

validating vegetation and searching for threatened flora and fauna species. The location of any important habitat features were marked using a Global Positioning System (GPS).

As noted in Section 3.2.1, the subject site did not contain Koala preferred feed tree species. As such, no further habitat assessments or determination of activity levels for Koala, as outlined in the *Flora and Fauna Survey Guidelines: Lower Hunter Central Coast Region 2002* (Murray et al. 2002), were undertaken. It was considered that the subject site was not potential Koala habitat as intended in SEPP 44 (and, therefore, requiring a management plan) due to the absence of preferred feed tree species in the subject site and the low number of Koala records within a 5 km radius (six records) of the subject site. Also, the subject site is less than 1 ha, and SEPP 44 applies only to areas greater than 1 ha.

3.2.3 Field survey limitations

It is important to note that some threatened flora and fauna species may not have been detected on the site during the inspection as they may be cryptic or seasonal, and only detectable when flowering. In this case, the assessment of their likelihood of their occurrence on site was based on the presence of potential habitat. Furthermore, not all species were in flower/seeding. Therefore, it was not possible to identify some specimens to species level.

No targeted fauna surveys and no Anabat surveys for threatened micro-bats were undertaken. The recommended minimum guidelines for fauna survey were considered for this assessment, but based on the size of the site, level of disturbance, position in the landscape and absence of corridors, a more streamlined assessment cognisant of the site's small size, was devised. Therefore, the importance of the site for threatened fauna was based on the recorded habitat features on the site such as feeding, shelter and nesting resources. The guidelines state that 'it is not necessary to conduct the fully survey effort recommended in Table 3.1 and 3.3' for small sites (Murray et al. 2002), which we consider are only slightly smaller than the subject site.

3.3 Impact assessment

3.3.1 TSC Act-listed species

The EP&A Act states that if a species, population or ecological community listed in Schedules 1, 1A and 2 of the TSC Act is identified as occurring or having the potential to occur on the subject site, a review of the factors set out to establish if there is likely to be a significant effect on that species, population, ecological community or habitat, must be undertaken. Section 5A of the EP&A Act sets out seven factors that must be addressed as part of an Assessment of Significance. This enables a decision to be made as to whether there is likely to be a significant effect on the species, population and ecological community and, hence, if a Species Impact Statement (SIS) is required.

Assessments of Significance were applied to flora and fauna species listed under the TSC Act that were assessed during the likelihood of occurrence process as having the terms of likelihood: yes, likely or potential (see Section 3.1). They were also applied to any Endangered Ecological Communities (EECs) identified during data audit as occurring near the subject site that could potentially be affected.

Impacts considered in the Assessments of Significance related to the direct and indirect impacts from the clearing of native and exotic vegetation in the development footprint on threatened species and populations.

Direct impacts considered in the Assessments of Significance included the loss of up to 0.33 ha of vegetation cover and associated habitat. Further, direct and indirect impacts considered included the possible introduction of sediments and nutrients into surrounding vegetation.

The following summarises some of the impacts considered:

- Loss of 0.33 ha of native and exotic vegetation within the subject site;
- Loss of habitat for flora and fauna species;
- Introduction of sediments and nutrients into surrounding vegetation;
- Spread of weeds into surrounding vegetation;
- Noise disturbance and vibration from the construction works; and
- Introduction of dust.

Due to similar habitat requirements and foraging resources, some species (owls and microbats) were assessed in groups, with exceptions highlighted where relevant.

3.3.2 EPBC Act-listed species

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of NES. Matters of NES listed under the EPBC Act include:

- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of International Importance;
- The Commonwealth marine environment;
- World heritage properties;
- National heritage places; and
- Nuclear actions.

Specific 'Significant Impact Criteria' are provided for each matter of NES except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Significance Assessments were applied to flora and fauna species listed under the EPBC Act that were assessed during the likelihood of occurrence process as having the terms of likelihood: yes, likely or potential (see Section 3.1). Impacts considered were as stated in Section 3.3.1.

4 Results

4.1 Data audit

Database searches and vegetation mapping of the locality (an area of 10 km radius around the subject site) indicated that a number of threatened species and EECs have been recorded within the locality (**Appendix B** for threatened species recorded).

The EEC in the locality was identified using Gosford Council's Electronic Mapping System (GEMS) (Gosford Council 2014). This was not mapped in the subject site but occurred approximately 150 m east of the subject site. While the EEC was mapped, it was not named in GEMS, so it is not known what EEC was represented. The EEC was mapped over Coastal Warm Temperate Rainforest (Unit E1a in Bell 2004). This vegetation community could potentially align with the EEC, *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion*, based on species composition (see descriptions in Bell 2004 and OEH 2014c). In any case, this listed EEC was not considered likely to occur in the subject site due to the location of the subject site in higher elevation.

Four threatened flora species, 20 threatened fauna species and five migratory species were considered to have the potential to occur prior to site inspection and were considered potential 'affected species' (**Appendix B**).

4.2 Site inspection

4.2.1 Vegetation communities and condition

Field survey confirmed vegetation within the subject site to be Narrabeen Coastal Blackbutt Forest (Unit E22ai in Bell 2004). The equivalent REMS vegetation community is Coastal Narrabeen Shrub Forest (Unit 22). This vegetation community occurs on the Erina soil landscape on the hills and slopes around Gosford and down to the Bouddi Peninsula (Bell 2004). It is not listed as threatened under the TSC or EPBC Acts. Further, it is not listed as 'regionally significant vegetation' under Gosford Council's DCP 2013, or as a matter of local significance in the *Flora and Fauna Survey Guidelines: Lower Hunter Central Coast Region 2002* (Murray et al. 2002).

