referral No. 2007/3411)
Stockland Residential Development / Wallarah Northern and coastal Precincts	8605 plant clumps located within development area (unspecified amount of within lot retention identified)	Local population across Wallarah Peninsula identified as 25,135 plant clumps. Total of 9988 plant clumps proposed for retention within land dedicated to the Wallarah National Park	Not a controlled action (Referral No. 2007/3412 & No.2006/2810)
Lake Macquarie City Council / Awaba Alternative Waste Treatment Facility	871 plant clumps to be removed	12,176 plant clumps within local population to remain	Identified as a controlled action (Referral No. 2012/6432)
Lake Macquarie City Council / Additions to Awaba Waste Disposal Facility	2118 plant clumps to be removed (based in initial referral information)	14822 plant clumps identified within local population	Approved with conditions (Referral No. 2011/5973)
Centennial Northern Coal Services / Coal Logistics Upgrade Project	583 plant clumps to be removed	425 plant clumps to be retained	Identified as a controlled action (Referral No. 2013/6906)

2.B Additional Information to Determine Potential Direct and Indirect Impacts to *Cryptostylis hunteriana* and *Diuris praecox.*

This information is not required to be provided as these species have not been observed within or adjoining the subject site during surveys.

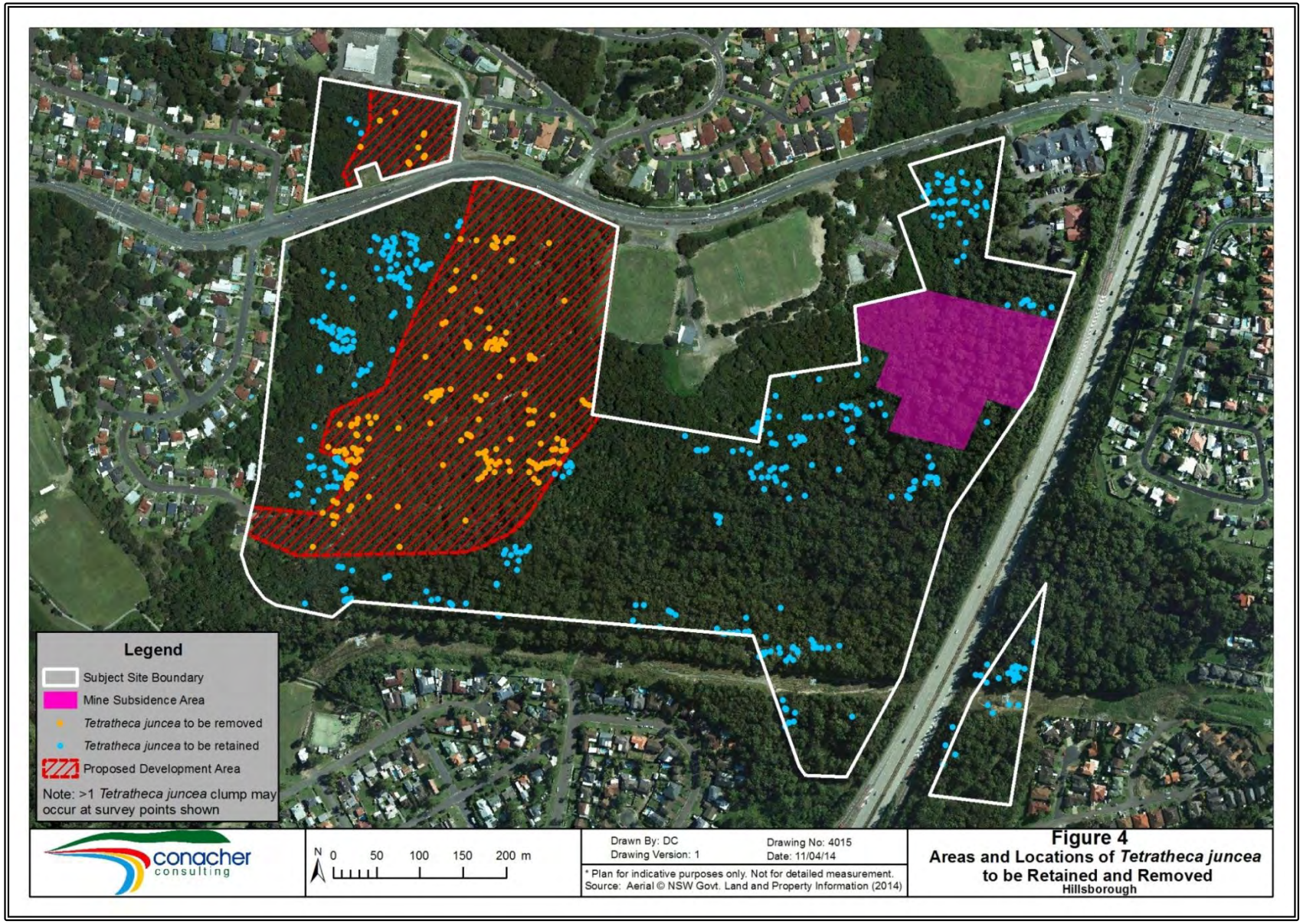


Figure 4
Areas and Locations of *Tetratheca juncea* to be Retained and Removed
Hillsborough

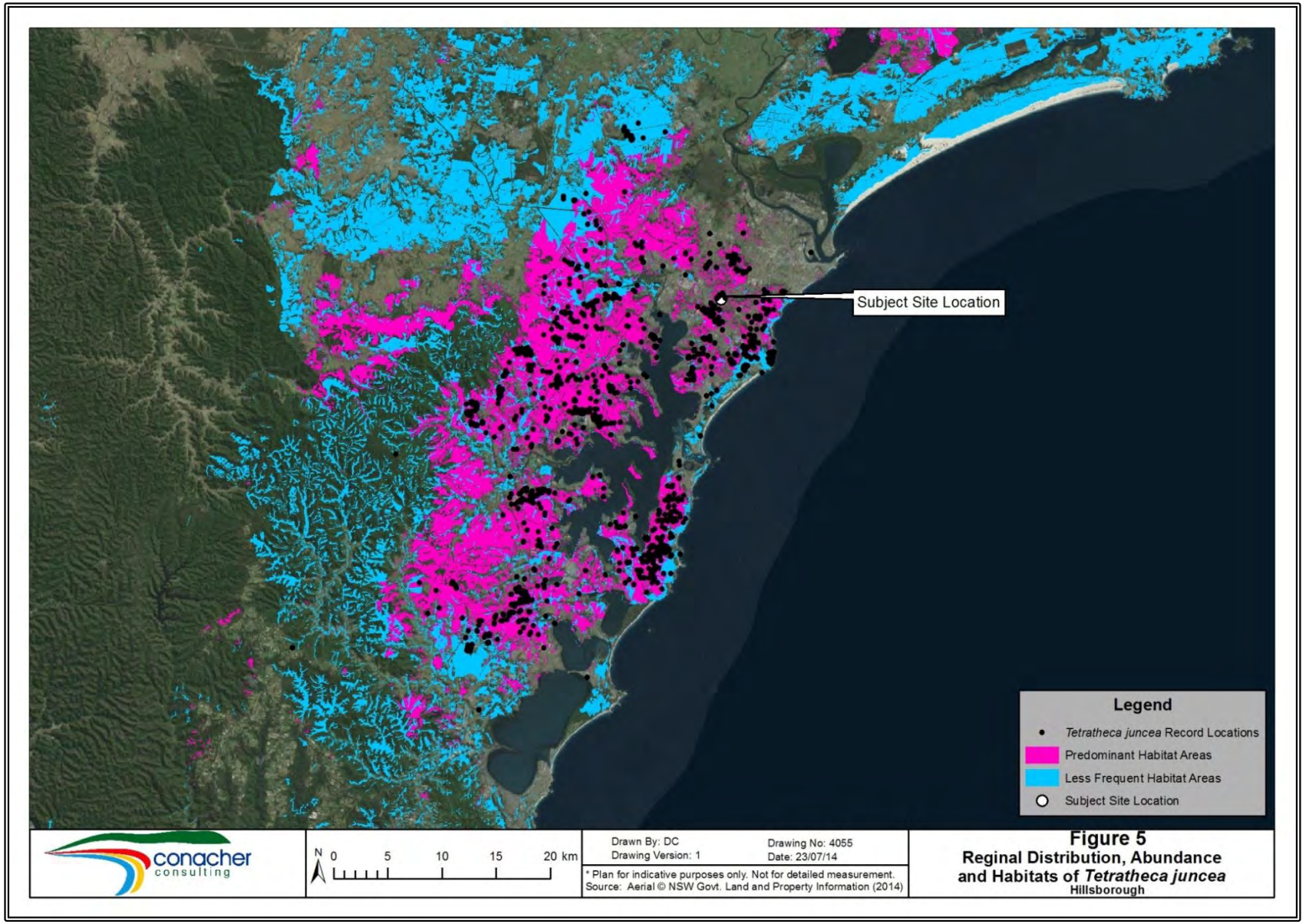


Figure 5
Reginal Distribution, Abundance and Habitats of *Tetratheca juncea*
Hillsborough

SECTION 3
PROPOSED AVOIDANCE, SAFEGUARDS AND MITIGATION MEASURES

3.A Description of avoidance and mitigation measures to reduce fragmentation impacts to *Tetratheca juncea* to ensure ongoing viability of the population to be retained onsite with regard to mitigating impacts to pollination and dispersal mechanisms and habitat conditions.

Previous State and Local Planning Considerations

The proposed development footprint has been determined following detailed biodiversity surveys and consultation with the NSW Department of Planning, NSW Office of Environment and Heritage, and Lake Macquarie City Council regarding the retention of the important biodiversity characteristics of the site in order to avoid potential significant effects to threatened biodiversity listed under both state and federal threatened species legislation.

The areas of the site considered for residential development are shown in Figure 6. The initial residential development investigation area covered most of the subject site. Following the initial biodiversity surveys and a constraints analysis the investigation was substantially reduced to mitigate potential biodiversity impacts. The reduced area is reflected in the development footprint area shown in Figure 6.

The development footprint was further refined to reduce potential impacts to *Tetratheca juncea,* associated with habitat loss and fragmentation, particularly in the south-western section of the site. These ongoing reductions in the extent of the proposed development, and subsequent increase in the proposed conservation area, were achieved by relocating the bushfire asset protection zones into the residential development area and reducing the eastern and western extent of the development areas. The refinement resulted in the identification of the current proposed development layout shown in Figure 6. It should be noted that the proposed access road in the south-western section of the site is a bushfire planning requirement of the NSW Rural Fire Service and cannot be excluded from the proposal.

A Site Compatibility Certificate was approved under the NSW State Environmental Planning Policy (Infrastructure) 2007 by the NSW Department of Planning which certifies that in the Director General's opinion, the proposed development areas are compatible with the surrounding land uses and the proposal is not likely to have an adverse effect on the environment such that it would cause any unacceptable environmental risks to the land.

Tetratheca juncea Fragmentation Considerations

Reproduction in *T. juncea* is through asexual rhizomal spread and sexual pollination, seed development and germination. Pollination has been observed by native bees (including *Lasioglossum convexum* and *Exoneura* sp.) and seed dispersal appears to occur through ants collecting the seed (Driscoll 2003).

It is considered that buzz pollination by bees is likely to provide the greatest source of genetic material movement through the site and across the site boundary. Seed dispersal by ants is considered likely to also contribute to the spread of genetic material throughout the site and across the site boundary, but perhaps at much slower time scales. Asexual reproduction is considered to result in population increase within the site, however would not contribute substantially to the spread of genetic material.

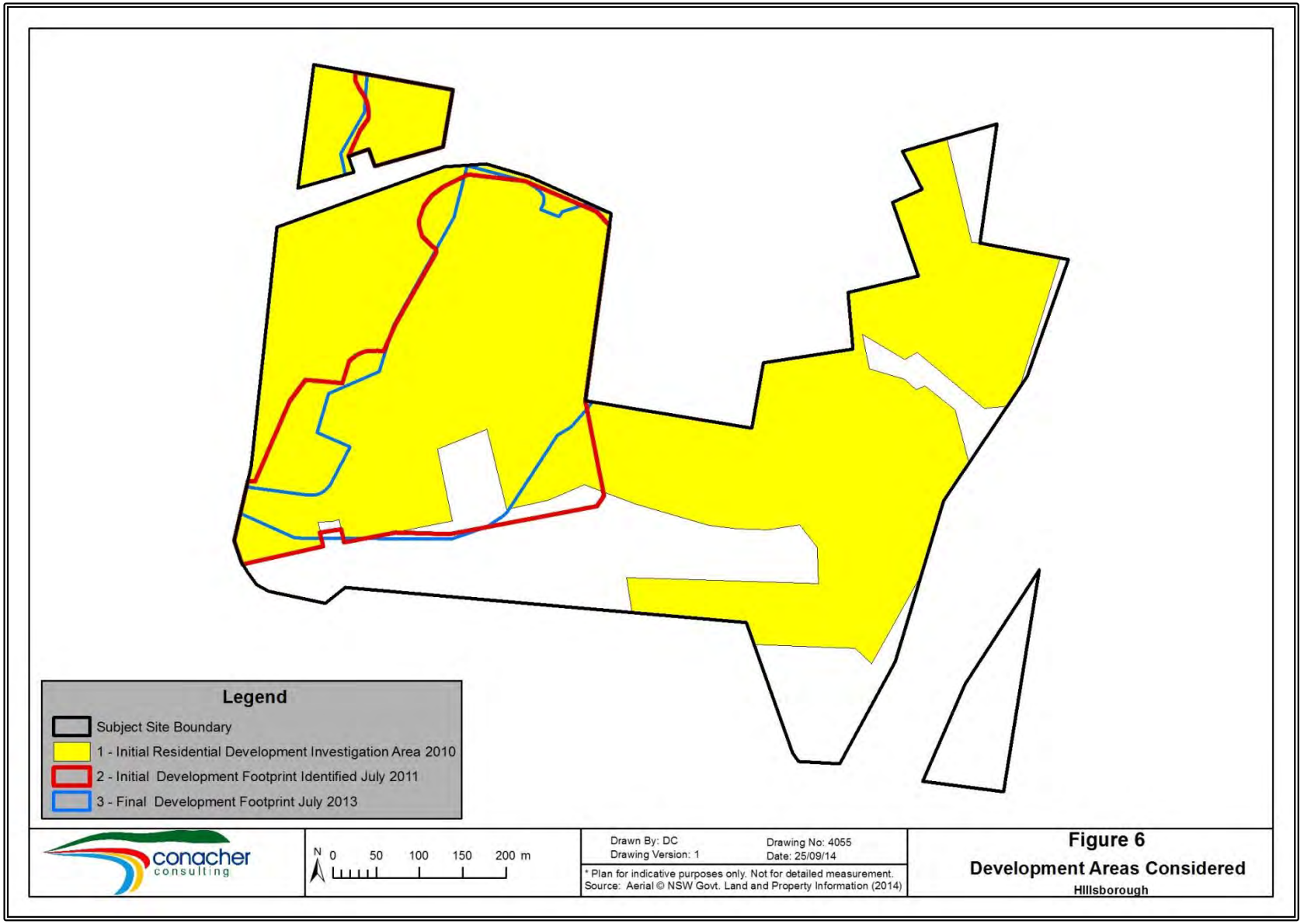
The proposed development footprint has been designed to avoid an increase in fragmentation between the overall site area and all existing offsite habitats. Measures which will be achieved include:

- Retention of habitat areas to the south of Myall Road which are adjacent to habitat areas to the north of Myall Road;
- Retention of all habitats in the eastern section of the site,
- Retention of all habitats along the southern site boundary;
- Retention of all habitats along the western site boundary with the exception of the proposed road connection to Gillian Crescent which is required to satisfy bushfire planning requirements of the NSW Rural Fire Service.

The proposed development footprint has been designed to minimise fragmentation impacts to *T. juncea* habitat within the site. Measures which will be achieved include:

- Maintenance of the existing pollinator connectivity between the central site area and the *T. juncea* habitat patch which forms part of the site to the north of Myall Road.

- Maintenance of the existing pollinator connectivity between *T. juncea* habitats within the central eastern site area which occurs on a rise adjacent to the Newcastle Inner City Bypass and the site *T. juncea* habitat patch which occurs to the east of the Newcastle Inner City Bypass.
- Maintenance of the existing pollinator and seed dispersal connectivity between the *T. juncea* habitat patches which occur either side of the existing services easement in the southern section of the central site area.
- Maintenance of pollinator and potentially some seed dispersal connectivity between the areas east and west of the proposed development footprint through the provision of a reduced width development footprint within southern section of the development footprint. This area will include roads and stormwater management infrastructure and associated revegetation surrounding these structures, with no construction of buildings. This measure has been designed to ensure pollinator connectivity between the eastern and western habitat retention areas.


Legend
Subject Site Boundary
1 - Initial Residential Development Investigation Area 2010
2 - Initial Development Footprint Identified July 2011
3 - Final Development Footprint July 2013
conacher consulting
N 0 50 100 150 200 m
Drawn By: DC
Drawing Version: 1
Drawing No: 4055
Date: 25/09/14
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © NSW Govt. Land and Property Information (2014)
Figure 6
Development Areas Considered
Hillsborough

B. Further information regarding mitigation measures that will be undertaken to prevent or minimise potential direct or indirect impacts to *Tetratheca juncea* including:

1. A description of the proposed mitigation measures for all phases of the action (construction and operation) to reduce impacts including for each measure, the environmental objectives, performance criteria, monitoring, reporting (by whom, to whom, how often), corrective actions (including thresholds for actions), responsibility and timing for proposed mitigation measures.

Further details of the mitigation measures proposed are provided in Table 3.1. The measures described are in addition to the avoidance and offset measures which have been separately documented within this report.

TABLE 3.1
DESCRIPTION OF PROPOSED MITIGATION MEASURES

Mitigation Measure	Implementation Phase	Environmental Objective	Performance Criteria	Monitoring Requirement	Reporting Requirement	Responsibility	Timing
Management of Key Threatening Processes	During subdivision construction and occupation	Prevent and remediate impacts of land clearance within the retained areas of the site Rehabilitate native plant and animal habitat by controlling invasions of escaped garden plants.	Strategic rehabilitation of disturbed areas to achieve total revegetation over a five year period. Targeted control of major weed infestations to achieve <5% weed cover and >80% survival rate for all supplementary plantings over a five year period	Annually for five years	Annually for five years	Urban Growth	Five years from the commencement of clearing works

TABLE 3.1 DESCRIPTION OF PROPOSED MITIGATION MEASURES							
Mitigation Measure	**Implementation Phase**	**Environmental Objective**	**Performance Criteria**	**Monitoring Requirement**	**Reporting Requirement**	**Responsibility**	**Timing**
Management of Fire Regimes	During subdivision construction and occupation	Mitigate impacts associated with altered fire regimes. Implement asset protection zones in accordance with NSW Rural Fire Service Approvals. Ensure management in accordance with the Lake Macquarie Bushfire Risk Management Plan.	APZ implementation to comply with NSW Rural Fire Service requirements. Bushfire Risk Management not to exceed thresholds specified within the Lake Macquarie Bushfire Risk Management Plan. Any back burning operations in *T. juncea* habitat areas are not to include slow cool fires which may damage roost stock.	APZ clearing works to be designated and monitored by surveyors and consulting ecologist. To be monitored annually for five years.	Annually for five years following subdivision construction.	Urban Growth	Initial creation of APZs to be undertaken during construction phase. Ongoing APZ and bushfire management to occur in perpetuity.

TABLE 3.1 DESCRIPTION OF PROPOSED MITIGATION MEASURES							
Mitigation Measure	**Implementation Phase**	**Environmental Objective**	**Performance Criteria**	**Monitoring Requirement**	**Reporting Requirement**	**Responsibility**	**Timing**
Management of Weed Invasion	During subdivision construction and occupation	Control identified areas containing weed invasions	Strategic rehabilitation of disturbed areas to achieve total revegetation over a five year period. Targeted control of major weed infestations to achieve <5% weed cover	Annually for five years	Annually for five years	Urban Growth	Five years from the commencement of clearing works
Targeted Revegetation of Degraded Areas	During subdivision construction and occupation	Mitigate impacts of habitat degradation through the revegetation areas of habitat degraded by undesirable vehicle and bike track construction	Strategic rehabilitation of disturbed areas to achieve total revegetation over a five year period.	Annually for five years	Annually for five years	Urban Growth	Five years from the commencement of clearing works
Access Exclusion and Management	During subdivision construction	Mitigate impacts of habitat degradation through exclusion of vehicle and motorbike access to areas of retained bushland	Implement access controls during subdivision construction works	Annually for five years	Annually for five years	Urban Growth	Implement controls during subdivision construction works

TABLE 3.1 DESCRIPTION OF PROPOSED MITIGATION MEASURES							
Mitigation Measure	**Implementation Phase**	**Environmental Objective**	**Performance Criteria**	**Monitoring Requirement**	**Reporting Requirement**	**Responsibility**	**Timing**
Prevention and Management of Rubbish Dumping	During subdivision construction and occupation	Mitigate habitat degradation impacts through the removal dumped rubbish and provision of access exclusion to prevent further dumping events	Removal of all dumped rubbish piles and abandoned vehicles	Annually for five years	Annually for five years	Urban Growth	Five years from the commencement of clearing works
Installation and utilisation of stormwater management and erosion and sediment control infrastructure	During subdivision construction and occupation	Mitigate habitat degradation impacts associated with contaminated stormwater runoff and erosion and sedimentation	Construct stormwater basins and implement sediment and erosion controls in accordance with the Landcom (2004) Blue Book.	N/A	N/A	Urban Growth	Implement controls during subdivision construction works and retain during the occupation phase.
Replanting of native flowering plants along the southern access road	Following subdivision construction	Mitigate impacts of habitat fragmentation / pollinator recruitment	>80% survival rate for all supplementary plantings over a five year period	Annually for five years	Annually for five years	Urban Growth	Five years from the completion of the southern road access.

2. An assessment of the expected or predicted effectiveness of the mitigation measures in reducing impacts on *Tetratheca juncea*, including supporting evidence.

The mitigation measures proposed will be undertaken in accordance with industry best practice standards and guidelines. The proposed revegetation and weed management works will be undertaken in accordance with the methodologies outlined within the document Restoring Natural Areas (Buchanan 2009) as published and endorsed by the NSW Government Department of Industry and Investment.

Several of the proposed mitigation measures associated with improving the existing habitat areas of the site have been accepted as effective by the Australian Government Department of the Environment on similar residential land subdivision projects involving *Tetratheca juncea,* for example a Residential Subdivision at 270 Fishery Point Road, Bonnells Bay (EPBC Referral Reference Number: 2011/5953).

3. Any statutory or policy basis for the mitigation measures.

The management measures proposed to mitigate potential impacts to *T. juncea* are to form part of the proposed offsets package which has been prepared in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (SEWPAC 2012). While the offsets policy states that offsets differ from avoidance and mitigation measures, in this particular instance they are related as the proposed offset land is located within the subject site in areas of retained habitat.

4. The cost of the mitigation measures, including how measures will be funded in perpetuity (an by whom).

The proposed mitigation measures will be funded as part of the proposed offset package.

C. Consolidated list of mitigation measures to be undertaken to prevent or minimise potential direct and indirect impacts for *Cryptostylis hunteriana* and *Diuris praecox* including:

1. A description of the proposed mitigation measures for all phases of the action (construction and operation) to reduce impacts including for each measure, the environmental objectives, performance criteria, monitoring, reporting (by whom, to whom, how often), corrective actions (including thresholds for actions), responsibility and timing for proposed mitigation measures.

Cryptostylis hunteriana and *Diuris praecox* have not been observed within the subject site, therefore mitigation measures are considered not necessary for the proposed development.

2. An assessment of the expected or predicted effectiveness of the mitigation measures in reducing impacts, including supporting evidence.

Cryptostylis hunteriana and *Diuris praecox* have not been observed within the subject site, therefore an assessment of the expected or predicted effectiveness of mitigation measures in reducing impacts is considered not necessary for the proposed development.

3. Any statutory or policy basis for the mitigation measures.

Cryptostylis hunteriana and *Diuris praecox* have not been observed within the subject site, therefore mitigation measures are considered not necessary for the proposed development.

4. The cost of the mitigation measures, including how measures will be funded in perpetuity (and by whom).

Cryptostylis hunteriana and *Diuris praecox* have not been observed within the subject site, therefore mitigation measures are considered not necessary for the proposed development.

SECTION 4
BIODIVERSITY OFFSETS

A. Provision of an Offset Package for *Tetratheca juncea* in accordance with the EPBC Act Offset Assessment Guide and Policy in accordance with the requirements of Addendum A.

A detailed offsets package is proposed and is further documented in Attachment 1 to this report. The offsets package has been determined in accordance with the Addendum A requirements utilising the EPBC Act Offsets Assessment Guide.

B. Additional Details of Vegetation Management Plan

1. Details on closing of existing tracks / trails, soil, water and erosion management, rehabilitation, vegetation buffers, bushfire management and weed and feral management.

The full list of measures to be undertaken as part of future vegetation management and habitat amelioration works on the site are as follows:

- Vegetation species composition, planting layout and densities for existing disturbed areas requiring revegetation;
- Weed monitoring and removal;
- Seed plant sources (to ensure local provenance stock is utilised);
- Details of planting priorities, rehabilitation methods and staging;
- Maintenance requirements;
- Flora and fauna / threatened species monitoring;
- Fire management;
- Feral animal management;
- Closure and rehabilitation of existing walking and vehicle tracks
- Donor topsoil areas;
- Use of machinery;
- Management of illegal dumping;
- Maintenance of riparian habitats and corridors;
- Methods for reducing stormwater impacts during construction;
- Methods for restricting and controlling public access.

All works identified above will be undertaken in accordance with industry best practice methods to the satisfaction of Lake Macquarie City Council. The further provision of detailed information regarding these matters will be provided subject to project approval, prior to the commencement of works.

2. Details of objectives, performance measures, performance indicators and thresholds for corrective actions which align with the SMART (specific, measurable, achievable, results-based and time-based) principles.

All vegetation and habitat amelioration works proposed are considered to be specific, measurable, achievable works which will achieve results within the management program timeline. The majority of the works specified will achieve a <5% weed cover within targeted areas and >80% survival rate for all supplementary plantings, over a five year period. Works associated with the management of fire regimes, illegal dumping, sediment and erosion controls and access exclusion will be undertaken prior to the commencement of civil works and/or on an as needs basis.

3. Description of consistency of the proposed offset package with the Department's Environmental Offsets Policy and the Offset Assessment Guide.

See Attachment 1.

4. Costing of proposed offsets package.

It is estimated that the proposed offsets package will cost $704,000.00.

SECTION 5
REFERENCES

Australian Government Department of Sustainability, Environment, Water, Population and Communities (2011). Environment Protection and Biodiversity Conservation Act (1999) Referral Guidelines for the Vulnerable Black-eyed Susan, *Tetratheca juncea*, Commonwealth of Australia.

Australian Government Department of the Environment (2014) *EPBC Act Policy Statement 1.1 Significant Impact Guidelines, Matters of National Environmental Significance*, Commonwealth of Australia.

Australian Government Department of the Environment (2014) Protected Matters Search Tool, EPBC Act Protected Matters Report, Website: http://www.environment.gov.au/epbc/pmst/index.html

Bell, S.A.J. (2001) Notes on population size and habitat of the vulnerable *Cryptostylis hunteriana* (Orchidaceae) from the Central Coast of New South Wales. *Cunninghamia* 7(2): 195-204.

Bell S., Driscoll C. (2010) Lake Macquarie City Council Working Draft Composite Vegetation Community Mapping December 2009, Eastcoast Flora Survey, Kotara Fair.

Buchanan R.A. 2009, *Restoring natural areas in Australia*, NSW Government Department of Industry and Investment.

Conacher Environmental Group (2013) Biodiversity Assessment Report, Proposed Residential Development Landcom Project No. 12806, Myall Road, Hillsborough. Unpublished report prepared for Landcom.

Conacher Travers (2005) Flora and Fauna Assessment Stages 8-12 Lake Sector North Wallarah Peninsula. Unpublished Report.

Cumberland Ecology (2013) Wallarah 2 Coal Project Ecological Impact Assessment. Unpublished report prepared for Hansen Bailey.

Department of Environment, Water, Heritage and the Arts (2009) *EPBC Act Policy Statement 1.1 Significant Impact Guidelines, Matters of National Environmental Significance*, Commonwealth of Australia.

Department of Sustainability, Environment, Water, Populations and Communities (2014) Protected Matters Search Tool. [Online]. Available from: http://www.environment.gov.au/epbc/pmst/index.html

Department of the Environment, Water, Population and Communities (2011) Environment Protection and Biodiversity Conservation Act (1999) Referral guidelines for the vulnerable black-eyed susan, *Tetratheca juncea*. Commonwealth of Australia.

Driscoll C. 2003, Pollination ecology of *Tetratheca juncea* (Tremandeaceae): finding the pollinators, *Cunninghamia*, 8(1) pp. 133-140.

Environmental Planning and Assessment Act (1979). New South Wales Government.

Environmental Protection and Biodiversity Conservation Act (1999). Department of Environment and Heritage.

Lake Macquarie City Council (2014) Lake Macquarie Tetratheca juncea Planning and Management Guidelines. Lake Macquarie City Council, Speers Point.

Lake Macquarie Local Environment Plan (2014) New South Wales Government.

Landcom 2004, Managing Urban Stormwater, Soils and Construction Volume 1 – 4th Edition. New South Wales Government.

Local Government Act (1993) New South Wales Government.

Matthei L.E. 1995, *Soil Landscapes of the Newcastle 1:100 000 Sheet Report*, NSW Department of Conservation and Land Management.

Murphy C.L. 1993, *Soil Landscapes of the Gosford-Lake Macquarie 1:100 000 Sheet Report*, NSW Department of Conservation and Land Management.

NSW Office of Environment and Heritage (2014) BioNet Atlas of NSW Wildlife. [Online]. Available from: http://www.bionet.nsw.gov.au/

RPS Harper Somers O'Sullivan Pty Ltd (2007) Ecological Assessment Report: Southern Lake Macquarie Lands. Unpublished Report prepared for Rosegroup Pty Ltd.

RPS (2010) Preliminary Flora and Fauna Surveys, Myall Road, Hillsborough. Unpublished report prepared for Landcom.

Threatened Species Conservation Act (1995). New South Wales Government.

Travers Bushfire and Ecology (2013) *Flora and Fauna Assessment Lot 229 DP 847847, Kanagra Drive Gwandalan*. Unpublished Report

ATTACHMENT 1
BIODIVERSITY OFFSET DETAILS

Addendum A Information
A. Offset Package Details

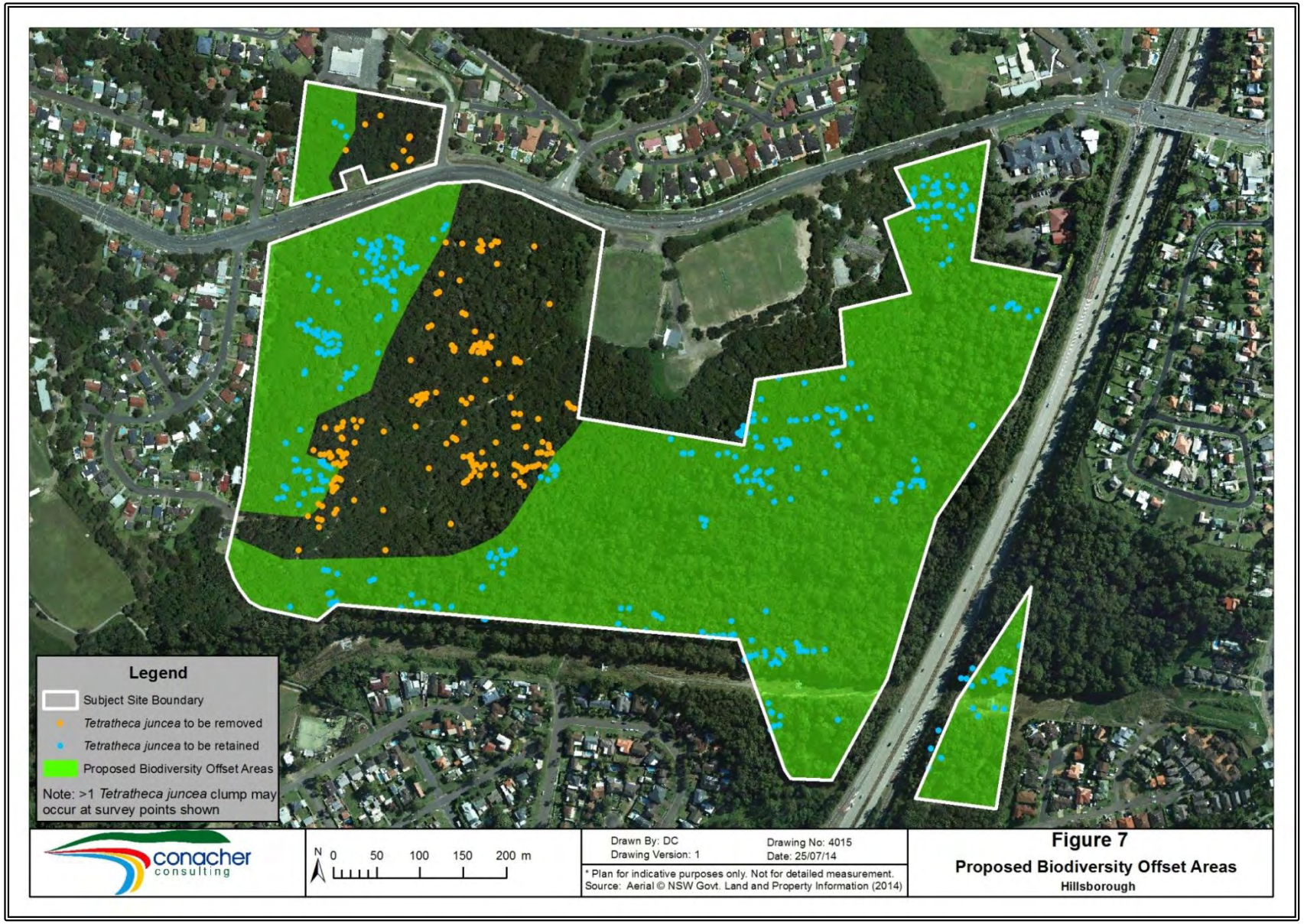
i. The location and size (ha) of the proposed offset area

The Australian Government Department of the Environment have identified that biodiversity offsets are required for impacts to *T. juncea*. The proposed biodiversity offsets package will result in the offsetting of land adjacent to and surrounding the site of the proposed development. In total 29.7 hectares of land are proposed as a biodiversity offset.

Tetratheca juncea Habitat Offset
Assessment of the adequacy of the proposed *T. juncea* offset utilising the EP&BC Act Biodiversity Offset Guide calculator has determined that 115.41% of the proposed impact will be offset. The offset package will result in the retention and future management of of 12.72 hectares of occupied *T. juncea* habitat.

Total Offset Area
Assessment utilising the EP&BC Act Biodiversity Offset Guide calculator has determined that 178.26% of the proposed impact (loss of 10.6 hectares of vegetation and habitat) will be offset. The offset package will result in the retention and future management of of 29.7 hectares of vegetation and habitat.

ii. Maps clearly showing:
- **the relevant ecological features,**
- **landscape context and**
- **cadastre boundaries**


Legend
Subject Site Boundary
Tetratheca juncea to be removed
Tetratheca juncea to be retained
Proposed Biodiversity Offset Areas
Note: >1 Tetratheca juncea clump may occur at survey points shown
conacher consulting
N 0 50 100 150 200 m
Drawn By: DC
Drawing Version: 1
Drawing No: 4015
Date: 25/07/14
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © NSW Govt. Land and Property Information (2014)
Figure 7
Proposed Biodiversity Offset Areas
Hillsborough

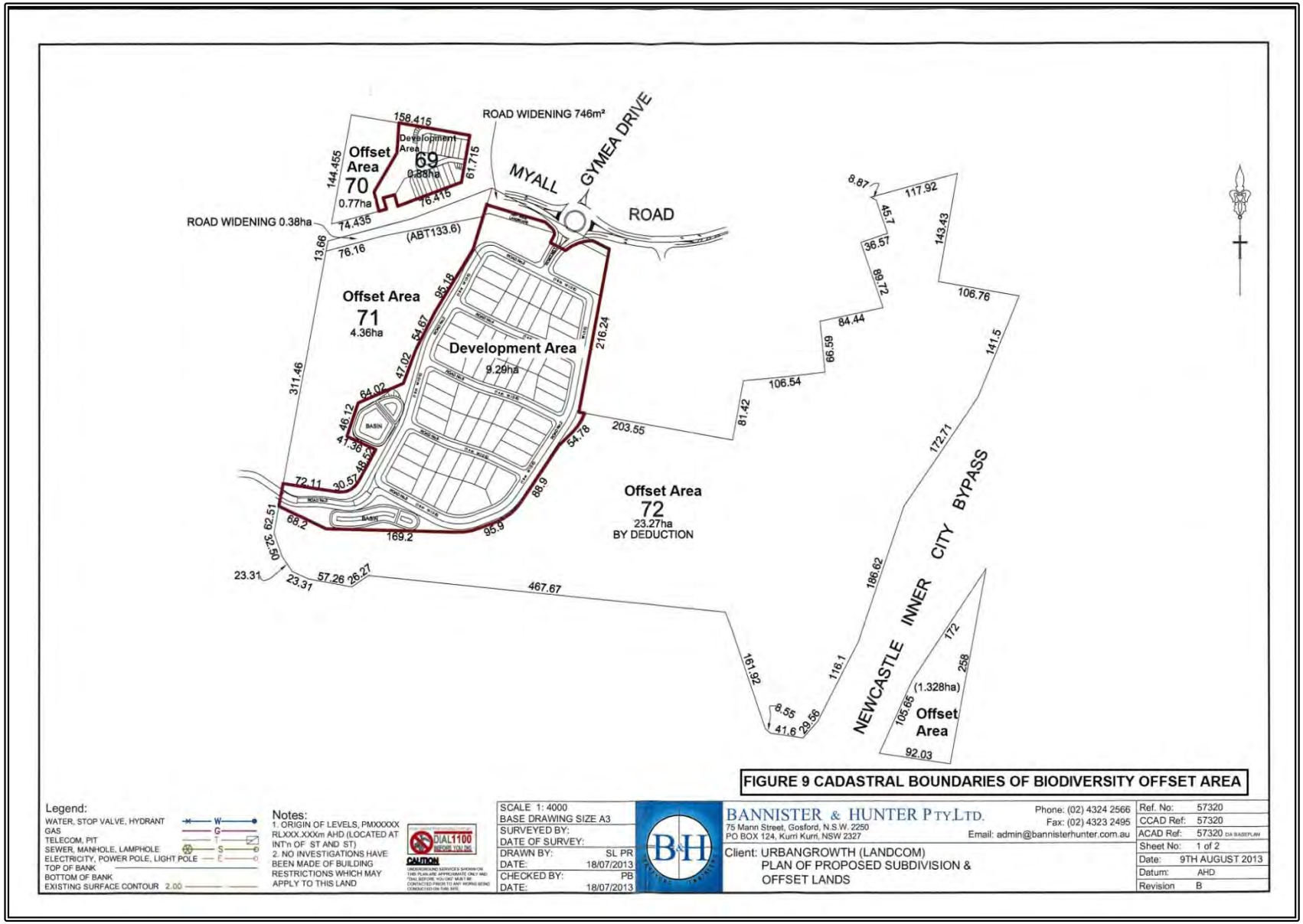


FIGURE 9 CADASTRAL BOUNDARIES OF BIODIVERSITY OFFSET AREA

Legend:
WATER, STOP VALVE, HYDRANT — W
GAS — G
TELECOM, PIT — T
SEWER, MANHOLE, LAMPHOLE — S
ELECTRICITY, POWER POLE, LIGHT POLE — E
TOP OF BANK
BOTTOM OF BANK
EXISTING SURFACE CONTOUR 2.00

Notes:
1. ORIGIN OF LEVELS, PMXXXXX RLXXX.XXXm AHD (LOCATED AT INT'n OF ST AND ST)
2. NO INVESTIGATIONS HAVE BEEN MADE OF BUILDING RESTRICTIONS WHICH MAY APPLY TO THIS LAND

DIAL 1100 BEFORE YOU DIG
CAUTION

SCALE 1: 4000	
BASE DRAWING SIZE A3	
SURVEYED BY:	
DATE OF SURVEY:	
DRAWN BY:	SL PR
DATE:	18/07/2013
CHECKED BY:	PB
DATE:	18/07/2013

BANNISTER & HUNTER PTY LTD.
75 Mann Street, Gosford, N.S.W. 2250
PO BOX 124, Kurri Kurri, NSW 2327
Phone: (02) 4324 2566
Fax: (02) 4323 2495
Email: admin@bannisterhunter.com.au

Client: URBANGROWTH (LANDCOM)
PLAN OF PROPOSED SUBDIVISION & OFFSET LANDS

Ref. No:	57320
CCAD Ref:	57320
ACAD Ref:	57320 DA BASEPLAN
Sheet No:	1 of 2
Date:	9TH AUGUST 2013
Datum:	AHD
Revision	B

iii. Details of the current and future tenure arrangements (including zoning and ownership) of the proposed offset areas

The proposed offset areas are currently under NSW Government Housing & Land tenure and were initially identified for investigation of development potential as part of the current project.

Under the Lake Macquarie Local Environment Plan (2014) most of the site is identified as a deferred matter and in accordance with the LMLEP (2014) the controls of the previous planning instrument, the Lake Macquarie Local Environmental Plan (1984) are applicable.

The LMLEP (1984) zones a substantial portion of the site Residential (2a and 2b), a small area as Neighbourhood Business (3c) within areas of Open Space (6c and 6b) around the edges and along the southern drainage line. The portion of the proposed offset area north of Myall Road is zoned Rural (1a).

The dedication of the site as a biodiversity offset is proposed to be undertaken through a voluntary planning agreement, with rezoning of the land to conservation. It is proposed that the future ownership of biodiversity offset areas will be by Lake Macquarie City Council, who will management the land under the NSW Local Government Act (1993) as community land for conservation.

iv. Confirmed records of presence of relevant protected matters on the offset site

There have been 1870 *Tetratheca juncea* plant clumps recorded within the proposed offset site over an area of 12.72 hectares (Conacher Environmental Group 2013).

v. Detailed information regarding the presence and quality of habitat for relevant protected matters on the offset site (assessed in accordance with the *How to use the offset assessment guide*).

Presence of Tetratheca juncea habitat
There are 1870 *Tetratheca juncea* plant clump records for the proposed offset site over an area of 12.72 hectares. An additional 14.78 hectares of potential and buffer habitat which consists of Coastal Plains Open Forest (*Angophora costata* / *Corymbia gummifera*) and Sheltered Open Forest (*Eucalyptus piperita / Angophora costata*) also forms part of the proposed offset package.

Determination of Existing Tetratheca juncea Habitat Quality
The existing quality of the habitats present for *T. juncea* were determined on a rating of 0 – 10 through an evaluation of the site characteristics in relation to the species ecology.

The following three main variables were assessed:

1. Site Condition

This variable is considered to be an important reflection of the ecological requirements of the species with regard to soil disturbance, presence of weeds, presence of suitable vegetation associations and microclimate for species survival.

This variable was allocated a weighting of 4/10 for habitat quality scoring which was further segregated as follows:

0 = Site not suitable for species
1 = Suitable habitat present with high levels of understorey disturbance
2 = Suitable habitat present with moderate levels of understorey disturbance
3 = Suitable habitat present with low levels of understorey disturbance
4 = Suitable habitat present with very low to no disturbance evident.

TABLE A1.1 SITE CONDITION SCORES		
Site Quality Variable	**Score**	**Justification**
Existing Site Condition (Development Area)	2	Informal vehicle tracks and an unauthorised bike jump track are present.
Existing Site Condition (Offset Area)	3	The habitats are in better condition than within the proposed development area, however still have weed invasion particularly within drainage line areas and walking tracks are present.
Future Site Condition (Offset Area / Without Offset)	2	The existing weed invasion present would continue to expand and further clearing may occur as a result of unauthorised construction of bike jump tracks.
Future Site Condition (Offset Area / With Offset)	4	The existing weed invasion, walking tracks and bike jump tracks would be successfully removed and/or managed to very low levels.

2. Site Context

This variable is considered to be relevant with regards to determining the ecological requirements of this species in terms of assessing surrounding threats but not detrimental to the overall species population due to its widespread occurrence within the region and the relatively small scales over which genetic material is transferred.

Accordingly this variable was only allocated a weighting of 2/10 for habitat quality scoring which was further segregated as follows:

0 = Site contains none of the following (A connective linkage for the species, A large population of importance to the species within the region and No serious threats to the species within or surrounding the site).

1 = Site contains some of the following (A connective linkage for the species, A large population of importance to the species within the region and no serious threats to the species within or surrounding the site).

2 = Site provides all of the following (A connective linkage for the species, A large population of importance to the species within the region and no serious threats to the species within or surrounding the site).

TABLE A1.2 SITE CONTEXT SCORES		
Site Quality Variable	**Score**	**Justification**
Existing Site Condition (Development Area)	1	The habitat may provide some connectivity between the existing plants present and plants within the surrounding population, is of moderate site with regard to other plants present within the region and is at low to moderate risk of threat from sources other than the proposed development.
Existing Site Condition (Offset Area)	1	the habitat may provide some connectivity between the existing plants present and plants offsite, is of large size with regard to other plants present, however is at high risk of threat due to its zoning as residential.
Future Site Condition (Offset Area / Without Offset)	1	The context is unlikely to change from the existing condition within management.
Future Site Condition (Offset Area / With Offset)	2	The offset area will provide connectivity, contain a large population of the species and management is

TABLE A1.2 SITE CONTEXT SCORES		
Site Quality Variable	**Score**	**Justification**
		proposed to mitigate all existing threats and provide security for the population under a formal Voluntary Planning Agreement.

3. Species Stocking Rate

This variable was considered to be an important measure of the habitat quality present as it represents an easily measurable way to determine and compare habitat quality through counting of individuals present.

This variable was allocated a weighting of 4/10 for habitat quality scoring which was further segregated as follows:

0 = Species is absent from the site

1 = Species is present but in low numbers of (< 10 plant clumps)

2 = Species is present in low to moderate numbers (>10 to <100 plants)

3 = Species is present in moderate to high numbers (>500 to < 1000 plant clumps)

4 = Species is present in high numbers (> 1000 plant clumps)

TABLE A1.3 SPECIES STOCKING RATE SCORES		
Site Quality Variable	**Score**	**Justification**
Existing Site Condition (Development Area)	3	The number of plants within this area is > 500 but <1000
Existing Site Condition (Offset Area)	4	The number of plants within this area is >1000
Future Site Condition (Offset Area / Without Offset)	4	The number of plants within this area is >1000
Future Site Condition (Offset Area / With Offset)	4	The number of plants within this area is >1000 and there is potential for increase under future management

4. Overall Site Quality Scores

TABLE A1.4 CALCULATED SITE QUALITY VARIABLES	
Site Quality Variable	**Calculated Score**
Existing Site Condition (Development Area)	6
Existing Site Condition (Offset Area)	8
Future Site Condition (Offset Area / Without Offset)	7
Future Site Condition (Offset Area / With Offset)	10

C. Details and justification on how the offsets package will deliver a conservation outcome that will maintain or improve the viability of the protected matter consistent with the EPBC Act Environmental Offsets Policy including:

i. Management actions that will be undertaken that improve or maintain the quality of the proposed offset site for the relevant protected matter. Management actions should be clearly described, planned and resourced as to justify any proposed improvements in quality for the protected matters over time. Evidence of the likely effectiveness / success of any proposed management actions must be provided.

1. Site condition improvements proposed

The offset package will improve the condition of the site from a score of 3 to a score of 4 through the implementation of vegetation management works. An initial concept Vegetation Management Plan has been prepared for the site and provides preliminary details on weed management and protection of threatened species and details of the management measures to be documented in the final Vegetation Management Plan to be provided for the site.

Further details on site condition improvements will be outlined through a revised Vegetation Management Plan prepared in accordance with Lake Macquarie City Council's Vegetation Management Plan Guidelines. The restoration measures to be implemented are currently being discussed with Lake Macquarie City Council and will be enforced as conditions of consent under the NSW *Environmental Planning and Assessment Act* (1979). The following matters have been identified in the concept VMP and will be addressed in detail for the final VMP:

- Vegetation species composition, planting layout and densities for existing disturbed areas requiring revegetation;
- Weed monitoring and removal;
- Seed plant sources (to ensure local provenance stock is utilised);
- Details of planting priorities, rehabilitation methods and staging;
- Maintenance requirements;
- Flora and fauna / threatened species monitoring;
- Fire management;
- Feral animal management;
- Closure and rehabilitation of existing walking and vehicle tracks
- Donor topsoil areas;
- Use of machinery;
- Management of illegal dumping;
- Maintenance of riparian habitats and corridors;
- Methods for reducing stormwater impacts during construction;
- Methods for restricting and controlling public access.

The measures will be generally in accordance with industry best practice guidelines, particularly the document Restoring Natural Areas (Buchanan 2009) as published and endorsed by the NSW Government Department of Industry and Investment. Following preparation of the final VMP endorsement by Council will be required prior to implementation.

Further evidence of the effectiveness and success of the proposed management actions will be provided to Lake Macquarie City Council as part of the monitoring requirements of the Vegetation Management Plan. Monitoring reports can also be forwarded to DOE if necessary.

ii. The time over which management actions will deliver any proposed improvement or maintenance of habitat quality for the relevant protected matters. This should include the timing for delivery of the offset.

The proposed offset will be delivered prior to the start of works and vegetation management works will be undertaken over a five year period.

iii. The risk of damage, degradation or destruction to any proposed offset site in the absence of any formal protection and/or management over a foreseeable time period (20 yrs). Such risk assessments may be based on:

- **Presence of pending development applications, mining leases or other activities on or near the proposed offset site that indicate development intent.**

- **Average risk of loss for similar sites**
- **Presence and strength of formal protection mechanisms currently in place**

It is considered that there is an approximately 20% (moderate risk) of loss of the proposed offset site without the proposed offset due to:

i. Unplanned external disturbance mechanisms such as unauthorised clearing for bike dirt jumps tracks and weed invasion; and
ii. Potential for future development applications (such as State Significant Developments).

It is considered that the future risk of loss as an offset would be reduced to <5% (low risk) due to the formal securing of the offset in perpetuity through a voluntary planning agreement under the NSW *Environmental Planning and Assessment Act* (1979) and the future active management of the site by Lake Macquarie City Council under the Local Government Act (1993).

iv. The legal mechanism proposed to protect offset sites into the future and avert any risk of damage, degradation or destruction.

The site will be secured for conservation under a formal planning agreement. In the future the site will be managed for conservation as community land under the NSW Local Government Act.

D. Information regarding how the proposed offsets package is additional to what is already required, as determined by law or planning regulations, agreed to under other schemes or programs or required under an existing duty-of-care.

The proposed development was assessed in accordance with Section 5A of the *Environmental Planning and Assessment Act* (1979) and was determined as not likely to significantly affect threatened species listed under the NSW *Threatened Species Conservation Act* (1995).

As such there are currently no legislative offset requirements, such as a Biobanking Statement, formally imposed under state or local government legislation pertaining to the site.

E. The overall cost of the proposed offsets package; including costs associated with, but not limited to:

i. Acquisition and transfer of lands/property;
ii. Implementation of all related management actions;
iii. Monitoring, reporting and auditing of offset performance.

These costs are to be determined following detailed discussion and agreement with Lake Macquarie City Council. At this stage it is considered likely that the costs will be covered through a contributions payment of an estimate sum of $704,000.00 to Lake Macquarie City Council who will undertake the works on the behalf of Urban Growth.

ATTACHMENT 2
BIODIVERSITY OFFSET CALCULATIONS

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Hillsborough TJ Offset
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

TJ HABITAT AREA CALCULATION

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		Area	7.58	Hectares	TJ Area Direct
			Quality	6	Scale 0-10	
			Total quantum of impact	4.55	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No	T. juncea				

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				Risk-related time horizon (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset									
									Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0								
					Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)									
Threatened species habitat																				
Area of habitat	Yes	4.55	Adjusted hectares	Onsite Offset	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	13.75	Risk of loss (%) without offset	20%	Risk of loss (%) with offset	5%	2.06	100%	2.06	1.98	5.25	115.41%	Yes	
									Future area without offset (adjusted hectares)	11.0	Future area with offset (adjusted hectares)	13.1								
					Time until ecological benefit	5	Start quality (scale of 0-10)	8	Future quality without offset (scale of 0-10)	7	Future quality with offset (scale of 0-10)	10	3.00	100%	3.00	2.97				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes		Count										0		0.00	0.00	#DIV/0!	#DIV/0!	$0.00	

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0	0.00	#DIV/0!	#DIV/0!	$0.00	#DIV/0!	#DIV/0!
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	4.548	5.25	115.41%	Yes	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Hillsborough TJ Offset
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

TOTAL SITE AREA CALCULATION

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	10.6	Hectares	Tj Area Direct
			Quality	6	Scale 0-10	
			Total quantum of impact	6.36	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No	T. juncea				

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	6.36	Adjusted hectares	Onsite Offset	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	29.7	**Risk of loss (%) without offset**	20%	**Risk of loss (%) with offset**	5%	4.45	100%	4.45	4.28	11.34	178.26%	Yes	
									Future area without offset (adjusted hectares)	23.8	**Future area with offset (adjusted hectares)**	28.2								
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	8	**Future quality without offset (scale of 0-10)**	7	**Future quality with offset (scale of 0-10)**	10	3.00	100%	3.00	2.97				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes		Count										0		0.00	0.00	#DIV/0!	#DIV/0!	$0.00	

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0	0.00	#DIV/0!	#DIV/0!	$0.00	#DIV/0!	#DIV/0!
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	6.36	11.34	178.26%	Yes	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Appendix B – Original EPBC Referral (2014)

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

Referral of proposed action

Project title: Residential Subdivision – Myall Road, Hillsborough, NSW.

1 Summary of proposed action

NOTE: You must also attach a map/plan(s) and associated geographic information system (GIS) vector (shapefile) dataset showing the location and approximate boundaries of the area in which the project is to occur. Maps in A4 size are preferred. You must also attach a map(s)/plan(s) showing the location and boundaries of the project area in respect to any features identified in 3.1 & 3.2, as well as the extent of any freehold, leasehold or other tenure identified in 3.3(i).

1.1 **Short description**

The development proposed is a residential subdivision. The subject site is located within Lot 7369 DP 1164052 Myall Road Cardiff and Lot 100 DP 8117722 and Lot 10 DP 1011323, Myall Road Garden Suburb.

1.2 **Latitude and longitude**

Latitude and longitude details are used to accurately map the boundary of the proposed action. If these coordinates are inaccurate or insufficient it may delay the processing of your referral.

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Northern precinct (north of Myall Road)						
1	32	56	52.99	151	40	26.44
2	32	56	53.84	151	40	32.47
3	32	56	55.80	151	40	32.06
4	32	56	56.86	151	40	28.80
5	32	56	56.37	151	40	28.62
6	32	56	56.52	151	40	28.07
7	32	56	56.98	151	40	28.24
8	32	56	57.61	151	40	25.46
Southern Precinct (south of Myall Road and west of the Newcastle Inner City Bypass)						
9	32	56	58.58	151	40	25.25
10	32	56	56.74	151	40	33.40
11	32	56	58.59	151	40	39.42
12	32	57	05.52	151	40	37.98
13	32	57	06.65	151	40	45.66
14	32	57	04.15	151	40	46.21
15	32	57	03.79	151	40	50.28
16	32	57	01.64	151	40	50.04
17	32	57	01.05	151	40	53.19
18	32	56	58.27	151	40	52.08
19	32	56	57.88	151	40	53.34
20	32	56	56.36	151	40	52.51
21	32	65	55.36	151	40	56.85
22	32	56	59.92	151	40	55.94
23	32	57	00.55	151	40	59.94
24	32	57	04.79	151	40	57.95
25	32	57	09.45	151	40	54.23
26	32	57	14.96	151	40	52.09
27	32	57	19.19	151	40	49.29
28	32	57	18.95	151	40	47.40

Location Point	Latitude			Longitude		
	Degrees	Minutes	Degrees	Minutes	Degrees	Minutes
29	32	57	13.95	151	40	45.30
30	32	57	12.41	151	40	27.55
31	32	57	12.95	151	40	26.58
32	32	57	12.32	151	40	23.58
33	32	57	10.75	151	40	22.72
Southern Precinct (east of the Newcastle Inner City Bypass)						
34	32	57	12.16	151	40	58.36
35	32	57	20.33	151	40	56.66
36	32	57	19.94	151	40	53.13
37	32	57	16.73	151	40	54.80

The Interactive Mapping Tool may provide assistance in determining the coordinates for your project area.

If the area is less than 5 hectares, provide the location as a single pair of latitude and longitude references. If the area is greater than 5 hectares, provide bounding location points.

There should be no more than 50 sets of bounding location coordinate points per proposal area.

Bounding location coordinate points should be provided sequentially in either a clockwise or anticlockwise direction.

If the proposed action is linear (eg. a road or pipeline), provide coordinates for each turning point.

Also attach the associated GIS-compliant file that delineates the proposed referral area. If the area is less than 5 hectares, please provide the location as a point layer. If greater than 5 hectares, please provide a polygon layer. If the proposed action is linear (eg. a road or pipline) please provide a polyline layer (refer to GIS data supply guidelines at Attachment A).

Do not use AMG coordinates.

1.3 **Locality and property description**

Provide a brief physical description of the property on which the proposed action will take place and the project location (eg. proximity to major towns, or for off-shore projects, shortest distance to mainland).

The subject site occupies an area of 38.8 hectares. The site includes three parcels of land, including a small parcel of land north of Myall Road, a large parcel of land located south of Myall Road on the western side of the Newcastle Inner City Bypass and a small parcel of land located east of the Newcastle Inner City Bypass.

The subject site is located approximately 2 km north west of Charlestown. Figure 1 shows the site location and is provided in the Attachments section of this referral.

1.4 **Size of the development footprint or work area (hectares)** 10.4 hectares.

1.5 **Street address of the site** 9A Myall Road, Garden Suburb.

1.6 **Lot description**

Describe the lot numbers and title description, if known.

Lot 7369 DP 1164052 Myall Road Cardiff and Lot 100 DP 8117722 and Lot 10 DP 1011323, Myall Road Garden Suburb.

1.7 **Local Government Area and Council contact (if known)**

If the project is subject to local government planning approval, provide the name of the relevant council contact officer.

Contact: Greg Field / LMCC Chief Subdivision Engineer
P: 02 4921 0281
F: 02 4921 0257
E: gfield@lakemac.nsw.gov.au
Street Address: 126-138 Main Road Speers Point NSW 2284
Postal Address: PO Box 1906 HRMC 2310.

1.8 **Time frame**

Specify the time frame in which the action will be taken including the estimated start date of construction/operation.

Works required for the subdivision are proposed to commence following development approval. Construction of buildings on individual lots may be subject to economic demand for vacant allotments in the area.

1.9	**Alternatives to proposed action** Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?		No
		✓	Yes, you must also complete section 2.2
1.10	**Alternative time frames etc** Does the proposed action include alternative time frames, locations or activities?	✓	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.11	**State assessment** Is the action subject to a state or territory environmental impact assessment?	✓	No
			Yes, you must also complete Section 2.5
1.12	**Component of larger action** Is the proposed action a component of a larger action?	✓	No
			Yes, you must also complete Section 2.7
1.13	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?	✓	No
			Yes, provide details:
1.14	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	✓	No
			Yes, provide details:
1.15	**Great Barrier Reef Marine Park** Is the proposed action inside the Great Barrier Reef Marine Park?	✓	No
			Yes, you must also complete Section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

NOTE: It is important that the description is complete and includes all components and activities associated with the action. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in section 2.7.

2.1 Description of proposed action

This should be a detailed description outlining all activities and aspects of the proposed action and should reference figures and/or attachments, as appropriate.

The proposal is for a subdivision to create 69 residential allotments and 3 residual lots for conservation purposes. The proposal will require the removal of vegetation, the regrading of land and installation of retarding basins, roads and services and asset protection zones within the proposed development footprint area. Mine remediation work, vegetation remediation and vegetation maintenance will also be undertaken. The subdivision master plan is provided in the Attachments section of this referral.

In total 9 hectares of Coastal Plains Open Forest vegetation will require removal. An additional 1.4 hectares of Coastal Plains Open Forest vegetation will be modified for asset protection zones. The remainder of the site will be retained and managed as a conservation area consisting of 28 hectares of Open Forest habitat including 24 hectares of Coastal Plains Open Forest and 4 hectares of Sheltered Open Forest vegetation. The conservation areas of the site will be managed in accordance with the Vegetation Management Plan prepared for the site which is provided in the Attachments section of this referral.

The footprint of the proposed residential development (including bushfire asset protection zones) is shown in Figure 1. A plan of the proposal showing the proposed lot layouts is provided in the Attachments section of this referral.

2.2 Alternatives to taking the proposed action

This should be a detailed description outlining any feasible alternatives to taking the proposed action (including not taking the action) that were considered but are not proposed (note, this is distinct from any proposed alternatives relating to location, time frames, or activities – see section 2.3).

The development scenario proposed achieves a balanced outcome for the site with regard to social, environmental and economic factors and the current site development layout has been revised several times to ensure that the retention of *Tetratheca juncea* was maximised on the site, while achieving a viable development outcome.

Not taking the action is considered not a feasible alternative for this project

2.3 Alternative locations, time frames or activities that form part of the referred action

If you have identified that the proposed action includes alternative time frames, locations or activities (in section 1.10) you must complete this section. Describe any alternatives related to the physical location of the action, time frames within which the action is to be taken and alternative methods or activities for undertaking the action. For each alternative location, time frame or activity identified, you must also complete (where relevant) the details in sections 1.2-1.9, 2.4-2.7, 3.3 and 4. Please note, if the action that you propose to take is determined to be a controlled action, any alternative locations, time frames or activities that are identified here may be subject to environmental assessment and a decision on whether to approve the alternative.

The proposed action is a site specific residential subdivision. The areas of proposed access road and allotments have been determined following comprehensive planning and studies. There are no alternative locations for the residential areas under consideration. Works required for the subdivision are proposed to commence following development application approval. Construction of dwellings on individual lots may be subject to economic demand for vacant allotments in the local area.

2.4 Context, planning framework and state/local government requirements

Explain the context in which the action is proposed, including any relevant planning framework at the state and/or local government level (e.g. within scope of a management plan, planning initiative or policy framework). Describe any Commonwealth or state legislation or policies under which approvals are required or will be considered against.

An application for a Site Compatibility Certificate (SCC), lodged under Clauses 18 and 19 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP), was approved by the NSW Department of Planning and Infrastructure (DP&I) on 7 September 2012. The SCC certifies that, in the Director General's opinion,

- the development site is compatible with the surrounding land uses, having regard to the matters specified in clause 19(6)(b) of the SEPP; and

- is not likely to have an adverse effect on the environment and does not cause any unacceptable environmental risks to the land.

The approval allows a development application to be assessed, based on land within the identified development footprint, in accordance with surrounding land use zonings, namely, Zone 2(a) Residential and Zone 2(b) Residential.

A development application has been lodged with Lake Macquarie City Council under Part 4 of the NSW *Environmental Planning and Assessment Act* 1979 (EPA). As the proposal comprises Crown development with a capital investment value exceeding $5 million, the proposal is considered to be development for which the Regional Planning Panel is the authorised to exercise consent authority functions of councils. Consequently, the development is to be determined by the Hunter and Central Coast Joint Regional Planning Panel.

The proposal is also considered to be Integrated Development under:

- Section 138 of the Roads Act 1993
- Section 100B of the Rural Fires Act 1997
- Sections 90 and 91 of the Water Management Act 2000
- Section 15 of the Mine Subsidence Compensation Act 1961

2.5 Environmental impact assessments under Commonwealth, state or territory legislation

If you have identified that the proposed action will be or has been subject to a state or territory environmental impact statement (in section 1.11) you must complete this section. Describe any environmental assessment of the relevant impacts of the project that has been, is being, or will be carried out under state or territory legislation. Specify the type and nature of the assessment, the relevant legislation and the current status of any assessments or approvals. Where possible, provide contact details for the state/territory assessment contact officer.

Describe or summarise any public consultation undertaken, or to be undertaken, during the assessment. Attach copies of relevant assessment documentation and outcomes of public consultations (if available).

The proposal will be assessed according to the provisions of the *Environmental Planning and Assessment Act* (*EP&A Act* 1979) which includes requirement for public consultation and provision for assessment of ecological, hydrological, archaeological and bushfire characteristics.

A Biodiversity Assessment Report (*Conacher Environmental Group* 2013) has been prepared for the proposal to identify the flora and fauna characteristics of the site. The Biodiversity Assessment report is provided in the Attachments section of this referral.

The report determined that the proposal is not likely to have a significant impact on threatened species, populations or ecological communities or their habitats, as listed under the *Threatened Species Conservation Act* 1995 (*TSC Act* 1995), and a Species Impact Statement is not required according to the provisions of Section 5(A) of the *EP&A Act* (1979).

2.6 Public consultation (including with Indigenous stakeholders)

Your referral must include a description of any public consultation that has been, or is being, undertaken. Where Indigenous stakeholders are likely to be affected by your proposed action, your referral should describe any consultations undertaken with Indigenous stakeholders. Identify the relevant stakeholders and the status of consultations at the time of the referral. Where appropriate include copies of documents recording the outcomes of any consultations.

Community consultation will be undertaken throughout the assessment and decision-making process.

Lake Macquarie City Council currently has placed the development application on public exhibition in accordance with statutory requirements.

The documentation for the development application (DA/1284/2013) can be viewed at the following webpage link:

http://apptracking.lakemac.com.au/modules/ApplicationMaster/default.aspx?page=bigapp&key=567101

The Regional Planning Panel meeting that will be undertaken to determine the DA is likely to be conducted as a public meeting and any person who wishes to make a submission can make a presentation to the regional

panel to express their views regarding the panel. Submissions made by the public are considered when the regional panel members make a decision on the DA.

2.7 A staged development or component of a larger project

If you have identified that the proposed action is a component of a larger action (in section 1.12) you must complete this section. Provide information about the larger action and details of any interdependency between the stages/components and the larger action. You may also provide justification as to why you believe it is reasonable for the referred action to be considered separately from the larger proposal (eg. the referred action is 'stand-alone' and viable in its own right, there are separate responsibilities for component actions or approvals have been split in a similar way at the state or local government levels).

The proposal is for a residential subdivision and it is not directly a part of any larger action. The proposal is not a staged development, however construction of dwellings on individual lots may be subject to economic demand for vacant allotments in the local area.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest.

Your assessment of likely impacts should refer to the following resources (available from the Department's web site):

- specific values of individual World Heritage properties and National Heritage places and the ecological character of Ramsar wetlands;
- profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;
- *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*; and
- associated sectoral and species policy statements available on the web site, as relevant.

Your assessment of likely impacts should consider whether a bioregional plan is relevant to your proposal. The Minister has prepared four marine bioregional plans (MBP) in accordance with section 176. It is likely that the MBP's will be more commonly relevant where listed threatened species, listed migratory species or a Commonwealth marine area is considered.

Note that even if your proposal will not be taken in a World Heritage area, Ramsar wetland, Commonwealth marine area, the Great Barrier Reef Marine Park or on Commonwealth land, it could still impact upon these areas (for example, through downstream impacts). Consideration of likely impacts should include both direct and indirect impacts.

A search was conducted of the Protected Matters Search Tool website (AGDE 2014) for Matters of National Environmental Significance recorded within 10km of the subject site. Results of the search are provided in the Attachments section of this referral.

3.1 (a) World Heritage Properties

Description

None located within 10 km, not likely to be affected.

Nature and extent of likely impact

Address any impacts on the World Heritage values of any World Heritage property.

No likely impact.

3.1 (b) National Heritage Places

Description

None located within 10 km, not likely to be affected.

Nature and extent of likely impact

Address any impacts on the National Heritage values of any National Heritage place.

No likely impact.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

There are no Wetlands of International Importance located within 10 km of the site. The Hunter Estuary Wetlands are located approximately 11 km from the site, however do not occur within the same catchment as the site.

No Wetlands of International Importance are likely to be affected by the proposed action.

Nature and extent of likely impact

Address any impacts on the ecological character of any Ramsar wetlands.

No likely impact.

3.1 (d) Listed threatened species and ecological communities

Description

Threatened Species

Comprehensive surveys for nationally listed threatened flora and fauna species have been undertaken within the subject site. Details are provided in the Biodiversity Assessment Report (*Conacher Environmental Group* 2013) provided in the Attachments section of this referral.

Threatened Flora Species

A search of the Protected Matters Search Tool (ADGE 2014) was undertaken to identify records of threatened flora species located within 10km of the site. This allowed for specific surveys for threatened flora species to be undertaken determining if any threatened flora species were present within the subject site. Details on threatened flora species listed within the *EP&BC Act* (1999), with a known or possible occurrence within the local area, are provided in Table 3.1.

TABLE 3.1
NATIONALLY THREATENED FLORA SPECIES OF THE AREA

Species	EP&BC Act	Growth Form and Habitat Requirements	Comments
Angophora inopina	V	Small tree, occurs in open sclerophyll forest and woodland growing on deep sandy soils with associated lateritic outcrops.	Suitable habitat present. Not observed during surveys.
Asterolasia elegans	E	Erect shrub 1-3 m high growing in sheltered moist sclerophyll forests on Hawkesbury sandstone on mid- to lower slopes and valleys.	No suitable habitat present.
Cryptostylis hunteriana	V	Saprophytic orchid. Grows in moist sandy soil in heath and sedgeland and coastal forest communities of Scribbly Gum, Bloodwood, Brown Stringy Bark and Smooth-barked Apple in moist to dry clay loam.	Suitable habitat present. Not observed during surveys.
Cynanchum elegans	E	Climber or twiner to 1 m. Grows in rainforest gullies, scrub & on scree slopes.	No suitable habitat present.
Diuris praecox	V	Terrestrial orchid. Grows in sclerophyll forest near the coast, most often found on clay graminoid heath on coastal headlands.	Suitable habitat present. Not observed during surveys.

TABLE 3.1 NATIONALLY THREATENED FLORA SPECIES OF THE AREA			
Species	**EP&BC Act**	**Growth Form and Habitat Requirements**	**Comments**
Eucalyptus camfieldii	V	Stringybark to 10 m high. Grows in coastal shrub heath and woodlands on sandy soils derived from alluviums and Hawkesbury sandstone.	No suitable habitat present.
Grevillea parviflora subsp. parviflora	V	Open to erect shrub to 1 metre. Grows in heathy woodland on light clayey soils and may have an affinity with disturbance margins.	Suitable habitat present. Not observed during surveys.
Melaleuca biconvexa	V	Tall shrub. Grows in wetlands adjoining perennial streams and on the banks of those streams, generally within the geological series known as the Terrigal Formation.	Suitable habitat present. Not observed during surveys.
Pterostylis gibbosa	E	Terrestrial orchid. Occurs in open forest or woodland on flat or gently sloping land with poorly drained soils.	No suitable habitat present.
Rutidosis heterogama	V	Small perennial herb to 30cm tall. Grows in heaths in clay soils and has been recorded along disturbed roadsides.	Suitable habitat present. Not observed during surveys.
Streblus pendulinus	E	Warm rainforest habitats along watercourses.	No suitable habitat present.
Syzygium paniculatum	V	Small tree. Subtropical and littoral rainforest on sandy soil.	No suitable habitat present.
Tetratheca juncea	V	Prostrate shrub to 1 m high. Typically grows in nutrient poor sandy soils in Smooth-barked Apple, Scribbly Gum, and Spotted Gum dry sclerophyll communities with grassy or heathy understorey. Less commonly recorded from moist forest communities.	Suitable habitat present. Observed during surveys.
Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species			

A total of 2528 clumps of *T. juncea* were observed and estimated to occur within the subject site. Threatened species locations are shown in Figure 2, provided in the attachments section of this referral.

Threatened Fauna Species

A search of the Protected Matters Search Tool (AGDE 2014) was undertaken to identify records of threatened fauna species located within 10 km of the site. This allowed for specific surveys for threatened fauna species to be undertaken determining if any threatened fauna species were present within the subject site. Details on threatened fauna species (excluding marine and estuarine species) listed within the *EPBC Act* (1999), with a known or possible occurrence within the local area, are provided in Table 3.2.

TABLE 3.2 NATIONALLY THREATENED FAUNA SPECIES OF THE AREA			
Species	**EP&BC Act**	**Growth Form and Habitat Requirements**	**Comments**
Giant Barred Frog *Mixophyes iteratus*	E	Forages and shelters in deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest near permanent flowing water.	No suitable habitat present.

TABLE 3.2 NATIONALLY THREATENED FAUNA SPECIES OF THE AREA			
Species	**EP&BC Act**	**Growth Form and Habitat Requirements**	**Comments**
Green and Golden Bell Frog *Litoria aurea*	V	Inhabits edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds, particularly areas free of Gambusia.	Suitable habitat present. Not observed during surveys.
Littlejohn's Tree Frog Litoria littlejohni	V	Inhabits permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	No suitable habitat present.
Broad-headed Snake *Hoplocephalus bungaroides*	V	Prefers rocky outcrops and adjacent sclerophyll forest and woodland. Shelters in rock crevices and tree hollows.	No suitable habitat present.
Australasian Bittern *Botaurus poiciloptilus*	E	Inhabits shallow freshwater or brackish wetlands with tall dense beds of reeds, sedges or rush species and swamp edges. Distribution Limit - N-North of Lismore. S- Eden.	No suitable habitat present.
Red Goshawk *Erythrotriorchis radiatus*	V	Inhabits tall open forests and woodlands. Breeds in tall trees adjacent to watercourses of wetlands.	No suitable habitat present.
Australian Painted Snipe *Rostratula australis*	V	Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation.	No suitable habitat present.
Swift Parrot *Lathamus discolor*	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts.	Suitable habitat present. Not observed during surveys.
Eastern Bristlebird *Dasyornis brachypterus*	E	Inhabits coastal woodland, dense scrub and heath, often near taller forest.	No suitable habitat present.
Regent Honeyeater *Anthochaera phrygia*	E	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts.	Suitable habitat present. Not observed during surveys.
Spotted-tailed Quoll *Dasyurus maculatus*	V	Inhabits a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Shelters in hollow-bearing trees, fallen logs, small caves and rock crevices.	No suitable habitat present.
Long-nosed Potoroo *Potorous tridactylus*	V	Coastal heath and dry and wet sclerophyll forests with a dense understorey.	Suitable habitat present. Not observed during surveys.
Koala *Phascolarctos cinereus*	V	Inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees.	Suitable habitat present. Not observed during surveys.
Brush-tailed Rock-wallaby *Petrogale penicillata*	V	Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country.	No suitable habitat present.

Grey-headed Flying-fox *Pteropus poliocephalus*	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy.	Suitable habitat present. Observed during surveys.
Large-eared Pied Bat *Chalinolobus dwyeri*	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies.	Suitable habitat present. Not observed during surveys.
Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species			

One threatened fauna species, the Grey-headed Flying-fox, as listed under the *EPBC Act* (1999), was observed within the subject site during nocturnal fauna surveys. No roost or camp sites for this species have been observed within the site. Threatened species locations are shown in Figure 2, provided in the attachments section of this referral.

Threatened Ecological Communities
Description
One nationally listed threatened ecological community, Littoral Rainforest and Coastal Vine Thickets of Eastern Australia was identified in the Protected Matters Search (AGDE 2014) within 10km of the proposal. No nationally listed threatened ecological communities were observed within the subject site during surveys.

Nature and extent of likely impact

Address any impacts on the members of any listened threatened species (except a conservation dependent species) or any threatened ecological community, or their habitat.

Threatened Flora Species

Tetratheca juncea
The proposed development will result in the removal of approximately 658 *T. juncea* clumps within the proposed development footprint. The local population of *T. juncea* will be reduced by the proposed development to approximately 1870 clumps (74%) within areas of the subject site to be retained for conservation outside of the proposed development and asset protection zone areas. The conservation areas of the site will be managed in accordance with the Vegetation Management Plan prepared for the site, which is provided in the Attachments section of this referral.

The following assessment of the potential for the proposed action to have a significant impact on *Tetratheca juncea* has been provided in accordance with The *EP&BC* Act Referral Guidelines for the vulnerable Black-eyed Susan, *Tetratheca juncea* (SEWPAC 2011).

- **Could the impacts of your action occur within the modelled distribution of *Tetratheca juncea*?**

  The proposal is located within the modelled distribution of *T. juncea,* therefore impacts of the proposed action will occur within this area.

- **Could the impacts of your action affect any *Tetratheca juncea* habitat or individuals?**

  Yes, the proposed development will require the removal of an area of known habitat for *T. juncea*.

- **Have surveys for *Tetratheca juncea* been undertaken using the recommended methods?**

  It is considered that the surveys undertaken have be conducted by a suitably qualified person with demonstrated skill in flora surveys, have maximised the chance of detecting the species and have accounted for uncertainty and error (such as false presences and absences).

  - **Determination of peak flowering**

    The surveys undertaken for *T. juncea* covered the main flowering period for the species (between 1 September and 31 October).

- **Survey of affected areas**

  - Surveys for *T. juncea* were conducted in excess of the requirements of SEWPAC (2011) for an area of habitat of greater than 30 hectares with counting of plant clumps undertaken in accordance with Payne *et al.* (2002).

  - Initial targeted surveys of *Tetratheca juncea* were undertaken during 2009 by RPS (2010) and involved two ecologists walking along parallel transects (approximately 10m apart) across the site, with counting of plant clumps undertaken in accordance with the methodology of Payne *et al* (2002). Locations of *T. juncea* were recorded with a hand-held GPS with sub-metre accuracy.

  - Additional targeted surveys were undertaken by *Conacher Environmental Group* during 2012 which involved two ecologists walking along parallel transects (approximately 10m apart) across areas of the site where *T. juncea* was not previously recorded by RPS (2010). Counting of plant clumps was also undertaken in accordance with the methodology of Payne *et al* (2002). Locations of *T. juncea* were recorded with a hand-held GPS with sub-metre accuracy.

  - The number of *T. juncea* clumps within an area of the site affected by mine subsidence was estimated based on area of occupancy polygons in surrounding areas of the site subject to detailed surveys (RPS 2010). All other areas of the subject site were subject to detailed counts.

  - Surveys for *T. juncea* were undertaken within the subject site on the following dates;

    RPS Surveys
    - 1 September 2009;
    - 2 September 2009;
    - 9 September 2009;
    - 9 November 2009;

    Conacher Environmental Group Surveys
    - 26 September 2012;
    - 27 September 2012;
    - 3 October 2012;
    - 17 October 2012;
    - 18 October 2012;
    - 19 October 2012;
    - 23 October 2012;
    - 24 October 2012;
    - 25 October 2012.

A total of 2528 clumps of *T. juncea* plant clumps were recorded within the subject site during surveys.

- **Habitat Assessment**

The area of habitat where *Tetratheca juncea* was observed contains the following habitat characteristics:

The site is predominantly located on the Gateshead erosional soil landscape, with the north-eastern corner of the site mapped on the Killingworth erosional soil landscape (Matthei 1995). Descriptions of these soil landscapes are provided below.

Gateshead Soil Landscape:

Soils
Moderately deep (100-200 cm) moderately well to imperfectly drained Yellow Podzolic Soils (Dy3.21) and yellow Soloths (Dy2.41, Dy3.41) on conglomerate crests and sideslopes, with some shallow (<50 cm), rapidly drained Lithosols (Um1.41). Moderately deep to deep, well to imperfectly drained Red Podzolic Soils (Dr3.21), red Soloths (Dr2.41, Dr3.41) and some Yellow Soloths (Dy2.41) on shale parent material.

Landscape
Undulating to rolling rises on Permian conglomerate, shale and sandstone in the Awaba Hills. Local

relief to 100 m. Slopes to 5-15%. Elevation to 130 m. Predominantly cleared woodland and open forest.

Killingworth Soil Landscape:

Soils
Shallow (<60 cm) to moderately deep (<150 cm), well to imperfectly drained Yellow Podzolic Soils (Dy3.21, Dy5.11, Dy2.11), yellow Soloths (Dy3.41, Dy2.41), Gleyed Podzolic Soils (Dg1.41) and gleyed Soloths (Dg2.41, Dg3.41), on crests and hill slopes, with shallow (<60 cm) well drained Structured Loams (Um6.32, Um6.22), Bleached Loams (Um2.12, UM 1.41) and Lithosols (U,4.4, Uc1.21, UC2.21) on some crests.

Landscape
Undulating to rolling hills and low hills on the Newcastle Coal Measures of the Awaba Hills region. Elevation 50-160 m, local relief 30-100 m, slopes are 3-20%. Predominantly uncleared tall open forest.