The canopy was comprised of a mixture of species including *Eucalyptus pilularis* (Blackbutt), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus fibrosa* (Broad-leafed Ironbark), and other *Eucalyptus* spp (not identified due to absence of distinguishing features e.g. fruits). There was a sub-canopy of *Allocasuarina torulosa* (Forest Oak). The mid-storey was comprised of both native and introduced species. In the upper layer of the mid-storey, species included **Ligustrum lucidum* (Large-leaved Privet), *Acacia decurrens* (Sydney Green Wattle), **Erythrina x sykesii* (Coral Tree), *Ceratopetalum gummiferum* (Christmas Tree Bush), **Cinnamomum camphora* (Camphor Laurel), *Glochidion ferdinandi* (Cheese Tree), *Pittosporum undulatum* (Sweet Pittosporum), **Cotoneaster* sp. and *Polyscias sambucifolia* (Elderberry Panax). In the lower layer of the mid-storey, species included **Polygala myrtifolia* (Myrtle-leaf Milkwort), **Ageratina adenophora* (Crofton Weed), **Lantana camara* (Lantana), *Breynia oblongifolia* (Breynia) and *Pteridium esculentum* (Bracken). The under-storey was comprised of grasses and herbs such as *Themeda australis* (Kangaroo Grass), **Andropogon virginicus* (Whiskey Grass), *Imperata cylindrica* (Blady Grass), *Rytidosperma longifolia* (Long-leaved Wallaby Grass), *Opismenus aemulus* (Basket Grass), *Centella asiatica* and *Pratia purpurascens* (Whiteroot).

Due to the structural integrity and high projected foliage cover of the vegetation, including native vegetation, with all structural components (canopy, mid-storey and ground-storey layers) present, the

condition of vegetation was considered to be moderate to good. This is despite the high density of introduced species in the mid-storey and under-storey at the subject site, and signs of previous disturbance at the subject site (possible building foundations). Note that this assessment of vegetation condition was not a formal assessment which measures the projected foliage cover of the strata (native species only), native species richness, the number of trees with hollows, the number of fallen logs, and the proportion of canopy species regenerating, and then calculates an overall score. However, according to a formal definition used in BioBanking, low condition vegetation generally requires the native over-storey percent foliage cover to be less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, amongst other criteria (Department of Environment and Climate Change [DECC] 2008). It is not considered that this was the case at the subject site.

4.2.2 Flora

A total of 68 flora species were recorded on the subject site. Of these, 37 were native species and 31 were introduced species (**Appendix C**).

Six of the introduced species are listed as either noxious species for the Gosford area, noxious species for the whole of NSW, or as Weeds of National Significance (WONS):

- *Ageratina adenophora* (Crofton Weed): Class 4 noxious weed in the Gosford LGA;
- *Ageratina riparia* (Mist Flower): Class 4 noxious weed in the Gosford LGA;
- *Asparagus aethiopicus* (Asparagus Weed): WONS, Class 4 noxious weed in the Gosford LGA;
- *Cortaderia* sp. (Pampas Grass): Class 3 noxious weed in the Gosford LGA;
- *Lantana camara*: WONS; and
- *Rubus fruticosus* aggregate (Blackberry): WONS, Class 4 noxious weed in the whole of NSW and Class 4 noxious weed in the Gosford LGA.

Ligustrum lucidum (Broad-leaved Privet) and *Lantana camara* are also listed as 'undesirable species in Gosford City' under the Gosford Council DCP 2013.

No threatened flora species, or flora species of regional significance (as listed for Gosford LGA in the *Flora and Fauna Survey Guidelines: Lower Hunter Central Coast Region 2002*; Murray et al. 2002), were recorded.

4.2.3 Fauna

A total of 14 fauna species (11 birds, one mammal, and two reptiles) were recorded via direct observation, signs, and by their calls. All species recorded are native species. The species recorded are common to bushland in Gosford. A list of fauna observed during the field survey is included in **Appendix D**.

No threatened fauna species were recorded. There are no fauna species listed as being of regional significance in the Gosford LGA in the *Flora and Fauna Survey Guidelines: Lower Hunter Central Coast Region 2002* (Murray et al. 2002).

4.2.4 Habitat elements

There were a number of habitat elements present within the subject site for flora and fauna species. Habitat elements included:

- Intact canopy, shrub and ground layers;
- Supplementary feed trees (*Eucalyptus pilularis*) for *Phascolarctos cinereus* (Koala);
- A relatively deep layer of leaf litter;

- A small amount of woody debris (fallen logs and braches);
- A tree stump;
- Loose rocks as well as rock piles;
- A sandstone rock face;
- Small amounts of standing water (pooled within a concrete drainage structure on the eastern boundary of the subject site, and in the sandstone rock face along the western side of the subject site, which appeared to have formed part of previous building foundations); and
- One small stag (no hollows observed).

No tree hollows were observed, although small hollows are difficult to detect from ground level. It is possible that small hollows may have been present in the ends of some tree branches that had broken off. A broken off tree branch approximately 15 cm in diameter was observed.

The habitat elements available across the subject site would provide sheltering, foraging, and roosting habitat for a range of fauna groups. The intact canopy, shrub, and ground layers would provide foraging habitat for arboreal mammals, bats and birds, and nesting habitat for birds and some arboreal mammals. Leaf litter, woody debris, and the loose rocks, rock piles and sandstone rock face would provide foraging and sheltering habitat for ground dwelling mammals and reptiles. Standing water would provide foraging and breeding habitat for frog species and foraging habitat for bat species.

With regards to threatened species, canopy trees and shrubs could provide foraging habitat for *Daphoenositta chrysoptera* (Varied Sittella), *Glossopsitta pusilla* (Little Lorikeet), *Pteropus poliocephalus* (Grey-headed Flying-fox), and microbat species (*Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Miniopterus australis* (Little Bentwing-bat), *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat), *Mormopterus norfolkensis* (East Coast Freetail Bat), and *Scoteanax rueppellii* (Greater Broad-nosed Bat)), with *Allocasuarina torulosa* providing foraging resources for *Calyptorhynchus lathami* (Glossy Black Cockatoo). Canopy trees and shrubs could support arboreal mammals, including *Petaurus norfolcensis* (Squirrel Glider), which are foraging resources for *Ninox strenua* (Powerful Owl) and *Tyto tenebricosa* (Sooty Owl). The rock piles, sandstone rock face, and woody debris could provide foraging and denning habitat for *Dasyurus maculatus* (Spotted-tailed Quoll). *Potorous tridactylus* (Long-nosed Potoroo) could forage in the understorey and leaf litter for fungi and invertebrates.