Vegetation Communities:

The following vegetation communities were observed within the subject site:

Coastal Plains Open Forest (*Angophora costata* / *Corymbia gummifera*)
This community corresponds to Map Unit (MU) 30 Coastal Plains Smooth-barked Apple Woodland as described by Bell and Driscoll (2010).

Sheltered Open Forest (*Eucalyptus piperita / Angophora costata*)
This community corresponds to MU 11 Coastal Sheltered Apple – Peppermint Forest as described by Bell and Driscoll (2010).

Cleared Land
This community contains areas of cleared land, and occurs particularly along the edges of the site adjoining larger offsite areas.

- **Could the action impact on an important population of *Tetratheca juncea*?**

Questions (**in bold)** to determine whether a population is an *"important population"* are as follows:

Has greater than 1000 plant clumps;
A total of 2528 plant clumps of *T. juncea* were observed within the subject site.

An area of habitat has an average estimated plant clump density of 20 clumps/hectare or greater;
The site has an average estimated plant clump density of >20 clumps per hectare.

Occurs in rare habitat as defined by SEWPAC (2011);
The rare habitat type, Coastal Sheltered Apple Peppermint Forest occurs within the site. Very low densities of scattered clumps are present within this community. It is proposed to retain these areas.

***Occurs in an area of "important habitat" as defined by SEWPAC (2011) and has greater than 500 plant clumps*;**
The subject site is located within an area of important habitat and contains more than 500 plant clumps.

Occurs at or near the distributional limits of Tetratheca juncea; or
The subject site does not occur at or near the mapped distributional limits of *Tetratheca juncea*.

Occurs in close proximity as defined by SEWPAC (2011) to a protected area (e.g. National Park) where Tetratheca juncea is known to occur.
The specimens observed do not occur in close proximity to a protected area where *T. juncea* is known to occur.

Conclusion
It is therefore considered that the specimens of *T. juncea* observed form an important population as defined by SEWPAC (2011).

- **Could your action impact on the species as a whole?**

The following criteria (provided in **bold** print below) has been to be addressed to determine whether the action proposed is likely to have a significant impact on the species, *T. juncea*, as a whole.

Adversely affect habitat critical to the survival of a species;
There has currently been no critical habitat for this species declared under the *EP&BC Act* (1999) or listed within a recovery plan for this species.

***Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that a species is likely to decline*;**

A total of 2528 plant clumps of *T. juncea* were observed within the subject site. The proposed development will result in the removal of approximately 658 *T. juncea* clumps within the proposed development footprint. The proposal will result in the retention of 74% (1870 clumps) of the local population of *T. juncea* within areas of the subject site to be retained for conservation outside of the proposed development and asset protection zone areas. The conservation areas of the site will be managed in accordance with the Vegetation Management Plan prepared for the site, which is provided in the Attachments section of this referral.

It is therefore considered that the proposal is not likely to modify, destroy or isolate or decrease the availability or quality of habitat to the extent that the species as a whole is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
The proposed development is not of a type of development that is likely to result in the direct establishment of invasive species that are harmful to this species, becoming established in this species habitat.

The conservation areas of the site will be managed in accordance with the Vegetation Management Plan prepared for the site, which is provided in the Attachments section of this referral.

Introduce disease that may cause the species to decline; or
It is considered that the proposal is not a type of development that is likely to introduce disease that may cause this species to decline.

Interferes substantially with recovery of the species
The proposed development is not likely to interfere with any identified recovery plan or recovery actions for the species.

Conclusion
Following consideration of the above factors it is considered that the proposal is unlikely to impact on the species as a whole.

- **Impact Mitigation**

In accordance with SEWPAC (2011) mitigation has the principal aim of avoiding significant impacts. The following mitigation measures are proposed:

Measures to Avoid Impacts
- Retention of 74% of the local population of *T. juncea*;
- Location of asset protection zones within roads footprints where appropriate;
- Location of asset protection zones outside of conservation areas;
- Maintenance of site connectivity and minimisation of fragmentation through avoidance of development adjacent to the southern access road; and
- Retention of a greater than 30m buffer for specimens of *T. juncea* within the eastern section of the site

Measures to Mitigate Impacts
Mitigation of impacts will be undertaken in accordance with the Vegetation and Habitat Management Plan for the site and will incorporate the following measures:

- Management of key threatening processes
- Management of fire regimes

- Management of weed invasion
- Targeted revegetation of degraded areas
- Access exclusion and management
- Prevention and management of rubbish dumping

Measures to Monitor Effectiveness of Mitigation
The effectiveness of works undertaken in accordance with the Vegetation and Habitat Management Plan will be evaluated to the completion of each monitoring period to allow for adaptive management.

- **Requirement for Referral for *Tetratheca juncea***

The proposed development will result in the degradation of an area of suitable habitat within a 30 m buffer extending from the edge of an important population. Therefore in accordance with the guidelines (AGDE 2014) a referral is required to determine if the proposed development will have a significant impact on *T. juncea*.

Threatened Fauna Species

Grey-headed Flying-fox (*Pteropus poliocephalus*)

- **Vulnerable Species Important Population Criteria**

For the purposes of assessment of a vulnerable threatened species under the *EP&BC Act* (1999) an assessment as to whether the species comprises an important population is required.

An *"important population"* is one that is necessary for a species' long-term survival and recovery. Questions (**in bold**) to determine whether a population is an *"important population"* are as follows:

Whether the population has been identified within a recovery plan
A draft recovery plan exists for this species at state level (DECCW 2009). An important population of this species has not been identified as occurring within the subject site within any recovery plan.

Whether the population constitutes a key source population for breeding or dispersal
No Grey-headed Flying Fox roost or camp sites were observed within the subject site. It is considered that while the specimens observed foraging within the locality may be part of a larger population, they do not alone constitute a key source population for breeding or dispersal.

Whether the population constitutes a population necessary for maintaining genetic diversity
No Grey-headed Flying Fox roost or camp sites were observed within the subject site. It is considered that while the specimens observed foraging within the locality may be part of a larger population, they do not alone constitute a population necessary for maintaining genetic diversity.

Whether the population is at the limit of its known distribution
The Grey-headed Flying-fox is known to occupy the coastal lowlands and slopes of south-eastern Australia from Bundaberg to Geelong and are usually found at altitudes < 200 m. Areas of repeated occupation extend inland to the tablelands and western slopes in northern New South Wales and the tablelands in southern Queensland. Sightings in inland areas of southern New South Wales and Victoria are uncommon. There are rare records of individuals or small groups west to Adelaide, north to Gladstone and south to Flinders Island (DECCW 2009).

This species is therefore not at the limit of its distribution within the subject site.

From the above information and details it is considered that the Grey-headed Flying-fox observed during surveys is not:

- Identified in a recovery plan for this species;
- A key source population for breeding or dispersal;
- A population necessary for maintaining genetic diversity;
- A population which is near this species range.

Therefore it is considered that the threatened species observed does not satisfy the criteria of an important population as identified by the DEWHA (2009) guidelines.

Notwithstanding the above conclusions if the precautionary approach is adopted, further consideration as to whether the proposed action is likely to have a significant impact on this species needs to assess the significant impact criteria (DEWHA 2009) for a vulnerable species.

- **Vulnerable Species Significant Impact Criteria**

Questions (in bold) to determine whether the proposal is likely to have a significant impact on an important population of a vulnerable species are as follows:

Lead to a long-term decrease in the size of an important population of a species;
This species utilised rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (DECC 2005).

While the proposal may result in a small reduction in forging habitat within the subject site, there are larger areas of suitable habitat for this species within the locality.

It is therefore considered that the proposal is not likely to lead to the long-term decrease in the size of an important population of the Grey-headed Flying-fox.

Reduce the area of occupancy of an important population;
The proposed development may require the removal of some potential habitat for this species, however there are larger areas of suitable habitat for this species within the locality.

It is therefore considered that the proposal is not likely to reduce the area of occupancy of an important population.

Fragment an existing important population into two or more populations;
Due to the mobile nature of this species and the fact that it is nomadic and migratory it is considered that the proposed development is not of a type that is likely to result in the fragmentation an existing important population into two or more populations.

Adversely affect habitat critical to the survival of a species;
There has currently been no critical habitat for this species declared under the *EP&BC Act* (1999) or listed within a recovery plan for this species.

Due to the presence of larger areas of suitable habitat for this species present within the locality it is considered that the subject site does not contain habitat necessary for foraging, breeding, roosting, or dispersal.

Furthermore the proposal is not likely to adversely affect an area necessary for the long term maintenance of the species essential to the survival of the species or an area necessary to maintain genetic diversity and long term evolutionary development or an area necessary for the reintroduction of populations or recovery of the species, critical to the survival of the species.

Therefore the proposed action is not likely to adversely affect habitat critical to the survival of this species.

Disrupt the breeding cycle of an important population*;*
No Grey-headed Flying Fox roost or camp sites were observed within the subject site.

It is therefore considered that the proposal will not disrupt the breeding cycle of an important population of this species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that a species is likely to decline;
There are larger areas of many different suitable habitat types that support this species within the locality. It is therefore considered not likely that the proposed action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
The proposed development is not of a type that is likely to result in the establishment in invasive species that are harmful to this species, becoming established in this species habitat.

Introduce disease that may cause the species to decline; or

The proposed development is not of a type that is likely to introduce disease that may cause this species to decline.

Interferes substantially with recovery of the species
It is considered that the proposed action is not likely to interfere substantially with the recovery of the species.

- **Conclusion**

The proposal is not likely to have a significant impact on an important population of the Grey-headed Flying-fox.

Additional Locally Occurring Nationally Listed Threatened Species
It is also considered that the proposal is not likely to have a significant impact on the additional locally occurring threatened fauna species with suitable habitat contained within the subject site due to the absence of records for these species within the site and the presence of larger areas of suitable quality habitat for these species within the local area.

Threatened Ecological Communities
None were observed within or adjoining the subject site during surveys. No likely impact.

3.1 (e) Listed migratory species

Description
A search of the Protected Matters Search Tool (AGDE 2014) was undertaken to identify records of migr species located within 10km of the site. This allowed for specific surveys for migratory fauna species t undertaken determining if any migratory species were present within the subject site. Details on migratory sp (excluding marine and estuarine species) listed within the *EPBC Act* (1999), with a known or possible occur within the local area, are provided in Table 3.3.

TABLE 3.3 LISTED MIGRATORY FAUNA SPECIES OF THE AREA		
Common Name ***Scientific Name***	**Preferred Habitat**	**Comments**
Fork-tailed Swift (*Apus pacificus*)	Almost exclusively aerial.	Suitable habitat present.
Great Egret (*Ardea modesta*)	Wetland and estuarine habitats.	No suitable habitat present.
Cattle Egret (*Ardea ibis*)	Grazing lands and open wetland habitats.	No suitable habitat present.
Latham's Snipe (*Gallinago hardwickii*)	Low dense vegetation within and surrounding freshwater wetlands.	No suitable habitat present.
Painted Snipe (*Rostratula australis*)	Inhabits shallow freshwater wetlands, vegetated ephemeral and permanent lakes and swamps, and inundated grasslands.	No suitable habitat present.
White-bellied Sea-eagle (*Haliaeetus leucogaster*)	Coastal areas and inland rivers and water bodies.	No suitable habitat present.
White-throated Needletail (*Hirundapus caudacutus*)	Almost exclusively aerial.	Suitable habitat present.
Rainbow Bee-eater (*Merops ornatus*)	Open, cleared or lightly timbered areas particularly in close proximity to water bodies.	Suitable habitat present.
Black-faced Monarch (*Monarcha melanopsis*)	Wet sclerophyll and rainforest vegetation.	Suitable habitat present.
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated forests. When migrating may be found in more open coastal habitats.	Suitable habitat present.
Rufous Fantail (*Rhipidura rufifrons*)	Wet sclerophyll and rainforest vegetation.	Suitable habitat present.

No migratory species listed within the *EPBC Act* (1999) were observed within the subject site during surveys.

Nature and extent of likely impact

Address any impacts on the members of any listed migratory species, or their habitat.

It is considered that the proposal is not likely to have a significant impact on nationally listed migratory species with suitable habitat contained within the subject site, due to the absence of records for these species within the subject site and the presence of larger areas of suitable quality habitat for these species within the local area.

3.1 (f) Commonwealth marine area

(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

Description

None located within 10 km, not likely to be affected.

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth marine area.

No likely impact.

3.1 (g) Commonwealth land

(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

Description

If the action will affect Commonwealth land also describe the more general environment. The Policy Statement titled *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* provides further details on the type of information needed. If applicable, identify any potential impacts from actions taken outside the Australian jurisdiction on the environment in a Commonwealth Heritage Place overseas.

The following ten areas of Commonwealth Lands are located within 10km of the proposal:

- Commonwealth Land - Australian & Overseas Telecommunications Corporation
- Commonwealth Land - Australian Broadcasting Corporation
- Commonwealth Land - Australian Postal Commission
- Commonwealth Land - Australian Postal Corporation
- Commonwealth Land - Australian Telecommunications Commission
- Commonwealth Land - Commonwealth Trading Bank of Australia
- Commonwealth Land - Defence Housing Authority
- Commonwealth Land - Defence Service Homes Corporation
- Commonwealth Land - Director of War Service Homes
- Commonwealth Land - Telstra Corporation Limited

No Commonwealth Land is located within or adjacent to the subject site, no Commonwealth Lands are likely to be affected by the proposal.

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth land. Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

No likely impact.

3.1 (h) The Great Barrier Reef Marine Park

Description

None located within 10 km, not likely to be affected.

Nature and extent of likely impact

Address any impacts on any part of the environment of the Great Barrier Reef Marine Park.

Note: If your action occurs in the Great Barrier Reef Marine Park you may also require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If so, section 37AB of the GBRMP Act provides that your referral under the EPBC Act is deemed to be an application under the GBRMP Act and Regulations for necessary permissions and a single integrated process will generally apply. Further information is available at www.gbrmpa.gov.au

No likely impact.

3.1 (i) A water resource, in relation to coal seam gas development and large coal mining development

Description

If the action is a coal seam gas development or large coal mining development that has, or is likely to have, a significant impact on water resources, the draft *Policy Statement Significant Impact Guidelines: Coal seam gas and large coal mining developments—Impacts on water resources* provides further details on the type of information needed.

The proposed action is not a coal seam gas development or a large coal mining development.

Nature and extent of likely impact

Address any impacts on water resources. Your assessment of impacts should refer to the draft *Significant Impact Guidelines: Coal seam gas and large coal mining developments—Impacts on water resources*.

No likely impact.

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

You must describe the nature and extent of likely impacts (both direct & indirect) on the whole environment if your project:

- is a nuclear action;
- will be taken by the Commonwealth or a Commonwealth agency;
- will be taken in a Commonwealth marine area;
- will be taken on Commonwealth land; or
- will be taken in the Great Barrier Reef marine Park.

Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.2 (a)	**Is the proposed action a nuclear action?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	✓	No
			Yes (provide details below)
If yes, nature & extent of likely impact on the whole environment			

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	✓	No
			Yes (provide details below)
If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))			

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	✓	No
			Yes (provide details below)
If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))			

3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**	✓	No
			Yes (provide details below)
If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))			

3.3 Other important features of the environment

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed above). If at Section 2.3 you identified any alternative locations, time frames or activities for your proposed action, you must complete each of the details below (where relevant) for each alternative identified.

3.3 (a) Flora and fauna

Flora species observed within the site are listed below in Table 3.1. The threatened flora species, *Tetratheca juncea*, as listed under the *EPBC Act* (1999), was observed within the subject site.

TABLE 3.1
FLORA SPECIES OBSERVED ON THE SUBJECT SITE

Family	Scientific Name	Common Name
TREES		
CASUARINACEAE	*Allocasuarina torulosa*	Forest Oak
CUNONIACEAE	*Callicoma serratifolia*	Black Wattle
EUPHORBIACEAE	*Glochidion ferdinandii*	Cheese Tree
LAURACEAE	*Cinnamomum camphora**	Camphor Laurel
MYRTACEAE	*Angophora costata*	Smooth-barked Apple
	Corymbia gummifera	Red Bloodwood
	Corymbia maculata	Spotted Gum
	Eucalyptus capitellata	Brown Stringybark
	Eucalyptus piperita	Sydney Peppermint
	Eucalyptus racemosa	Narrow-leaved Scribbly Gum
	Eucalyptus resinifera subsp. *resinifera*	Red Mahogany
	Eucalyptus signata	Scribbly Gum
	Eucalyptus umbra subsp. *umbra*	Broad-leaved White Mahogany
	Melaleuca sieberi	-
	Syncarpia glomulifera	Turpentine

TABLE 3.1
FLORA SPECIES OBSERVED ON THE SUBJECT SITE

Family	Scientific Name	Common Name
PITTOSPORACEAE	*Pittosporum undulatum*	Sweet Pittosporum
SHRUBS		
ANACARDIACEAE	*Toxicodendron succendanium* *	Rhus Tree
ARALIACEAE	*Polyscias sambucifolia*	Elderberry Panax
ARECACEAE	*Livistona australis*	Cabbage Tree Palm
ASTERACEAE	*Ageratina adenophora**	Crofton Weed
	Bidens pilosa	Cobblers Pegs
CASUARINACEAE	*Allocasuarina littoralis*	Black She-oak
CESALPINIOIDEAE	*Senna pendula* var. *glabrata**	-
CUNONIACEAE	*Ceratopetalum gummiferum*	Christmas Bush
ELEOCARPACEAE	*Elaeocarpus reticulatus*	Blueberry Ash
EUPHORBIACEAE	*Breynia oblongifolia*	Coffee Bush
	Homalanthus popufolius	Bleeding Heart
	Phyllanthus hirtellus	
FABOIDEAE	*Aotus ericoides*	-
	Bossiaea heterophylla	Variable Bossiaea
	Bossiaea stephensonii	-
	Daviesia ulicifolia	Gorse Bitter Pea
	Dillwynia retorta var. *retorta*	Eggs and Bacon
	Gompholobium grandiflorum	Large Wedge-pea
	Gompholobium latifolium	Broad-leaf Wedge-pea
	Hovea linearis	-
	Hovea purpurea	-
	Platylobium formosum	Handsome Flat Pea
	Podolobium ilicifolium	Prickly Shaggy Pea
	Pultenaea daphnoides	Large-leaf Bush Pea
	Pultenaea paleacea	Chaffy Bush-pea
	Pultenaea villosa	Hairy Bush-pea
MIMOSOIDEAE	*Acacia falcata*	Sickle Wattle
	Acacia floribunda	Sally Wattle
	Acacia longifolia var. *longifolia*	Sydney Golden Wattle
	Acacia mearnsii	Black Wattle
	Acacia myrtifolia	Red Stem Wattle
	Acacia suaveolens	Sweet Scented Wattle
	Acacia terminalis	Sunshine Wattle
	Acacia ulicifolia	Prickly Moses
MYRSINACEAE	*Myrsine varibilis*	-
MYRTACEAE	*Callistemon linearis*	Narrow-leaved Bottlebrush
	Leptospermum juniperinum	Prickly Tea-tree
	Leptospermum polygalifolium	Lemon Scented Tea-tree
	Leptospermum trinervium	Flaky-barked Tea-tree
	Rhodamnia rubescens	Brush Turpentine
OCHNACEAE	*Ochna serrulata**	Mickey Mouse Plant
OLEACEAE	*Ligustrum lucidum**	Large-leaved Privet
	*Ligustrum sinense**	Small-leaved Privet
	Notelaea longifolia	Mock Olive
	Notelaea ovata	Mock Olive

TABLE 3.1 FLORA SPECIES OBSERVED ON THE SUBJECT SITE		
Family	**Scientific Name**	**Common Name**
	Notelaea venosa	Veined Mock Olive
PROTEACEAE	*Banksia oblongifolia*	Fern-leaved Banksia
	Banksia spinulosa	Hairpin Banksia
	Hakea sericea	Needlebush
	Isopogon anemonifolius	Flat-leaved Drumsticks
	Lambertia formosa	Mountain Devil
	Lomatia myricoides	River Lomatia
	Lomatia silaifolia	Crinkle Bush
	Persoonia lanceolata	Lance-leaved Geebung
	Persoonia levis	Broad-leaved Geebung
	Persoonia linearis	Narrow-leaved Geebung
	Petrophile pulchella	Conesticks
ROSACEAE	*Photinia serratifolia**	Hawthorn
	*Rubus anglocandicans**	Blackberry
SANTALACEAE	*Exocarpos cupressiformis*	Native Cherry
	Exocarpos strictus	Dwarf Currant
SAPINDACEAE	*Dodonaea triquetra*	Hop Bush
STYPHELIOIDEAE	*Acrotriche divaricata*	Ground-berry
	Epacris pulchella	NSW Coral Heath
	Leucopogon ericoides	-
	Leucopogon lanceolatus	-
	Trochocarpa laurina	Tree Heath
VERBENACEAE	*Lantana camara**	Lantana
GROUNDCOVERS		
ACANTHACEAE	*Pseuderanthemum variabile*	Pastel Flower
ADIANTACEAE	*Adiantum aethiopicum*	Common Maidenhair
AGAVACEAE	*Yucca aloifolia**	Dagger Plant
APIACEAE	*Centella asiatica*	Swamp Pennywort
	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
	Hydrocotyle peduncularis	Pennywort
	Gymnostachys anceps	Settlers Flax
	*Monstera deliciosa**	Fruit-salad Plant
ASPARAGACEAE	*Asparagus aethiopicus**	Asparagus Fern
ASTERACEAE	*Bidens pilosa**	Cobbler's Pegs
	*Hypochaeris radicata**	Flatweed
	Lagenofora gracilis	
BLECHNACEAE	*Blechnum camfieldii*	-
	Blechnum cartilagineum	Gristle Fern
COMMELINACEAE	*Tradescantia fluminensis**	Wandering Jew
CONVOLVULACEAE	*Dichondra repens*	Kidney Weed
CYATHEACEAE	*Cyathea australis*	Rough Tree-fern
CYPERACEAE	*Gahnia clarkei*	Tall Saw-sedge
	Gahnia sieberiana	Red-fruited Saw-sedge
	Lepidosperma laterale	Variable Sword-sedge
DAVALLIACEAE	*Nephrolepis cordifolia**	Fish-bone Fern
DENNSTAEDTIACEAE	*Hypolepis muelleri*	Harsh Ground Fern

TABLE 3.1
FLORA SPECIES OBSERVED ON THE SUBJECT SITE

Family	Scientific Name	Common Name
	Pteridium esculentum	Bracken
DICKSONIACEAE	*Calochlaena dubia*	False Bracken
DILLENIACEAE	*Hibbertia aspera*	-
DROSERACEAE	*Drosera peltata*	
ELAEOCARPACEAE	***Tetratheca juncea*** [TS]	Black-eyed Susan
FABOIDEAE	*Desmodium rhytidophyllum*	Rusty Tick Trefoil
	Mirbelia rubiifolia	Heathy Mirbelia
GLEICHENIACEAE	*Gleichenia dicarpa*	Pouched Coral Fern
GOODENIACEAE	*Dampiera purpurea*	-
	Dampiera stricta	Blue Dampiera
GOODENIACEAE	*Goodenia heterophylla* subsp. *heterophylla*	-
HALORAGACEAE	*Gonocarpus tetragynus*	Poverty Raspwort
	Gonocarpus teucroides	Raspwort
IRIDACEAE	*Patersonia glabrata*	Leafy Purple Flag
	Patersonia sericea	Wild Iris
LILIACEAE	*Lilium formosanum**	Formosan Lily
LINDSAEACEAE	*Lindsaea linearis*	Screw Fern
	Lindsaea microphylla	Lacy Wedge-fern
LOBELIACEAE	*Pratia purpurascens*	Whiteroot
LOMANDRACEAE	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush
	Lomandra longifolia	Spiky-headed Mat-rush
	Lomandra multiflora subsp. multiflora	-
	Lomandra obliqua	Twisted Mat-rush
MALVACEAE	*Sida rhombifolia**	Paddy's Lucerne
ORCHIDACEAE	*Acianthus fornicatus*	Pixie Caps
	Caladenia catenata	White Finger Orchid
	Calochilus sp.	Beareded Orchid
	Corybas aconitiflorus	Helmet Orchid
	Cryptostylis subulata	Large Tongue Orchid
	Pterostylis longifolia	Tall Greenhood
	Pterostylis nutans	Nodding Greenhood
OXALIDACEAE	*Oxalis perrenans*	-
PHORMIACEAE	*Dianella caerulea*	Blue Flax Lily
PLANTAGINACEAE	*Plantago lanceolata**	Ribwort
	Veronica plebeia	Creeping Speedwell
POACEAE	*Andropogon virginicus**	Whisky Grass
	Aristada vagans	Three-awn Speargrass
	Austrodanthonia tenuior	Wallaby Grass
	*Briza maxima**	Quaking Grass
	Capillipedium spicigerum	Scented-top Grass
	*Cortaderia selloana**	Pampas Grass
	Cymbopogon refractus	Barbwire Grass
	Cynodon dactylon	Common Couch
	Echinopogon caespitosus var. *caespitosus*	Tufted Hedgehog Grass
	Echinopogon ovatus	Forest Hedgehog Grass
	Entolasia marginata	Bordered Panic

TABLE 3.1 FLORA SPECIES OBSERVED ON THE SUBJECT SITE		
Family	**Scientific Name**	**Common Name**
	Entolasia stricta	Wiry Panic
	Imperata cylindrica var. *major*	Blady Grass
	Joycea pallida	Red Anther Grass
	*Melinus repens**	Red Natal Grass
	Microlaena stipoides var. *stipoides*	Weeping Rice Grass
	Panicum simile	Two Colour Panic
	Paspalum dilatatum *	Paspalum
	*Paspalum urvillei**	Vasey Grass
	Stenotaphrum secundatum *	Buffalo Grass
	Themeda australis	Kangaroo Grass
POLYGALACEAE	*Comesperma ericinum*	Pyramid Flower
RESTIONACEAE	*Leptocarpus tenax*	Slender Twine-rush
SCROPHULARIACEAE	*Veronica plebia*	Trailling Speedwell
STYPHELIOIDEAE	*Epacris microphylla*	Coral Heath
THYMELAEACEAE	*Pimelea linifolia subsp. linifolia*	Slender Rice Flower
VERBENACEAE	*Verbena bonariensis**	Purpletop
VIOLACEAE	*Viola betonicifolia*	Native Violet
XANTHORRHOACEAE	*Xanthorrhoea latifolia* subsp. *latifolia*	-
CLIMBERS		
ACANTHACEAE	*Thunbergia alata**	Black-eyed Susan
APOCNYACEAE	*Araujia sericifera**	Moth Vine
	Parsonsia straminea	Common Silkpod
BIGNONIACEAE	*Pandorea pandorana*	Wonga Vine
CONVOLVULACEAE	*Ipomoea indica**	Morning Glory
DILLENIACEAE	*Hibbertia dentata*	Twining Guinea Flower
	Hibbertia scandens	Climbing Guinea-flower
DIOSCOREACEAE	*Dioscorea transversa*	Native Yam
FABOIDEAE	*Desmodium varians*	Slender Tick-trefoil
	Glycine clandestina	Twining Glycine
	Glycine microphylla	-
	Hardenbergia violacea	False Sasparilla
	Kennedia rubicunda	Dusky Coral Pea
	*Wisteria sinensis**	Wisteria
LAURACEAE	*Cassytha glabella*	Slender Devil's Twine
	Cassytha pubescens	Common Devil's Twine
LUZURIAGACEAE	*Eustrephus latifolius*	Wombat Berry
MENISPERMIACEAE	*Stephania japonica* var. *discolor*	Snake Vine
OLEACEAE	*Jasminum polyanthum**	Jasmine
PASSIFLORACEAE	*Passiflora edulis**	Common Passionfruit
PITTOSPORACEAE	*Billardiera scandens*	Apple Dumplings
RANUNCULACEAE	*Clematis glycinoides* var. *glycinoides*	Forest Clematis
SMILACACEAE	*Ripogonum album*	White Supplejack
	Smilax australis	Lawyer Vine
	Smilax glyciphylla	Sarsaparilla
EPIPHYTES		
LORANTHACEAE	*Amyema congener subsp. congener*	Mistletoe
Species name ^{TS} = Threatened Species * = Introduced Species		

Fauna species observed within the site are listed below in Table 3.2. No threatened or migratory fauna species, as listed under the *EPBC Act* (1999), were observed within the subject site.

TABLE 3.2
FAUNA OBSERVED AND RECORDED

Family Name	Common Name	*Scientific Name*	Observation Method
Amphibians			
Hylidae	Smooth Toadlet	*Uperoleia laevigata*	C
Myobatrachidae	Common Eastern Froglet	*Crinia signifera*	C
Reptiles			
Agamidae	Jacky Lizard	*Amphibolurus muricatus*	O
	Eastern Water Dragon	*Physignathus lesueurii lesueurii*	O
Elapidae	Red-bellied Black Snake	*Pseudechis porphyriacus*	O
Scincidae	Land Mullet	*Egernia major*	O
	Pale-flecked Garden Sunskink	*Lampropholis guichenoti*	O
	Eastern Blue-tongue	*Tiliqua scincoides*	O
Birds			
Anatidae	Australian Wood Duck	*Chenonetta jubata*	O
	Pacific Black Duck	*Anas superciliosa*	O
Columbidae	Spotted Dove*	*Streptopelia chinensis*	O
	Crested Pigeon	*Ocyphaps lophotes*	O
Podargidae	Tawny Frogmouth	*Podargus strigoides*	Sp
Threskiornithidae	Australian White Ibis	*Threskiornis molucca*	O
	Straw-necked Ibis	*Threskiornis spinicollis*	O
Accipitridae	Grey Goshawk	*Accipiter novaehollandiae*	O
Cacatuidae	Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	O C
	Galah	*Eolophus roseicapillus*	O C
	Little Corella	*Cacatua sanguinea*	O C
	Sulphur-crested Cockatoo	*Cacatua galerita*	O C
Psittacidae	Rainbow Lorikeet	*Trichoglossus haematodus*	O C
	Little Lorikeet	*Glossopsitta pusilla*	O C
	Australian King-Parrot	*Alisterus scapularis*	O C
	Crimson Rosella	*Platycercus elegans*	O
	Eastern Rosella	*Platycercus eximius*	O C
Cuculidae	Eastern Koel	*Eudynamys orientalis*	O C
	Channel-billed Cuckoo	*Scythrops novaehollandiae*	O C
	Fan-tailed Cuckoo	*Cacomantis flabelliformis*	O C
Strigidae	Powerful Owl	*Ninox strenua*	O
	Southern Boobook	*Ninox novaeseelandiae*	O
Halcyonidae	Laughing Kookaburra	*Dacelo novaeguineae*	O C
	Sacred Kingfisher	*Todiramphus sanctus*	O C
Climacteridae	White-throated Treecreeper	*Cormobates leucophaea*	O C
Maluridae	Superb Fairy-wren	*Malurus cyaneus*	O C
	Variegated Fairy-wren	*Malurus lamberti*	O C
Acanthizidae	White-browed Scrubwren	*Sericornis frontalis*	O C
	Brown Gerygone	*Gerygone mouki*	O C
	Yellow Thornbill	*Acanthiza nana*	O C
	Brown Thornbill	*Acanthiza pusilla*	O C
Pardalotidae	Spotted Pardalote	*Pardalotus punctatus*	O C
Meliphagidae	Eastern Spinebill	*Acanthorhynchus tenuirostris*	O C

TABLE 3.2
FAUNA OBSERVED AND RECORDED

Family Name	Common Name	*Scientific Name*	Observation Method
	Lewins Honeyeater	*Meliphaga lewinii*	O C
	Yellow-faced Honeyeater	*Lichenostomus chrysops*	O C
	Noisy Miner	*Manorina melanocephala*	O C
	Red Wattlebird	*Anthochaera carunculata*	O C
	Scarlet Honeyeater	*Myzomela sanguinolenta*	O C
	White-cheeked Honeyeater	*Phylidonyris niger*	O C
	Noisy Friarbird	*Philemon corniculatus*	O C
Campephagidae	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	O C
Pachycephalidae	Golden Whistler	*Pachycephala pectoralis*	O C
	Grey Shrike-thrush	*Colluricincla harmonica*	O C
Artamidae	Grey Butcherbird	*Cracticus torquatus*	O C
	Pied Butcherbird	*Cracticus nigrogularis*	O C
	Australian Magpie	*Cracticus tibicen*	O C
	Pied Currawong	*Strepera graculina*	O C
Rhipiduridae	Grey Fantail	*Rhipidura albiscapa*	O C
Corvidae	Australian Raven	*Corvus coronoides*	O C
Petroicidae	Eastern Yellow Robin	*Eopsaltria australis*	O C
Hirundinidae	Welcome Swallow	*Hirundo neoxena*	O C
Estrildidae	Red-browed Finch	*Neochmia temporalis*	O C
Mammals			
Petauridae	Squirrel Glider	*Petaurus norfolcensis*	E
Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*	Sp
Pseudocheiridae	Common Ringtail Possum	*Pseudocheirus peregrinus*	Sp
Muridae	Black Rat *	*Rattus rattus*	E
Leporidae	Rabbit *	*Oryctolagus cuniculus*	Sp
Leporidae	Brown Hare *	*Lepus capensis*	Sp
Canidae	Fox *	*Vulpes vulpes*	Sp
Canidae	Dog *	*Canis lupus familiaris*	O C
Pteropodidae	**Grey-headed Flying-fox** [TS]	*Pteropus poliocephalus*	Sp
Molossidae	White-striped Freetail-bat	*Tadarida australis*	A
Vespertilionidae	Little Bentwing-bat	*Miniopterus australis*	A
	Gould's Wattled Bat	*Chalinolobus gouldii*	A
	Chocolate Wattled Bat	*Chalinolobus morio*	A
	Eastern Broad-nosed Bat	*Scotorepens orion*	A
	Little Forest Bat	*Vespadelus vulturnus*	A

Key to Observation Type

O	-	Observation	S	-	Search
C	-	Call identification	A	-	Anabat II
Sp	-	Spotlight	Sc	-	Scat, Track or Sign
E	-	Elliott Trap	K	-	Kill

Note: * indicates introduced species. [TS] indicates threatened species EPBC Act.

3.3 (b) Hydrology, including water flows

The site occurs within the Lake Macquarie Catchment. Drainage from the site is to the south-west via an unnamed tributary of Winding Creek which occurs within the southern boundary of the site.

3.3 (c) Soil and Vegetation characteristics

Soils

The site is predominantly located on the Gateshead erosional soil landscape, with the north-eastern corner of the site mapped on the Killingworth erosional soil landscape (Matthei 1995). Descriptions of these soil landscapes are provided below.

Gateshead Soil Landscape

Landscape
Undulating to rolling rises on Permian conglomerate, shale and sandstone in the Awaba Hills. Local relief to 100 m. Slopes to 5-15%. Elevation to 130 m. Predominantly cleared woodland and open forest.

Soils
Moderately deep (100-200 cm) moderately well to imperfectly drained Yellow Podzolic Soils (Dy3.21) and yellow Soloths (Dy2.41, Dy3.41) on conglomerate crests and sideslopes, with some shallow (<50 cm), rapidly drained Lithosols (Um1.41). Moderately deep to deep, well to imperfectly drained Red Podzolic Soils (Dr3.21), red Soloths (Dr2.41, Dr3.41) and some Yellow Soloths (Dy2.41) on shale parent material.

Qualities and Limitations
Water erosion hazard, Mine Subsidence District, locally steep slopes and shallow soils, high run-on and seasonal waterlogging on lower slopes, acid soils of low fertility.

Killingworth Soil Landscape

Landscape
Undulating to rolling hills and low hills on the Newcastle Coal Measures of the Awaba Hills region. Elevation 50-160 m, local relief 30-100 m, slopes are 3-20%. Predominantly uncleared tall open forest.

Soils
Shallow (<60 cm) to moderately deep (<150 cm), well to imperfectly drained Yellow Podzolic Soils (Dy3.21, Dy5.11, Dy2.11), yellow Soloths (Dy3.41, Dy2.41), Gleyed Podzolic Soils (Dg1.41) and gleyed Soloths (Dg2.41, Dg3.41), on crests and hill slopes, with shallow (<60 cm) well drained Structured Loams (Um6.32, Um6.22), Bleached Loams (Um2.12, UM 1.41) and Lithosols (U,4.4, Uc1.21, UC2.21) on some crests.

Qualities and Limitations
High water erosion hazard, Mine Subsidence District, foundation hazard (localised), shallow soils (localised), sodic/dispersible soils of low wet strength, very strong acid soils of low fertility.

Vegetation
The vegetation communities Coastal Plains Open Forest (*Angophora costata* / *Corymbia gummifera*), Sheltered Open Forest (*Eucalyptus piperita* / *Angophora costata*) and Cleared Land have been identified within the site by *Conacher Environmental Group* (2013). Vegetation community descriptions are provided below.

COASTAL PLAINS OPEN FOREST (*Angophora costata* / *Corymbia gummifera*)

Structure:

Canopy: To 30 metres high, with 70% Projected Foliage Cover (PFC).

Sub-canopy: To 6 metres high, with 10% PFC.

Shrubs: To 2 metres high, with 15% PFC.

Groundlayer: To 0.5 metres high, with 30-50% PFC.

Floristics:
(Characteristic Species)

Canopy: *Angophora costata*, *Corymbia gummifera, Eucalyptus capitellata*, *Eucalyptus piperita,* and *Eucalyptus signata.*

Sub-canopy: *Allocasuarina littoralis* and regrowth eucalypts.

Shrubs: *Banksia spinulosa, Glochidion ferdinandi*, *Acacia terminalis, Dodonaea triquetra, Leptospermum polygalifolium* and *Persoonia levis.*

Groundlayer: *Entolasia stricta, Pteridium esculentum, Pratia purpurascens, Pultenaea paleacea* and *Themeda australis.*

Weeds: *Lantana camara, Ligustrum sinense and Cinnamomum camphora.*

Classification:
This vegetation community corresponds to the Sydney Coastal Dry Sclerophyll Forest class within the Dry Sclerophyll Forests formation (shrubby sub-formation) of Keith (2004).

The majority of the site has been mapped by Bell and Driscoll (2010) as Map Unit (MU) 30 Coastal Plains Smooth-barked Apple Woodland. Small patches of vegetation in the south-eastern section of the site have been mapped as MU 15 Coastal Foothills Spotted Gum – Ironbark Forest and a small patch of vegetation in the north-eastern section of the site has been mapped as MU 31 Coastal Plains Scribbly Gum Woodland. Field surveys have determined that the vegetation within the site is most similar to MU 30.

MU 30 corresponds to the OEH Biometric Vegetation Type, Smooth-barked Apple – Red Bloodwood Open Forest on Coastal Plains of the Central Coast and Sydney Basin (NSW Office of Environment and Heritage 2012b).

This vegetation community does not correspond to any threatened ecological community listed within the *TSC Act* (1995) or the *EPBC Act* (1999

Variation:
The following variations were observed throughout this vegetation community:

Variant 1 (Woody Shrub Understory)
This variant was dominant throughout the site and generally corresponded to the characteristic community description provided. The understorey was characterised by an open to mid-dense cover of woody shrubs. Variation observed was attributed to weed invasion and canopy tree composition. The composition of the listed characteristic canopy species was variable throughout the site and the western section of the vegetation north of Myall Road contained *Corymbia maculata*.

Variant 2 (Heath Understorey)
This variant occurs within the central section of the site south of the playing fields. The listed characteristic canopy species were present, however projected canopy foliage cover was reduced and the understorey was dominated by a dense cover of heath-type species such as *Leptospermum polygalifolium*, *Pultenaea palacea, Leptospermum trinervium, Adiantum aethiopicum, Epacris pulchella, Gahnia sieberiana* and *Bossiaea heterophylla*.

Disturbance:
This vegetation community has been disturbed by weed invasion, clearing for tracks, ongoing management of a power-line easement in the southern section of the site, a previous bushfire and historical coal mining. Areas most disturbed by previous fire regimes contained a high projected foliage cover of *Dodonaea triquetra, Imperata cylindrica* and *Pteridium esculentum*.

Weed Invasion:
High to moderate levels of weed invasion were observed in the patch of vegetation north of Myall Road and along the boundaries of the subject site. Generally low levels of weeds were observed throughout the remaining areas of this community and were predominantly restricted to track edges.

Location and Distribution:
This community occupies approximately 34 hectares and occurs throughout most of the site with the exception of drainage line areas and cleared areas and shown in Figure 2. The separate vegetation variants within this community occupy the following areas:

- Coastal Plains Open Forest Variant 1 (Woody Shrub Understorey) = 30.7 ha;
- Coastal Plains Open Forest Variant 2 (Dense Heath Understorey) = 3.5 ha.