Despite the presence of *Eucalyptus pilularis* in the subject site, it is unlikely that the Koala would use the subject site. *Eucalyptus pilularis* is not listed as a feed tree species under Schedule 2 of SEPP 44 (Koala Habitat Protection). Rather it is listed as a supplementary feed tree species in Murray et al. 2002. The subject site is not considered to represent potential or core Koala habitat requiring a Plan of Management under SEPP 44.

The subject site lies on the interface between a large patch of contiguous vegetation and Gosford's built up area. As such, it is unlikely to form part of a habitat corridor that may be of local or regional significance. As stated in Section 1.2, there are no watercourses or wetlands within the subject site.



Figure 3: Vegetation communities and threatened flora and fauna records in the subject site and adjacent areas (vegetation community mapping extracted from Gosford Council's Electronic Mapping System (GEMS))

4.3 Impact assessment

4.3.1 TSC Act-listed species

The Assessment of Significance was applied to the following species (refer to **Appendix E**).

- *Calyptorhynchus lathami* (Glossy Black Cockatoo);
- *Daphoenositta chrysoptera* (Varied Sittella);
- *Glossopsitta pusilla* (Little Lorikeet);
- *Ninox strenua* (Powerful Owl);
- *Tyto tenebricosa* (Sooty Owl);
- *Dasyurus maculatus* (Spotted-tailed Quoll);
- *Petaurus norfolcensis* (Squirrel Glider);
- *Potorous tridactylus* (Long-nosed Potoroo);
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Miniopterus australis* (Little Bentwing-bat);
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat);
- *Mormopterus norfolkensis* (East Coast Freetail Bat);
- *Pteropus poliocephalus* (Grey-headed Flying-fox); and
- *Scoteanax rueppellii* (Greater Broad-nosed Bat).

Application of the Assessment of Significance determined that none of the threatened species occurring or with the potential to occur in the subject site would be significantly impacted by the proposed works. For Glossy Black Cockatoo, Powerful Owl and Sooty Owl, this would be provided that no breeding habitat was present in the vicinity of the subject site (within 300 m), or construction occurred outside of these species' breeding seasons (March to July).

The area impacted was not considered to represent a significant portion of key habitat such that it would significantly impact these threatened species. The area impacted (0.33 ha) is small. Approximately 3,877 ha of the vegetation community to be impacted (Coastal Narrabeen Shrub Forest) is mapped in the Gosford LGA (REMS mapping); the subject site comprises 0.009% of this community. More extensive areas of less degraded vegetation are present within the locality, in particular to the north-east of the subject site in Rumbalara Reserve (53 ha) and Katandra Reserve (232 ha). The vegetation proposed to be cleared is marginal for some species or mostly represents foraging habitat that would be used on an occasional basis. No waterbodies or large hollow-bearing trees that would be used by species such as Glossy Black Cockatoo, Powerful Owl, Sooty Owl, or Squirrel Glider are present in the subject site. In addition, works would be need to be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan that met the requirements set out in Gosford Council's DCP 2013. Under the plan and in accordance with SEPP 19, the proposal would not impact on the adjacent Rumbalara Reserve. The proposal would result in only temporary and short-term noise disturbance from construction during daytime hours, and would not isolate or fragment any currently connecting areas of habitat.

Given that no species protected under the TSC Act would be significantly impacted by the proposed works, a SIS is not required for the proposed development with respect to these matters.

4.3.2 EPBC Act-listed species

Significance Assessments (the Significant Impact Criteria) for the following species are included in **Appendix F**:

- Spotted-tailed Quoll;

- Long-nosed Potoroo; and
- Grey-headed Flying-fox.

The Significance Impact Criteria determined that none of the species would be significantly impacted by the proposed works. The areas impacted, which included mostly foraging habitat for fauna species, were not considered to represent a significant portion of key habitat such that it would significantly impact these threatened species through the disruption to their breeding cycles. Works would not isolate any currently interconnecting areas of habitat, impact on habitat critical to the survival of species, introduce diseases, or result in the introduction of invasive species that are harmful to any species potentially present. The populations of Long-nosed Potoroo and Grey-headed Flying-fox that might use the subject site are not considered to be 'important populations' as defined.

Given that no matters protected under the EPBC Act would be significantly impacted by the proposed works, no referral to DoE for assessment and approval by the Environment Minister is considered necessary.

5 Avoidance and mitigation measures

The impact assessment determined that no matters protected under the TSC and EPBC Acts would be significantly impacted by the proposed works provided that construction controls were in place to avoid and mitigate impacts. These controls must be implemented, and include the following:

- Prepare a Site Management Plan that includes a Sediment and Erosion Control Plan, in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), to:
 - o demonstrate that appropriate controls are planned to limit transport of weed propagules and sediment to areas downstream of the impact area;
 - o address all aspects of site disturbance, erosion, and sediment control;
 - o provide a mechanism for any remaining exposed soil to be treated and for ongoing site maintenance;
 - o cover the contingency of change or delay in the project implementation, activity or work scope
- Employ methods to contain disturbance from construction (as outlined in the Site Management Plan) to the adjacent vegetation and flora and fauna habitat within Rumbalara Reserve. Erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Control drainage in the impact areas in line with the *Protection of the Environment Operations Act 1997* requirements and the Sediment and Erosion Control Plan to avoid impacts on downstream habitats, and potential threatened species habitat;
- Wash down machinery before conducting works to limit weed spread. Gosford Council's DCP 2013 (Part 6 Environmental Controls – Preservation of Trees or Vegetation) states that removal or control of declared noxious weeds and undesirable species on private land is the landowner's responsibility;
- Undertake surveys in the vicinity of the subject site (within 300 m) to determine if any nest of Glossy Black Cockatoo, Powerful Owl and Sooty Owl are present. If not undertake the construction phase at any time. If present, undertake the construction phase outside of the breeding seasons of Glossy Black Cockatoo, Powerful Owl and Sooty Owl (March to July);
- Establish and implement a pre-clearing procedure to avoid direct impacts on any threatened fauna species that may be present in the subject site prior to vegetation removal. Ensure the pre-clearing procedure uses specific removal techniques such as 'soft dropping' of any potential hollow-bearing trees.

6 Conclusions

This report aimed to provide information on the flora and fauna of the subject site to accompany a DA for a residential development. The report further provided a description of the survey methodology and discussion of limitations, a likelihood of occurrence table and separate Assessments of Significance and EPBC significance assessments for threatened species, populations or communities that could be directly or indirectly affected by the proposal.

Vegetation in the subject site was confirmed as Narrabeen Coastal Blackbutt Forest. Despite previous disturbance and high density of introduced species in the mid-storey and under-storey at the subject site, the condition of vegetation was considered to be moderate to good. The subject site contained habitat elements that could support a range of flora and fauna species. However, the subject site did not support any matters listed as being of local or regional significance in the Gosford LGA.

A number of threatened flora and fauna species have been recorded within the locality, and there is potential that some threatened fauna species could use the subject site on an occasional basis. Application of the Assessment of Significance to threatened fauna species occurring or with the potential to occur in the subject site determined that none of these would be significantly impacted by the proposed works provided that no nests of Glossy Black Cockatoo, Powerful Owl and Sooty Owl occurred in the vicinity of the subject site (within 300 m), or if present, construction works occurred outside of the breeding seasons of Glossy Black Cockatoo, Powerful Owl and Sooty Owl (March to July) and effective controls were established and implemented to prevent impacts to the adjacent Rumbalara Reserve (spread of weeds, erosion, sedimentation, changes to water flows) and fauna. Similarly, Significance Assessments conducted for nationally threatened fauna species determined that none of the species would be significantly impacted by the proposed works. The area to be impacted was small (0.33 ha) and not considered to represent a significant portion of key habitat for threatened fauna. No key habitat features, such as large hollows or waterbodies/riparian habitat, were present in the subject site. The proposal would result in only temporary and short-term noise disturbance from construction during daytime hours, and would not isolate or fragment any currently connecting areas of habitat.

Given that the proposed works would not significantly impact on any EECs, species or populations protected under the TSC Act or EPBC Act, a Species Impact Statement is not required for the proposed development with respect to matters protected under the TSC Act, nor is a referral to the DoE for assessment and approval by the Environment Minister considered necessary.

Avoidance and mitigation measures have been included to minimise impacts to the adjacent Rumbalara Reserve.

References

Bell, S. A. J. 2004. *The Natural Vegetation of the Gosford Local Government Area, Central Coast, New South Wales: Vegetation Community Profiles* (Version 2.0). Final Report to Gosford City Council.

Bureau of Meteorology (BOM) 2014. Daily weather observations. Available online: <http://www.bom.gov.au/climate/dwo/201412/html/IDCJDW2048.201412.shtml>

Department of Environment (DoE) 2014. *Protected Matters Search Tool*. Available online: <http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protected>

Department of Environment and Climate Change (DECC) 2008. *BioBanking Assessment Methodology and Credit Calculator Operation Manual*. Department of Environment and Climate Change.

Department of Environment and Conservation (DEC) 2004 *Threatened species survey and assessment; guidelines for developments and activities (working draft)* New South Wales Department of Environment and Conservation, Hurstville, NSW.

Gosford Council (2014). *Gosford Council's Electronic Mapping System*. Available online: <http://www.gosford.nsw.gov.au/about-council/general-information-rates/mapping#>

Murray, M. Bell, S., and Hoyer, G. 2002. *Flora and Fauna Survey Guidelines: Lower Hunter Central Coast Region 2002*. Lower Hunter Central Coast Regional Environmental Management Strategy.

Office of Environment and Heritage (OEH) 2014a. *BioNet Atlas of NSW Wildlife website*. Available online: <http://www.bionet.nsw.gov.au/>

Office of Environment and Heritage (OEH) 2014b. *Threatened Species Profiles*. Available online: <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>

Office of Environment and Heritage (OEH) 2014c. *Scientific Committee threatened species determinations*. Available online: <http://www.environment.nsw.gov.au/determinations/index.htm>

Appendix A Qualifications and experience of personnel, and licence details

Details are provided overleaf



CURRICULUM VITAE

Dr Enhua Lee**SENIOR ECOLOGIST****QUALIFICATIONS**

- PhD in Ecology and Wildlife Management. The Ecological Effects of Sealed Roads in Australia's Arid Zone. – 2006
- Bachelor of Advanced Science (First Class Honours). Mitochondrial Adjustments in the Muscles of the Fat-tailed Dunnart, *Sminthopsis crassicaudata*, During Cold Acclimation - 2000

Enhua is a Senior Ecologist in the Sutherland office of ELA with a Doctor of Philosophy in wildlife management and over 10 years of experience in environmental research and consulting.

Enhua has extensive practical experience in biodiversity survey and monitoring. As a senior ecologist, Enhua has been involved in planning, establishing and undertaking vegetation and fauna monitoring programs, and baseline flora and fauna surveys. Enhua also has well developed research and analytical skills, and time management and project management skills. She is an effective communicator, as demonstrated through her work in developing biodiversity education programs and her invitations to present her research findings at specialist conferences and to lay audiences. She has trained people in conducting flora and fauna surveys in Australia's rangelands and has published peer-reviewed book chapters and papers in international and national scientific journals.

Since joining Eco Logical Australia in 2007, Enhua has completed work for state and federal government agencies, local councils, as well as private businesses and property owners. She has a sound knowledge of environmental and planning legislation (NSW, VIC and WA State legislation and Commonwealth legislation) and has applied her knowledge to a range of projects. Her work has ranged from completing ecological impact assessments, flora and fauna surveys, vegetation, bushfire and fauna management plans, master plans and literature reviews for clients, to conducting complex statistical analyses to inform management plans. She has also been involved in numerous monitoring projects, and has provided high level conservation advice to government agencies.