SHELTERED OPEN FOREST (*Eucalyptus piperita* / *Angophora costata*)

Structure:

Canopy: To 25 metres high, with 40% Projected Foliage Cover (PFC).

Shrubs: To 6 metres high, with 40% PFC.

Groundlayer: To 2 metres high, with 70% PFC.

Floristics:
(Characteristic Species)

Canopy: *Eucalyptus piperita* and *Angophora costata.*

Shrubs: *Callicoma serratifolia, Dodonaea triquetra, Syncarpia glomulifera, Glochidion ferdinandi* and *Notelaea ovata.*

Groundlayer: *Calochlaena dubia, Gahnia clarkei, Blechnum camfieldii,* and *Pteridium esculentum.*

Weeds: *Lantana camara, Ligustrum sinense and Cinnamomum camphora.*

Classification:
This vegetation community corresponds to the Sydney Coastal Dry Sclerophyll Forest class within the Dry Sclerophyll Forests formation (shrubby sub-formation) of Keith (2004).

The majority of the site has been mapped by Bell and Driscoll (2010) as Map Unit (MU) 30 Coastal Plains Smooth-barked Apple Woodland. Field surveys have determined that this vegetation community occurs as a sheltered variant of the Coastal Plains Open Forest community within shallow drainage line areas and corresponds to MU 11 Coastal Sheltered Apple – Peppermint Forest as described by Bell and Driscoll (2010).

It is considered that this vegetation community is a sheltered drainage line variant of the Biometric Vegetation Type, Smooth-barked Apple – Red Bloodwood Open Forest on Coastal Plains of the Central Coast and Sydney Basin (NSW Office of Environment and Heritage 2012b).

This vegetation community does not correspond to any threatened ecological community listed within the *TSC Act* (1995) or the *EPBC Act* (1999).

Variation:
Two patches of this community are mapped within the site. The western patch of this community contains *S. glomulifera* which is generally absent in other areas of this community. The patch of this community along the southern boundary of the site contains generally low levels of weed invasion and the western patch contains high levels of weed invasion.

Disturbance:
This community has been disturbed by weed invasion and clearing for the creation of walking tracks.

Weed Invasion:
Weed invasion was observed in mostly low levels within the southern patch of this community and high levels within the western patch of this community.

Location and Distribution:
This community occurs within shallow drainage lines adjacent to the southern and western boundaries of the site and occupies approximately 4 hectares as shown in Figure 2.

CLEARED LAND
This vegetation community occurs in parts of the site which have been previously cleared and subject to ongoing management. The areas of cleared land occur as portions of larger cleared areas and occupy approximately 0.65 hectares within the subject site. The patch in the central northern section of the site is associated with a playing field and contains mostly exotic grasses. The two patches in the south-eastern section of the site are associated with a power-line easement and contain a mixture of predominantly exotic and low levels of native species. Areas cleared for tracks are also present throughout the site, however have not been mapped.

3.3 (d) Outstanding natural features

There are no outstanding natural features such as caves, rock faces, outcrops or other geological or topographical outstanding features present.

3.3 (e) Remnant native vegetation

The Coastal Plains Open Forest and Sheltered Open Forest vegetation communities within the site described in point 3.3 (c) are composed of remnant native vegetation.

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

The topography of the site consists of undulating to rolling low hills and rises. The elevation of the subject site ranges from approximately 30 m in the south-western section of the site to 100 m in the eastern section of the site.

3.3 (g) Current state of the environment

Include information about the extent of erosion, whether the area is infested with weeds or feral animals and whether the area is covered by native vegetation or crops.

The subject site currently contains vacant land surrounded by residential development and a sporting oval. Incursions of weeds and feral animals were observed within the site and are listed below in Table 3.3. The introduced species observed are considered to be relatively common in similar disturbed habitats within the locality. Erosion was observed along drainage line areas, cleared tracks and areas affected by mine subsidence. No crops are present within the site.

TABLE 3.3
INTRODUCED FLORA AND FAUNA OBSERVED ON THE SUBJECT SITE

Family	Scientific Name	Common Name
TREES		
LAURACEAE	*Cinnamomum camphora**	Camphor Laurel
SHRUBS		
ANACARDIACEAE	*Toxicodendron succendanium **	Rhus Tree
ASTERACEAE	*Ageratina adenophora**	Crofton Weed
CESALPINIOIDEAE	*Senna pendula* var. *glabrata**	-
OCHNACEAE	*Ochna serrulata**	Mickey Mouse Plant
OLEACEAE	*Ligustrum lucidum**	Large-leaved Privet
	*Ligustrum sinense**	Small-leaved Privet
ROSACEAE	*Photinia serratifolia**	Hawthorn
	*Rubus anglocandicans**	Blackberry
VERBENACEAE	*Lantana camara**	Lantana
GROUNDCOVERS		
AGAVACEAE	*Yucca aloifolia**	Dagger Plant
APIACEAE	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
	*Monstera deliciosa**	Fruit-salad Plant
ASPARAGACEAE	*Asparagus aethiopicus**	Asparagus Fern
ASTERACEAE	*Bidens pilosa**	Cobbler's Pegs
	*Hypochaeris radicata**	Flatweed
COMMELINACEAE	*Tradescantia fluminensis**	Wandering Jew
DAVALLIACEAE	*Nephrolepis cordifolia**	Fish-bone Fern
LILIACEAE	*Lilium formosanum**	Formosan Lily
MALVACEAE	*Sida rhombifolia**	Paddy's Lucerne

TABLE 3.3
INTRODUCED FLORA AND FAUNA OBSERVED ON THE SUBJECT SITE

Family	Scientific Name	Common Name
PLANTAGINACEAE	*Plantago lanceolata**	Ribwort
POACEAE	*Andropogon virginicus**	Whisky Grass
	*Briza maxima**	Quaking Grass
	*Cortaderia selloana**	Pampas Grass
	*Melinus repens**	Red Natal Grass
	*Paspalum dilatatum **	Paspalum
	*Paspalum urvillei**	Vasey Grass
	*Stenotaphrum secundatum **	Buffalo Grass
VERBENACEAE	*Verbena bonariensis**	Purpletop
CLIMBERS		
ACANTHACEAE	*Thunbergia alata**	Black-eyed Susan
APOCNYACEAE	*Araujia sericifera**	Moth Vine
CONVOLVULACEAE	*Ipomoea indica**	Morning Glory
DIOSCOREACEAE	*Wisteria sinensis**	Wisteria
OLEACEAE	*Jasminum polyanthum**	Jasmine
PASSIFLORACEAE	*Passiflora edulis**	Common Passionfruit
BIRDS		
COLUMBIDAE	Spotted Dove*	*Streptopelia chinensis*
MAMMALS		
MURIDAE	Black Rat *	*Rattus rattus*
LEPORIDAE	Rabbit *	*Oryctolagus cuniculus*
	Brown Hare *	*Lepus capensis*
CANIDAE	Fox *	*Vulpes vulpes*
	Dog *	*Canis lupus familiaris*

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

No Commonwealth Heritage Places or other places recognised as having heritage values have been identified within the project area or within the area likely to be affected by the proposal.

3.3 (i) Indigenous heritage values

Two Aboriginal Heritage Due Diligence Reports have been prepared for the proposal in accordance with the NSW National Parks and Wildlife Act (1974) by RPS (2012). The reports determined that no Aboriginal objects or places have been identified in the study area and that an Aboriginal Heritage Impact permit under the NSW NPW Act (1974) is not required for the proposed activity.

3.3 (j) Other important or unique values of the environment

Describe any other key features of the environment affected by, or in proximity to the proposed action (for example, any national parks, conservation reserves, wetlands of national significance etc).

No other key features of the environment likely to be affected by, or in proximity to the proposed action have been identified.

3.3 (k) Tenure of the action area (eg freehold, leasehold)

The subject site is freehold land owned by Urban Growth NSW

3.3 (l) Existing land/marine uses of area

The site is currently vacant land, the surrounding land usage is primarily residential.

3.3 (m) Any proposed land/marine uses of area

Residential

4 Measures to avoid or reduce impacts

Note: If you have identified alternatives in relation to location, time frames or activities for the proposed action at Section 2.3 you will need to complete this section in relation to each of the alternatives identified.

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

For any measures intended to avoid or mitigate significant impacts on matters protected under the EPBC Act, specify:
- what the measure is,
- how the measure is expected to be effective, and
- the time frame or workplan for the measure.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

Provide information about the level of commitment by the person proposing to take the action to implement the proposed mitigation measures. For example, if the measures are preliminary suggestions only that have not been fully researched, or are dependent on a third party's agreement (e.g. council or landowner), you should state that, that is the case.

Note, the Australian Government Environment Minister may decide that a proposed action is not likely to have significant impacts on a protected matter, as long as the action is taken in a particular manner (section 77A of the EPBC Act). The particular manner of taking the action may avoid or reduce certain impacts, in such a way that those impacts will not be 'significant'. More detail is provided on the Department's web site.

For the Minister to make such a decision (under section 77A), the proposed measures to avoid or reduce impacts must:
- clearly form part of the referred action (eg be identified in the referral and fall within the responsibility of the person proposing to take the action),
- be must be clear, unambiguous, and provide certainty in relation to reducing or avoiding impacts on the matters protected, and
- must be realistic and practical in terms of reporting, auditing and enforcement.

More general commitments (eg preparation of management plans or monitoring) and measures aimed at providing environmental offsets, compensation or off-site benefits CANNOT be taken into account in making the initial decision about whether the proposal is likely to have a significant impact on a matter protected under the EPBC Act. (But those commitments may be relevant at the later assessment and approval stages, including the appropriate level of assessment, if your proposal proceeds to these stages).

The following measures to avoid or reduce impacts to matters of national environmental significance are proposed.

Measures to Avoid Impacts
- Retention of 74% of the local population of *T. juncea*;
- Location of asset protection zones within roads footprints where appropriate;
- Location of asset protection zones outside of conservation areas;
- Maintenance of site connectivity and minimisation of fragmentation through avoidance of development adjacent to the southern access road; and
- Retention of a greater than 30m buffer for specimens of *T. juncea* within the eastern section of the site.

Measures to Mitigate Impacts

The areas outside of the proposed development area will be retained as a conservation area consisting of 27.5 hectares of Open Forest habitat including 23.5 hectares of Coastal Plains Open Forest and 4 hectares of Sheltered Open Forest vegetation. The conservation areas of the site will be managed in accordance with the Vegetation Management Plan prepared for the site, which is provided in the Attachments section of this referral.

Mitigation of impacts will be undertaken in accordance with the Vegetation and Habitat Management Plan for the site and will incorporate the following measures:

- Management of key threatening processes;
- Management of fire regimes;
- Management of weed invasion;
- Targeted revegetation of degraded areas;
- Access exclusion and management; and
- Prevention and management of rubbish dumping.

Ongoing Monitoring and Management

The areas of retained habitats within the site will be subject to management and monitoring in accordance with the Vegetation Management Plan prepared for the site, which is provided in the Attachments section of this referral.

The environmental management objectives for the ongoing future management of conservation areas are:

- Protection of the environmental and ecological values of Conservation Area;
- Minimisation of the impacts of development within adjacent land upon Conservation Areas during construction and occupation of adjoining residential areas;
- Maintenance of biodiversity and protection of native flora and fauna species and their habitats (including threatened species) within Conservation Areas;
- Increased awareness and promotion of a culture of protection of Conservation Areas by the community;
- Management of Asset Protection Zones and Stormwater Detention Basins as a buffer between development and conservation areas;
- Long term monitoring of the Conservation Areas to determine changes (if any) to flora and fauna, particularly threatened species, and vegetation communities and recommend corrective actions if required.

Environmental Management Plan For Civil Works

It is expected that as part of Urban Growth's internal policy framework, a site-specific Environmental Management Plan for all civil works will be prepared for the site.

5 Conclusion on the likelihood of significant impacts

Identify whether or not you believe the action is a controlled action (ie. whether you think that significant impacts on the matters protected under Part 3 of the EPBC Act are likely) and the reasons why.

5.1 Do you THINK your proposed action is a controlled action?

✓	No, complete section 5.2
	Yes, complete section 5.3

5.2 Proposed action IS NOT a controlled action.

Specify the key reasons why you think the proposed action is NOT LIKELY to have significant impacts on a matter protected under the EPBC Act.

According to EPBC Act Policy Statement 1.1 *Significant Impact Guidelines* (DEWHA 2009), a significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value and quality of the environment which is impacted and upon the intensity, duration, magnitude and geographic extent of the impacts. All of these factors should be considered when determining whether an action is likely to have a significant impact on matters of national environmental significance.

Two matters of national environmental significance, *Tetratheca juncea* and the Grey-headed Flying-fox were observed within the subject site.

Tetratheca juncea

One threatened flora species, *Tetratheca juncea*, as listed within the *EPBC Act* (1999), was observed within the subject site. The factors for assessment for *T. juncea* have determined that it is uncertain as to whether the proposal will have a significant impact on the species. Taking into account the retention of 74% of the local population of the species within the site, the best practice mitigation measures proposed to be implemented in accordance with the Vegetation and Habitat Management Plan, and the retention of habitat connectivity for pollinators throughout the site, it is considered that the proposal is not likely to have a significant impact on this species.

Grey-headed Flying-fox

Assessment in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DEWHA 2009) has determined that the proposal is not likely to have a significant impact on an important population of the Grey-headed Flying-fox (*Conacher Environmental Group* 2013).

5.3 Proposed action IS a controlled action

Type 'x' in the box for the matter(s) protected under the EPBC Act that you think are likely to be significantly impacted. (The 'sections' identified below are the relevant sections of the EPBC Act.)

	Matters likely to be impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)

	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

Specify the key reasons why you think the proposed action is likely to have a significant adverse impact on the matters identified above.

6 Environmental record of the responsible party

NOTE: If a decision is made that a proposal needs approval under the EPBC Act, the Environment Minister will also decide the assessment approach. The EPBC Regulations provide for the environmental history of the party proposing to take the action to be taken into account when deciding the assessment approach.

		Yes	No
6.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details**	✓	
6.2	**Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?** **If yes, provide details**		✓
6.3	**If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?** **If yes, provide details of environmental policy and planning framework**	✓	
6.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?** **Provide name of proposal and EPBC reference number (if known)** Urban Growth (Landcom) has lodged 15 referrals since 2001. Details of these referrals can be obtained by accessing the Referrals List Webpage at: http://www.environment.gov.au/cgi-bin/epbc/epbc_ap.pl?name=current_referrals&limit=999999&text_search=landcom	✓	

7 Information sources and attachments

(For the information provided above)

7.1 References

- List the references used in preparing the referral.
- Highlight documents that are available to the public, including web references if relevant.

Bell S., Driscoll C. (2010) Lake Macquarie City Council Working Draft Composite Vegetation Community Mapping December 2009, Eastcoast Flora Survey, Kotara Fair.

Conacher Environmental Group (2013) Biodiversity Assessment Report, Proposed Residential Development Landcom Project No. 12806, Myall Road, Hillsborough. Unpublished report prepared for Landcom.

Conacher Environmental Group (2013) Vegetation Management Plan Retained Bushland Areas 12806, Myall Road, Hillsborough. Unpublished report prepared for Landcom.

Australian Government Department of the Environment (2013) *EPBC Act Policy Statement 1.1 Significant Impact Guidelines, Matters of National Environmental Significance*, Commonwealth of Australia.

Department of the Environment, Water, Population and Communities (2011) Environment Protection and Biodiversity Conservation Act (1999) Referral guidelines for the vulnerable black-eyed susan, *Tetratheca juncea*. Commonwealth of Australia.

Australian Government Department of the Environment (2014) Protected Matters Search Tool, EPBC Act Protected Matters Report, Website:
http://www.environment.gov.au/epbc/pmst/index.html

Payne, R., Stevenson, D. & Wellington, R. (2002). A standardised method for counting black-eyed susan populations. Unpublished Report.

RPS (2010) Preliminary Flora and Fauna Surveys, Myall Road, Hillsborough. Unpublished report prepared for Landcom.

7.2 Reliability and date of information

For information in section 3 specify:

- source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

Source 1: EPBC Act Protected Matters Report (AGDE 2014)
Date: 14 April 2014
Information reliability / uncertainties in information: This source provides a general guide only as stated in the search results. For information regarding uncertainties regarding this source refer to the Caveat section in the Protected Matters Search Report provided in the Attachments section of this referral.

Source 2: Biodiversity Assessment Report (*Conacher Environmental Group* 2013)
Date: May 2013
Information reliability / uncertainties in information: As with any flora or fauna survey the absence of a species during surveys does not necessarily mean a species does not inhabit the survey area. Lack of detection for a species may be a result of several factors including the survey method adopted and the prevailing seasonal or climatic conditions during which surveys were conducted.

Source 2: Preliminary Flora and Fauna Surveys, Myall Road, Hillsborough (RPS 2010)
Date: 2010
Information reliability / uncertainties in information: As with any flora or fauna survey the absence of a species during surveys does not necessarily mean a species does not inhabit the survey area. Lack of detection for a species may be a result of several factors including the survey method adopted and the prevailing seasonal or climatic conditions during which surveys were conducted.

7.3 Attachments

Indicate the documents you have attached. All attachments must be less than three megabytes (3mb) so they can be published on the Department's website. Attachments larger than three megabytes (3mb) may delay the processing of your referral.

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	✓	Attachment 1 – Figure 1 Site Boundary and Proposed Development Footprint Attachment 2 – Subdivision Masterplan
	GIS file delineating the boundary of the referral area (section 1)		
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Attachment 1 - Figure 2 Threatened Species Locations
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	NA	
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	✓	Attachment 3 - Biodiversity Assessment Report Attachment 4 –Vegetation Management Plan
	copies of any flora and fauna investigations and surveys (section 3)	✓	Attachment 3 - Biodiversity Assessment Report
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)	✓	Attachment 3 - Biodiversity Assessment Report Attachment 5 - EPBC Act Protected Matters Report
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)	NA	

8 Contacts, signatures and declarations

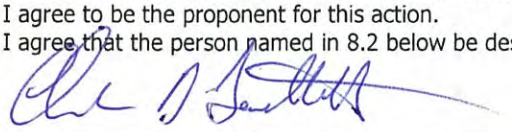
NOTE: Providing false or misleading information is an offence punishable on conviction by imprisonment and fine (s 489, EPBC Act).

Under the EPBC Act a referral can only be made by:

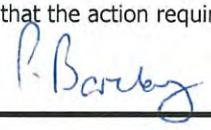
- the person proposing to take the action; or
- the Commonwealth, state or territory government, or agency with administrative responsibility for the action.

Project title:

8.1 **Person proposing to take action**

Name	Charles Bartlett
Title	Development Director
Organisation	UrbanGrowth NSW
ACN / ABN (if applicable)	79 268 260 688
Postal address	PO Box 237 Parramatta NSW 2124
Telephone	(02) 4927 7401
Email	Cbartlett@urbangrowth.nsw.gov.au
Declaration	I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct. I understand that giving false or misleading information is a serious offence. I agree to be the proponent for this action. I agree that the person named in 8.2 below be designated as the proponent of the action.
Signature	 Date 20/5/14

8.2 **Proponent**

Name	Bannister and Hunter
Title	Director & Registered Surveyor
Organisation	Bannister and Hunter Pty Ltd
ACN / ABN (if applicable)	065 297 127 / 89 065 297 127
Postal address	75 Mann Street Gosford NSW 2250
Telephone	(02) 4324 7566
Email	admin@bannisterhunter.com.au
Declaration	I agree to be designated as the proponent for the action described above if it is decided that the action requires approval under Part 9 of the EPBC Act.
Signature	 Date 20/5/14

8.3 **Person preparing the referral information**

Name	Jacob Manners
Title	Senior Project Manager / Ecologist
Organisation	Conacher Consulting Pty Ltd
Postal address	PO Box 4082 East Gosford NSW 2250
Telephone	(02) 4324 7888
Email	conacherconsulting@gmail.com
Declaration	I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct. I understand that giving false or misleading information is a serious offence.
Signature	 Date 20/5/14

ATTACHMENTS

Attachment 1 – Figures

Attachment 2 – Subdivision Masterplan

Attachment 3 – Biodiversity Assessment Report

Attachment 4 –Vegetation Management Plan Retained Bushland Areas

Attachment 5 – Protected Matters Search

Appendix C – Updated EPBC Referral (2023)

Residential Subdivision 82, 69, and 9A Myall Road Hillsborough, NSW

Application Number: **01631** Commencement Date: **20/01/2023** Status: **Draft**

1. About the project

1.1 Project details

1.1.1 Project title *

Residential Subdivision 82, 69, and 9A Myall Road Hillsborough, NSW

1.1.2 Project industry type *

Residential Development

1.1.3 Project industry sub-type

—

1.1.4 Estimated start date *

1/08/2023

1.1.4 Estimated end date *

1/08/2026

1.2 Proposed Action details

1.2.1 Provide an overview of the proposed action, including all proposed activities. *

The DA relates to two undeveloped areas of bushland on the northern and southern sides of Myall Road, Hillsborough. The proposed activities subject to this referral are associated with the development of a residential subdivision including the creation of 66 residential allotments, and 3 superlots. Construction activities associated with the subdivision will involve the clearance of native vegetation, including important habitat for the threatened flora species *Tetratheca juncea,* which is listed as Vulnerable under the Commonwealth EPBC Act. Refer to subdivision lot layout plans attached.

Two 2 residue lots will also be set aside for conservation purposes within the Project Area. The residue land is proposed to be managed under a biodiversity stewardship agreement (BSA) under the NSW *Biodiversity Conservation Act* 2016 (BC Act) and zoned for conservation. The areas proposed to be retained within BSA site also contains important habitat for *Tetratheca juncea,* and will form the offset mechanism for impacts associated with the proposed development.

Refer to EPBC Referral 2014/7217 - Preliminary Documentation Package attached:

- page 154 (of 376)

Approximately 2528 clumps of *T.juncea* were identified within the Study Area (development site and BSA site). Approximately 658 clumps of *T.juncea* will be impacted by the proposed development, with 1870 to be retained within the BSA site. This represents in perpetuity retention of 74% of the local population.

Refer to EPBC Referral 2014/7217 - Preliminary Documentation Package attached:

- page 7 (of 376)

- page 34 (of 376)
- pages 73 - 76 (of 376)

1.2.2 Is the project action part of a staged development or related to other actions or proposals in the region?

No

1.2.6 What Commonwealth or state legislation, planning frameworks or policy documents are relevant to the proposed action, and how are they relevant? *

When the DA for the proposed development was originally lodged in 2013 the associated ecological assessments were undertaken under the *Threatened Species Conservation Act* (1995), which is now repealed and relevant NSW State Environmental Planning Policies, and the *Environment Protection and Biodiversity Conservation Act* (1999) applies.

A notice of Deferred Commencement for the DA was issued in 2020 pursuant to Section 4.16(3) of the *Environmental Planning and Assessment Act* 1979 (NSW), subject to addressing conditions of consent to the satisfaction of Council in accordance with the *Environmental Planning and Assessment Regulation* 2000 (NSW).

The conditions of consent state that a Biodiversity Stewardship Agreement (BSA) is to be established, which includes offsetting requirements of the Biodiversity Assessment Method 2020 (BAM) established under Section 6.7 of the *Biodiversity Conservation Act 2016* (NSW). Biodiversity credits generated from the BSA site would be voluntarily retired utilising the Savings and Transitional Regulation 2017 of the BC Act 2016. Refer to the Conditions of Consent attached (DA Conditions of consent - LMCC (2020) page 2).

1.2.7 Describe any public consultation that has been, is being or will be undertaken regarding the project area, including with Indigenous stakeholders. Attach any completed consultation documentations, if relevant. *

Public consultation for the proposal was undertaken by Landcom in July 2012 whereby a community consultation and feedback session was held. Feedback from this session was compiled and considered in a Site Consultation Outcomes Report, which is contained within the approved Statement of Environmental Effects.

Refer to EPBC Referral 2014/7217 - Preliminary Documentation Package page 9 (of 376) and Statement of Environmental Effects Myall Road Hillsborough page 43 (of 76) S6.16.

1.3.1 Identity: Referring party

Privacy Notice:

Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

By completing and submitting this form, you consent to the collection of all personal information contained in this form. If you are providing the personal information of other individuals in this form, please ensure you have their consent before doing so.

The Department of Climate Change, Energy, the Environment and Water (the department) collects your personal information (as defined by the Privacy Act 1988) through this platform for the purposes of enabling the department to consider your submission and contact you in relation to your submission. If you fail to provide some or all of the personal information requested on this platform (name and email address), the department will be unable to contact you to seek further information (if required) and subsequently may impact the consideration given to your submission.

Personal information may be disclosed to other Australian government agencies, persons or organisations where necessary for the above purposes, provided the disclosure is consistent with relevant laws, in particular the Privacy Act 1988 (Privacy Act). Your personal information will be used and stored in accordance with the Australian Privacy Principles.

See our Privacy Policy to learn more about accessing or correcting personal information or making a complaint. Alternatively, email us at privacy@awe.gov.au.

☑ **Confirm that you have read and understand this Privacy Notice ***

1.3.1.1 Is Referring party an organisation or business? *

Yes

Referring party organisation details

ABN/ACN	57659651537
Organisation name	Rhipidura Pty Ltd, trading as AEP
Organisation address	10 Darvall Street, Carrington, NSW, 2294

Referring party details

Name	Kelly Drysdale
Job title	Ecology Project Manager
Phone	0428296470
Email	kelly@andersonep.com.au
Address	10 Darvall Street, Carrington, NSW, 2294

1.3.2 Identity: Person proposing to take the action

1.3.2.1 Are the Person proposing to take the action details the same as the Referring party details? *

No

1.3.2.2 Is Person proposing to take the action an organisation or business? *

Yes

Person proposing to take the action organisation details

ABN/ACN	79268260688
Organisation name	Landcom
Organisation address	14/60 Station St E, Parramatta NSW 2150

Person proposing to take the action details

Name	Alex Seal
Job title	Development Assistant
Phone	0298418644
Email	aseal@landcom.nsw.gov.au
Address	14/60 Station St E, Parramatta NSW 2150

1.3.2.14 Are you proposing the action as part of a Joint Venture? *

No

1.3.2.15 Are you proposing the action as part of a Trust? *

No

1.3.2.17 Describe the Person proposing the action's history of responsible environmental management including details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Person proposing to take the action. *

Landcom is committed to responsible environmental management and aims to create communities that demonstrate global standards of resilience and environmental quality. Landcom was placed within the top three most sustainable residential development organisations in Oceania and in the top 9% globally in the 2022 GRESB Real Estate Assessment. Landcom has successfully established Biodiversity Stewardship Sites within NSW and received approval under the EPBC Act for various projects.

1.3.2.18 If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

Landcom is committed to responsible environmental management and aims to create communities that demonstrate global standards of resilience and environmental quality. Landcom was placed within the top three most sustainable residential development organisations in Oceania and in the top 9% globally in the 2022 GRESB Real Estate Assessment. Landcom has successfully established Biodiversity Stewardship Sites within NSW and received approval under the EPBC Act for various projects.

1.3.3 Identity: Proposed designated proponent

1.3.3.1 Are the Proposed designated proponent details the same as the Person proposing to take the action? *

Yes

Proposed designated proponent organisation details

ABN/ACN	79268260688
Organisation name	Landcom
Organisation address	14/60 Station St E, Parramatta NSW 2150

Proposed designated proponent details

Name	Alexander Seal
Job title	Development Assistant
Phone	0298418644
Email	aseal@landcom.nsw.gov.au
Address	14/60 Station St E, Parramatta NSW 2150

1.3.4 Identity: Summary of allocation

Confirmed Referring party's identity

The Referring party is the person preparing the information in this referral.

ABN/ACN	57659651537
Organisation name	Rhipidura Pty Ltd, trading as AEP
Organisation address	10 Darvall Street, Carrington, NSW, 2294
Representative's name	Kelly Drysdale
Representative's job title	Ecology Project Manager
Phone	0428296470
Email	kelly@andersonep.com.au
Address	10 Darvall Street, Carrington, NSW, 2294

Confirmed Person proposing to take the action's identity

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	79268260688
Organisation name	Landcom
Organisation address	14/60 Station St E, Parramatta NSW 2150
Representative's name	Alex Seal
Representative's job title	Development Assistant
Phone	0298418644
Email	aseal@landcom.nsw.gov.au
Address	14/60 Station St E, Parramatta NSW 2150

Confirmed Proposed designated proponent's identity

The Person proposing to take the action is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

1.4 Payment details: Payment exemption and fee waiver

1.4.1 Do you qualify for an exemption from fees under EPBC Regulation 5.23 (1) (a)? *

No

1.4.3 Have you applied for or been granted a waiver for full or partial fees under Regulation 5.21A? *

No

1.4.5 Are you going to apply for a waiver of full or partial fees under EPBC Regulation 5.21A?

No

1.4.7 Has the department issued you with a credit note? *

No

1.4.9 Would you like to add a purchase order number to your invoice? *

No

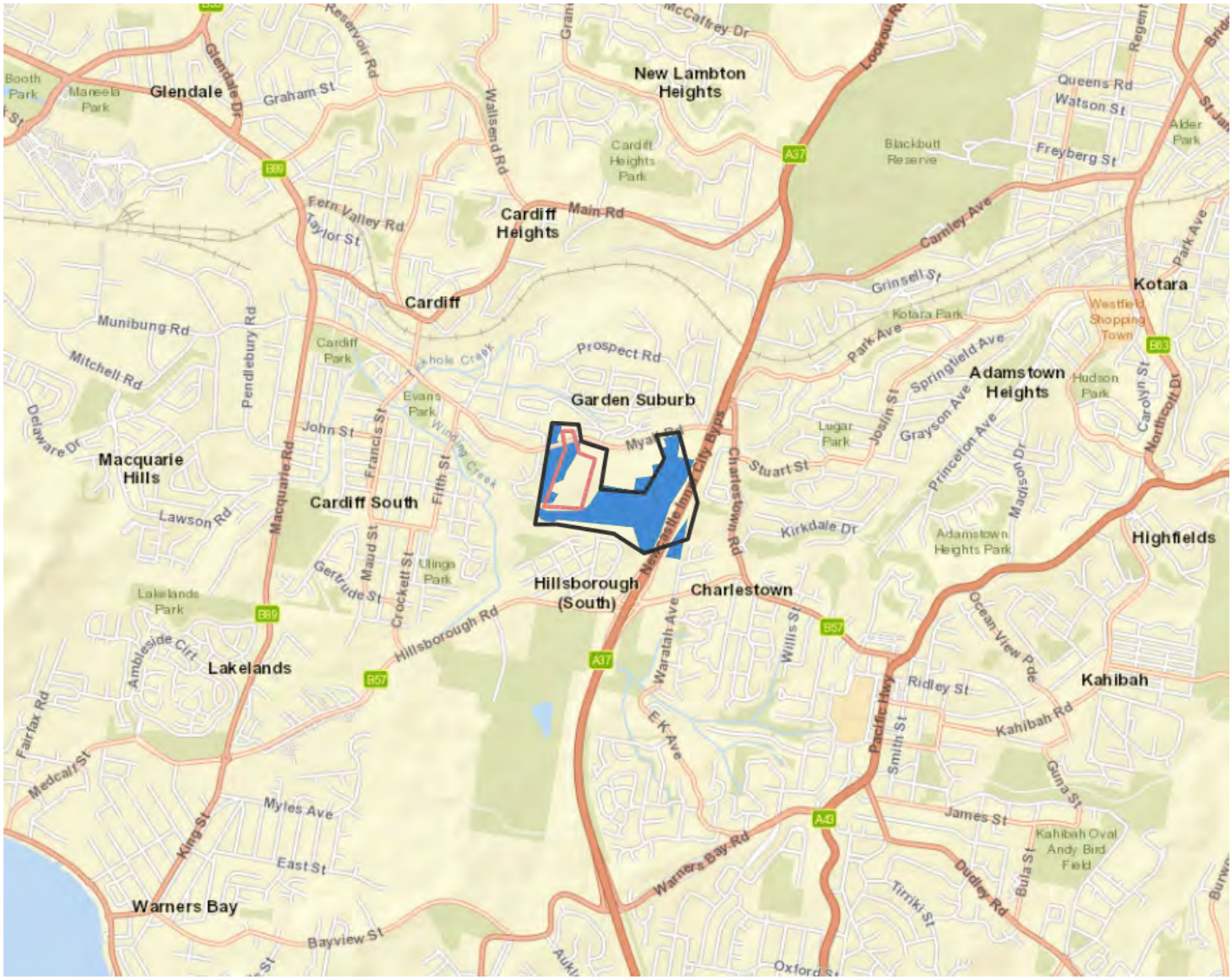
1.4 Payment details: Payment allocation

1.4.11 Who would you like to allocate as the entity responsible for payment? *

Proposed designated proponent

2. Location

2.1 Project footprint



2.2 Footprint details

2.2.1 What is the address of the proposed action? *

Landholdings involving multiple lots fronting both sides of Myall Road, within the suburbs of Hillsborough and Garden Subur

2.2.2 Where is the primary jurisdiction of the proposed action? *

New South Wales

2.2.3 Is there a secondary jurisdiction for this proposed action? *

No

2.2.5 What is the tenure of the action area relevant to the project area? *

The site (Lot 100 DP 811772, Lot 10 DP 1011323 and Lot 1 DP 1168657) is owned by NSW Crown Lands however the land title is held by NSW Land and Housing Corporation. Landcom has an agreement with NSW Crown Lands whereby Landcom acts as the developer of the site on behalf of NSW Crown Lands. This role includes obtaining all environmental approvals. Revenue from the project is then split between both parties.

3. Existing environment

3.1 Physical description

3.1.1 Describe the current condition of the project area's environment.

The Study Area comprises a mix of native and exotic vegetation, as mapped by Bell (2013), and covers approx. 38.6ha with 25.69ha proposed to be placed under a BSA. The extent and current condition of native vegetation within the Study Area is described in the Biodiversity Assessment Report (BAR 2013) 21 - 27 (of 175) and further refined for the BSA in Tables 5 to 12 within the Biodiversity Stewardship Site Assessment (BSSAR 2023), which is referenced in the EPBC Referral 2014/7217 - Preliminary Documentation Package pages 164 - 176 (of 376) .

3.1.2 Describe any existing or proposed uses for the project area.

The Project Area of 38.6ha comprises of undeveloped land within an existing urban area. The majority of the Study Area contains moderate to high quality remnant bushland, which is being utilised by members of public for bush walking, mountain biking, trail bikes and dogs walking both on and off lead. The Project Area consists of both the development proposal and proposed Stewardship Site. Refer to page 153 - 158 (of 376) of the EPBC Referral Preliminary Documentation Package.

The subdivision is contained within various portions of the encompassing lots directly adjacent to the proposed Stewardship Site, which predominantly surrounds the development lands. The proposed subdivision will contain, 66 residential Lots, 3 Superlots, roads, landscaping, on-site detention and remediation works. Refer to the proposed subdivision lot layout plans attached page 1 & 2.

Proposed management actions (in perpetuity) within the Stewardship site will improve vegetation integrity and threatened species habitat values over approx. 25.69ha.

3.1.3 Describe any outstanding natural features and/or any other important or unique values that applies to the project area.

The following Commonwealth listed threatened species have been recorded within the Subject Site and Study Area:

- Tetratheca juncea (refer previous section one of EPBC)
- Grey-headed Flying Fox was observed in the Study Area however no camps are present in the locality. Refer to pages 41 (of 175) in the Biodiversity Assessment Report- Landcom Project No. 12806 Myall Road Hillsborough (Conacher 2013)

Grey-headed Flying Fox was observed during nocturnal surveys feeding within the Subject Site. No maternity or roosting colony was observed within or near the Subject Site. Considering there is a substantial amount of remnant vegetation connected to the Subject Site and the remnant vegetation within the Subject Site is more confined to the edges, it is considered unlikely that the clearing of remnant vegetation within the Subject Site will impact significantly impact this highly mobile species. The proposed development will not lead to long term decrease in population due to the high mobility of the species and proposed stewardship site, restoring foraging and preserving connectivity habitat for the species. The proposed development is in area of fragmented habitat and is unlikely to have an adverse impact to the population. The proposal is not likely to increase invasive species or disease. Given that only a very small amount of marginal foraging habitat would be removed, this development is unlikely to substantially impact on the species or its recovery within the local area. Therefore, is has been determined that there is not a significant impact.

One threatened Ecological Community (TEC), Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is located within the Study Area, however this vegetation community is contained within the BSA site and will not be impacted by the development.

State listed threatened species recorded within the Study Area include:

- Powerful Owl
- Squirrel Glider
- Little Lorikeet
- Little Bent-winged Bat

The Stewardship Site contains several habitat features which support listed species such as Hollow Bearing Tree (HBTs) and fallen logs, and an unnamed tributary which forms a first order stream in the Winding Creek Catchment.

Further species and viability of flora & fauna in the Lake Macquarie LGA are expected with improvements under a Biodiversity Stewardship Agreement (BSA).

Refer to pages 129 - 135 (of 175) in the Biodiversity Assessment Report- Landcom Project No. 12806 Myall Road Hillsborough (Conacher 2013), and pages 186 (of 371) in the EPBC Referral 2014/7217 Preliminary Documentation Package.

3.1.4 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

The site contains areas of subsidence following historical mining operations Undulating to rolling rises on Permian conglomerate, shale and sandstone in the Awaba Hills. Local relief to 100 m. Slopes 5–15%. Elevation to 130 m. Predominantly cleared woodland and open-forest. Refer to Page 74 (of 175) Biodiversity Assessment Report Landcom Project No. 12806 Myall Road Hillsborough (Conacher 2013).

3.2 Flora and fauna

3.2.1 Describe the flora and fauna within the affected area and attach any investigations of surveys if applicable.

The Study Area comprises of approximately 38.6ha and of which 25.69ha is proposed to be managed primarily for conservation purposes under a BSA with the remaining approx area of 12.91ha being the development site/impact area.

Three (3) Plant Community Types (PCTs) existing in varying conditions were identified within the Study Area as were a number of threatened species. Details of surveys and findings for the Subject Site can be found within the Biodiversity Assessment Report Figure 3.5 p 6 for the Vegetation Communities on site & Table 2.4 p 16-18 and for a listing of all threatened flora and fauna assessed under a 7-part test p 75-91.

3.2.2 Describe the vegetation (including the status of native vegetation and soil) within the project area.

Tables 5 to 12 within the Biodiversity Stewardship Site Assessment (BSSAR) provides a detailed description of the extent, condition and occurrence of each PCT within the BSA area which is applicable for the Study Area and in detail. Refer to the Biodiversity Stewardship Site Assessment (BSSAR 2023), which is referenced in the EPBC Referral 2014/7217 - Preliminary Documentation Package pages 164 - 176 (of 376).

The Subject Site within the BDAR describes the vegetation within the site consisting of the following vegetation communities:
· Coastal Plains Open Forest (*Angophora costata / Corymbia gummifera)*;
· Sheltered Open Forest (*Eucalyptus piperita / Angophora costata*);
· Cleared Land.

The Subject Site is predominantly consisting of Variant 1 Woody Shrub Understory (V1) Coastal Plains Open Forest (*Angophora costata /Corymbia gummifera*). Refer to table 2.4 p 16-18 in Biodiversity Assessment Report and Figure 3.1 page 1 for location of quadrats.

3.3 Heritage

3.3.1 Describe any Commonwealth heritage places overseas or other places recognised as having heritage values that apply to the project area.

The site (Lot 100 DP 811772, Lot 10 DP 1011323 and Lot 1 DP 1168657) is owned by NSW Crown Lands with the land title being held by NSW Land and Housing Corporation. There are no known Commonwealth heritage listed places overseas or other recognised places.

3.3.2 Describe any Indigenous heritage values that apply to the project area.

The project area is located on Awabakal country. No heritage values were noted via hms.heritage.nsw.gov.au resource.

3.4 Hydrology

3.4.1 Describe the hydrology characteristics that apply to the project area and attach any hydrological investigations or surveys if applicable. *

The Study Area contains two watercourses, one along the southern boundary (the mapped southern watercourse) and one along the western boundary (the unmapped western watercourse) of the Subject Site. Both watercourses are tributaries of Winding Creek. Only the watercourse along the southern boundary of the site is mapped as a first order watercourse on the Wallsend 1: 25 000 topographic map and will form part of the Stewardship Site and the watercourse along the western boundary of the site is not mapped and would not hold pools of water and therefore are considered drainage lines only. A Stormwater Management Plan for the development would be included in the SEE.

Refer EPBC Referral 2014/7217 Preliminary Documentation page 157 **Figure 2** page 5 within the BSSAR details Stream orders and locations.

4. Impacts and mitigation

4.1 Impact details

Potential Matters of National Environmental Significance (MNES) relevant to your proposed action area.

EPBC Act section	Controlling provision	Impacted	Reviewed
S12	World Heritage	No	Yes
S15B	National Heritage	No	Yes
S16	Ramsar Wetland	No	Yes
S18	Threatened Species and Ecological Communities	Yes	Yes
S20	Migratory Species	No	Yes
S21	Nuclear	No	Yes
S23	Commonwealth Marine Area	No	Yes
S24B	Great Barrier Reef	No	Yes
S24D	Water resource in relation to large coal mining development or coal seam gas	No	Yes
S26	Commonwealth Land	No	Yes
S27B	Commonwealth heritage places overseas	No	Yes
S28	Commonwealth or Commonwealth Agency	No	Yes

4.1.1 World Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.1.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.1.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not a World Heritage area and is not in close proximity to any such area.

4.1.2 National Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.2.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.2.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not a National Heritage Place and does not contain any matters of national heritage

4.1.3 Ramsar Wetland

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Ramsar wetland
Yes		Hunter Estuary Wetlands

4.1.3.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.3.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site contains a mapped first order stream that is a tributary of Winding Creek which is located upstream and within 10km from the Ramsar-listed Hunter estuary Wetland. The creek and the majority of riparian lands is proposed to be retained under a BSA and will be given specific consideration to avoid impacts on the creek and its hydrological processes.

The conservation of major riparian corridors and areas of significant geological value will be managed under a BSA, thus supporting the environmental processes that are critical to the sustainability of such areas of non-native vegetation.

Furthermore, conservation measures within the Subject Site will be dictated by a site-specific DCP which will legislate the type of biodiversity conservation measures enforced in order to deliver environmentally-friendly landscaping and urban bushland management and a requirement to produce and implement CEMPs, SWMPs, BMPs and/or VMPs where relevant, at future DA stages.

With the implementation of CEMPs and SWMPs during pre-construction and construction phases within the Subject Site consideration of downstream impacts of works will be undertaken and it is therefore concluded that direct and/or indirect impacts the Ramsar Wetland are unlikely.

4.1.4 Threatened Species and Ecological Communities

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Threatened species

Direct impact	Indirect impact	Species
No	No	Angophora inopina
No	No	Anthochaera phrygia
No	No	Botaurus poiciloptilus
No	No	Caladenia tessellata
No	No	Calidris canutus
No	No	Calidris ferruginea
No	No	Callocephalon fimbriatum
No	No	Calyptorhynchus lathami lathami
No	No	Chalinolobus dwyeri
No	No	Charadrius leschenaultii
No	No	Cryptostylis hunteriana
No	No	Dasyurus maculatus maculatus (SE mainland population)
No	No	Diuris praecox
No	No	Erythrotriorchis radiatus

Direct impact	Indirect impact	Species
No	No	Eucalyptus camfieldii
No	No	Euphrasia arguta
No	No	Falco hypoleucos
No	No	Grantiella picta
No	No	Grevillea parviflora subsp. parviflora
No	No	Grevillea shiressii
No	No	Hirundapus caudacutus
No	No	Lathamus discolor
No	No	Litoria aurea
No	No	Melaleuca biconvexa
No	No	Mixophyes balbus
No	No	Notamacropus parma
No	No	Numenius madagascariensis
No	No	Persicaria elatior
No	No	Petauroides volans
No	No	Petaurus australis australis
No	Yes	Petaurus norfolcensis
No	No	Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)
No	No	Potorous tridactylus tridactylus
No	No	Pseudomys novaehollandiae
No	Yes	Pteropus poliocephalus
No	No	Pterostylis gibbosa
No	No	Pycnoptilus floccosus
No	No	Rhizanthella slateri
No	Yes	Rhodamnia rubescens
No	No	Rhodomyrtus psidioides
No	No	Rostratula australis
No	No	Sternula nereis nereis
No	No	Syzygium paniculatum
Yes	Yes	Tetratheca juncea
No	No	Thesium australe
No	No	Uperoleia mahonyi

Ecological communities

Direct impact	Indirect impact	Ecological community
No	No	Central Hunter Valley eucalypt forest and woodland
No	No	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community
No	No	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
No	No	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

4.1.4.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.4.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

***Tetratheca juncea* (Black-eyed Susan)**

Targeted surveys and counts of *Tetratheca juncea* were undertaken by RPS (2010) across the site.

100m transects across the entire site (Conacher 2012-2013)

Parallel transects approximately 10m apart and random meander surveys covering the entire site (RPS 2010).

AEP confirmed locations (2022) within the Study Area.

This species broadly occurs throughout the southern portion of the site within the dry sclerophyll communities. Individuals are roughly clustered throughout PCT 1183 (over 14.51ha), and to a lesser extent PCT 1627 (over 9.29ha).

A total of 36.29ha of vegetation is present within the Study Area (BSA site + Subject Site), which constitutes important habitat for *T.juncea*. The breakdown of vegetation areas are as follows:

- The direct impact from the Development Area constitutes 10.59ha.
- A 30m buffer around the Development Area takes into account indirect impacts, which constitutes 3.4ha.
- The *T.juncea* Species Polygon accounts for 20.96ha, representing 57.77% important habitat of the local population retained within the BSA site.

The primary mitigation measure to reduce impacts on *Tetratheca juncea* is the in-perpetuity conservation of approximately 74% of the local population within the proposed BSA site. Active management actions proposed in the BSSAR Management Plan would be undertaken over a 20 year period, with ongoing maintenance of the site in-perpetuity. The policy underpinning the in-perpetuity conservation of approximately 74% of the *Tetratheca juncea* local population is the application of the Biodiversity Offsets Scheme (BOS), under Section 6.7 of the Biodiversity Conservation Act 2016 (NSW).

When considering the wider landscape, the proposed development will not contribute to further fragmentation of the local population which is already significantly fragmented by the urban landscape.

The identification of areas occupied by high numbers of *Tetratheca juncea* has informed avoidance and mitigation measures for the species and led to the reduction of the proposed development footprint in these areas increasing the retention of *Tetratheca juncea* suitable habitat.

The establishment of the Stewardship Site will help mitigate impacts by protecting and enhancing retained suitable habitat and *Tetratheca juncea* occurrences therein. It is therefore considered that the proposed development will not significantly impact the subpopulation or wider population of *Tetratheca juncea*.

Refer EPBC Referral 2014/7217 Preliminary documentation page 194, which is Figure 7 within the BSSAR depicts the species locations and retention status in the context of the Study Area.

Grey-headed Flying-fox *(Pteropus poliocephalus)*

Grey-headed Flying-foxes roost in camps during the day, which may contain tens of thousands of individuals, and then disperse to surrounding areas to forage at night. This species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and urbanised and agricultural areas. Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy. Camps may also be formed in urban parkland areas (Tidemann 1998).

Grey-headed Flying-foxes were observed flying over the subject site during spotlighting surveys undertaken on 21 and 22 September 2009 by RPS (2010). The Grey-headed Flying-foxes was also observed foraging on flowering *Corymbia maculata* trees within the subject site during spotlighting surveys undertaken by *Conacher Environmental Group*. Two individuals were observed on both the 20 and 22 March 2012 and 10 individuals were observed on 26 February 2013. No roost or camp sites were observed within the subject site.

The Grey-headed Flying-fox is considered to be a nomadic and migratory species and therefore the local population constitutes those individuals that are likely to occur in the study area from time to time (DECC 2007). It is considered that the local population of this species is likely to utilise the extensive areas of foraging habitats present within the regional area and may from time to time forage within the study area according to the seasonal availability of food resources.

The proposed development will result in the removal or modification of approximately 10.6 hectares of Coastal Plains Open Forest habitats for this species. As part of the proposal 27.5 hectares of habitats including 23.5 hectares of Coastal Plains Open Forest and 4 hectares of Sheltered Open Forest habitats will be retained within the subject site.

The proposal is not likely to significantly reduce the area of suitable habitat available to the local population of this species due to the retention of habitats within the subject site and the occurrence of several larger areas of suitable habitat within areas reserved for long term conservation such as Blackbutt Reserve, Green Point Foreshore Reserve, Lake Macquarie State Recreation Area, Glenrock State Conservation Area and Awabakal Nature Reserve.

It is therefore considered that the proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

***Rhodamnia rubescens* (Scrub Turpentine)**

Conacher Environmental Group identified one individual within the Study Area in their Biodiversity Assessment Report (2013) within quadrat 6 of their surveys. The species was listed as critically endangered as of 11 December 2020, as such targeted surveys were not conducted at the time the BDAR was drafted in 2013 as the species was not listed as threatened. Therefore, taking the precautionary approach AEP conducted targeted surveys for the species across the development footprint to ensure species was not present.

Survey efforts concluded that the targeted surveys for the species was not present within the development footprint. According to the Threatened Species Scientific Committee's *Conservation Advice – Rhodamnia rubescens* (2020), a greater than 80% reduction in the populations across Australia has been documented due to levels of mortality from infections and high susceptibility to *Austropuccinia psidii* (Mrytle Rust) in both mature individuals and seedlings. *A. psidii* infection has negatively affected *R. rubescens* across the species entire range. As such, the one individual identified in 2013 is not going to be significantly impacted by the development.

Refer Appendix G within the EPBC Referral Preliminary Documentation outlines the significant impact assessment for this species.

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is a threatened Ecological Community (TEC), which is located within the Study Area but not within the Subject Site and hence no impact. Retaining this TEC has been considered in the design process and the BSA will enhance and preserve the condition of this TEC.

Refer BSSAR Table 8 with reference to PCT 1649 page 170 of the EPBC Referral 2014/7217 Preliminary Documentation

4.1.4.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

Yes

4.1.4.5 Describe why you consider this to be a Significant Impact. *

A response to this question is required. Your response must succinctly address any applicable sub points of the question and the requirements found in the 'More Guidance' section for this question. If necessary, additional information can be attached and referenced appropriately (e.g. Attachment file name, section, page number/s).

4.1.4.7 Do you think your proposed action is a controlled action? *

Yes

4.1.4.8 Please elaborate why you think your proposed action is a controlled action. *

A response to this question is required. Your response must succinctly address any applicable sub points of the question and the requirements found in the 'More Guidance' section for this question. If necessary, additional information can be attached and referenced appropriately (e.g. Attachment file name, section, page number/s).

4.1.4.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

All impacts have been minimised with the development design and BSA.

The BDAR explains the 2528 clumps of T. Juncea that were observed and estimated to occur within the Study Area.

LMCC (2012) state that to adequately conserve a population on a site, approximately 75% of plant clumps must be conserved, with a native vegetation corridor linking the plant clumps to be conserved to other native vegetation. LMCC (2012) have also stated that the following matters should be considered:
- The spatial relationship and connectivity of plant clumps within 500m of the development site;
- The number of individuals affected
- The patch size of the native vegetation that the plant clumps occur within
- Whether the plant clumps occur at the edge of suitable habitat ie. near a barrier that is unlikely to be able to be readily crossed

The proposed development will result in the removal of approximately 658 T. juncea clumps within the proposed development footprint. The local population of T. juncea will be reduced by the proposed development to approximately 1870 clumps within areas of the subject site to be retained for conservation. This will result in the retention of 74% of the local population of the species outside of the proposed development and asset protection zone areas. The proposed retention rate is not substantially less than the 75% retention rate recommended by LMCC (2012).

This species broadly occurs throughout the southern portion of the site within the dry sclerophyll communites, PCTs 1183 and 1627 within the BSSAR land. This species is assessed by the ‘Area’ method, in accordance with the BAM (2020) and Threatened Biodiversity Profile Data Collection, to determine the number of credits likely to be generated. Individuals are roughly clustered throughout PCT 1183 (over 14.51ha), and to a lesser extent PCT 1627 (over 9.29ha) generating 162 species credits. Additionally the stewardship site should not only preserve but enhance the population of T juncea over time.

4.1.4.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

The policy underpinning the in-perpetuity conservation of approximately 74% of the Tetratheca juncea local population is the application of the Biodiversity Offsets Scheme (BOS), under Section 6.7 of the Biodiversity Conservation Act 2016 (NSW).

4.1.5 Migratory Species

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Species
Yes		Actitis hypoleucos
Yes		Apus pacificus
Yes		Calidris acuminata

Direct impact	Indirect impact	Species
Yes		Calidris canutus
Yes		Calidris ferruginea
Yes		Calidris melanotos
Yes		Charadrius leschenaultii
Yes		Cuculus optatus
Yes		Gallinago hardwickii
Yes		Hirundapus caudacutus
Yes		Monarcha melanopsis
Yes		Motacilla flava
Yes		Myiagra cyanoleuca
Yes		Numenius madagascariensis
Yes		Rhipidura rufifrons
Yes		Symposiachrus trivirgatus
Yes		Tringa nebularia

4.1.5.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.5.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

Although EPBC listed migratory species have potential to utilise the site, the majority have no records within the locality, suggesting that the Subject Site it not utilised to any notable degree or considered habitat of importance for any such threatened migratory species.

Given the distance to areas of suitable habitat (such as lakes, maritime areas and shore lands), continued availability of large areas high-quality contiguous habitat post development and the retention and enhancement of residue lands under a BSA; it is not considered that these threatened species will be significantly impacted by the proposal.

4.1.6 Nuclear

4.1.6.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.6.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not in the proximity to any such area.

4.1.7 Commonwealth Marine Area

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.7.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.7.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not part of, or within close proximity to, any Commonwealth Marine Area.

4.1.8 Great Barrier Reef

4.1.8.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.8.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not part of, or within close proximity to, the Great Barrier Reef Marine Park.

4.1.9 Water resource in relation to large coal mining development or coal seam gas

4.1.9.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.9.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not in close proximity to any such area.

4.1.10 Commonwealth Land

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.10.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.10.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The site is not located on Commonwealth Land and the proposal not directly or indirectly will impact such lands.

4.1.11 Commonwealth heritage places overseas

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.11.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.11.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposal is for Biodiversity Certification of lands located in NSW, not overseas.

4.1.12 Commonwealth or Commonwealth Agency

4.1.12.1 Is the proposed action to be taken by the Commonwealth or a Commonwealth Agency? *

No

4.2 Impact summary

Conclusion on the likelihood of significant impacts

You have indicated that the proposed action will likely have a significant impact on the following Matters of National Environmental Significance:

- Threatened Species and Ecological Communities (S18)

Conclusion on the likelihood of unlikely significant impacts

You have indicated that the proposed action will unlikely have a significant impact on the following Matters of National Environmental Significance:

- World Heritage (S12)
- National Heritage (S15B)
- Ramsar Wetland (S16)
- Migratory Species (S20)
- Nuclear (S21)
- Commonwealth Marine Area (S23)
- Great Barrier Reef (S24B)
- Water resource in relation to large coal mining development or coal seam gas (S24D)
- Commonwealth Land (S26)
- Commonwealth heritage places overseas (S27B)
- Commonwealth or Commonwealth Agency (S28)

4.3 Alternatives

4.3.1 Do you have any possible alternatives for your proposed action to be considered as part of your referral? *

No

4.3.8 Describe why alternatives for your proposed action were not possible. *

The overall planning proposal of the Study Area with the Subject Site of approx.12.91ha and the proposed BSA area of approx. 25.69ha is the result of an iterative and consultative design process which has involved Project Ecologists, Bushfire Consultants, Town Planners, Civil Engineers and Lake Macquarie City Council, over the course of several years. As such, alternatives were considered throughout the

consultation and design process, in order to achieve a version suitable for lodgement, noting that the BSSAR is still in a draft format.

It is anticipated that through this iterative design process will result in balanced outcomes, contributing to the achievement of growth and housing objectives whilst seeking optimal environmental outcomes within retained lands. Reiterating that the Subject Site area for development is approximately 12.91ha which represents a third of the Study Area.

5. Lodgement

5.1 Attachments

1.2.1 Overview of the proposed action

#1.	EPBC Referral 2014/7217 Preliminary Documentation	Document	EPBC Referral 2014/7217 Preliminary Documentation
#2.	Subdivision lot layout plans	Document	Subdivision lot layout plans

1.2.6 Commonwealth or state legislation, planning frameworks or policy documents that are relevant to the proposed action

#1.	Development Application Notice of Deferred Commencement	Document	Development Application Notice of Deferred Commencement - Conditions of Consent

1.2.7 Public consultation regarding the project area

#1.	EPBC Referral 2014/7217 Preliminary Documentation	Document	Public consultation reference.
#2.	Statement of Environmental Effects Myall Road Hillsborough	Document	Statement of Environmental Effects Myall Road Hillsborough

3.1.1 Current condition of the project area's environment

#1.	Biodiversity Assessment Report - Landcom Project No. 12806 Myall Road Hillsborough	Document	Biodiversity Assessment Report 2013
#2.	EPBC Referral 2014/7217 Preliminary Documentation	Document	EPBC Referral 2014/7217 Preliminary Documentation

3.1.2 Existing or proposed uses for the project area

#1.	EPBC Referral 2014/7217 Preliminary	Document	EPBC Referral 2014/7217 Preliminary Documentation

Documentation			
#2.	Subdivision lot layout plans	Document	Subdivision lot layout plans

3.1.3 Natural features, important or unique values that applies to the project area

#1.	Biodiversity Assessment Report - Landcom Project No. 12806 Myall Road Hillsborough	Document	Biodiversity Assessment Report - Landcom Project No. 12806 Myall Road Hillsborough
#2.	EPBC Referral 2014/7217 Preliminary Documentation	Document	EPBC Referral 2014/7217 Preliminary Documentation

3.1.4 Gradient relevant to the project area

#1.	Biodiversity Assessment Report - Landcom Project No. 12806 Myall Road Hillsborough	Document	Biodiversity Assessment Report - Landcom Project No. 12806 Myall Road Hillsborough

3.2.1 Flora and fauna within the affected area

#1.	Biodiversity Assessment Report	Document	Vegetation communities within Subject Site described in table 2.4 and threatened flora and fauna summarised in 7 part test

3.2.2 Vegetation within the project area

#1.	Biodiversity Assessment Report	Document	Vegetation description
#2.	EPBC Referral 2014/7217 Preliminary Documentation	Document	EPBC Referral 2014/7217 Preliminary Documentation

3.4.1 Hydrology characteristics that apply to the project area

#1.	EPBC Referral 2014/7217 Preliminary Documentation	Document	Mapped hydrolines

4.1.4.2 (Threatened Species and Ecological Communities) Why your action has a direct and/or indirect impact on the identified protected matters

#1.	EPBC Referral 2014/7217 Preliminary Documentation	Document	Tetratheca juncea locations in Figure 7, Appendix G - Rhodamania rubescens assessment

4.1.4.5 (Threatened Species and Ecological Communities) Why you consider the direct and/or indirect impact to be a Significant Impact

#1.	Significant Impact Assessment Tetratheca juncea	Document	Significant Impact assessment Tetratheca juncea

4.1.4.8 (Threatened Species and Ecological Communities) Why you think your proposed action is a controlled action

#1.	Significant Impact Assessment Tetratheca juncea	Document	Assessment TJ

4.1.4.10 (Threatened Species and Ecological Communities) Avoidance or mitigation measures proposed for this action

#1.	Biodiversity Assessment Report	Document	T juncea identified impact within development footprint
#2.	EPBC Referral 2014/7217 Preliminary Documentation	Document	T juncea summary of all surveys

5.2 Declarations

● Awaiting Referring party's declaration

The Referring party is the person preparing the information in this referral.

ABN/ACN	57659651537
Organisation name	Rhipidura Pty Ltd, trading as AEP
Organisation address	10 Darvall Street, Carrington, NSW, 2294
Representative's name	Kelly Drysdale
Representative's job title	Ecology Project Manager
Phone	0428296470
Email	kelly@andersonep.com.au
Address	10 Darvall Street, Carrington, NSW, 2294

☐ Check this box to indicate you have read the referral form. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

☐ By checking this box, I, **Kelly Drysdale of Rhipidura Pty Ltd, trading as AEP**, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

● Awaiting Person proposing to take the action's declaration

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	79268260688
Organisation name	Landcom

Organisation address	14/60 Station St E, Parramatta NSW 2150
Representative's name	Alex Seal
Representative's job title	Development Assistant
Phone	0298418644
Email	aseal@landcom.nsw.gov.au
Address	14/60 Station St E, Parramatta NSW 2150

☐ Check this box to indicate you have read the referral form. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

☐ I, **Alex Seal of Landcom**, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

● Awaiting Proposed designated proponent's declaration

The Proposed designated proponent is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

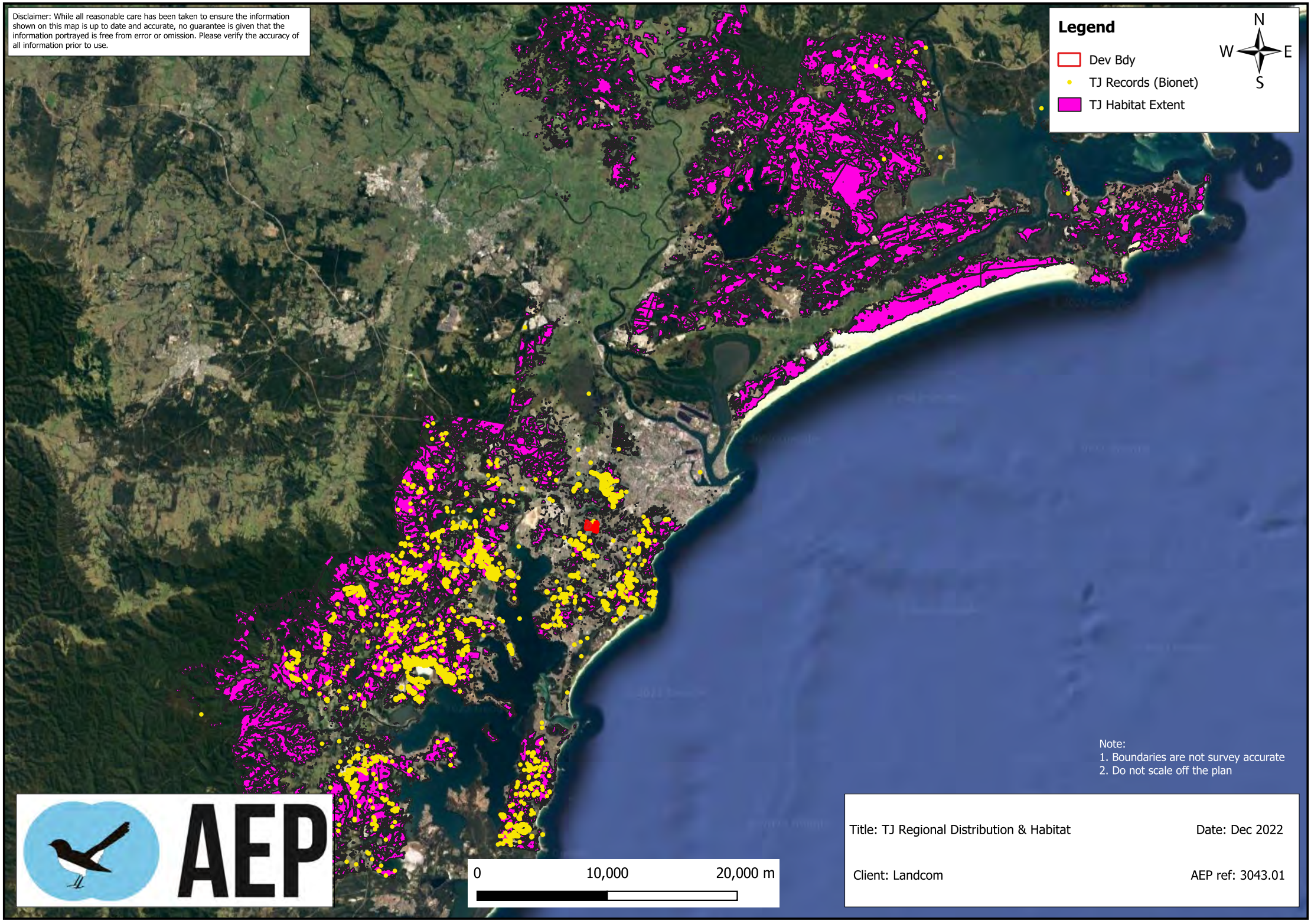
☐ Check this box to indicate you have read the referral form. *

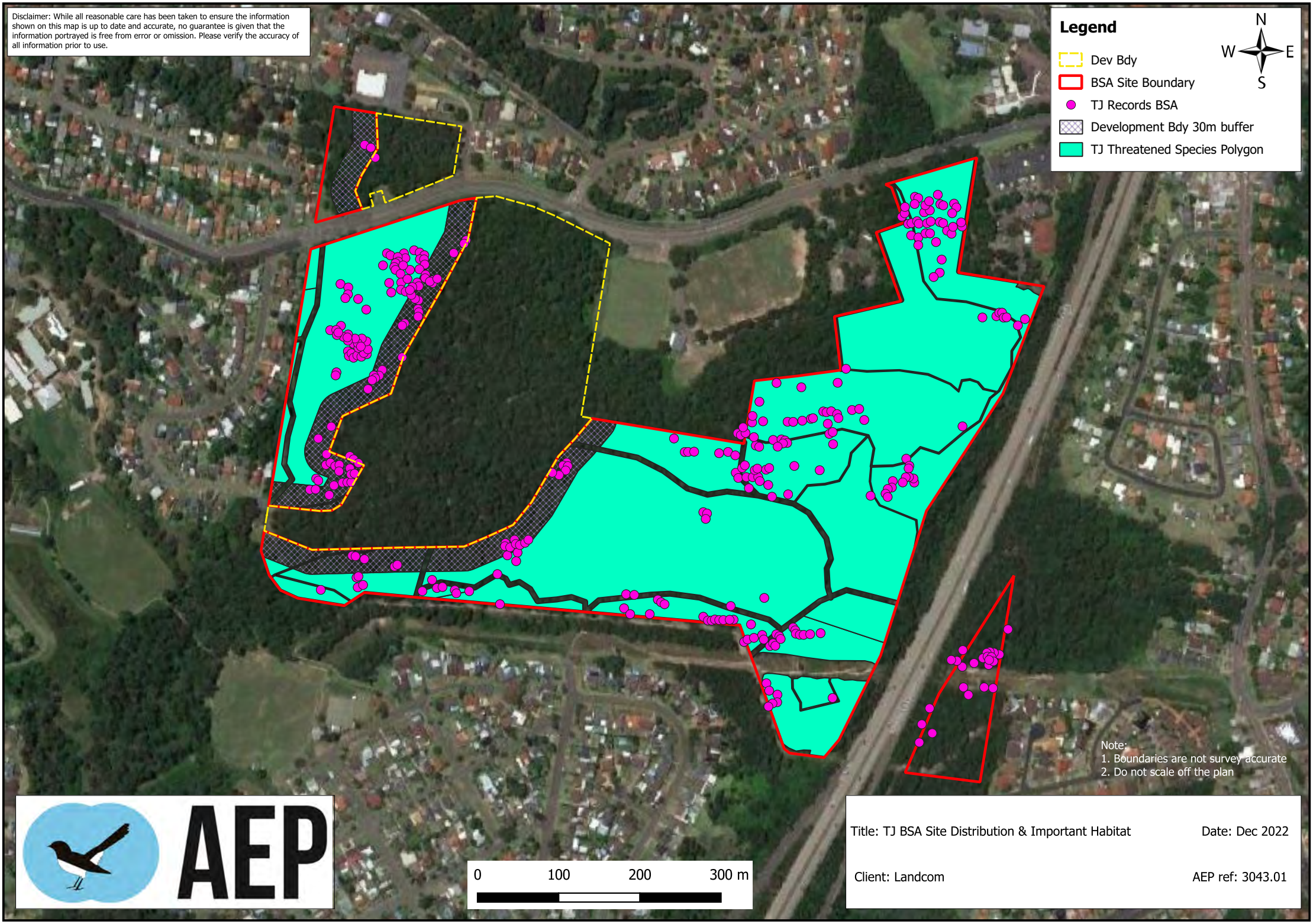
☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

☐ I, **Alex Seal of Landcom**, the Proposed designated proponent, consent to the designation of myself as the Proposed designated proponent for the purposes of the action described in this EPBC Act Referral. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

Appendix D – Updated *Tetratheca juncea* Mapping


Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.
Legend
Dev Bdy
TJ Records (Bionet)
TJ Habitat Extent
N
W
E
S
Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan
AEP
0
10,000
20,000 m
Title: TJ Regional Distribution & Habitat
Date: Dec 2022
Client: Landcom
AEP ref: 3043.01


Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.
Legend
Dev Bdy
BSA Site Boundary
TJ Records BSA
Development Bdy 30m buffer
TJ Threatened Species Polygon
N
W
E
S
Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan
AEP
0
100
200
300 m
Title: TJ BSA Site Distribution & Important Habitat
Date: Dec 2022
Client: Landcom
AEP ref: 3043.01

Appendix E – Biodiversity Stewardship Site Assessment (2023)

Biodiversity Stewardship Site Assessment Report

Proposed Biodiversity Stewardship Site on 9A, 69 & 82 Myall Road, Hillsborough NSW

Prepared for: Landcom Holding

6 January 2023

BOAMS: 00036999/BAAS19076/22/00037000

AEP Ref: 3043

Revision: 00

P 0420 624 707 E info@andersonep.com.au

10 Darvall St Carrington NSW 2294 ABN 57 659 651 537

Document Control

Document Name	Proposed Biodiversity Stewardship Site on 9A, 69 & 82 Myall Road, Hillsborough NSW
Project Number	3043
Client Name	Landcom Holding
Accredited Assessor	Natalie Black

Revision

Revision	Date	Author	Reviewed	Approved
00	06/01/2023	Warwick Muir	Natalie Black	Natalie Black

Distribution

Revision	Date	Name	Organisation
00	06/01/2023	Alexander Seal	Landcom Holding

EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Landcom Holding to undertake a Biodiversity Stewardship Site Assessment Report (BSSAR) over land contained within Lot 1 DP 1168657 and Lot 100 DP 811772 and Lot 10 DP 1011323, fronting both sides of Myall Road, within the suburbs of Hillsborough and Garden Suburb, NSW.

An approved subdivision is located in various portions of the encompassing lots directly adjacent to the proposed Stewardship Site, which will contain, 66 residential Lots, 3 Superlots & 3 conservation lots, roads, landscaping, on-site detention and remediation works, which totals approx. 25.69ha. Site surveys have been undertaken within the subject site over numerous years, including a range of targeted seasonal periods throughout 2022.

The proposed Biodiversity Stewardship Agreement will capture a diversity of ecosystem types, flora and fauna species, habitat niches and landscapes, to benefit from long term conservation and management. The following species / communities have been recorded within the Subject Site, which will generate Credits under the Biodiversity Offset Scheme (BOS).

Three (3) Plant Community Types (PCTs) occur, one (1) of which are associated with Threatened Ecological Communities (TEC):

- 1183 – *Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion;*
- 1627 – *Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast.* This community is not associated with a TEC; and
- 1649 - *Smooth-barked Apple - Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands.* This community is associated with listed TEC, *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.*

The Subject Site contains several habitat features which support listed species such as Hollow Bearing Tree (HBTs) and fallen logs, and an unnamed tributary which forms a first order stream in the Winding Creek Catchment. The habitat within the Subject Site supports three (3) Species Credit Species , being:

- *Tetratheca juncea* (Black-eyed Susan);
- *Ninox strenua* (Powerful Owl); and
- *Petaurus norfolcensis* (Squirrel Glider).

Averted loss and management will improve vegetation integrity and threatened species habitat values over time.

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Appendix E – Surveyed Candidate Species Credit Species

Appendix F – Surveyed Species Credit Species

Appendix G – Author CVs

Appendix H – Total Fund Deposit Spreadsheet

Appendix I – BSSAR BAM Checklist

Study Certification and Licensing

This report was primarily written by Warwick Muir, Thomas Stephen, Bonni Yare and Natalie Black BSc (Hons) (BAAS 19076), and reviewed by Craig Anderson (BAAS 17002) of Anderson Environment & Planning.

Contributing staff member are as follows:

Staff	Title/Qualification	Tasks
Craig Anderson	Director BAppSc (EAM) BAAS: 18002	Scientific advice, report review.
Ian Benson	Principal Ecologist & Business Manager BEng (Civil) GradDipSc (Ecology) BAAS: 18147	Scientific advice, nocturnal field surveys.
Tim Mouton	BEnvSc; MEnvSc (BAAS 19083);	BAM Plots, PCT determination, vegetation mapping.
Natalie Black	Senior Environmental Manager / Works Coordinator BSc (Hons), Master Planning, Cert IV (TA) BAAS: 19076	Contributing report author.
Warwick Muir	Senior Arborist and Ecologist B.Sc (Biology) DipArb (AQF5)	BAM Plots, weed loads, tracks/ rubbish / fencing, target flora surveys, Lead author.
Bonni Yare	Ecologist/Botanist BSc (NRM), Cert 3 Cons&LandMgt (partial completion)	PCT determination, contributing report author.
Dennis Neader	BSc (Env Geo)	Nocturnal field surveys.
Thomas Stephens	Ecologist BEnvScMgt	GIS, targeted flora surveys, legless lizard surveys, nocturnal fauna surveys, bird surveys, contributing report author, BAM-C
Sebastian Doleac	Ecologist B.Sc (Biology), M. Conservation Biology	GIS
Stephen Currie	Ecologist BEnvScMgt – (to be completed 2023)	BAM Plots and target flora surveys.
Oscar Anderson	Ecologist BEnvScMgt – (to be completed 2023)	Targeted flora surveys, weed loads, tracks/ rubbish / fencing.

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Research Establishment Accreditation Number 53724.

Certification:

As the Certifying author, I, Natalie Black, make the following certification:

- This report has been written to comply with the requirements of the BAM 2020 and obligations outlined within the BAM Assessor Code of Conduct and includes, in the opinion of the writer, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area, and inferences of such for biodiversity credit calculations;
- BAM Assessment methodology, as well as Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Author and Certifier:

Natalie Black

Senior Environmental Manager

Anderson Environment & Planning

BAAS no. 19076

Calculator Ref: 00036999/BAAS19076/22/00037000

6 January 2023

Glossary of Terms

BAM	*Biodiversity Assessment Method Order* (2020) that determines: • Methodology applicable to quantifying biodiversity values inherent within a development site; • Avoid and mitigation efforts required to be employed as part of any development proposal; and • Number and class of credits required to offset residual impacts of the proposal upon the biodiversity values therein.
BAM Calculator	The online tool used to interpret site survey data and regional location information to quantify ecosystem and species credits required / generated at a development / stewardship site.
BC Act	*Biodiversity Conservation Act 2016.*
Biodiversity Credit Report	Specifies the number and type of biodiversity credits generated to offset the impacts of a development.
Biodiversity credits	Ecosystem or Species Credits generated via conservation actions within a stewardship site or required to offset the loss of biodiversity values on a development site.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.
Biodiversity values	The composition, structure and function of ecosystems, threatened species, populations and ecological communities, and their habitats.
BSA Site	Biodiversity Stewardship Assessment Site
Council	Lake Macquarie City Council
Development Site	Lands surrounding and directly adjacent to the Biodiversity Stewardship Site where development is proposed.
DoEE	Former Commonwealth Department of Environment and Energy.
DPE	NSW Department of Planning and Environment (formerly known as NSW Department of Planning, Industry and Environment)
DPI	NSW Department of Primary Industries
Ecosystem credit	The class of biodiversity credits created or required for the impact on a Plant Community Type.
Ecosystem Credit Species	A threatened species that can be reliably predicted by a PCT.
EEC	Endangered Ecological Community (under BC Act)
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
OEH	Former NSW Office of Environment and Heritage.
PFC	Percentage Foliage Cover
SEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Populations and Communities.
Species Credit	Class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area based on habitat surrogates.
Stewardship Site	Land upon which the Biodiversity Stewardship Agreement is proposed.
TBDC	Threatened Biodiversity Data Collection

TEC	Threatened Ecological Community

1.0 Stage 1 – Biodiversity Assessment

1.1 Introduction

It is proposed that a Stewardship Site be established over land contained within Lot 1 DP1168657, Lot 100 DP811772, Lot 10 DP1011323 (*the stewardship site*).

At the request of Landcom Holding (*the client*), Anderson Environment & Planning (AEP) have undertaken required investigations and calculations to inform this Biodiversity Stewardship Site Assessment Report (BSSAR).

The assessment was undertaken as per the requirements outlined in the Biodiversity Assessment Methodology (DPIE 2020) (the BAM).

1.1.1 The Proposal

A Biodiversity Stewardship Agreement is proposed for approx. 26ha within the site as shown in **Figure 1**. The agreement would see the long-term protection and conservation of land previously unmanaged.

A residential estate development is proposed in areas adjacent to the BSA Site. This development encompasses remnant vegetation, disturbed land, and a first order stream. Various easements also dissect the site, including fire management trails, access sites and walking trails for public and Bush Regenerator Contractor, which are excluded from the BSA (Refer to Figure 13 – Boundary Management Map).

1.1.2 Assessment Scope

The BSSAR presented herewith aims to quantify contributions of the site to regional biodiversity values based upon the methods described within the Biodiversity Assessment Method Order 2020 (BAM), including threatened entities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act).

This report includes:

- **Stage 1 – Biodiversity Assessment** – including the mapping of remnant vegetation communities including Endangered Ecological Communities (EECs) within the Stewardship Site, the location of previously identified threatened species and their habitats, and potential occurrence of threatened species identified within the BAM Calculator; and
- **Stage 3– Improving Biodiversity Values** – including the identification of management actions to improve biodiversity values, preparation of a management plan for the stewardship site, a projection of future vegetation integrity scores based on management options, and quantifying the ecosystem credits generated by the improvement in biodiversity values.

1.1.3 Site Particulars

Table 1 – Site Particulars

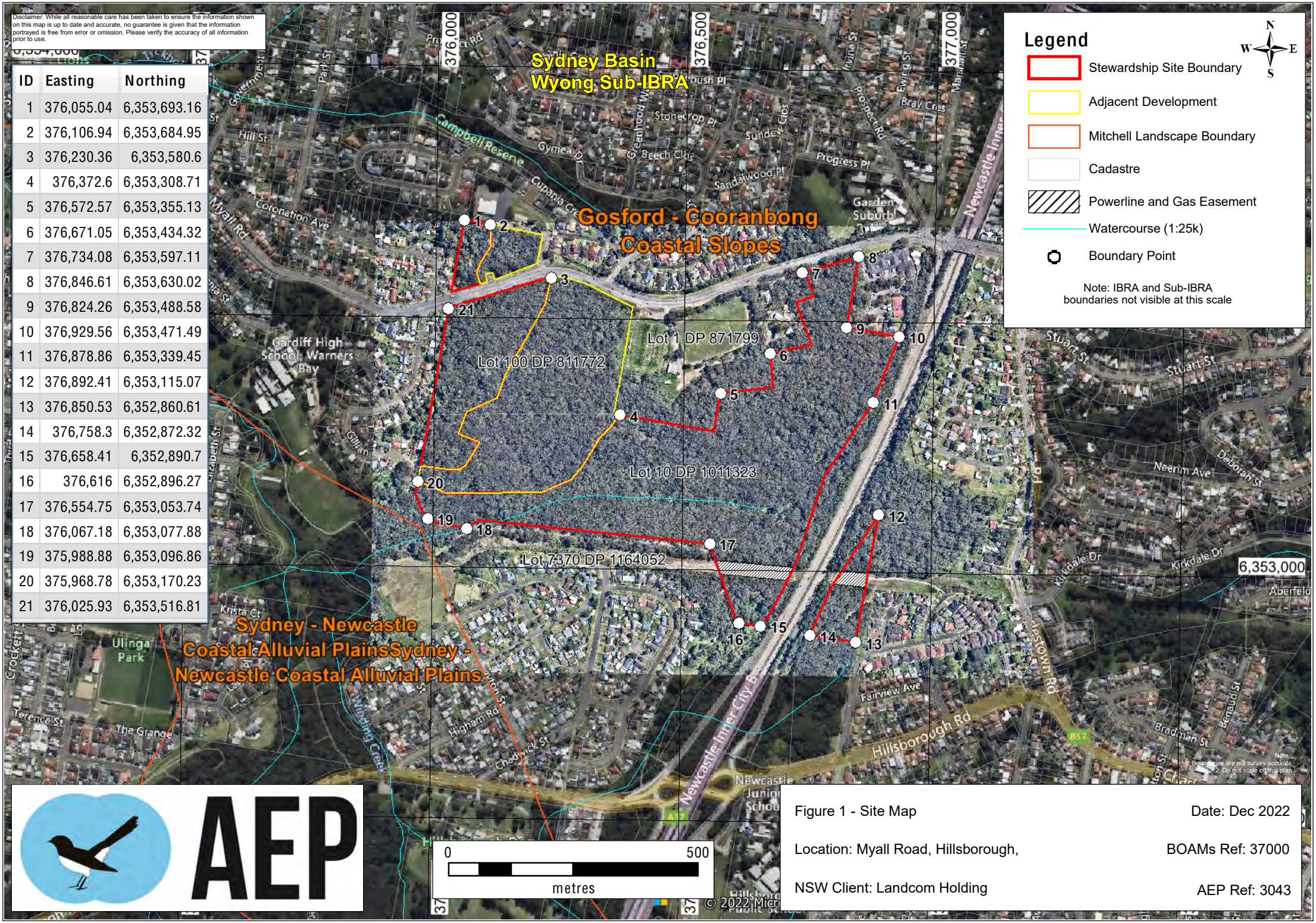
Detail	Comments
Client	Landcom Holding Pty Ltd
Address	Myall Road, Hillsborough, NSW
LGA	Lake Macquarie
Subject Site Zoning	As per LMCC LEP 2014, the following zoning applies to the site: C2 – Environmental Conservation, RU6 – Transition and RE1 – Public Recreation.
BV Mapped Land	No
BV Mapped Explanation	N/A
Subject Site	The Subject Site is the BSA site, which forms a subset of the Lots located within Lake Macquarie LGA. It covers approx. 26ha and comprises titles as detailed below.
Subject Site Titles (Lot DPs)	Lot 1 DP1168657, Lot 100 DP811772, Lot 10 DP1011323
Current Land Use	The Subject Site comprises of undeveloped land within an existing urban area, which is being utilised by members of public for bush walking, mountain biking, trail bikes and dogs walking both on and off lead. The site comprises a mix of native and exotic vegetation, as mapped by Bell (2013).
Surrounding Land Use	Residential housing bounds the site to the North, South and West of the Subject Site with varying areas of urban bushland and residential development further beyond. To the east of the main body (and west of the SW Site) of the site is the Newcastle Inner-City Bypass and associated road reserve, which comprises remnant and planted native vegetation and exotic vegetation surrounding the active roadway.
Surrounding Land Zoning	SP2 – Infrastructure, R2 - Low Density Residential; RE1 – Public Recreation; and C2 – Environmental Conservation.