RELEVANT PROJECT EXPERIENCE**Ecological Constraints / Impact Assessment / Flora and Fauna Survey**

- Narrabri Ecological Assessment (Santos)
- Lancelin Defence Training Area Flora and Fauna Survey (Defence)
- Marandoo East Drilling and Brockman 2 Expansion Flora and Fauna Survey for Native Vegetation Clearing Permit (RTIO)
- McPhee Creek Environmental Approvals (Atlas Iron)
- Pilbara Expansion Cumulative Impact Assessment (BHPBIO)
- Kemerton Industrial Park Gap Analysis and Ecological Surveys (LandCorp)
- WestBank Ecological Survey and Assessment (LandCorp)
- Ninga Vertebrate Fauna Survey and Habitat Mapping (BHPBIO)
- Koodaideri Iron Ore and Infrastructure Project (Public Environmental Review) (Rio Tinto Iron Ore)
- Carnaby's Cockatoo habitat surveys throughout the south-west of WA (DSEWPac)
- Edgewater Quarry Flora and Fauna Survey (City of Joondalup)

- Callawa Vertebrate Fauna Survey (WA Level 2 Fauna Survey) (BHPBIO)
- Annangrove Light Industrial Area Flora and Fauna Constraints Assessment (Hills Shire Council)
- Crudine Ridge Wind Farm Ecological Assessment (Part 3A project) (Wind Prospect)
- Narrabri Gas Field Ecological Assessment (Part 3A project) (Eastern Star Gas)
- Beacon Hill Species Impact Statement (The Trustees of the Sisters of the Good Samaritan)
- Pittwater Road Upgrade Flora and Fauna Assessment (City of Ryde)
- Ecological Assessment of Allenby Park (AMPCI)
- Ecological Assessment, Proposed Drainage Augmentation, Warringah Mall (AMPCI)
- Wedderburn Hazard Reduction Flora and Fauna Assessment (Campbelltown Council)
- Stanwell Tops Conference Centre Ecological Assessment (Borst and Conacher Architects)
- Ecological Impact Assessments – various (Integral Energy)
- Sensitivity Mapping for NW and SW Growth Centre (Sydney Water)
- Western Parklands Ecological Constraints Assessment (DoP)
- El Caballo Blanco and Gledswood Rezoning Ecological and Bushfire Assessment (Landcom)
- South Randwick Feasibility Review: Environmental Issues and Constraints (Landcom)
- Whitebridge Constraints Assessment (Landcom)
- Ballanagatang Biobanking Assessment (Ecotrades)
- Fauna Report for the Gap Park Masterplan (Thompson Berril Landscape Design)

Management Plans

- Cloudbreak Life of Mine Revegetation Plan and Procedures (Fortescue Metals Group)
- Sunningdale Vegetation and Fauna Management Plan (Pacific Dunes)
- North and South Bandiana Landscape Management Plan (Defence)
- Kapooka Box-Gum Mapping and Monitoring Plan (Defence)
- Cooper Park Management Plan (Woollahra Council)
- Sydney South West Property Environmental and Vegetation Management Plans (Sydney Water)
- Hawkesbury Roadside Vegetation Management Plan (Hawkesbury Council)
- Flying Fox Plan of Management – Parramatta Park (Parramatta Park Trust)
- *Acacia terminalis* Plan of Management – North Head Sewerage Treatment Plant (Sydney Water)
- North Head Sewage Treatment Plant Fire Management Plan (Sydney Water)

Vegetation Community Mapping

- Kapooka Box-Gum Mapping and Monitoring Plan (Defence)
- Wetland Vegetation Surveys for LiDAR, Lowbidgee and Gwydir wetlands (DECC)
- Molonglo River Vegetation and Habitat Survey and Mapping (ACT Planning)

Ecological Monitoring

- Bindoon Defence Training Area Annual Monitoring (Defence)
- Mulgara Trapping, Translocation and Monitoring (Samsung/Roy Hill)
- Garden Island Weed Monitoring Survey and Assessment (Defence)
- Lancelin Defence Training Area Rapid Vegetation Monitoring (Defence)
- Tropicana Gold Mine Vegetation Monitoring (AngloGold Ashanti Australia) (ongoing)
- Bungaribee *Themeda australis* Relocation Monitoring (Landcom)
- Werris Creek Biodiversity Offset Area Annual Monitoring (Werris Creek Coal)
- Liddell Colliery Flora and Fauna Monitoring (Liddell Coal Operations)
- Kapooka and Latchford Barracks Kangaroo Impact Monitoring (Defence)
- Microbat Monitoring, Warringah Mall (AMPCI)
- Metropolitan Colliery Vegetation Monitoring (Metropolitan Colliery)

Ecological Reviews

- EPBC Conservation Advice (DEWHA)
- Review of Threatened Species Recovery Plans (DECC)
- Review of DA documents (Ku-ring-gai Council)

Statistical Analyses

- Vegetation Community Assessment (PATN analysis), Neerabup Industrial Area (Landcorp)
- Historical Impacts of Linear Infrastructure on Sheetflow-dependent Vegetation Associations (API)

- Habitat Modelling for Flora and Fauna species in the Gold Coast region (Gold Coast Council)
- Rufous Scrub-bird Monitoring Assessment (DECC)
- Habitat Modelling Pilot for Flora and Fauna Species: Swan Coastal Plain and Jarrah Forest IBRAs (WA DEC)
- Far South Coast Fire Assessment: Effects of Fire on Vegetation Composition (DECC)

Training/Education

- Biodiversity Awareness Training Course (DECC)
- Part 5 Training Course (Rockdale Council)

Other

- Ecological Character Description for the Paroo River Wetlands Ramsar Site (DEWHA)
- Information sheet for the Menindee Lakes System (Australian Floodplain Association)
- Flora assessment at Pinaroo Lake in north-western New South Wales (DEHWA)

BIODIVERSITY SURVEY EXPERIENCE

Enhua has conducted surveys in a range of ecosystems, including semi-arid woodlands, shrublands and grasslands, temperate woodlands, forests, rainforests, and grasslands, and alpine woodlands across NSW, and in parts of Victoria (North east region) and WA (Pilbara region). This experience has exposed her to a diversity of fauna distributed across these ecosystems.

She is familiar with both active and passive survey techniques, including:

- Terrestrial and arboreal Elliott trapping
- Pitfall trapping
- Cage trapping
- Harp trapping
- Funnel trapping
- Active searches (herpetofauna)
- Bird point and transect census
- 'Distance' transect surveys (for population density estimation)
- Call playback
- Remote camera survey
- Anabat detection
- Call detection



Office of
Environment & Heritage
NSW National Parks & Wildlife Service



SCIENTIFIC LICENCE

NATIONAL PARKS & WILDLIFE ACT, 1974
Section 132c

Name and postal address of principal licensee

Nominated premises (where appropriate)

Mr Bruce Mulins
Eco Logical Australia Pty Ltd
PO Box 12
SUTHERLAND NSW 1499

Your licence number is: SL100243

This licence is valid from: 01 August 2013

This licence will expire on: 31 July 2015

Additional authorisations:

Project Title: General flora and fauna survey work

This licence authorises the following activities: Harm, trap, capture, hold and release fauna for survey purposes; Pick flora for identification purposes.

This licence authorises the principal licensee and any associates named in **Attachment A** to conduct those activities authorised above, to those species, communities or materials listed in **Attachment B**, at the locations specified in **Attachment C** of this licence.

This licence also authorises the principal licensee to import or export those species, or materials listed in **Attachment B** interstate as provided under s126 of the *National Parks and Wildlife Act 1974* (NPW Act) and to conduct research on park under clause 23 of the *National Parks and Wildlife Regulation 2009* (NPW Reg), where this forms part of a project approved by a delegated officer of OEH.

This licence is issued subject to the provisions of NPW Act, NPW Reg, the general conditions listed below, any special conditions as may be notified in writing to the licensee by the Director General of the Department of Premier and Cabinet ("Director General") or a 'delegated officer' of OEH ("delegated officer") and the OEH "Scientific Licensing" policy.

Signature of Delegated Officer

Date: 07 November 2013

Signature of Principal Licensee*

Date: 8/11/13

* This licence is not valid unless it is signed by the principal licensee. By signing this licence the licensee agrees that they have read, understood and agree to comply with all of the conditions listed on the licence.

TRIM FILE:13/1641 Secretary's ACEC Meeting 162, 30 June 2014

ANIMAL RESEARCH AUTHORITY

**Issued by the
SECRETARY NSW TRADE & INVESTMENT**

Principal Investigator: Mr Bruce Mullins
Eco Logical Australia Pty Ltd
PO Box 12
SUTHERLAND NSW 1499

Associate Investigators:	Mr Martin Sullivan	Mr Matthew Jones
	Mr Ryan Smithers	Mr Peter Knock
	Ms Tammy Paartalu	Dr Rodney Armistead
	Dr Sarah Smith	Mr Lucas McKinnon

Other Participants:	Ms Andrea Sabella	Mr David Coombes
	Mr Will Introna	Mr Antony von Chrismar
	Ms Belinda Failes	Mr Kurtis Lindsay
	Mr Peter Hancock	

are authorised to conduct the following research

GENERAL WILDLIFE SURVEY ASSOCIATED WITH CONSULTANCIES, PROJECTS OR CONTRACT RESEARCH

**Being general wildlife survey associated with consultancies, projects or
contract research**

Location: Various locations throughout New South Wales and Northern Territory

as approved by and in accordance with the
**ANIMAL CARE AND ETHICS COMMITTEE OF THE
SECRETARY OF NSW TRADE & INVESTMENT**

*Being animal research carried out in accordance with the Code of Practice, for a recognised research
purpose and in connection with animals (other than exempt animals) that have been obtained from the
holder of an animal suppliers licence.*

Approved with the following conditions:

1. The Secretary's Animal Care and Ethics Committee is to be informed of the specific location of each study and the procedures to be undertaken prior to work being commenced.
2. Cage trapping is limited to a maximum of four consecutive nights at any one site.

PAGE 2 OF 2

This authority remains in force from **10 May 2014 – 10 May 2015** unless suspended, cancelled or surrendered



SUZANNE ROBINSON
SENIOR MANAGER, ANIMAL WELFARE *
ANIMAL WELFARE UNIT

Date: 3 July 2014

NSW Department of Primary Industries, an office of NSW Trade & Investment

*Delegate of the Secretary of the Department of Trade and Investment, Regional Infrastructure and Services

PAGE 3 OF 2

TRIM File 13/1641
DG ACEC Meeting 154, 6 May 2013

**ANIMAL CARE AND ETHICS COMMITTEE OF
THE DIRECTOR-GENERAL OF
DEPARTMENT OF PRIMARY INDUSTRIES**

CERTIFICATE OF APPROVAL

**Mr Bruce Mullins
Eco Logical Australia Pty Ltd
PO Box 12
SUTHERLAND NSW 1499**

Is approved to conduct the following research

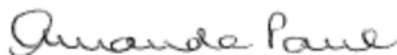
**GENERAL WILDLIFE SURVEY ASSOCIATED WITH
CONSULTANCIES, PROJECTS OR CONTRACT RESEARCH**

as approved by and in accordance with the

**ANIMAL CARE AND ETHICS COMMITTEE OF THE DIRECTOR-GENERAL OF
DEPARTMENT OF PRIMARY INDUSTRIES**

*being animal research carried out in accordance with the Code of Practice, for a recognised
research purpose and in connection with animals (other than exempt animals) that have been
obtained from the holder of an animal suppliers licence*

This approval remains in force from **10 May 2013** to **10 May 2016** unless suspended, cancelled or
surrendered



**AMANDA PAUL
EXECUTIVE OFFICER (DG ACEC)
ANIMAL WELFARE UNIT**

Date: 14 May 2013

NSW Department of Primary Industries, an office of the Department of Trade and Investment, Regional Infrastructure
and Services

* Delegate of the Director-General of the Department of Trade and Investment, Regional Infrastructure and Services

Appendix B Threatened Flora and Fauna Likelihood of Occurrence table

An assessment of likelihood of occurrence was made for threatened species identified from the NSW Wildlife Atlas and the EPBC Protected Matters Search Tool database searches. A 10 km radial search of the EPBC database and a 5 km buffer zone search around the study area of the Wildlife Atlas data was conducted on 20th November 2014.