Figure 1 depicts the extent of the Subject Site and defines the BSA Site and **Figure 2** depicts the location of the site within the landscape.

1.1.4 Information Sources

Information and spatial data provided within this BSSAR has been compiled from various sources including:

- Previous surveys conducted within the site and surrounding areas by RPS (2009, 2010);
- Previous surveys conducted within the site and surrounding areas by Conacher (2013);
- Previous surveys conducted within the site and surrounding areas by AEP (2022);
- Aerial Photograph Interpretation (API) of the site and surrounding locality (Bing Hybrid 2022; NSW SIX Aerial 2022, Nearmap 2022);
- State survey guidelines (DEC 2004; DECC 2009; DPIE 2020a; OEH 2018; DPIE 2020b; DPIE 2020c);
- DPIE Threatened Species, Populations and Ecological Communities website https://www.environment.nsw.gov.au/threatenedspeciesapp/);
- Search and review of flora and fauna sighting records in the BioNet Atlas of NSW within 10km of the site (https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet);
- Protected Matters Search within a 5km radius of the site held by the Commonwealth Department of Agriculture, Water and the Environment, summarising Matters of National Environmental Significance that may occur in, or may relate to the Study Area (https://www.environment.gov.au/epbc/protected-matters-search-tool);
- DPIE BAM – Important Areas Map to determine whether the site is mapped as containing Swift Parrot Important Areas, Regent Honeyeater Important Areas and/or Migratory Shorebirds Important Areas;
- Collective knowledge gained from previous ecological survey and assessment in the Lake Macquarie area over the past 25+ years; and
- Anecdotal records.



ID	Easting	Northing
1	376,055.04	6,353,693.16
2	376,106.94	6,353,684.95
3	376,230.36	6,353,580.6
4	376,372.6	6,353,308.71
5	376,572.57	6,353,355.13
6	376,671.05	6,353,434.32
7	376,734.08	6,353,597.11
8	376,846.61	6,353,630.02
9	376,824.26	6,353,488.58
10	376,929.56	6,353,471.49
11	376,878.86	6,353,339.45
12	376,892.41	6,353,115.07
13	376,850.53	6,352,860.61
14	376,758.3	6,352,872.32
15	376,658.41	6,352,890.7
16	376,616	6,352,896.27
17	376,554.75	6,353,053.74
18	376,067.18	6,353,077.88
19	375,988.88	6,353,096.86
20	375,968.78	6,353,170.23
21	376,025.93	6,353,516.81

AEP

Figure 1 - Site Map

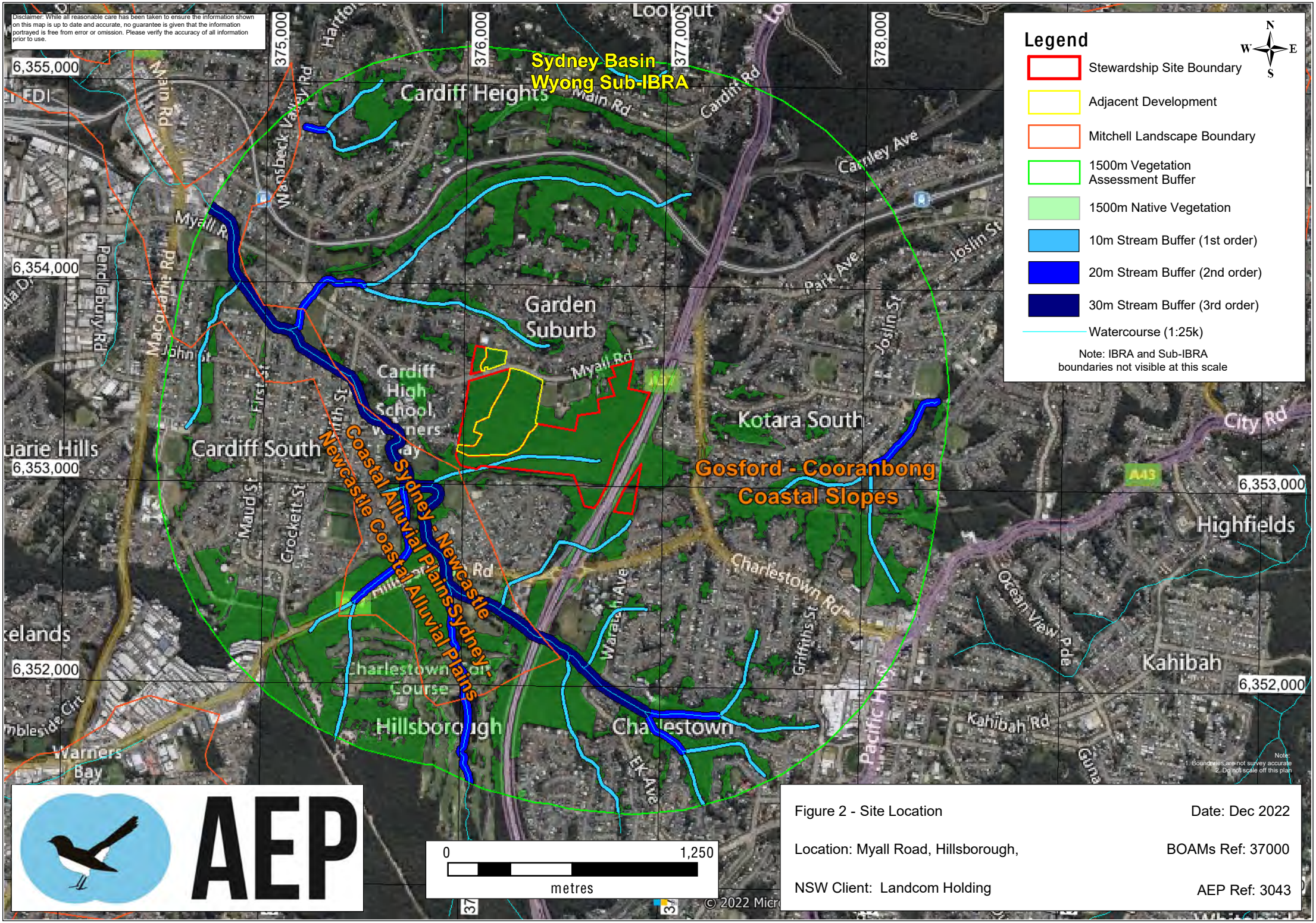
Date: Dec 2022

Location: Myall Road, Hillsborough,

BOAMs Ref: 37000

NSW Client: Landcom Holding

AEP Ref: 3043


Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.
Legend
Stewardship Site Boundary
Adjacent Development
Mitchell Landscape Boundary
1500m Vegetation Assessment Buffer
1500m Native Vegetation
10m Stream Buffer (1st order)
20m Stream Buffer (2nd order)
30m Stream Buffer (3rd order)
Watercourse (1:25k)
Note: IBRA and Sub-IBRA boundaries not visible at this scale
N
W
E
S
Sydney Basin
Wyong Sub-IBRA
Gosford - Cooranbong
Coastal Slopes
Newcastle Coastal Alluvial Plains Sydney - Newcastle Coastal Alluvial Plains Sydney
Cardiff Heights
Garden Suburb
Cardiff South
Kotara South
Highfields
Kahibah
Hillsborough
Charlestown
Warners Bay
Charlestown Golf Course
Cardiff High School
375,000
376,000
377,000
378,000
6,355,000
6,354,000
6,353,000
6,352,000
0
1,250
metres
Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
AEP
Figure 2 - Site Location
Date: Dec 2022
Location: Myall Road, Hillsborough,
BOAMs Ref: 37000
NSW Client: Landcom Holding
AEP Ref: 3043

1.2 Landscape Features

1.2.1 Regional Landscapes

The development site was identified as occurring within the following landscape areas:

- *IBRA Bioregion* – Sydney Basin;
- *IBRA Subregion* – Wyong*;* and
- *NSW Landscape* –Gosford-Cooranbong Coastal Slopes.

Delineation of *NSW Landscape* areas are shown in both **Figure 1 – Site Map** and **Figure 2 – Location Map.**

1.2.2 Landscape Native Vegetation Cover

The 1500m buffer placed around the Site is approximately 1128ha in size. Of this, approximately 297ha comprises native vegetation as per **Section 4.3.2** of the BAM. This equates to approximately **26%** native vegetation cover and was entered as such within the Calculator.

1.2.3 Identified Landscape Features

The BAM Calculator identifies seven (7) landscape features that require assessment for their relevance to the BSA Site. These features are outlined in **Table 2**:

Table 2 – Landscape Feature Assessment

Landscape Feature	Assessment
Rivers and Streams	An unnamed first order stream is located in the south of the Subject Site.
Wetlands	There are no wetlands on the Site.
Native Vegetation Extent	Approximately 25.69ha of native vegetation occurs within the Site.
Connectivity Features	The Site has limited connectivity to the south west through C1 Zoned land.
Areas of geological significance and hazard features	The site contains areas of subsidence following historical mining operations. Acid sulphate soils have not been recorded as present on site.
Features identified in SEARs for major projects	Proposal is not a major project.
Areas of Outstanding Biodiversity Value (AOBV) under the BC Act:	No areas of AOBV are present on the BSA Site and the adjacent lands.

1.3 Native Vegetation

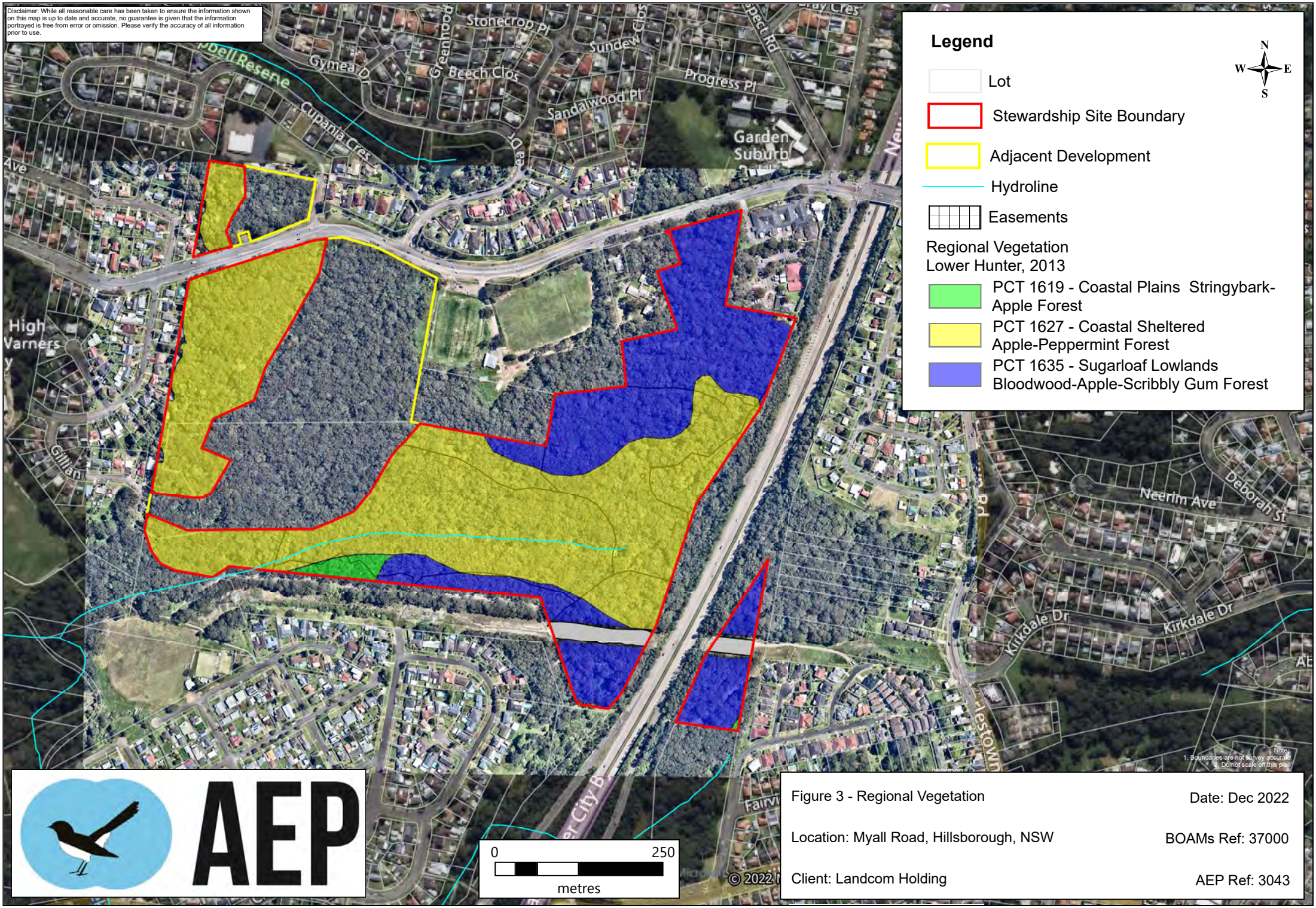
1.3.1 Regional Mapping

The regional vegetation map that best applies to the site is the Lower Hunter Vegetation Mapping dataset (SEWPaC 2013).

Communities mapped within the Site are provided in **Table 3** and shown in **Figure 3**.

Table 3 - Vegetation Mapping Results

Vegetation Community	Plant Community Type	Plant Community Type Code	Associated EEC	Area present within the Subject (BSA) Site (ha)
Coastal Sheltered Apple-Peppermint Forest	Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast	1627	N/A	17.67
Kahibah Snappy Gum Forest	Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast	1638	N/A	9.06
Coastal Plains Stringybark Apple Forest	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	1619	N/A	0.38
Total extent of native vegetation				**27.11**


Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.
Legend
N
W
E
S
Lot
Stewardship Site Boundary
Adjacent Development
Hydroline
Easements
Regional Vegetation
Lower Hunter, 2013
PCT 1619 - Coastal Plains Stringybark-Apple Forest
PCT 1627 - Coastal Sheltered Apple-Peppermint Forest
PCT 1635 - Sugarloaf Lowlands Bloodwood-Apple-Scribbly Gum Forest
Stonecrop Pl
Gymea Cl
Beech Clos
Sandalwood Pl
Progress Pl
Cupania Cres
Garden Suburb
Gillian
Neerim Ave
Deborah St
Kirkdale Dr
Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
AEP
0
250
metres
© 2022
Figure 3 - Regional Vegetation
Date: Dec 2022
Location: Myall Road, Hillsborough, NSW
BOAMs Ref: 37000
Client: Landcom Holding
AEP Ref: 3043

1.3.2 Plot Based Floristics Surveys

Plot Based Floristic surveys were undertaken by AEP to identify the most likely Plant Community Types within the Study Area. The surveys were stratified and targeted to assess the expected environmental variation and address any areas with gaps in existing mapping and information.

- Ground-truthing of regional vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices.
- The plot-based floristic vegetation survey is based on a 20 m × 20 m plot (or 400 m^2 equivalent for linear areas). The assessor must assess the plot for the information contained in Table 1 of BAM 2020.
- 14 BAM plots were undertaken within the remnant native vegetation present within the BSA Site. Plots were located by producing random points via GIS software. Modifications to plot locations were made on site due to factors such as ecotones and proximity to disturbed edges.
- Field sheets are provided in **Appendix B** and field data provided in **Appendix A**. Survey effort including plot location is depicted in **Figures 4** and **Figure 5**. A summary of the plot data and a flora list for all flora species is provided in **Appendix A**.

1.3.3 Plant Community Types

The Stewardship Site was found to be comprised of three (3) Plant Community Types (PCTs):

- PCT 1183 – *Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion*;
- PCT 1627 – *Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast*; and
- PCT 1649 - *Smooth-barked Apple - Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands* which is commensurate with the state listed TEC; *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*.

The BAM's assessment module requires the identification of the PCT or the most likely PCTs, and all TECs, on the BSA Land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC.

Table 4 provides details of the floristic composition of each PCT based on the Vegetation Information System (VIS) classification system and BAM plot data.

1.3.4 PCT Selection Justification

The BAM's assessment module requires the identification of the PCT or the most likely PCTs, and all TECs, on the Subject Land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification system. The identification of TECs must be consistent with the NSW Threatened Species Scientific Committee Final Determination for the TEC.

Diagnostic species recorded on site during fieldwork that support the determination of PCTs are shown in **Tables 3** and **4** below.

Table 4 – Species Data for Potential PCT Determination

Plot ID	Dominant Native Species	Diagnostic Species Present	Potential PCTs
1	*Angophora costata, Eucalyptus resinifera, Leptospermum polygafolium, Melaleuca sieberi, Banksia oblongifolia, B. spinulosa, Callicoma seratifolia, Gahnia clarkei*	*Angophora costata, Eucalyptus resinifera, Leptospermum polygafolium, Melaleuca sieberi, Banksia spinulosa, Gahnia clarkei*	1649, 1624, 1716, 1718
2	*Eucalyptus piperita, Corymbia gummifera, Angophora costata, Eucalyptus haemastoma, Dodonaea triquetra, Lambertia formosa, Allocasuarina littoralis, Banksia spinulosa, Xanthorrhoea macronema, Entolasia stricta, Lomandra obliqua, Themeda triandra, Pteridium esculentum*	*Eucalyptus piperita, Corymbia gummifera, Angophora costata, Dodonaea triquetra, Lambertia formosa, Allocasuarina littoralis, Banksia spinulosa, Entolasia stricta, Lomandra obliqua, Themeda triandra, Pteridium esculentum*	1636, 1643, 1638, 1619, 1627, 1183
3	*Callicoma seratifolia, Angophora costata, Calochlaena dubia, Hypolepis muelleri, Oplismenus imbecillis, Carex appressa, Pittosporum undulatum, Glochidion ferdinandii, Livistona australis, Breynia oblongifolia, Smilax glyciphylla*	*Callicoma seratifolia, Angophora costata, Calochlaena dubia, Hypolepis muelleri, Oplismenus imbecillis, Pittosporum undulatum, Glochidion ferdinandii, Livistona australis, Breynia oblongifolia*	1632, 1833, 1915, 1627
4	*Eucalyptus racemosa. Eucalyptus capitellata, Allocasuarina littoralis, Corymbia gummifera, Banksia spinulosa, Lambertia formosa, Leptospermum polygafolium, Elaeocarpus reticulatus, Hibbertia aspera, Lomandra obliqua, Entolasia stricta, Xanthorrhoea latifolia, Smilax glyciphylla, Lindsaea linearis, Themeda triandra*	*Eucalyptus capitellata, Allocasuarina littoralis, Corymbia gummifera, Banksia spinulosa, Leptospermum polygafolium, Lomandra obliqua, Entolasia stricta, Xanthorrhoea latifolia, Themeda triandra*	1619, 1636, 1638, 1183
5	*Angophora costata, Ceratopetalum gummiferum, Eucalyptus piperita, Eucalyptus resinifera, Platylobium formosum, Allocasuarina torulosa, Themeda triandra, Lepidosperma laterale, Entolasia stricta, Pteridium esculentum*	*Angophora costata, Eucalyptus piperita, Allocasuarina torulosa, Themeda triandra, Lepidosperma laterale, Entolasia stricta, Pteridium esculentum*	1636, 1643, 1638, 1619, 1627, 1183
6	*Angophora costata, Corymbia gummifera, Syncarpia glomulifera, Poa affinis, Platylobium formosum, Leucopogon lanceolatus, Eucalyptus resinifera, Allocasuarina torulosa, Lepidosperma laterale*	*Angophora costata, Corymbia gummifera, Syncarpia glomulifera, Poa affinis, Allocasuarina torulosa,*	1183, 1579, 1627
7	*Syncarpia glomulifera, Eucalyptus umbra, Angophora costata, Allocasuarina torulosa, Oplismenus aemulus, Blechnum cartilagineum, Lomandra longifolia*	*Syncarpia glomulifera, Eucalyptus umbra, Angophora costata, Allocasuarina torulosa, Blechnum cartilagineum, Lomandra longifolia*	1183, 1579, 1627

Plot ID	Dominant Native Species	Diagnostic Species Present	Potential PCTs
8	*Angophora costata, Eucalyptus piperita, Corymbia gummifera, Banksia spinulosa, Xanthorrhoea macronema, Platylobium formosum, Entolasia stricta, Pteridium esculentum, Themeda triandra*	*Angophora costata, Eucalyptus piperita, Corymbia gummifera, Banksia spinulosa, Entolasia stricta, Pteridium esculentum, Themeda triandra*	1619, 1627, 1636, 1638, 1183
9	*Callicoma serratifolia, Eucalyptus piperita, Lomandra longifolia, Platylobium formosum, Calochlaena dubia, Poa affinis, Xanthorrhoea macronema, Entolasia stricta, Angophora costata, Oplismenus imbecilis, Pteridium esculentum, Corymbia gummifera*	*Callicoma serratifolia, Eucalyptus piperita, Lomandra longifolia, Calochlaena dubia, Poa affinis, Entolasia stricta, Angophora costata, Oplismenus imbecilis, Pteridium esculentum, Corymbia gummifera*	1183, 1627, 1632, 1833, 1915
10	*Eucalyptus racemosa, Allocasuarina littoralis, Angophora costata, Themeda triandra, Corymbia gummifera, Xanthorrhoea macronema, Hibbertia empetrifolia, Microlaena stipoides, Goodenia heterophylla*	*Eucalyptus racemosa, Allocasuarina littoralis, Angophora costata, Themeda triandra, Corymbia gummifera, Hibbertia empetrifolia, Microlaena stipoides*	1638, 1636, 1619, 1183
11	*Gahnia sieberiana, Angophora costata, Corymbia gummifera, Eucalyptus piperita, Glochidion ferdinandi, Entolasia stricta, Eucalyptus resinifera, Leptospermum polygafolium, Callicoma serratifolia, Smilax glyciphylla, Themeda triandra, Banksia spinuloa, Lomandra longifolia*	*Angophora costata, Corymbia gummifera, Eucalyptus piperita, Glochidion ferdinandi, Entolasia stricta, Leptospermum polygafolium, Themeda triandra, Banksia spinuloa, Lomandra longifolia*	1619, 1627, 1636, 1638, 1643
12	*Corymbia gummifera, Eucalyptus piperita, Lambertia formosa, Allocasuarina littoralis, Eucalyptus capitellata, Anisopogon avenaceus, Imperata cylindrica, Entolasia stricta, Callistemon linearis, Xanthorrhoea macronema, Polyscias sambucifolia, Eucalyptus racemosa*	*Corymbia gummifera, Eucalyptus piperita, Allocasuarina littoralis, Eucalyptus capitellata, Imperata cylindrica, Entolasia stricta, Eucalyptus racemosa*	1638, 1619, 1627, 1183
13	*Dodonaea triquetra, Corymbia gummifera, Xanthorrhoea macronema, Angophora costata, Gahnia sieberiana, Eucalyptus haemastoma, Acacia myrtifolia, Acacia terminalis, Polyscias sambucifolia*	*Corymbia gummifera, Angophora costata, Allocasuarina littoralis, Banksia spinulosa, Microlaena stipoides, Entolasia stricta, Lomandra obliqua, Pimelea linifolia, Persoonia levis*	1619, 1627, 1636, 1638, 1183
14	*Corymbia maculata, Syncarpia glomulifera, Gymnostachys anceps, Eucalyptus piperita, Glochidion ferdinandi, Platylobium formosum, Angophora costata*	*Corymbia maculata, Syncarpia glomulifera, Gymnostachys anceps, Eucalyptus piperita, Glochidion ferdinandi, Angophora costata, Microlaena stipoides, Allocasuarina torulosa*	1183, 1627, 1584, 1588, 1579

Review of floristic data concluded that plots and PCTs were associated as follows. Further justification is provided in **Tables 5** and **13**.

- PCT 1183: BAM plots 2, 4, 5, 8, 10, 11, 12, 13; in two conditions;
- PCT 1627: BAM plot 3, 6, 7, 9 & 14; in two conditions; and
- PCT 1649: BAM plot 1.

Table 5 – Determination of PCT 1183

Potential PCTs	1183	1619	1627	1636	1638	1643
Regional Vegetation	No	Yes – mapped within the site	Yes – mapped within the site	No	Yes – mapped within the site	No
IBRA Region	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin
IBRA Subregion	Wyong	Wyong	Wyong	Wyong	Wyong	Wyong
NSW Landscape	No information available	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes
LGA	No Information Available	Lake Macquarie	Lake Macquarie	Lake Macquarie	Lake Macquarie	Lake Macquarie
Listed Key Diagnostic Species (VIS)	**Canopy Species:** *Angophora costata; Eucalyptus piperita; Syncarpia glomulifera; Corymbia maculata; Eucalyptus umbra; Corymbia gummifera; Eucalyptus deanei; Eucalyptus pilularis; Eucalyptus punctata;* **Mid Stratum:** *Acacia elata; Acacia linifolia; Allocasuarina torulosa; Backhousia myrtifolia; Breynia oblongifolia; Dodonaea triquetra; Doryanthes excelsa; Gompholobium latifolium; Persoonia levis; Persoonia linearis; Pittosporum undulatum;* **Ground Stratum:** *Adiantum aethiopicum; Blechnum cartilagineum; Calochlaena dubia; Caustis flexuosa; Dianella caerulea; Entolasia stricta; Gonocarpus teucrioides; Lepidosperma laterale; Lomandra longifolia; Lomatia silaifolia; Pteridium esculentum;*	**Canopy Species:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata;* **Mid Stratum:** *Banksia spinulosa; Allocasuarina littoralis; Xanthorrhoea latifolia; Leptospermum polygalifolium; Acacia myrtifolia; Persoonia levis; Persoonia linearis; Billardiera scandens;* **Ground Stratum:** *Themeda australis; Panicum simile; Aristida vagans; Dianella caerulea; Lepidosperma laterale; Lomandra obliqua; Goodenia heterophylla;*	**Canopy Species:** *Angophora costata; Syncarpia glomulifera; Eucalyptus piperita; Corymbia gummifera;* **Mid Stratum**: *Persoonia levis; Banksia serrata; Leptospermum polygalifolium; Acacia ulicifolia; Acacia linifolia; Ceratopetalum gummiferum; Persoonia linearis;* **Ground Stratum:** *Dianella caerulea; Entolasia stricta; Lomandra longifolia; Lepidosperma laterale;*	**Canopy Species:** *Eucalyptus haemastoma; Corymbia gummifera;* **Mid Stratum:** *Banksia oblongifolia; Leptospermum trinervium; Lambertia formosa; Xanthorrhoea latifolia; Hakea dactyloides;* **Ground Stratum:** *Epacris pulchella; Ptilothrix deusta; Petrophile pulchella; Lomandra obliqua; Themeda australis; Lepyrodia scariosa; Aristida warburgii;*	**Canopy Species:** *Angophora costata; Corymbia gummifera;* **Mid Stratum:** *Allocasuarina littoralis; Leptospermum trinervium; Acacia myrtifolia; Persoonia levis; Lambertia formosa; Pimelea linifolia;* **Ground Stratum:** *Themeda australis; Ptilothrix deusta; Lepyrodia scariosa; Entolasia stricta; Lomandra obliqua;*	**Canopy Species:** *Corymbia gummifera; Angophora costata; Eucalyptus haemastoma;* **Mid Stratum:** *Lambertia formosa; Leptospermum trinervium; Banksia serrata; Phyllota phylicoides; Banksia spinulosa; Bossiaea obcordata; Persoonia levis;* **Ground Stratum:** *Platysace linearifolia; Anisopogon avenaceus; Actinotus minor; Cyathochaeta diandra; Patersonia sericea; Lomandra glauca; Lepyrodia scariosa; Entolasia stricta;*
Present Key Diagnostic Species within Study Area	**Canopy Species:** *Angophora costata; Corymbia gummifera; Eucalyptus piperita; Syncarpia glomulifera;* **Mid Stratum:** *Breynia oblongifolia; Dodonaea triquetra; Persoonia levis;* **Ground Stratum:** *Billardiera scandens; Cassytha glabella; Dianella caerulea; Entolasia stricta; Lepidosperma laterale; Pteridium esculentum;*	**Canopy Species:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata; (outside plots)* **Mid Stratum:** *Banksia spinulosa; Allocasuarina littoralis; Leptospermum polygalifolium; Acacia myrtifolia; Persoonia levis; Persoonia linearis; Billardiera scandens; Xanthorrhoea latifolia* **Ground Stratum:** *Themeda australis; Dianella caerulea; Lepidosperma laterale; Lomandra obliqua;*	**Canopy Species:** *Angophora costata; Eucalyptus piperita; Corymbia gummifera;* **Mid Stratum**: *Persoonia levis; Leptospermum polygalifolium; Ceratopetalum gummiferum; Persoonia linearis;* **Ground Stratum:** *Dianella caerulea; Entolasia stricta; Lomandra longifolia; Lepidosperma laterale;*	**Canopy Species:** *Eucalyptus haemastoma; Corymbia gummifera;* **Mid Stratum:** *Banksia oblongifolia; Leptospermum trinervium; Lambertia formosa; Xanthorrhoea latifolia;* **Ground Stratum:** *Epacris pulchella; Ptilothrix deusta; Lomandra obliqua; Themeda australis;*	**Canopy Species:** *Angophora costata; Corymbia gummifera;* **Mid Stratum:** *Allocasuarina littoralis; Leptospermum trinervium; Acacia myrtifolia; Persoonia levis; Lambertia formosa; Pimelea linifolia;* **Ground Stratum:** *Themeda australis; Entolasia stricta; Lomandra obliqua;*	**Canopy Species:** *Corymbia gummifera; Angophora costata; Eucalyptus haemastoma;* **Mid Stratum:** *Lambertia formosa; Leptospermum trinervium; Banksia spinulosa; Persoonia levis;* **Ground Stratum:** *Anisopogon avenaceus; Entolasia stricta;*

Potential PCTs	1183	1619	1627	1636	1638	1643
Absence of Key Diagnostic Species within the Study Area	**Canopy Species:** *Syncarpia glomulifera; Allocasuarina littoralis; Glochidion ferdinandi;* **Mid Stratum:** *Banksia spinulosa var. collina; Epacris pulchella; Platylobium formosum; Polyscias sambucifolia; Leptospermum polygalifolium; Grevillea linearifolia; Lomatia silaifolia;* **Ground Stratum:** *Pratia purpurascens; Smilax glyciphylla; Tetrarrhena juncea;*	**Canopy Species:** **Mid Stratum:** **Ground Stratum:** *Panicum simile; Goodenia heterophylla*	**Canopy Species:** *Syncarpia glomulifera;* **Mid Stratum**: *Banksia serrata; Acacia ulicifolia; Acacia linifolia; Ceratopetalum gummiferum;* **Ground Stratum:**	**Canopy Species:** **Mid Stratum:** *Hakea dactyloides;* **Ground Stratum:** *Ptilothrix deusta; Petrophile pulchella; Lepyrodia scariosa; Aristida warburgii;*	**Canopy Species:** **Mid Stratum:** **Ground Stratum:** *Ptilothrix deusta; Lepyrodia scariosa;*	**Canopy Species:** **Mid Stratum:** *Banksia serrata; Phyllota phylicoides; Bossiaea obcordata;* **Ground Stratum:** *Platysace linearifolia; Actinotus minor; Cyathochaeta diandra; Patersonia sericea; Lomandra glauca; Lepyrodia scariosa;*
PCT Description	Occurs on either Hawkesbury or Narrabeen Sandstone substrates. Occurs in sheltered gullies or on slopes of the sandstone plateaux of the southern Central Coast.	Open forests with a canopy dominated by *Angophora costata* and *Corymbia gummifera.* The mid-storey is typically shrubby and commonly includes grass trees and scrambling climbers. The ground layer is typically dominated by grasses along with graminoids and scattered forbs. Coastal lowlands and low ranges of the lower North Coast and Central Coast; mainly on sandy substrates.	Open Forests to Woodlands with a generally well developed and distinctly two-layered mid-stratum. The ground cover is characterized by graminoids; sub-shrubs and forbs. Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to Pearl Beach and north to about Wyong Creek| including Dharug NP. Elevation is from 50 to 300m.	Eucalypt dominated Woodlands with a shrubby mid-stratum and a graminoid ground cover. This community occurs on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie. The substrate is sandstone with moist sandy soils| elevation is usually under 100m.	Woodlands; the canopy is characterised by Angophora and Eucalypts| the mid-stratum is typically comprised of low shrubs and the ground stratum is generally grassy. This community is found the area bounded by Norah Head and Catherine Hill Bay in the east and extends to about the Pacific Highway in the west. Substrates are sandstones and elevations are typically below 100m.	Open Forests to Woodlands; the canopy characterised by Corymbia and Angophora| the mid-stratum is typically two-layered and composed of sclerophyllous shrubs| the third (ground) stratum comprises forbs; sub-shrubs and graminoids.
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);
Vegetation Class	Sydney Coastal Dry Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;
Geographical Restrictions	Has been recorded from the local government area of Gosford within the Sydney Basin Bioregion, and may occur elsewhere in the Bioregion	Coastal lowlands and low ranges of the lower North Coast and Central Coast; mainly on sandy substrates.	Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to Pearl Beach and north to about Wyong Creek| including Dharug NP.	This community occurs on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie. The substrate is sandstone with moist sandy soils| elevation is usually under 100m.	This community is found the area bounded by Norah Head and Catherine Hill Bay in the east and extends to about the Pacific Highway in the west. Substrates are sandstones and elevations are typically below 100m.	Plateau surface; ridges; flats; lower slopes
Elevation	Information not available	Information not available	Elevation is from 50 to 300m.	elevation is usually under 100m.	Typically, below 100m.	Information not available
Soil Profiles	Information not available	Sandstone, Conglomerate	Sandstone	Siltstone, Conglomerate	Sandstone	Sandstone
Habitat Restrictions	Occurs on either Hawkesbury or Narrabeen Sandstone substrates.	coastal hillslopes; upper slopes; Coastal lowlands and low ranges of the lower North Coast and Central Coast; mainly on sandy substrates.	ridges; upper slopes; mid slopes	coastal flats; rises; low hills	flats; rises; low hills	Information not available
PCT Determination	This community contains one of the strongest floristic matches with the vegetation on site and includes species	This community has a high match of diagnostic species and is mapped within the Subject Site, however	This community fit reasonably well for the site, however this PCT is described as more mesic when	This community fits the site fairly well, however contains graminoid species in the ground stratum which were not	This PCT has a high match with the site with a high number of diagnostic species present, however other	This PCT fit the site reasonably well, however groundcovers were inconsistent with the community on

Potential PCTs	1183	1619	1627	1636	1638	1643
	present within most plots and encompasses slight variations across the site. Despite not being recorded in Lake Macquarie, the similarity between this community and other similar communities is strong. Other communities which were similar were PCT 1619 and PCT 1638. No clear division between either community was able to be determined and PCT 1183 encompassed elements of both communities and was determined to be the best fit.	elements of the community on site contained scribbly gums, *E. haemastoma* and *E. racemosa* and other shrubs that were present in many plots across this zone, additionally E. capitellata was present in low abundance throughout this area and is typically a dominant tree throughout this community which was not consistent with the site. PCT 1183 was considered to be a better fit and described a greater number of diagnostic species that occurred in most plots.	recorded within Lake Macquarie which isn't consistent with this vegetation zone and other communities were considered to be a better fit.	present on site, as such other communities were considered a better fit.	species common across the site were not included in this PCT, as such PCT 1183 was considered a better fit.	site. Other communities were considered a better fit.
Result	**PCT 1183**					
BAM Plots	2, 4, 5, 8, 10 - 13					
Estimate cleared value of PCT (%)	50					
EEC	No associated TEC					
	Vegetation Zones					
Vegetation Zones of PCT 1183 within Subject Site	Moderate Moderate – High Weed Load					

Table 6 – PCT 1183 - Moderate

Category	Description
Description of Vegetation Zone	This vegetation zone occurs within the drier areas of the site, consisting of open forest with a midstorey of myrtaceous and heathy shrubs, the ground stratum is grassy with a low abundance of forbs and ferns. Weed cover is generally low, consisting of woody weed species such as Camphor Laurel and Lantana. **Canopy Stratum:** The canopy commonly contains *Angophora costata, Corymbia gummifera* and *Eucalyptus piperita*, along with other eucalypt species such as *E. racemosa, E. haemastoma* and *Eucalyptus capitellata* (Brown Stringy Bark). **Mid-Stratum:** The midstory contains a diverse shrub layer consisting of *Banksia oblongifolia, B. spinulosa, Persoonia levis, P. linearis, Allocasuarina torulosa, Lambertia formosa, Dodonaea triquetra, Polyscias sambucifolia, Platylobium formosum, Leptospermum spp, Pittosporum undulatum* and *Elaeocarpus reticularis.* **Ground-Stratum:** The ground stratum is typically grassy, commonly containing, *Entolasia stricta, Themeda triandra, Gahnia sieberiana, Imperata cylindrica* and *Lomandra obliqua*. Forbs, *Dianella caerulea* and *Dampiera purpurea* are sparse, along with ferns, *Pteridium esculentum* and *Lindsaea spp*. Grass tree, *Xanthorrhoea latifolia* is common. Vines included, *Billardiera scandens, Cassytha glabella, Parsonsia straminea* and *Smilax glyciphylla*. **Common weeds:** Woody weed species present consist of mostly Cinnamomum camphora (Camphor laurel) and Lantana camara (Lantana). Both species are listed as HTE. **Associated Threatened Species:** *Tetratheca juncea* (Black-eyed Susan).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 13.75ha of the Subject Site.
Plots	2, 4, 5, 8, 10, 11,13

PCT 1183 Moderate BAM Plot 2

PCT 1183 Moderate BAM Plot 4

PCT 1183 Moderate BAM Plot 5

PCT 1183 Moderate BAM Plot 8

Category	Description			
 PCT 1183 Moderate BAM Plot 10	 PCT 1183 Moderate BAM Plot 11	 PCT 1183 Moderate BAM Plot 12	 PCT 1183 Moderate BAM Plot 13	