Five terms for the likelihood of occurrence of species are used in this table. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal study area, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- “yes” = the species was or has been observed on the site;
- “likely” = a medium to high probability that a species uses the site;
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur;
- “unlikely” = a very low to low probability that a species uses the site; and
- “no” = habitat on the site and in its vicinity is unsuitable for the species.

Flora

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	<i>Acacia bynoeana</i> is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains, and has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels (OEH 2014b).	None	Unlikely	Unlikely
<i>Acacia pubescens</i>	Downy Wattle	V	V	<i>Acacia pubescens</i> occurs on the NSW Central Coast in Western Sydney, mainly in the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. It is associated with Cumberland Plains Woodlands, Shale / Gravel Forest and Shale / Sandstone Transition Forest growing on clay soils, often with ironstone gravel (OEH 2014b).	None	No	No
<i>Asterolasia elegans</i>	<i>Asterolasia elegans</i>	E	E	<i>Asterolasia elegans</i> is restricted to a few localities on the NSW Central Coast north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs. It is found in sheltered forests on mid- to lower slopes and valleys, in or adjacent to gullies (OEH 2014b).	None	Unlikely	Unlikely
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	V	V	<i>Astrotricha crassifolia</i> occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). It	None	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
				occurs in dry sclerophyll woodland on sandstone and flowers in spring (OEH 2014b).			
<i>Baloskion longipes</i>	Dense Cord-rush	V	V	<i>Baloskion longipes</i> is has been recorded in small populations from the Kanangra-Boyd area to the Southern Tablelands, in Blue Mountains National Park, Kanangra-Boyd National Park, Penrose State Forest (in Hanging Rock Swamp), Morton National Park (The Vines), the Clyde Mountain area and Ballalaba (south of Braidwood). This species is commonly found in swamps or depressions in sandy alluvium, sometimes growing with sphagnum moss, and it also occurs in swales within tall forest, and in Black Gum (<i>Eucalyptus aggregata</i>) Woodland (OEH 2014b).	1	No	No
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E	V	<i>Caladenia tessellata</i> occurs in grassy sclerophyll woodland, often growing in well-structured clay loams or sandy soils south from Swansea, usually in sheltered moist places and in areas of increased sunlight. It flowers from September to November (OEH 2014b).	None	Unlikely	Unlikely
<i>Callistemon linearifolius</i>	Netted Bottlebrush	V	—	<i>Callistemon linearifolius</i> has been recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW, growing in dry sclerophyll forest. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River (OEH	2	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
				2014b).			
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	<i>Cryptostylis hunteriana</i> is known from a range of vegetation communities including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>). Flowers between November and February, although may not flower regularly (OEH 2014b).	1	Unlikely	Unlikely
<i>Darwinia glaucophylla</i>	<i>Darwinia glaucophylla</i>	V	—	<i>Darwinia glaucophylla</i> is found in heaths and woodlands often in association with sandstone rock platforms. Recorded between Gosford and the Hawkesbury River, occurring in sandy heath, scrub and woodlands often associated with sandstone rock platforms or near hanging swamps (OEH 2014b).	177	Potential	Unlikely
<i>Dendrobium melaleucaphilum</i>	Spider Orchid	E	—	Occurs from the lower Blue Mountains north to the Queensland border. Mostly grows on the bark of <i>Melaleuca styphelioides</i> in paperbark swamps but also occasionally on rainforest trees and rarely as a lithophyte on rocks (OEH 2014b).	None	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V	—	<i>Epacris purpurascens</i> var. <i>purpurascens</i> has been recorded between Gosford in the north to Avon Dam in the south, in a range of habitats, but most have a strong shale soil influence (OEH 2014b).	2	Unlikely	Unlikely
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	<i>Eucalyptus camfieldii</i> is associated with shallow sandy soils bordering coastal heath with other stunted or mallee eucalypts, often in areas with restricted drainage and in areas with laterite influenced soils, thought to be associated with proximity to shale (OEH 2014b).	3	Unlikely	Unlikely
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	<i>Eucalyptus glaucina</i> is restricted to the north coast of NSW, in separate districts; near Casino where it can be locally common; and farther south, from Taree to Broke, west of Maitland. The species grows in grassy woodland and dry eucalypt forest, on deep, moderately fertile and well-watered soils (OEH 2014b).	1	Unlikely	Unlikely
<i>Genoplesium baueri</i>	Bauer's Midge Orchid or Yellow Gnat-orchid	E	E	Known from coastal areas from northern Sydney south to the Nowra district. Previous records from the Hunter Valley and Nelson Bay are now thought to be erroneous. Grows in shrubby woodland in open forest on shallow sandy soils (OEH 2014b).	None	No	No
<i>Grevillea shiressii</i>	<i>Grevillea shiressii</i>	V	V	<i>Grevillea shiressii</i> occurs along creek banks in wet sclerophyll forest, on sandy soil on Hawkesbury sandstone, restricted to the Gosford area (OEH 2014b).	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square Raspwort	V	V	<i>Haloragis exalata</i> has been recorded in 4 widely scattered localities in eastern NSW; the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW; where it appears to require protected and shaded damp situations in riparian habitats (OEH 2014b).	None	No	No
<i>Hibbertia procumbens</i>	Spreading Guinea Flower	E	—	Restricted to the Central Coast of NSW in the Gosford and Wyong LGA, where it seems to be associated with <i>Banksia ericifolia</i> - <i>Angophora hispida</i> - <i>Allocasuarina distyla</i> scrub/heath on skeletal sandy soils, and may also be associated with hanging swamps (OEH 2014b).	243	No	No