Table 7 - PCT 1183 – Moderate – High Weed Load

Category	Description
Description of Vegetation Zone	This vegetation zone occurs within the drier areas of the site, consisting of open forest with a midstorey of myrtaceous and heathy shrubs, the ground stratum is grassy with a low abundance of forbs and ferns. Weed cover is generally high in the southern section, consisting of woody weed species such as Camphor Laurel and Lantana. **Canopy Stratum:** The canopy commonly contains *Angophora costata, Corymbia gummifera* and *Eucalyptus piperita*, along with other eucalypt species such as *E. racemosa, E. haemastoma* and *Eucalyptus capitellata* (Brown Stringy Bark). **Mid-Stratum:** The midstory contains a diverse shrub layer consisting of *Banksia oblongifolia, B. spinulosa, Persoonia levis, P. linearis, Allocasuarina torulosa, Lambertia formosa, Dodonaea triquetra, Polyscias sambucifolia, Platylobium formosum, Leptospermum spp, Pittosporum undulatum* and *Elaeocarpus reticularis.* **Ground-Stratum:** The ground stratum is typically grassy, commonly containing, *Entolasia stricta, Themeda triandra, Gahnia sieberiana, Imperata cylindrica* and *Lomandra obliqua*. Forbs, *Dianella caerulea* and *Dampiera purpurea* are sparse, along with ferns, *Pteridium esculentum* and *Lindsaea spp*. Grass tree, *Xanthorrhoea latifolia* is common. Vines included, *Billardiera scandens, Cassytha glabella, Parsonsia straminea* and *Smilax glyciphylla*. **Common weeds:** Woody weed species present consist of mostly Cinnamomum camphora (Camphor laurel) and Lantana camara (Lantana). Both species are listed as HTE. These weeds have high coverage both within and to the south **Associated Threatened Species:** *Tetratheca juncea* (Black-eyed Susan).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.66ha of the Subject Site.
Plots	12

PCT 1183 Moderate BAM Plot 12

Table 8 – Determination of PCT 1649

Potential PCTs	1624	1627	1649	1716
Regional Vegetation	No	Yes – mapped nearby	No	No
IBRA Region	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin
IBRA Subregion	Wyong	Wyong	Wyong	Wyong
NSW Landscape	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes	Gosford - Cooranbong Coastal Slopes
LGA	Lake Macquarie	Lake Macquarie	Lake Macquarie	Lake Macquarie
Listed Key Diagnostic Species (VIS)	**Canopy Species**: *Angophora costata; Eucalyptus robusta; Eucalyptus resinifera; Livistona australis;* **Mid Stratum**: *Pultenaea villosa; Leptospermum polygalifolium; Dodonaea triquetra; Melaleuca linariifolia; Glochidion ferdinandi; Acacia longifolia; Banksia spinulosa; Polyscias sambucifolia; Smilax glyciphylla;* **Ground Stratum:** *Entolasia stricta; Imperata cylindrica; Themeda australis; Dianella caerulea; Gahnia sieberiana; Gahnia clarkei;*	**Canopy Species:** *Angophora costata; Syncarpia glomulifera; Eucalyptus piperita; Corymbia gummifera;* **Mid Stratum:** *Persoonia levis; Banksia serrata; Leptospermum polygalifolium; Acacia ulicifolia; Acacia linifolia; Ceratopetalum gummiferum; Persoonia linearis;* **Ground Stratum:** *Dianella caerulea; Entolasia stricta; Lomandra longifolia; Lepidosperma laterale;*	**Canopy Species**: *Angophora costata; Eucalyptus resinifera; Eucalyptus robusta;* **Mid Stratum:** *Melaleuca sieberi; Melaleuca thymifolia; Pultenaea paleacea; Leptospermum juniperinum; Melaleuca nodosa; Leptospermum polygalifolium;* **Ground Stratum:** *Lepyrodia scariosa; Themeda australis; Ptilothrix deusta; Panicum simile; Entolasia stricta; Gahnia clarkei;*	**Canopy Species**: *Eucalyptus resinifera;* **Mid Stratum:** *Melaleuca nodosa; Breynia oblongifolia; Glochidion ferdinandi; Acacia longifolia; Melaleuca sieberi; Melaleuca linariifolia;* **Ground Stratum:** *Imperata cylindrica; Dichondra repens; Microlaena stipoides; Entolasia marginata; Dianella caerulea; Entolasia stricta; Oplismenus imbecillis; Lomandra longifolia;*
Present Key Diagnostic Species within Study Area	**Canopy Species**: *Angophora costata; Eucalyptus resinifera;* **Mid Stratum**: *Leptospermum polygalifolium; Banksia spinulosa;* **Ground Stratum:** *Gahnia clarkei;*	**Canopy Species:** *Angophora costata;* **Mid Stratum:** *Leptospermum polygalifolium;* **Ground Stratum:**	**Canopy Species**: *Angophora costata; Eucalyptus resinifera;* **Mid Stratum:** *Melaleuca sieberi; Leptospermum juniperinum; Leptospermum polygalifolium;* **Ground Stratum:** *Gahnia clarkei;*	**Canopy Species**: *Eucalyptus resinifera;* **Mid Stratum:** *Melaleuca sieberi;* **Ground Stratum:**
Absence of Key Diagnostic Species within the Study Area	**Canopy Species**: *Eucalyptus robusta; Livistona australis;* **Mid Stratum**: *Pultenaea villosa; Dodonaea triquetra; Melaleuca linariifolia; Glochidion ferdinandi; Acacia longifolia; Polyscias sambucifolia; Smilax glyciphylla;* **Ground Stratum:** *Entolasia stricta; Imperata cylindrica; Themeda australis; Dianella caerulea; Gahnia sieberiana;*	**Canopy Species:** *Syncarpia glomulifera; Eucalyptus piperita; Corymbia gummifera;* **Mid Stratum:** *Persoonia levis; Banksia serrata; Acacia ulicifolia; Acacia linifolia; Ceratopetalum gummiferum; Persoonia linearis;* **Ground Stratum:** *Dianella caerulea; Entolasia stricta; Lomandra longifolia; Lepidosperma laterale;*	**Canopy Species**: *Eucalyptus robusta;* **Mid Stratum:** *Melaleuca thymifolia; Pultenaea paleacea; Melaleuca nodosa;* **Ground Stratum:** *Lepyrodia scariosa; Themeda australis; Ptilothrix deusta; Panicum simile; Entolasia stricta;*	**Canopy Species**: **Mid Stratum:** *Melaleuca nodosa; Breynia oblongifolia; Glochidion ferdinandi; Acacia longifolia; Melaleuca linariifolia;* **Ground Stratum:** *Imperata cylindrica; Dichondra repens; Microlaena stipoides; Entolasia marginata; Dianella caerulea; Entolasia stricta; Oplismenus imbecillis; Lomandra longifolia;*
PCT Description	Open forests with a canopy characterised by Angophora costata. The mid- storey is typically shrubby with a range of tall and smaller shrubs. The ground layer is dominated by grasses and other graminoids with sparse ferns and forbs. Coastal lowlands on the Central Coast in the Lake Macquarie/ Tuggerah Lakes area; mainly on sandy substrates.	Open Forests to Woodlands with a generally well developed and distinctly two-layered mid-stratum. The ground cover is characterized by graminoids; sub-shrubs and forbs. Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to Pearl Beach and north to about Wyong Creek| including Dharug NP. Elevation is from 50 to 300m.	Damp Woodlands dominated in the canopy by Angophoras. The mid-stratum is characteristic and is dominated by Melaleucas and Leptospermums. The ground cover is moderately sparse to sparse and is comprised of a variety of graminoids. This community is characteristic of low; poorly drained sands from Tumbi Umbi to just north of Crowdy Head. Elevation is below 50m.	Myrtaceous; seasonally wet; Tall Shrubland/Low Open Forest with emergent Eucalypts. The main canopy may contain a variety of species in association with M. nodosa. The ground stratum is relatively dense and is dominated by grasses. This community is found on poorly drained areas on the undulating coastal lowlands from Wamberal north to Yarratt State Forest. This community typically occurs on unconsolidated sediments or on fine-grained sedimentary geologies at elevations up to 100m.
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation);	Dry Sclerophyll Forests (Shrubby sub-formation);	Forested Wetlands;	Forested Wetlands;

Potential PCTs	1624	1627	1649	1716
Vegetation Class	Sydney Coastal Dry Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;	Coastal Swamp Forests;	Coastal Swamp Forests;
Geographical Restrictions	Coastal lowlands on the Central Coast in the Lake Macquarie/ Tuggerah Lakes area; mainly on sandy substrates.	Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to Pearl Beach and north to about Wyong Creek| including Dharug NP	This community is characteristic of low; poorly drained sands from Tumbi Umbi to just north of Crowdy Head	This community is found on poorly drained areas on the undulating coastal lowlands from Wamberal north to Yarratt State Forest
Elevation	Information not available	50 to 300m.	Below 50m	Up to 100m
Soil Profiles	Sandstone	Sandstone	Sandstone	Sandstone
Habitat Restrictions	open forest on lowlands of the Central Coast	heathy woodland on sandstone ranges of the Central Coast	heathy swamp woodland of coastal lowlands	Myrtaceous; seasonally wet; Tall Shrubland/Low Open Forest with emergent Eucalypts
PCT Determination	This community contains a moderate floristic match with the community on site. However, this PCT does not present as a Swamp Forest, which is what was found on site. The community on site has a much lower diversity. As such other communities were considered to be a better fit.	Despite containing a low diagnostic fit for this vegetation type, this community was included to compare similarities with the rest of the site. The vegetation was considered distinct enough to be consistent as a separate swamp forest community and other PCTs were considered to be a better fit.	This community contained the highest number of diagnostic species within all stratums, with a low diversity ground cover and was considered to be the best fit PCT.	The community on site does not contain a grassy understorey and Melaleuca nodosa was absent from the vegetation type. PCT 1649 was considered to be best fit.
Result	**PCT 1649**			
BAM Plots	1			
Estimate cleared value of PCT (%)	46			
EEC	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions; Listed EPBC Act: Forms part of the Endangered Ecological Community Swamp sclerophyll forest on coastal floodplains of the NSW North Coast	Sydney Basin and South East Corner bioregions The community on site is considered to be commensurate with the state listed TEC.		
Vegetation Zones				
Vegetation Zones of this PCT within Subject Site	Moderate Condition			

Table 9 – PCT 1649 – Moderate condition

Category	Description
Description of Vegetation Zone	This vegetation zone consists of heathy swamp forest, containing an open eucalypt canopy with a mid-stratum of myrtaceous and heathy shrubs. The ground cover has little diversity, containing predominantly *Gahnia clarkei*. This vegetation zone has little to no disturbance. **Canopy Stratum:** *Angophora costata* and *Eucalyptus resinifera.* **Mid-Stratum:** *Banksia oblongifolia, B. spinulosa, Callicoma serratifolia, Leptospermum polygafolium, L. juniperinus* and *Melaleuca sieberi.* **Ground-Stratum:** The ground stratum possesses a low number of native species, consisting predominantly of *Gahnia clarkei. Pteridium esculentum* (Bracken) and parasitic vine, *Cassytha glabella* were also present. **Common weeds:** None present.
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 1.89ha of the Subject Site.
Plots	1

PCT 1649 Good BAM Plot 1

Table 10 – Determination of PCT 1627

	1183	1579	1584	1627
Regional Vegetation	No	No	No	Yes – mapped within the Subject Area
IBRA Region	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin
IBRA Subregion	Wyong	Wyong	Wyong	Wyong
NSW Landscape	Information not available	Gosford - Cooranbong Coastal Slopes	Not mapped within the correct landscape	Gosford - Cooranbong Coastal Slopes
LGA	Information not available	Lake Macquarie	Not mapped with the Lake Macquarie LGA	Lake Macquarie
Listed Key Diagnostic Species (VIS)	**Canopy Species**: *Angophora costata; Eucalyptus piperita; Syncarpia glomulifera; Corymbia maculata; Eucalyptus umbra; Corymbia gummifera; Eucalyptus deanei; Eucalyptus pilularis; Eucalyptus punctata;* **Mid Stratum**: *Acacia elata; Acacia linifolia; Allocasuarina torulosa; Backhousia myrtifolia; Breynia oblongifolia; Dodonaea triquetra; Doryanthes excelsa; Gompholobium latifolium; Persoonia levis; Persoonia linearis; Pittosporum undulatum;* **Ground Stratum:** *Adiantum aethiopicum; Blechnum cartilagineum; Calochlaena dubia; Caustis flexuosa; Dianella caerulea; Entolasia stricta; Gonocarpus teucrioides; Lepidosperma laterale; Lomandra longifolia; Lomatia silaifolia; Pteridium esculentum;*	**Canopy Species:** *Angophora costata; Syncarpia glomulifera; Eucalyptus pilularis;* **Mid Stratum:** *Allocasuarina torulosa; Persoonia linearis; Breynia oblongifolia; Polyscias sambucifolia; Podolobium ilicifolium; Gompholobium latifolium; Billardiera scandens; Cissus hypoglauca;* **Ground Stratum:** *Pteridium esculentum; Calochlaena dubia; Lomandra longifolia; Entolasia stricta; Imperata cylindrica; Pomax umbellata;*	**Canopy Species**: *Eucalyptus acmenoides; Corymbia maculata;* **Mid Stratum:** *Backhousia myrtifolia; Notelaea longifolia; Myrsine variabilis; Clerodendrum tomentosum; Pittosporum revolutum; Streblus brunonianus; Breynia oblongifolia; Pandorea pandorana; Cissus antarctica;* **Ground Stratum:** *Adiantum aethiopicum; Doodia aspera; Pellaea falcata; Microlaena stipoides; Oplismenus aemulus; Dichondra repens; Plectranthus parviflorus;*	**Canopy Species**: *Angophora costata; Syncarpia glomulifera; Eucalyptus piperita; Corymbia gummifera;* **Mid Stratum:** *Persoonia levis; Banksia serrata; Leptospermum polygalifolium; Acacia ulicifolia; Acacia linifolia; Ceratopetalum gummiferum; Persoonia linearis;* **Ground Stratum:** *Dianella caerulea; Entolasia stricta; Lomandra longifolia; Lepidosperma laterale;*
Present Key Diagnostic Species within Study Area	**Canopy Species**: *Angophora costata; Eucalyptus piperita; Syncarpia glomulifera; Corymbia maculata; Eucalyptus umbra; Corymbia gummifera;* **Mid Stratum**: *Allocasuarina torulosa; Breynia oblongifolia; Dodonaea triquetra; Persoonia linearis; Pittosporum undulatum;* **Ground Stratum:** *Blechnum cartilagineum; Calochlaena dubia; Dianella caerulea; Entolasia stricta; Lepidosperma laterale; Lomandra longifolia; Pteridium esculentum;*	**Canopy Species:** *Angophora costata; Syncarpia glomulifera;* **Mid Stratum:** *Allocasuarina torulosa; Persoonia linearis; Breynia oblongifolia; Polyscias sambucifolia; Podolobium ilicifolium; Billardiera scandens;* **Ground Stratum:** *Pteridium esculentum; Calochlaena dubia; Lomandra longifolia; Entolasia stricta; Imperata cylindrica;*	**Canopy Species**: *Corymbia maculata;* **Mid Stratum:** *Notelaea longifolia; Breynia oblongifolia; Pandorea pandorana;* **Ground Stratum:** *Microlaena stipoides; Oplismenus aemulus;*	**Canopy Species**: *Angophora costata; Syncarpia glomulifera; Eucalyptus piperita; Corymbia gummifera;* **Mid Stratum:** *Leptospermum polygalifolium; Acacia ulicifolia; Ceratopetalum gummiferum; Persoonia linearis;* **Ground Stratum:** *Dianella caerulea; Lomandra longifolia; Lepidosperma laterale;*
Absence of Key Diagnostic Species within the Study Area	**Canopy Species**: *Eucalyptus deanei; Eucalyptus pilularis; Eucalyptus punctata;* **Mid Stratum**: *Acacia elata; Acacia linifolia; Backhousia myrtifolia; Doryanthes excelsa; Gompholobium latifolium; Persoonia levis;* **Ground Stratum:** *Adiantum aethiopicum; Caustis flexuosa; Gonocarpus teucrioides; Lomatia silaifolia;*	**Canopy Species:** *Eucalyptus pilularis;* **Mid Stratum:** *Gompholobium latifolium; Cissus hypoglauca;* **Ground Stratum:** *Pomax umbellata;*	**Canopy Species**: *Eucalyptus acmenoides;* **Mid Stratum:** *Backhousia myrtifolia; Myrsine variabilis; Clerodendrum tomentosum; Pittosporum revolutum; Streblus brunonianus; Cissus antarctica;* **Ground Stratum:** *Adiantum aethiopicum; Doodia aspera; Pellaea falcata; Dichondra repens; Plectranthus parviflorus;*	**Canopy Species**: **Mid Stratum:** *Persoonia levis; Banksia serrata; Acacia linifolia;* **Ground Stratum:** *Entolasia stricta;*
PCT Description	Other Diagnostics Features: Occurs on either Hawkesbury or Narrabeen Sandstone substrates; Landscape Position: Occurs in sheltered gullies or on slopes of the sandstone plateaux of the southern Central Coast.	Open forests with a mixed canopy including Angophora costata. The mid- storey consists of a diverse shrub layer and climbers. The ground layer is a mix of graminoids; forbs and ferns. Ranges of the Central Coast hinterland at lower elevations.	Open forests with a canopy dominated by Eucalyptus acmenoides and Corymbia maculata. The mid storey is characterised by mesic small trees; an open shrub layer and various climbers. The ground layer is predominately a mix of grasses and ferns and sparse	Open Forests to Woodlands with a generally well developed and distinctly two-layered mid-stratum. The ground cover is characterized by graminoids; sub-shrubs and forbs. Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to

	1183	1579	1584	1627
			graminoids and forbs. Central and lower Hunter Valley in gullies and on lower slopes mainly on sandstone substrates and at mid to lower elevations.	Pearl Beach and north to about Wyong Creek| including Dharug NP. Elevation is from 50 to 300m.
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation);	Wet Sclerophyll Forests (Shrubby sub-formation);	Wet Sclerophyll Forests (Grassy sub-formation);	Dry Sclerophyll Forests (Shrubby sub-formation);
Vegetation Class	Sydney Coastal Dry Sclerophyll Forests;	North Coast Wet Sclerophyll Forests;	Northern Hinterland Wet Sclerophyll Forests;	Sydney Coastal Dry Sclerophyll Forests;
Geographical Restrictions	Occurs on either Hawkesbury or Narrabeen Sandstone in sheltered gullies or on slopes of the sandstone plateaux of the southern Central Coast.	PCT 1579 occurs on ranges of the Central Coast hinterland at lower elevations, and is associated with Hunter, Pittwater, Wyong, and Yengo SRs	Central and lower Hunter Valley in gullies and on lower slopes mainly on sandstone substrates and at mid to lower elevations.	Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to Pearl Beach and north to about Wyong Creek
Elevation	Information not available	Lower elevations	Mid to lower elevations	50-300m
Soil Profiles	Information not available	Sandstone	Mudstone Claystone	Sandstone
Habitat Restrictions	Occurs in sheltered gullies or on slopes of the sandstone plateaux of the southern Central Coast.	ridges/plateau surface; upper slopes; Ranges of the Central Coast hinterland at lower elevations.	mid-slopes; lower slopes; Central and lower Hunter Valley in gullies and on lower slopes mainly on sandstone substrates and at mid to lower elevations.	ridges; upper slopes; mid slopes
PCT Determination	Floristically, this community is a very good fit for the site, however the site does not occur in a sheltered gully and the distribution occurs further south of the site. Other similar communities were considered a better fit.	The community on site occurs along drainage lines which is not consistent with this PCT. This community is typically described as containing Eucalyptus pilularis which is absent within the site. Other communities were considered as a better fit for this vegetation type.	Locally described variants of this PCT within Lake Macquarie LGA, contain a broader list of species which are commensurate with the site, however main diagnostic species such as Backhousia myrtifolia were absent within the vegetation on site, as such PCT 1627 contained a higher number of diagnostic species and was considered a better fit for the site.	Canopy species described are all present within this vegetation type, the general landscape is incorrect as the community on site occurs along a drainage line and contains mesic trees and shrubs. Local variants within Lake Macquarie LGA describe this community as occurring along drainage lines. Considering the distribution and high floristic fit, this PCT was determined to be best fit.
Result	**PCT 1627**			
BAM Plots	**3, 6, 7, 9 & 14**			
Estimate cleared value of PCT (%)	9			
EEC	No associated TEC			
Vegetation Zones				
Vegetation Zones of this PCT within Subject Site	Moderate Condition Poor Condition			

Table 11 – PCT 1627 – Moderate condition

Category	Description
Description of Vegetation Zone	This vegetation zone contains an open to closed forest containing mesic species, occurring along creek lines and drainage areas. These areas contain a low cover of woody weed species such as Lantana and Privet. The vegetation contains hollow-bearing trees and a mix of stem classes with occasional large trees. Leaf litter is high in this zone. **Canopy Stratum:** The canopy contains eucalypt species particularly, *Angophora costata, Corymbia gummifera, Eucalyptus piperita* along with other eucalypt species such as *E. umbra* and *Corymbia maculata*. *Syncarpia glomulifera* is often present with *Callicoma serratifolia* dominating along drainage lines. **Mid-Stratum:** A combination of heathy and mesic shrub species, *Allocasuarina torulosa, Acacia terminalis, Breynia oblongifolia, Ceratopetalum gummiferum, Dodonaea triquetra, Eleocarpos reticularis* (Blueberry Ash), *Glochidion ferdinandi, Hibbertia aspera, Leucopogon spp, Persoonia linearis, Pittosporum undulatum* and *Platylobium formosum*. Vines are frequent and diverse, common species include; *Billardiera scandens, Dioscorea transversa, Pandorea pandorana, Hibbertia dentata* and *H. scandens. Smilax australis* and *Tylophora paniculata.* **Ground-Stratum:** The ground stratum possesses a number of native species, consisting of ferns, grasses and grass-like species including ferns, *Blechnum cartilageum, Calochlaena dubia, Hypolepis muelleri* and *Pteridium esculentum*. Grasses and grass-like species; *Entolasia stricta, Gymnostachys anceps* (Settlers Flax), *Imperata cylindrica* (Blady Grass), *Lepidosperma laterale, Lomandra longifolia, Oplismenus imbecilis, Poa affinis, Microlaena stipoides* and *Themeda triandra.* **Common weeds:** Woody weed species occur in low abundance, including, *Lantana camara, Ochna serrulata, Cinnamomum camphora* (Camphor Laurel), and *Ligustrum spp* (Privets). All species are listed as high threat exotics (HTE).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 7.87ha of the Subject Site.
Plots	3, 6, 9

PCT 1627 Moderate BAM Plot 3

PCT 1627 Moderate BAM Plot 6

PCT 1627 Moderate BAM Plot 9

Table 12 – PCT 1627 – Poor Condition

Category	Description
Description of Vegetation Zone	This vegetation zone contains an open canopy of eucalypts with a thick shrub cover made up of predominantly woody weeds. The groundcover consists of a number of ferns and grasses. Vines and native shrubs persist in low abundance. **Canopy Stratum:** *Angophora costata, Syncarpia glomulifera and Eucalyptus umbra.* **Mid-Stratum:** *Allocasuarina torulosa, Glochidion ferdinandi, Podocarpus elatus.* **Ground-Stratum:** The ground stratum consists of a diverse layer of ferns, grasses and glasslike plants, and vines; prominent species include, fern, *Blechnum cartilagineum*, forb, *Geranium solanderi* and grasses and grasslike plants; *Gymnostachys anceps, Lomandra longifolia* and *Oplimenus imbecilis*. Vines such as *Smilax australis, Dioscorea transversa, Pandorea pandorana* and *Stephania japonica* were prominent. **Common weeds:** Woody weed species occur in high abundance in the midstratum, including, *Lantana camara, Ochna serrulata, Cinnamomum camphora* (Camphor Laurel), and *Ligustrum spp* (Privets). Herbaceous weeds such as *Tradescantia fluminensis* and grass, *Ehrharta erecta* were also frequent. All species are listed as high threat exotics (HTE).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 1.42ha of the Subject Site.
Plots	7, 14

PCT 1627 Poor BAM Plot 7

PCT 1627 Poor BAM Plot 14

1.3.5 Patch Size

The native vegetation within the BSA Site forms a largely contiguous single parcel of remnant native vegetation, including direct linkages in the south. Therefore, as per the definition of a patch within the BAM, the maximum patch size of '≥100ha' is appropriate for each vegetation zone and was entered as such within the Calculator.

Table 13 – Vegetation Zones

Vegetation Type	Zone	Area (ha)
PCT 1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney basin Bioregion	Moderate	13.85
	Moderate – High Weed Load	0.66
PCT 1627 – Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast	Moderate	7.87
	Poor	1.42
PCT 1649 - Smooth-barked Apple - Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands	Good	1.89
Total – Remnant Vegetation		**25.69**
Total – Stewardship Site		**25.69**

1.3.6 Vegetation Integrity Score

Plot data was used to determine the composition, structure and function condition score the vegetation zones within the BSA Site, which informed the Vegetation Integrity Score (VIS). Vegetation Condition Class has been rated using the following percentage bands associated with the Vegetation Integrity Scores:

- 70 – 100 Good;
- 50 – 69 Moderate;
- 35 – 49 Poor;
- 20 – 34 Highly Degraded; and
- 0 - 19 Cleared/Exotic.

A total of 14 BAM plots were undertaken in November 2022 within remnant native vegetation over the entire Subject Site. These plots were undertaken over the Subject Site within each vegetation zone as per requirements within Table 4 of the BAM (see **Figure 4**).

Plot data was used to determine the composition, structure and function condition score for each zone, which together comprise the vegetation integrity score. Plot data has been tabulated (refer to **Appendix A**) and used to calculate the corresponding condition scores along with the overall vegetation integrity score for each zone as shown in **Table 14**.

See **Appendix A** for individual Plot attributes. See **Figure 4** for the location of each plot.

Table 14 – Vegetation Integrity Score

PCT	Vegetation Zone	Current Vegetation Integrity Score			
		Composition	Structure	Function	Current VIS
PCT 1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion	Moderate	59.5	59.1	67.5	61.9
	Moderate – High Weed Load	61.2	41.1	54.8	51.7
PCT 1627 – Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast	Moderate	47.2	68.9	61.9	58.6
	Poor	48.3	29.9	57.6	43.6
PCT 1649 - Smooth-barked Apple - Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands	Good	32.7	93.5	45	58.6

1.3.7 Field Survey Methods

1.3.7.1 Habitat Features Surveys

An assessment of the relative habitat values present within the Subject Site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources within the Subject Site favoured by known threatened listed in **Section 1.4.2**. The assessment also considered the potential value of the BSA Site (and surrounding areas) for all major guilds of native flora and fauna. The assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements.

Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages. In particular, focus was put on documenting the presence of key habitat features such as tree hollows. Hollows are an important resource utilised by a variety of forest fauna, and are particularly relevant for several of the likely key threatened species in this locality.

1.3.7.2 Flora Field Survey

All required flora survey techniques were utilised for targeted survey of Candidate Species Credit species derived from the BAM calculator and Bionet searches, as listed in **Table 8** and **9**. Surveys adhered to relevant guidelines including *Surveying threatened plants and their habitats - NSW Survey Guides for the Biodiversity Assessment Method* (2004) and *BAM Assessment Methodology* (2020).

The following survey methods were undertaken to record the presence of threatened species within the Study Area and Subject Site:

- Rapid Data Points were used to ground-truth regional vegetation mapping to identify all vegetation communities present within the Subject Site, as well as segregate vegetation zones according to condition and current management practices.
- Identification of all vascular plant species encountered during fieldwork was systematic to ensure all key points of the site were checked. Survey methods employed to maximise species encountered include, BAM Plot surveys, weed mapping surveys, and Random Meander Technique (Cropper 1993).
- Threatened flora surveys walking 5 – 10m line transects were utilised to survey for threatened trees and shrubs targeted within specific habitat and vegetation types within the Study Area and Subject Site.
- 14 BAM plots were undertaken throughout the Subject Site in accordance with BAM 2020.

Previous Flora Surveys

RPS Surveys (2010)

- Random meander surveys were conducted according to Cropper (1993). Two ecologists traversed the site, walking along parallel transects approximately 10m apart. Random meander surveys comprehensively covered the entire site.
- Targeted surveys and counts of *Tetratheca juncea* were undertaken by RPS (2010) across the site in accordance with the methodology of Payne et al (2000; 2001). Locations of *T. juncea* were recorded with a hand-held GPS with sub-metre accuracy.

Conacher Environmental Group Surveys (2012-2013)

Flora surveys were undertaken in accordance with the methodologies outlined in Lake Macquarie City Council's Draft Flora and Fauna Survey Guidelines (LMCC 2012);

- Vegetation transects were surveyed within the subject site. Transects were approximately 100m long and were traversed on foot with observation and recording of all species occurring within 2m of each transect.
- For sites of <50ha require 3 walking transects and 2 quadrats per vegetation community of complex structure with an additional quadrat for communities >5ha.
- Highly disturbed areas mapped within the site were subject to walk over surveys and threatened flora searches only to obtain an inventory of the flora species present.

Table 8 shows the results of the surveys for the candidate flora species. **Appendix D** provides a detailed account of the level of survey effort undertaken.

1.3.7.3 Fauna Field Surveys

Fauna survey design was guided by the *Threatened Species Survey and Assessment Guidelines* (2004), and further advice for specific fauna species from DPE.

The fauna surveys undertaken were stratified according to Lake Macquarie City Council's Flora and Fauna Survey Guidelines (2012) for sites of <50 ha which require 1 survey site per vegetation community and one replicate site per vegetation community ≥5 ha.

The following survey methods were undertaken to record the presence of broad fauna assemblages within the BSA site, in particular birds, mammals, reptiles, and amphibians:

- Arboreal mammal trapping using Elliott B type traps;
- Terrestrial small mammal trapping using Elliot A type traps;
- Terrestrial medium mammal trapping using Elliot B and cage type traps;
- Bat echolocation call detection;
- Spotlighting and call playback for nocturnal mammals and birds;
- Spotlighting transects for reptiles and amphibians;
- Koala Habitat Assessment; and
- Diurnal and nocturnal bird surveys.

Table 8 lists the required fauna survey techniques for Candidate Species Credit species, derived from the BAM calculator and Bionet searches and listed in **Table 8** and **9**. **Appendix D** provides a detailed account of the level of survey effort undertaken.

1.3.7.4 Incidental Observations

Incidental records of any fauna species observed during fieldwork were noted. This included opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of any resident or migratory species. Searches were also conducted for whitewash, regurgitation pellets and prey remain from Owls, chewed Casuarina cones from Black-Cockatoos, chewed fruit remains from frugivorous birds etc.

These surveys are deemed to fulfill minimum survey requirement. Details of the flora and fauna survey are presented in **Table 9** and was conducted using relevant guidelines, including those referenced above, and along with applicable EPBC guidelines (2010; 2011). Flora Survey Effort, Threatened Flora Sightings and Fauna Survey Effort is shown in **Figure 6 and 7** respectively.

Complete details of the total fauna survey effort is contained within **Appendix D**.

1.3.8 Habitat Survey Effort Results

1.3.8.1 Habitat Trees

RPS (2010) undertook Hollow-bearing tree (HBT) surveys across the Subject Site identified 133 HBTs within 25.69 Ha of the Subject Site, at an indicative density of approx. 5 HBT/ha. A wide range of hollow sizes were observed and would represent a viable habitat resource for most guilds of native fauna that utilise tree hollows including birds, microbats, possums, and gliders, and herpetofauna.

Habitat trees recorded are shown in Figure 1 of **Appendix D**.

1.3.8.2 Water Features

A mapped tributary of Winding Creek runs through the south of the site, with multiple ephemeral unnamed watercourses and depressions. Stormwater management practices for the Newcastle Inner-City Bypass are evident on the eastern boundary of the main body of the subject site.

1.3.8.3 Geological Features

No significant geological features including areas of rocky scarps and boulders associated with the steeper slopes and gullies were found within the site.

1.3.9 Species Credit Species Survey Results

Overall survey effort and methodologies within the Study Area and Subject Site (BSA Site) including plots, targeted searches, habitat assessments, and remote monitoring equipment, are detailed in **Table 8** and **Appendix D**.

All candidate species as identified in **Table 8** were included for presence analysis based on habitat assessment and targeted surveys. The results of Species Credit species presence is detailed in **Table 9**.

Complete details of the survey effort undertaken is contained in **Appendix D.**

1.4 Threatened Species

Under the BAM, threatened species are classified into two types: 'Ecosystem Credit' and 'Species Credit' type species, as detailed within the BioNet Atlas Threatened Species Profile Database (DPE).

A summary of survey effort within the Study Area and Subject Site (BSA Site) is presented in **Appendix D**, including a full flora species list and recorded fauna species.

1.4.1 Ecosystem Credit Species

Ecosystem Credit species are associated with PCTs and other habitat surrogates that are used to predict their occurrence on a particular site.

The 'biodiversity risk weighting' for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix 7 of the BAM, and are used in credit calculations to assess impacts of the proposal on a threatened species. The sensitivity to gain class is listed within the BAM calculator for Ecosystem Credit Species. Those Ecosystem Credit Species predicted to occur within the site are provided in **Table 7**.

Table 15 – Predicted Ecosystem Credit Species

Common Name	Scientific Name	Sensitivity to Gain Class
Barking Owl	*Ninox connivens*	High
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Moderate
Broad-headed Snake	*Hoplocephalus bungaroides*	High
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	High
Diamond Firetail	*Stagonopleura guttata*	Moderate
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	High
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	High
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	High
Eastern Osprey	*Pandion cristatus*	Moderate
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Moderate
Glossy Black Cockatoo	*Calyptorhynchus lathami*	High
Golden-tipped Bat	*Phoniscus papuensis*	High
Greater Broad-nosed Bat	*Scoteanax rueppellii*	High
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	Moderate
Grey-headed Flying-fox	*Pteropus poliocephalus*	High
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	High
Little Bent-winged Bat	*Miniopterus australis*	High
Little Eagle	*Hieraaetus morphnoides*	Moderate
Little Lorikeet	*Glossopsitta pusilla*	High
Masked Owl	*Tyto novaehollandiae*	High
Painted Honeyeater	*Grantiella picta*	Moderate
Powerful Owl	*Ninox strenua*	Moderate
Red-legged Pademelon	*Thylogale stigmatica*	High
Regent Honeyeater	*Anthochaera phrygia*	High

Common Name	Scientific Name	Sensitivity to Gain Class
Rosenberg's Goanna	*Varanus rosenbergi*	High
Scarlet Robin	*Petroica boodang*	Moderate
Speckled Warbler	*Chthonicola sagittata*	High
Spotted-tailed Quoll	*Dasyurus maculatus*	High
Square-tailed Kite	*Lophoictinia isura*	Moderate
Swift Parrot	*Lathamus discolor*	Moderate
Turquoise Parrot	*Neophema pulchella*	High
Varied Sittella	*Daphoenositta chrysoptera*	Moderate
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	High
White-throated Needletail	*Hirundapus caudacutus*	High
Yellow-bellied Glider	*Petaurus australis*	High
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	High

1.4.2 Species Credit Species

Targeted surveys recorded a number of threatened species within the Study Area and Stewardship Site, classified as 'Species' Credit Species under the BAM, as detailed below.

Species Credits Generated are shown in **Table 12**.

Tetratheca juncea (Black-eyed Susan)

This species broadly occurs throughout the southern portion of the site within the dry sclerophyll communites, PCTs 1183 and 1627. This species is assessed by the 'Area' method, in accordance with the BAM (2020) and Threatened Biodiversity Profile Data Collection, to determine the number of credits likely to be generated. Individuals are roughly clustered throughout PCT 1183 (over 14.51ha), and to a lesser extent PCT 1627 (over 9.29ha).

Ninox strenua (Powerful Owl)

Powerful Owl was recorded during call playback by RPS (2009) in various locations and observed by AEP during nocturnal survey and call playback in 2022. One potential breeding hollow has been located during nocturnal survey and stagwatch by AEP 2022.

Petaurus norfolcensis (Squirrel Glider)

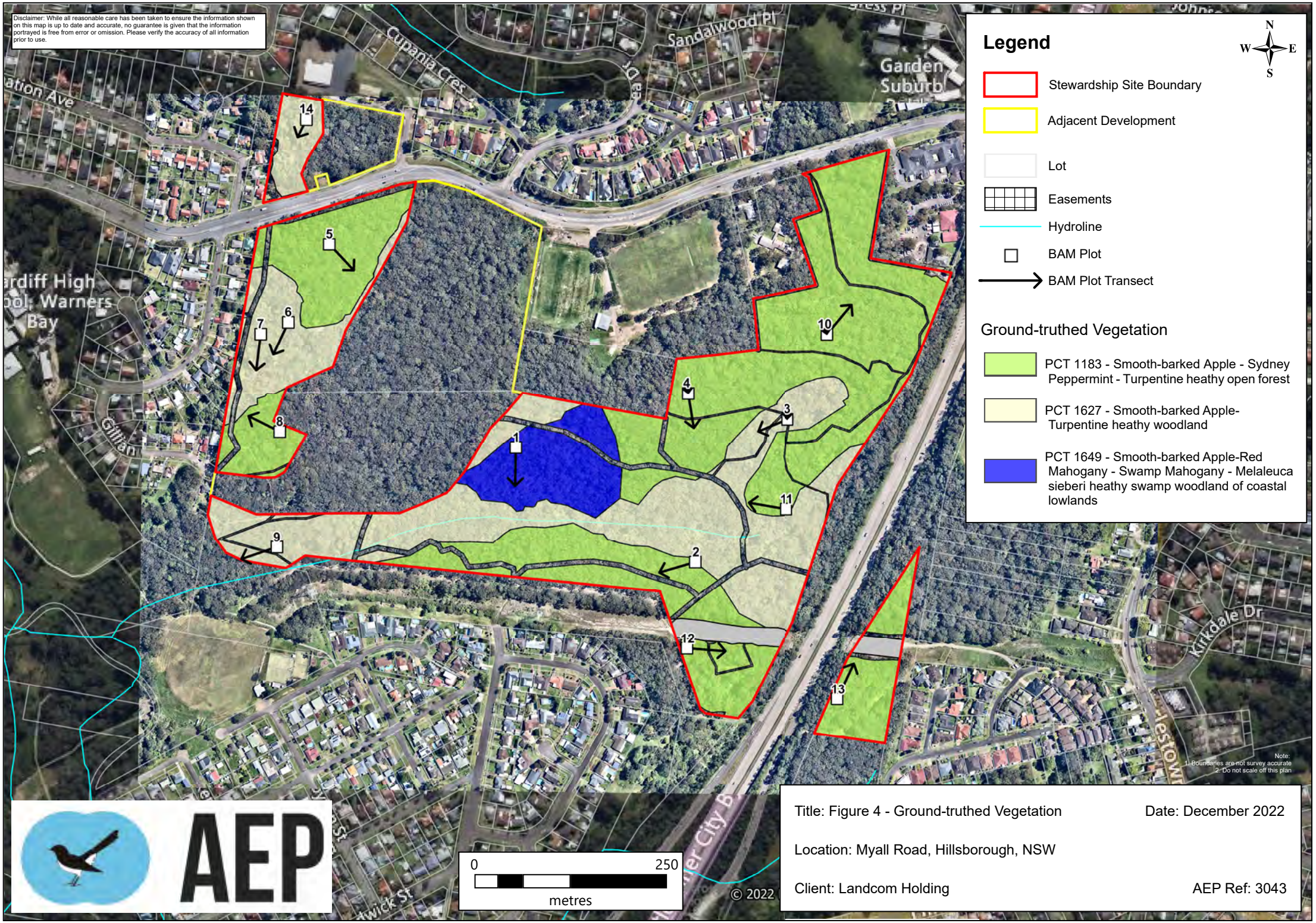
Squirrel Glider was identified via trapping surveys on three occasions and a potential den by Conacher (2013). Therefore, species credits are generated and the entirety of the vegetation located on site is included in the species polygon.

Table 16 – Candidate Species Credit Species

Species	BC Act	Specified Survey Period (BAM-C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	RPS, Conacher Environmental Group & AEP Survey Method	Date
Flora						
Black-eyed Susan *Tetratheca juncea*	V	Sep-Oct	Cryptic shrub – difficult to distinguish the clumped grass like stems from other vegetation when not in flower. Generally found in low open forest/woodland with a mixed shrub understorey and grassy groundcover, also occurs in heathland and moist forest and is most often associated with low nutrient soils of the Awaba Soil Landscape. Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation. When local reference population is flowering (typically Jul– Aug peak period)	Targeted surveys and counts of *Tetratheca juncea* were undertaken by RPS (2010) across the site. 100m transects across the entire site (Conacher 2012-2013) Parallel transects approximately 10m apart and random meander surveys covering the entire site (RPS 2010). AEP confirmed locations (2022).	Sep & Nov 2010 Sep-Oct 2012 Feb 2013 Nov 2022
Fauna						
Powerful Owl *Ninox strenua*	V	May-Aug	The species inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tree hollows (≥0.5m deep) in large eucalypts (DBH 80-240cm) that are at least 150 years old. Powerful Owl are a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit.	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset.	8 call playback nights, day habitat, HBT and pellet searches Confirmation of Roost Hollow and Nocturnal survey	Sep 2009, Mar, May, Sep, Oct 2012, Feb 2013, Nov 2022
Squirrel Glider *Petaurus norfolcensis*	V	Jan-Dec	Inhabits Blackbutt- Bloodwood forest with heath understorey in coastal areas. Lives in family groups. Requires abundant tree hollows for refuge and nesting. Survey year round but sites with bi-pinnate acacia, autumn winter flowering trees and shrubs such as Eucalyptus robusta and Banksia sp (integrifolia etc.) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart). Important known food plants – Eucalyptus siderophloia/tereticornis/pilularis/robusta, Corymbia maculata/gummifera, Melaleuca quinquenervia, Acacia irrorata/longifolia, Banksia integrifolia/oblongifolia/serrata/spinulosa and Xanthorrhoea spp.	Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights. Stagwatching - Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset	Coastal Plains Open Forest: 24 x 30min spotlight searches 36 Cage Trap nights / Elliott B 173 Arboreal Trap nights Sheltered Open Forest: 6 x 30min spotlight searches 18 Cage Trap nights / Elliott B 63 Arboreal Trap nights	Sep 2009, Mar, May, Oct 2012, Feb 2013, Nov 2022

Table 17 – Species Credit Species

Species	Survey Technique Adhere to Guidelines in Table 15 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment	Observed within BSA Site (Y/N)	Species Credits Apply (Y /N)
Flora								
Black-eyed Susan *Tetratheca juncea*	Y	Y	Y	N	Habitat is present and in good condition. The survey observed this species in many locations.		Y Species recorded in subject site	**Y**
Fauna								
Powerful Owl (Breeding) ***Ninox strenua***	**Y**	**Y**	**107**	**Records are scattered over the entirety of the 10km² search area, with higher counts around Blackbutt Reserve, the Study Area, Jesmond Bushland and north Lake Macquarie**	**The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover.**	**Large hollows are present on site. Potentially suitable habitat occurs in varying conditions.**	**Y Species recorded within the subject site.**	**Y**
Squirrel Glider *Petaurus norfolcensis*	**Y**	**Y**	**82**	**Most records occur north of the Study Area and in the Lake Macquarie LGA section of the 10km² search area. One record adjacent to the Study Area in 2004. This species is recorded in the subject site.**	**The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.**		**Y This species is recorded in the subject site.**	**Y**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Stewardship Site Boundary
Adjacent Development
Lot
Easements
Hydroline
BAM Plot
BAM Plot Transect
Ground-truthed Vegetation
PCT 1183 - Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest
PCT 1627 - Smooth-barked Apple- Turpentine heathy woodland
PCT 1649 - Smooth-barked Apple-Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands
Cupania Cres
Sandalwood Pl
Garden Suburb
Gillian
Kirkdale Dr
Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
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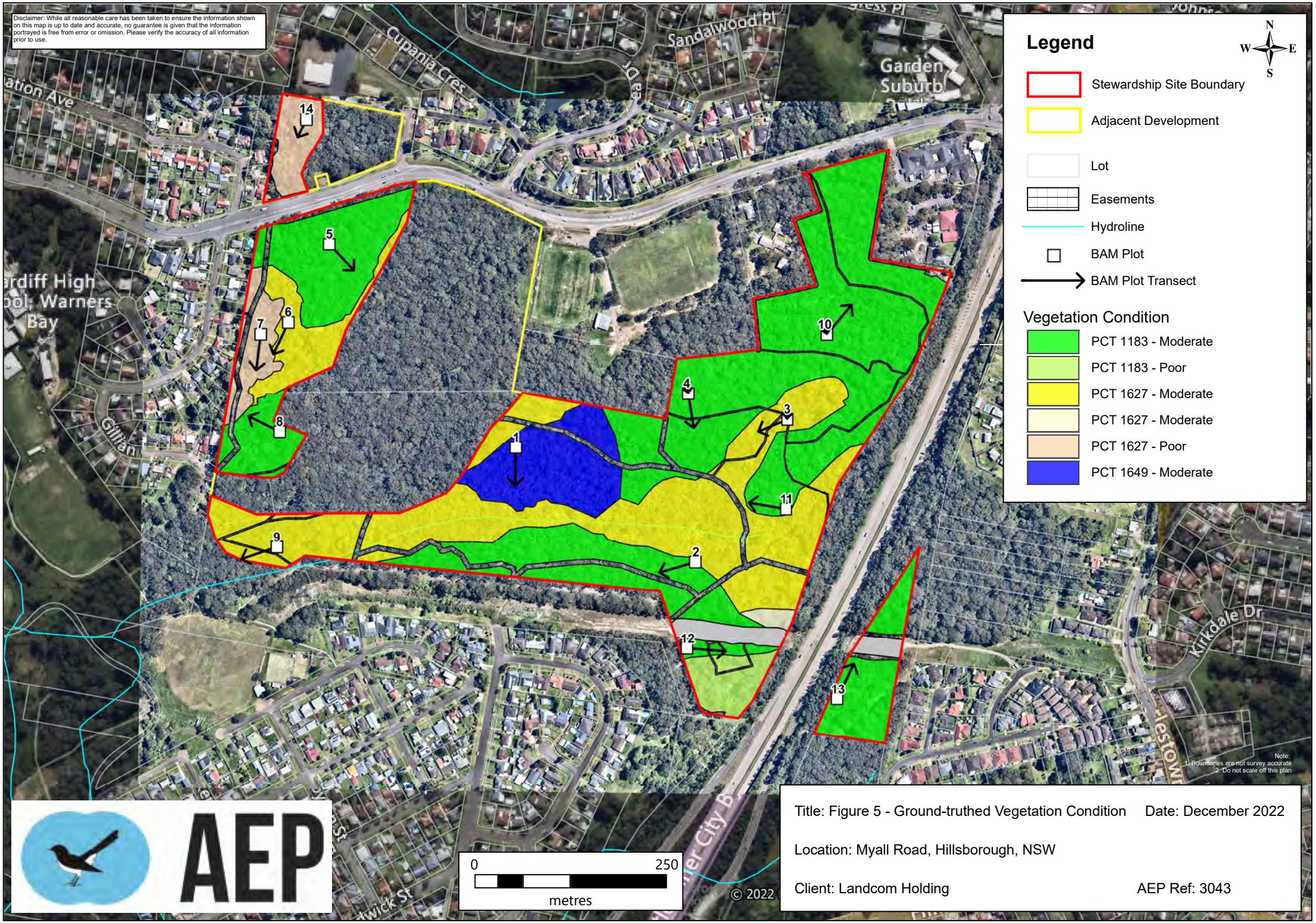
AEP
Title: Figure 4 - Ground-truthed Vegetation
Date: December 2022
Location: Myall Road, Hillsborough, NSW
Client: Landcom Holding
AEP Ref: 3043


Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.
Legend
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Stewardship Site Boundary
Adjacent Development
Lot
Easements
Hydroline
BAM Plot
BAM Plot Transect
Vegetation Condition
PCT 1183 - Moderate
PCT 1183 - Poor
PCT 1627 - Moderate
PCT 1627 - Moderate
PCT 1627 - Poor
PCT 1649 - Moderate
1
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Cupania Cres
Sandalwood Pl
Garden Suburb
Kirkdale Dr
Gillian
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Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
© 2022
AEP
Title: Figure 5 - Ground-truthed Vegetation Condition
Date: December 2022
Location: Myall Road, Hillsborough, NSW
Client: Landcom Holding
AEP Ref: 3043

2.0 Stage 3 – Improving Biodiversity Values

Section 12 of the **BAM** provides a list of measures that need to be taken into consideration during Stewardship Site Assessment to improve biodiversity. Considerations of management actions applicable to the Site to increase biodiversity values as part of this agreement are provided below.

2.1 Management Actions to Improve Biodiversity Values

In order to create biodiversity credits from a Stewardship Site, management actions or active restoration management actions which improve biodiversity values are to be carried out for a 20-year period in accordance with **Section 11.3** of the **BAM**.

The nine (9) prescribed actions which must be considered include;

- Preparation of a management plan;
- Fire management;
- Native vegetation management;
- Threatened species habitat management;
- Integrated pest animal control;
- Integrated weed management and control of high threat weeds;
- Grazing management;
- Management of human disturbance; and
- Monitoring.

Table 18 details strategies for these prescribed actions, and a Management Plan for the Site addressing all the relevant considerations has been prepared and is included as **Appendix B.**

Table 18 - Prescribed Actions and Strategy

Prescribed action	Strategy	Priority
Preparation of a management plan	A Management Plan for the Site addressing all the relevant considerations has been prepared and is included as **Appendix B.**	High
Fire management	• Ecological burn strategies and mapping have been included .in **Appendix B.** • Designated fire trails are to be widened.	Moderate
Native vegetation management	The Subject Site is in moderate condition, therefore the management proposed for native vegetation is weed management to allow for the natural regeneration and fire management. Given the species diversity within the site the seed bank within the soil will ensure native regeneration. Natural regeneration has a higher survival rate than plantings for many reasons such as it is having resilience to local pest and disease, etc.	High
Threatened species habitat management	The proposed weed and fire management will enhance the natural regeneration within the Subject site. Providing a greater range of macro and micro habitats for both flora and fauna species.	High
Integrated pest animal control	• Limited and incidental pest animals are present • Urban bush • Dog walking limited to on-leash only is to be allowed within the BSA site.	Low
Integrated weed management and control of high threat weeds	High Threat Exotics that are widespread with coverage throughout the site; • *Lantana camara* – Thickets and individuals are to be removed manually or chemically from the BSA site, with ongoing management and removal. • *Cinnamonum camphora* – Juveniles to be removed manually, whilst semi-mature and mature individuals are to be chemically treated within the BSA site, with ongoing management and removal. • Ongoing edge management practices to prevent exotic species intrusion into the subject site.	High
Grazing management	This action has been excluded from the management plan, as the site in the past and currently has not included grazing activities, and its location as urban bushland without rural holdings adjoining site.	N/A
Management of human disturbance and	• Some existing paths to be remediated and fenced to exclude human activity, to assist natural regeneration.	High

Prescribed action	Strategy	Priority
	• Some existing trails are to be upgraded and widened to prevent erosion. • Signage at site entrances prohibiting garbage dumping, wood removal, or path cutting is to be installed.	
Monitoring	Nine (9) flora and fauna monitoring points are to be established within the site.	High

2.2 Future Vegetation Integrity Scores (with and without management)

Future Vegetation Integrity scores as calculated from the BAM calculator are presented in **Table 18.**

Table 19 – Future Vegetation Integrity Scores

		Future VI (without management)					Future VI (with management)					
PCT	**Vegetation Zone**	**Comp.**	**Struct.**	**Funct.**	**VIS**	**Change in VI**	**Comp.**	**Struct.**	**Funct.**	**VIS**	**Change in VI**	**Gain in VI**
PCT 1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion	**Moderate**	55.6	55.4	61	57.3	-4.7	80.9	92.3	77.9	83.5	26.2	28.7
	Moderate – High Weed Load	58.4	38.9	51.1	48.8	-2.9	75.5	83.5	61.7	73	24.2	24.2
PCT 1627 – Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast	**Moderate**	44.1	27.6	56.9	54.1	-4.5	69.6	96.2	78.3	80.6	26.5	26.5
	Poor	46	27.6	54.9	41.1	-2.5	58.8	38.5	66.4	53.2	12.1	12.1
PCT 1649 - Smooth-barked Apple - Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands	**Moderate**	30.0	93.5	44.8	50.1	-1.6	47.4	93.6	45	58.4	8.4	8.4

2.3 Ecosystem Credits Generated

Ecosystem credits generated for the Subject Site through BAM 2020 are presented in **Table 19**.

Table 20 – Ecosystem Credits

PCT	Community	Threatened Ecological Community (TEC)	Ecosystem Credits
1183	**Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion**	-	104
1627	**Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast**	-	54
1649	**Smooth-barked Apple - Red Mahogany - Swamp Mahogany - Melaleuca sieberi heathy swamp woodland of coastal lowlands**	Y	4
		Total – Ecosystem Credits	**162**

2.4 Species Credits Generated

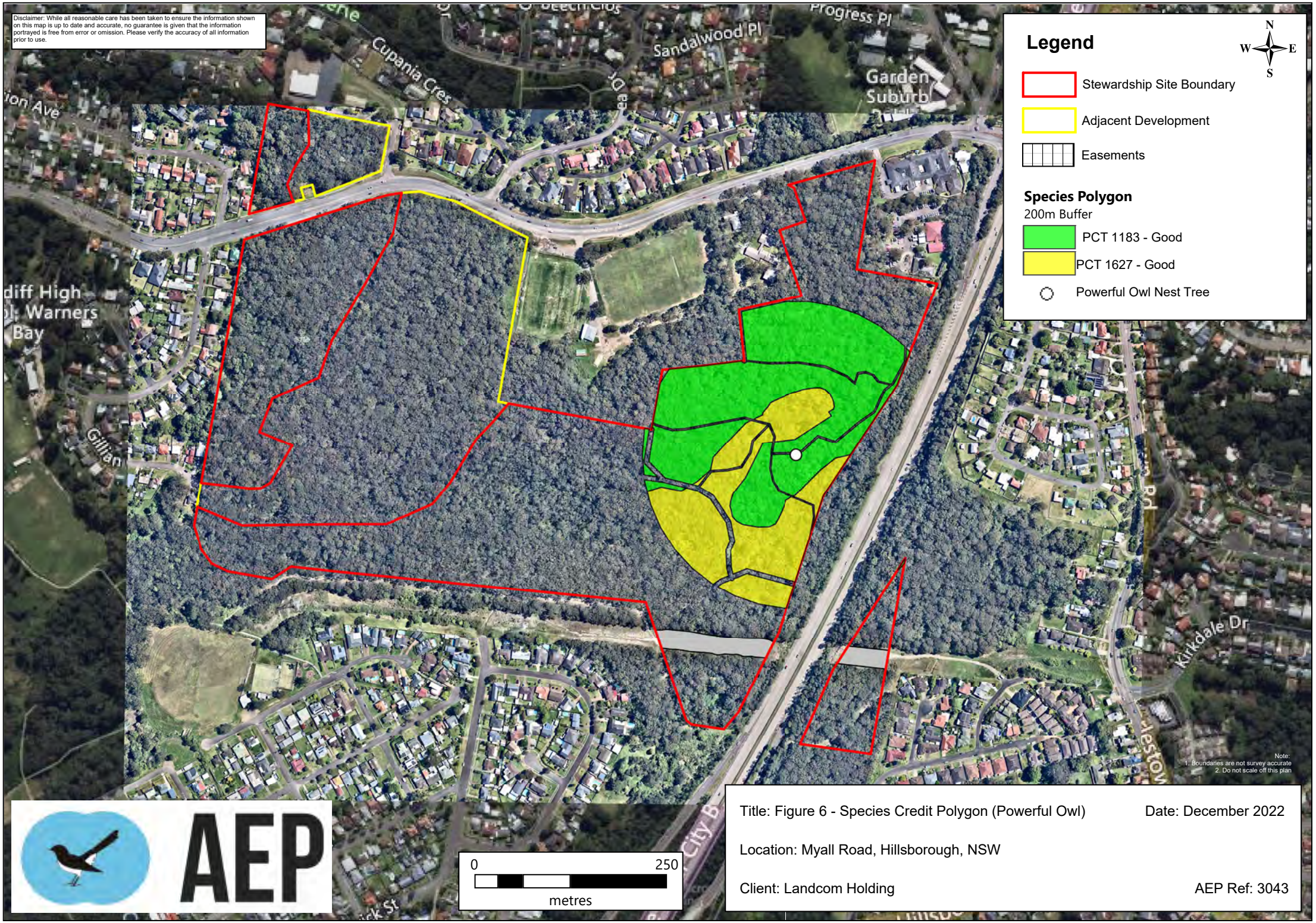
Species credits generated for the Subject Site through BAM 2020 are presented in **Table 20**.

Table 21 – Species Credits

Common Name	Scientific Name	Species Buffer	Species Credits
Black-eyed Susan	*Tetratheca juncea*	25.69	162
Powerful Owl	*Ninox strenua*	8.04	56
Squirrel Glider	*Petaurus norfolcensis*	25.69	162

2.5 Biodiversity Credit Report

The Biodiversity Credit Report generated within the BAM Calculator is provided in **Appendix C**.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Legend
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Stewardship Site Boundary
Adjacent Development
Easements
Species Polygon
200m Buffer
PCT 1183 - Good
PCT 1627 - Good
Powerful Owl Nest Tree
Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
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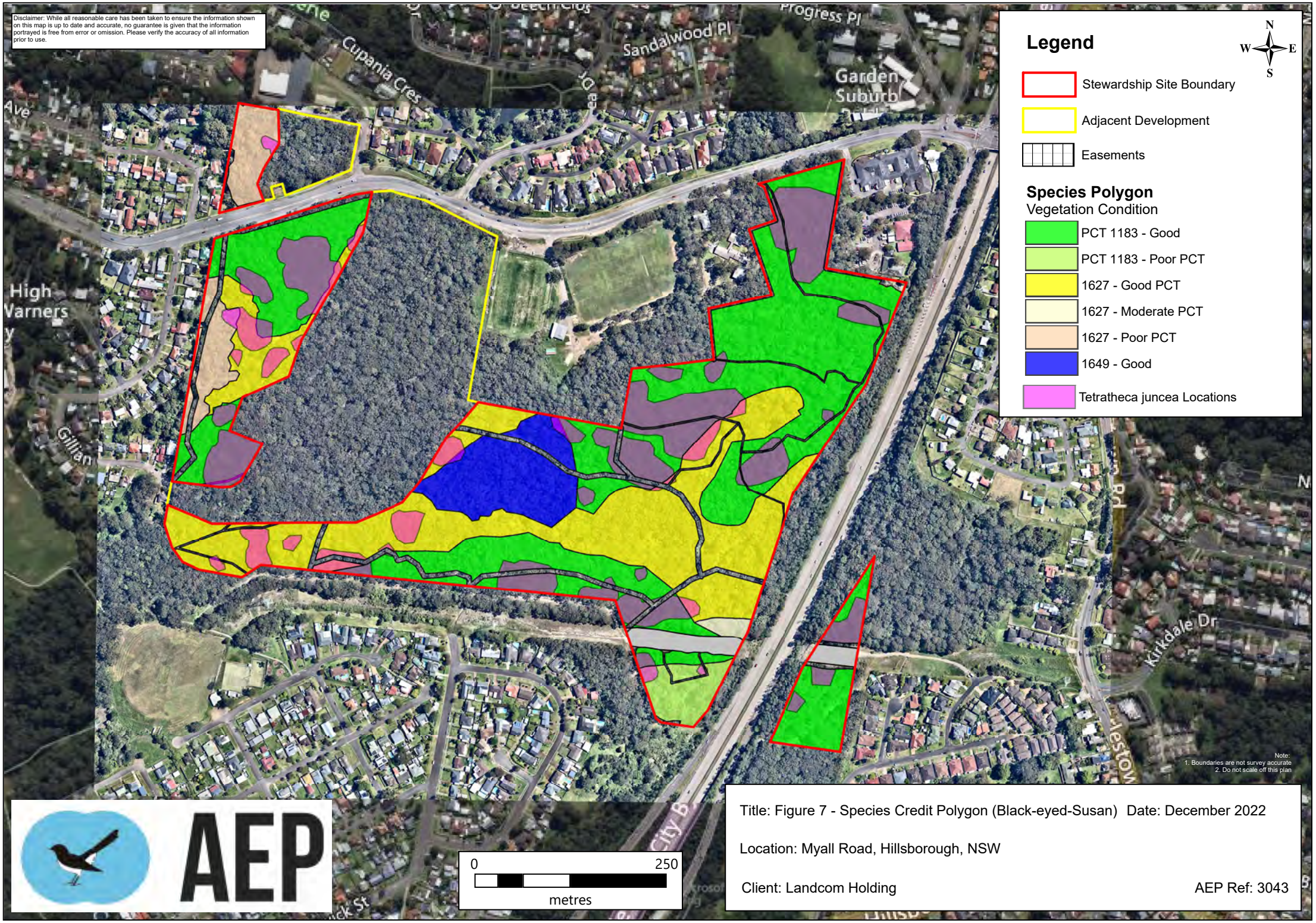
Title: Figure 6 - Species Credit Polygon (Powerful Owl)
Date: December 2022
Location: Myall Road, Hillsborough, NSW
Client: Landcom Holding
AEP Ref: 3043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Stewardship Site Boundary
Adjacent Development
Easements
Species Polygon
Vegetation Condition
PCT 1183 - Good
PCT 1183 - Poor PCT
1627 - Good PCT
1627 - Moderate PCT
1627 - Poor PCT
1649 - Good
Tetratheca juncea Locations
Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
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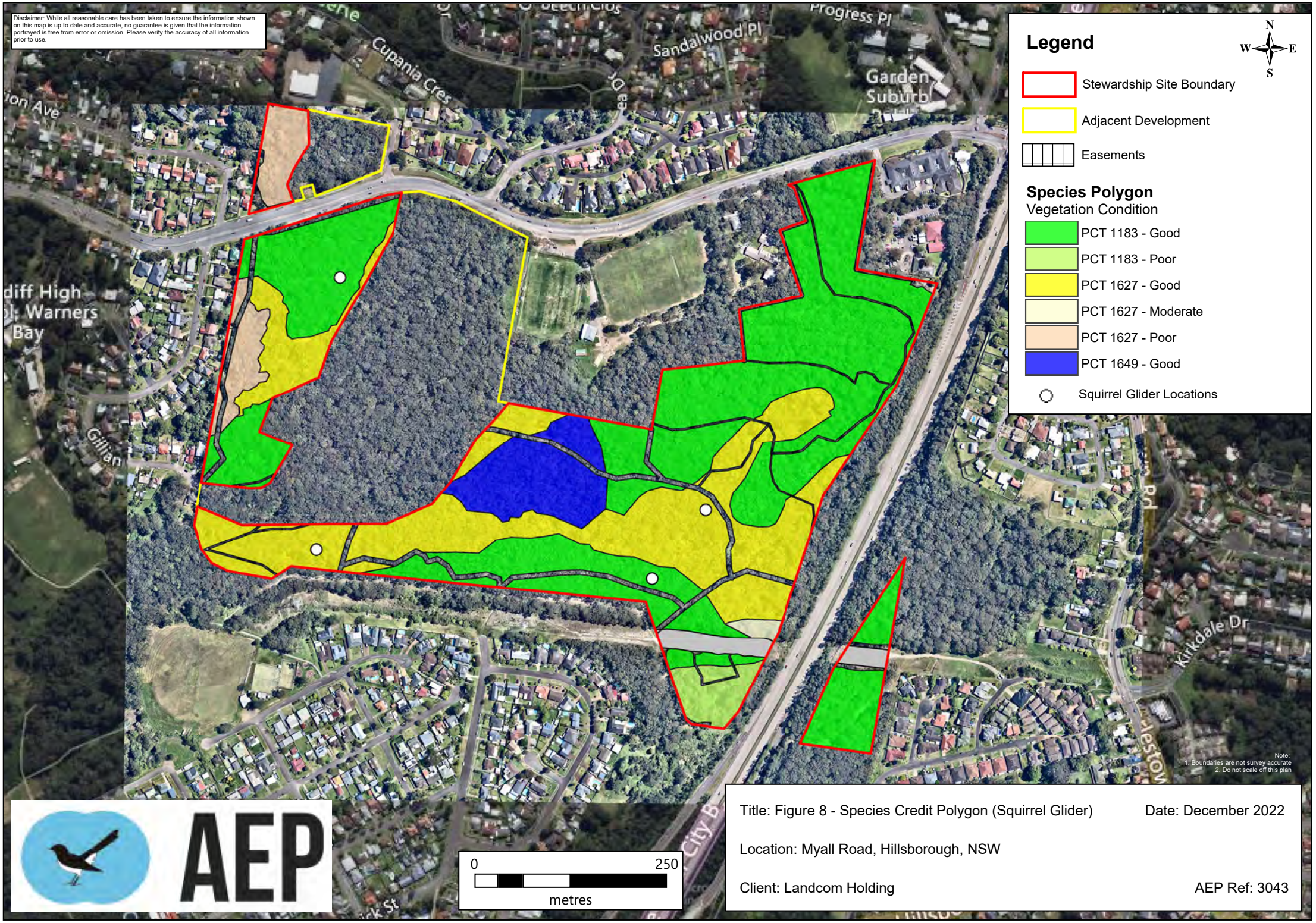
Title: Figure 7 - Species Credit Polygon (Black-eyed-Susan) Date: December 2022
Location: Myall Road, Hillsborough, NSW
Client: Landcom Holding
AEP Ref: 3043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Stewardship Site Boundary
Adjacent Development
Easements
Species Polygon
Vegetation Condition
PCT 1183 - Good
PCT 1183 - Poor
PCT 1627 - Good
PCT 1627 - Moderate
PCT 1627 - Poor
PCT 1649 - Good
Squirrel Glider Locations
Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan
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Title: Figure 8 - Species Credit Polygon (Squirrel Glider)
Date: December 2022
Location: Myall Road, Hillsborough, NSW
Client: Landcom Holding
AEP Ref: 3043

3.0 Conclusion

Application of the BAM has quantified biodiversity values within the Stewardship Site, and calculated biodiversity credits created, following the implementation of management activities outlined in **Appendix B** to improve vegetation integrity and threatened species habitat.

4.0 References

Australian Museum (2021) *Frog ID* (https://portal.frogid.net.au/), Australian Museum, Sydney, NSW.

Bell S A J & Sims R (2020) *Vegetation and Floristics of Bushland around the Wallsend Link Road, Lower Hunter Valley, NSW* (draft). Eastcoast Flora Survey, August 2020.

Brooker, M. I. H., & Kleinig, D. (2006). *Field Guide to Eucalypts, Volume 1*. Bloomings Books, Toorak VIC.

CANBR (2020) *EUCLID: Eucalypts of Australia,* Fourth Edition, Centre for Australian National Biodiversity Research, Canberra, ACT.

Churchill, S (2008). Australian Bats. Second Edition. Allen & Unwin Publishers.

Cogger, H (2014). *Reptiles and Amphibians of Australia.* CSIRO Publishing, Melbourne.

DECC (2002). *Descriptions for NSW (Mitchell) Landscapes - Version 2 (2002)*. NSW Department of Environment and Climate Change

DECC (2009). *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for fauna – amphibians.* NSW Department of Environment and Climate Change

DPIE (2020). *Biodiversity Assessment Method*, the State of NSW and Department of Planning, Industry and Environment, Paramatta, Australia.

DPIE (2020). *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method*. Department of Planning, Industry & Environment.

Harden, G. (ed) (1992). *Flora of New South Wales, Volume 3*. UNSW, Kensington, NSW.

Harden, G. (ed) (1993). *Flora of New South Wales, Volume 4*. UNSW, Kensington, NSW.

Harden, G. (ed) (2000). *Flora of New South Wales*, Volume 1. Revised edition. UNSW, Kensington, NSW.

Harden, G. (ed) (2002). *Flora of New South Wales*, Volume 2. Revised edition. UNSW, Kensington, NSW.

Jacobs, S.W.L., Whalley, R.D.B. and Wheeler, D.J.B., *Grasses of New South Wales,* 4th Edition. The University of New England, Armidale NSW.

Keith D (2004). Ocean Shores to Desert Dunes. DEC, Sydney.

Maslin, B.R. (coordinator) (2018). *WATTLE, Interactive Identification of Australian Acacia*. Version 3. (Australian Biological Resources Study, Canberra Department of Biodiversity, Conservation and Attractions, Perth Identic Pty. Ltd., Brisbane).

Menkhorst, P., Rogers, D.I. and Clarke, R. (authors) and Davies, J.N., Marsack, P. and Franklin, K. (artists) (2017). *The Australian Bird Guide*. CSIRO Publishing, Clayton, Victoria.

NSW Department of Environment and Conservation (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*. Working Draft, November 2004.

OEH (2018) *'Species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method*, Office of Environment and Heritage (NSW), Sydney.

OEH (2019) *Soil Landscapes of Central and Eastern NSW* - v2, NSW Office of Environment and Heritage, Sydney.

OEH (2019). *Threatened Species, Populations and Ecological Communities website*. (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/)

OEH (2020) *Bionet: the website for the Atlas of NSW Wildlife.* (http://www.bionet.nsw.gov.au) Accessed January 2023. NSW OEH, Sydney. NSW Office of Environment and Heritage.

Pennay, M., Law, B. and Reinhold, L. (2004). *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats*. NSW Department of Environment and Conservation, Hurstville.

Richardson, F. J., Richardson, R. G., & Shepherd, R. C. H. (2006). *Weeds of the South-east: An Identification Guide for Australia*. R.G. and F.J. Richardson.

Robinson, L (2003). *Field Guide to the Native Plants of Sydney*. Revised Third Edition. Kangaroo Press.

Sivertsen, D., Roff, A., Somerville, M., Thonell, J., and Denholm, B (2011). Greater Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia.

Strahan, R (2004). *The Mammals of Australia*. New Holland Publishers.

Tyler, M.J., and Knight, F. (2011). *Field Guide to the Frogs of Australia*. Revised Edition. CSIRO Publishing.

Van Klaphake (2010). *Eucalypts of the Sydney Region*. Second Edition, Ludomira Filisiewicz-Klaphake, Australia.

Van Klaphake (2011). *Guide to the Grasses of Sydney*. Second Edition, Ludomira Filisiewicz-Klaphake, Australia.

Appendix A – Plot Data

Family	Scientific Name	Common Name	BAM Growth Form Group	Present on Site	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14
Fabaceae	*Acacia longifolia*		Shrub (SG)	1								0.1	0.1				0.2	
Fabaceae	*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle	Shrub (SG)	1								0.2						
Fabaceae	*Acacia myrtifolia*	Red Stem Wattle	Shrub (SG)	1					0.1								2	
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair	Fern (EG)	1						40	5							
Alliaceae	*Agapanthus spp.**			1							0.1							
Apiaceae	*Hydrocotyle sibthorpioides*	Pennywort	Forb (FG)	1						0.3								
Apiaceae	*Hydrocotyle sibthorpioides*		Forb (FG)	1						0.3								
Apocynaceae	*Marsdenia spp.*		Other (OG)	1						0.2								
Fabaceae	*Acacia terminalis*	Sunshine Wattle	Shrub (SG)	1									0.1				2	0.2
Fabaceae	*Acacia ulicifolia*	Prickly Moses	Shrub (SG)	1										0.1				0.1
Asteraceae	*Ageratina adenophora**	Crofton Weed		1			0.1											
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak	Tree (TG)	1		4		15						10	0.2	5	0.2	
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	Tree (TG)	1					3	5	5							0.2
Zingiberaceae	*Alpinia caerulea*	Native Ginger	Forb (FG)	1							0.1							
Myrtaceae	*Angophora costata*	Smooth-barked Apple	Tree (TG)	1	20	5	5		9	30	5	10	5	15	15		13	1
Poaceae	*Anisopogon avenaceus*	Oat Speargrass	Grass & grasslike (GG)	1												3		
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern		1						0.1				0.1				
Aspleniaceae	*Asplenium australasicum*	Birds Nest Fern	Fern (EG)	1			0.5				0.1							
Poaceae	*Austrostipa pubescens*	Tall Speargrass	Grass & grasslike (GG)	1				10										
Proteaceae	*Banksia oblongifolia*	Fern-leaf Banksia	Shrub (SG)	1	3													
Proteaceae	*Banksia spinulosa*	Hairpin Banksia	Shrub (SG)	1	2	4		5	0.1			15			0.5		0.2	
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry	Other (OG)	1		0.1		0.1	0.2	0.1			0.2	0.1	0.1	0.1	0.1	0.1
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	Fern (EG)	1						2	2							
Fabaceae	*Bossiaea stephensonii*		Shrub (SG)	1				0.1							0.1			
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	Shrub (SG)	1			0.2		0.1									
Acanthaceae	*Brunoniella australis*	Blue Trumpet	Forb (FG)	1					0.2						0.2	0.1		0.1
Cunoniaceae	*Callicoma serratifolia*	Black Wattle	Shrub (SG)	1	3		60						20		1			
Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush	Shrub (SG)	1												2		
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	Other (OG)	1			8						5		0.2		0.1	0.1
Cyperaceae	*Carex appressa*	Tall Sedge	Grass & grasslike (GG)	1			0.5											
Lauraceae	*Cassytha glabella*		Other (OG)	1	0.1			0.2	2			2		0.1		0.2	0.5	0.1
Cunoniaceae	*Ceratopetalum gummiferum*	NSW Christmas Bush	Tree (TG)	1									0.5					
Lauraceae	*Cinnamomum camphora**	Camphor Laurel		1		0.1	0.2	0.1	0.1			1	5	2	0.1	1	15	
Myrtaceae	*Corymbia gummifera*	Red Bloodwood	Tree (TG)	1		15		35	11	2		5	1	10	5	20	17	
Myrtaceae	*Corymbia maculata*	Spotted Gum	Tree (TG)	1														10
Dilleniaceae	*Hibbertia bracteata*		Shrub (SG)	1														0.2
Orchidaceae	*Cryptostylis subulata*	Large Tongue Orchid	Forb (FG)	1												0.2	0.1	

Goodeniaceae	*Dampiera purpurea*	Purple Dampiera	Forb (FG)	1				3	0.2			0.2	0.1					
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax Lily	Forb (FG)	1		0.2		0.2	1					0.5	0.2	0.5	0.2	0.2
Fabaceae	*Dillwynia ramosissima*		Shrub (SG)	1													0.1	
Fabaceae	*Dillwynia retorta*	Eggs and Bacon	Shrub (SG)	1				0.1						0.5		0.1		
Dioscoreaceae	*Dioscorea transversa*	Native Yam	Other (OG)	1						0.1	0.1							0.1
Sapindaceae	*Dodonaea triquetra*	Hop-bush	Shrub (SG)	1		4				0.2			0.1	0.2	0.2	0.1	40	0.2
Poaceae	*Ehrharta erecta**	Panic Veldtgrass		1							3							
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Shrub (SG)	1				3	0.1	0.1	0.1		0.2	0.2	0.2		0.2	0.2
Poaceae	*Entolasia stricta*	Wiry Panic	Grass & grasslike (GG)	1		5		20	5	0.5		10	5	0	5	3	0.2	0.1
Ericaceae	*Epacris pulchella*	Wallum Heath	Shrub (SG)	1		0.2												
Myrtaceae	*Eucalyptus capitellata*	Brown Stringybark	Tree (TG)	1				5								4		
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum	Tree (TG)	1		5											5	
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint	Tree (TG)	1		20	5		20			30	20		10	15		5
Myrtaceae	*Eucalyptus racemosa*	Narrow-leaved Scribbly Gum	Tree (TG)	1				8						30		1		
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	Tree (TG)	1	25				5	5					3			
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany	Tree (TG)	1							10							
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	Other (OG)	1					1	0.8	0.3	0.1	0.3					0.2
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	Grass & grasslike (GG)	1	85	0.2												
Cyperaceae	*Gahnia sieberiana*	Red-fruited Saw-sedge	Grass & grasslike (GG)	1											25		10	
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	Other (OG)	1														0.3
Geraniaceae	*Geranium solanderi*	Cutleaf Cranesbill	Forb (FG)	1							0.2							
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	Tree (TG)	1		2	0.5	0.2	1.5	0.5	2	0.2	1	0.5	5	0.1	0.5	1
Fabaceae	*Glycine clandestina*	Twining Glycine	Other (OG)	1					0.1								0.1	0.1
Fabaceae	*Glycine clandestina*		Other (OG)	1					0.1								0.1	0.1
Fabaceae	*Glycine microphylla*	Small-leaf Glycine	Other (OG)	1					0.1									
Fabaceae	*Gompholobium latifolium*	Broad-leaf Wedge-pea	Shrub (SG)	1				0.2										
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort	Forb (FG)	1				0.1										
Goodeniaceae	*Goodenia heterophylla*		Forb (FG)	1						0.8				1		0.2		
Proteaceae	*Grevillea robusta*	Silky Oak	Tree (TG)	1							0.1							
Araceae	*Gymnostachys anceps*	Settlers Flax	Forb (FG)	1						0.3	0.2							5
Fabaceae	*Hardenbergia violacea*	False Sarsparilla	Other (OG)	1					0.1	0.1			0.1			0.5		
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	Shrub (SG)	1		0.5		2	1	0.2		1	0.2					
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower	Other (OG)	1						0.1			0.3					
Dilleniaceae	*Hibbertia empetrifolia subsp. empetrifolia*		Shrub (SG)	1										3	0.5			
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	Other (OG)	1		0.2				0.5			0.3				0.5	
Asteraceae	*Hypochaeris radicata**	Flatweed		1							0.1							

Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern	Fern (EG)	1			4											
Poaceae	*Imperata cylindrica*	Blady Grass	Grass & grasslike (GG)	1		2			3	0.1		3	0.5			3		0.1
Proteaceae	*Isopogon anemonifolius*	Flat-leaved Drumsticks	Shrub (SG)	1												0.2		
Proteaceae	*Lambertia formosa*	Mountain Devil	Shrub (SG)	1		4		2							0.1	10	0.1	
Verbenaceae	*Lantana camara**	Lantana		1			1		0.5	2	2	0.2	1			1	0.5	
Cyperaceae	*Lepidosperma filiforme*		Grass & grasslike (GG)	1				0.2				0.1						
Myrsinaceae	*Myrsine variabilis*	Muttonwood	Shrub (SG)	1						0.1								
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	Grass & grasslike (GG)	1		2		2	5	3								0.3
Myrtaceae	*Leptospermum juniperinum*	Prickly Tea-tree	Shrub (SG)	1	1													
Myrtaceae	*Leptospermum polygalifolium*	Tantoon	Shrub (SG)	1	15	2		3	0.2						2		0.5	
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree	Shrub (SG)	1		4		0.5						0.2	1	1		
Ericaceae	*Leucopogon juniperinus*	Prickly Beard-heath	Shrub (SG)	1														0.3
Ericaceae	*Leucopogon lanceolatus*	Lance-leaf Beard-heath	Shrub (SG)	1					0.1	10		5	0.1					
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet		1			0.3			0.1	20							
Oleaceae	*Ligustrum sinense**	Small-leaved Privet		1			1			2	35				0.2			0.1
Lindsaeaceae	*Lindsaea linearis*	Screw Fern	Fern (EG)	1				0.2	0.1				0.3		0.1		0.2	
Lindsaeaceae	*Lindsaea microphylla*	Lacy Wedge-fern	Fern (EG)	1		0.1		0.1		0.1				0.1		0.1		0.1
Arecaceae	*Livistona australis*	Cabbage Tree Palm	Other (OG)	1			0.2											
Lobeliaceae	*Lobelia purpurascens*	Whiteroot	Forb (FG)	1					0.1							0.1	0.1	0.1
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	Grass & grasslike (GG)	1							1		10		0.5			
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	Grass & grasslike (GG)	1					0.3						0.2	0.2		
Lomandraceae	*Lomandra obliqua*	Twisted Mat-rush	Grass & grasslike (GG)	1		5		10						0.5		0.2	0.5	
Apocynaceae	*Marsdenia suaveolens*	Scented Marsdenia	Other (OG)	1									0.1					
Myrtaceae	*Melaleuca sieberi*		Shrub (SG)	1	8													
Poaceae	*Microlaena stipoides*	Weeping Grass	Grass & grasslike (GG)	1		0.2		0.2		1				1	0.2	0.2	0.2	0.2
Nandinaceae	*Nandina domestica**	Japanese Sacred Bamboo		1							0.1							
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive	Tree (TG)	1		0.2		4		0.2	0.1			0.5	0.5	0.2	0.1	
Orchidaceae	*Cryptostylis spp.*		Forb (FG)	1		0.1			0.1									
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant		1			1		0.1	0.5	10	0.2		0.5				0.2
Poaceae	*Oplismenus aemulus*	Basket Grass	Grass & grasslike (GG)	1							3							0.2
Phormiaceae	*Dianella caerulea var. caerulea*	Flax Lily	Forb (FG)	1						0.5	0.2	1						
Poaceae	*Oplismenus imbecillis*		Grass & grasslike (GG)	1			3				0.1		3					
Bignoniaceae	*Pandorea pandorana*	Wonga Vine	Other (OG)	1					0.5		0.2		0.3			0.1		0.2
Apocynaceae	*Parsonsia straminea*	Common Silkpod	Other (OG)	1		0.1		0.1	0.2			0.1		0.1				1