<i>Leptospermum deanei</i>	<i>Leptospermum deanei</i>	V	V	<i>Leptospermum deanei</i> has been recorded in Hornsby, Warringah, Ku-ring-gai and Ryde LGAs, in woodland on lower hill slopes or near creeks, at sites with sandy alluvial soil or sand over sandstone. It has also been recorded in riparian scrub dominated by <i>Tristaniopsis laurina</i> and <i>Baeckea myrtifolia</i> ; woodland dominated by <i>Eucalyptus haemastoma</i> ; and open forest dominated by <i>Angophora costata</i> , <i>Leptospermum trinervium</i> and <i>Banksia ericifolia</i> (OEH 2014b).	None	No	No
<i>Lindsaea fraseri</i>	Fraser's Screw Fern	E	—	<i>Lindsaea fraseri</i> is known only from two areas in NSW - near Hastings Point on the Tweed coast and in the Pillar Valley east of Grafton, where it grows in poorly drained, infertile soils in swamp forest or open	1	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
				eucalypt forest, usually as part of a ferny understorey (OEH 2014b).			
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	<i>Melaleuca biconvexa</i> occurs in coastal districts and adjacent tablelands from Jervis Bay north to the Port Macquarie district. It grows in damp places often near streams (OEH 2014b).	78	Potential	Unlikely
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Found in heath on sandstone, and also associated with woodland on <i>broad</i> ridge tops and slopes on sandy loam and lateritic soils (OEH 2014b).	None	No	No
<i>Pelargonium</i> sp. Straitellum (G.W. Carr 10345)		E	—	In NSW, <i>Pelargonium</i> sp. Straitellum (G.W. Carr 10345) is known from the Southern Tablelands. Otherwise, only known from the shores of Lake Omeo near Benambra in Victoria where it grows in cracking clay soil that is probably occasionally flooded (OEH 2014b).	None	No	No
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	<i>Persoonia hirsuta</i> occurs from Singleton in the north, south to Bargo and the Blue Mountains to the west. It grows in dry sclerophyll eucalypt woodland and forest on sandstone (OEH 2014b).	1	No	No
<i>Pimelea curviflora</i> var. <i>curviflora</i>	<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	V	<i>Pimelea curviflora</i> var. <i>curviflora</i> is confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. It grows on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Associated with the Duffys Forest Community, shale lenses on ridges	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
				in Hawkesbury sandstone geology (OEH 2014b).			
<i>Prostanthera askania</i>	Tranquillity Mintbush	CE	CE	<i>Prostanthera askania</i> is endemic to the Gosford-Wyong area where it is found in moist sclerophyll forests and warm temperate rainforests and the ecotone between them (OEH 2014b).	71	Potential	Unlikely
<i>Prostanthera junonis</i>	Somersby Mintbush	E	E	Likely to be restricted to the Somersby Plateau, found on the Somersby and Sydney Town soil landscapes. Occurs predominantly in the low woodland component of the Hawkesbury Sandstone Complex dominated by <i>Eucalyptus haemastoma</i> with <i>Banksia ericifolia</i> or <i>B. serrata</i> in the understorey. Has been found in the ecotone between low woodland and open forest or the open scrub/heath components. Not found in sedgelands or <i>Allocasuarina distyla</i> open heath (OEH 2014b).	271	Unlikely	Unlikely
<i>Rhizanthella slateri</i>	<i>Rhizanthella slateri</i> in the Great Lakes local government area	E2	—	The <i>Rhizanthella slateri</i> population near Bulahdelah in the Great Lakes LGA occurs at the northern limit of the species' known range and is disjunct from other known populations. It grows in sclerophyll forest with a reasonably deep layer of organic litter (OEH 2014b).	None	No	No
<i>Streblus pendulinus</i>	<i>Siah's Backbone</i>	—	E	Siah's Backbone occurs from Cape York Peninsula to Milton, south-east NSW, as well as Norfolk Island. On the Australian mainland, Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800m above	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
				sea level. The species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest.			
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities. In the Ourimbah Creek valley, <i>S. paniculatum</i> occurs within gallery rainforest with <i>Alphitonia excelsa</i> , <i>Acmena smithii</i> , <i>Cryptocarya glaucescens</i> , <i>Toona ciliata</i> , <i>Syzygium oleosum</i> with emergent <i>Eucalyptus saligna</i> . At Wyrabalong NP, <i>S. paniculatum</i> occurs in littoral rainforest as a co-dominant with <i>Ficus fraseri</i> , <i>Syzygium oleosum</i> , <i>Acmena smithii</i> , <i>Cassine australe</i> , and <i>Endiandra sieberi</i> (OEH 2014b).	16	Potential	Unlikely
<i>Tetratheca glandulosa</i>	<i>Tetratheca glandulosa</i>	V	V	Associated with ridgetop woodland habits on yellow earths, also in sandy or rocky heath and scrub. Often associated with sandstone / shale interface where soils have a stronger clay influence. Flowers July to November (OEH 2014b).	3	No	No
<i>Tetratheca juncea</i>	Black-eyed Susan	V	V	Occurs on predominantly low nutrient soils with a dense grassy understorey of grasses although it has been recorded in heathland and moist forest. It is associated with dry open forest or woodland habitats dominated by <i>Corymbia gummifera</i> , <i>Eucalyptus capitellata</i> , <i>E. haemastoma</i> and <i>Angophora costata</i> .	1	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post survey
				<i>Themeda australis</i> is generally the dominant ground cover. <i>T. juncea</i> also displays a preference for southern aspect slopes, although is slopes with different aspects. Flowers July to December (OEH 2014b).			
<i>Thesium australe</i>	Austral Toadflax	V	V	Widespread throughout the eastern third of NSW but most common on the North Western Slopes, Northern Tablelands and North Coast. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (<i>Themeda australis</i>). The preferred soil type is a fertile loam derived from basalt although it occasionally occurs on metasediments and granite (OEH 2014b).	None	No	No

Fauna

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
Ray-finned Fish							
<i>Epinephelus daemeli</i>	Black Rockcod	—	V	The Black Rockcod is a common New South Wales species but is rarely seen due to its secretive nature usually found hiding in caves and under ledges. Found on coastal reefs, estuaries and deep offshore.	None	No	No
<i>Macquarie australasica</i>	Macquarie Perch	—	E1	Habitat for the Macquarie perch is on the bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	None	No	No
<i>Prototroctes maraena</i>	Australian Grayling	—	V	The historic distribution of the Australian Grayling included coastal streams from the Grose River southwards through NSW, Vic. and Tas. On mainland Australia, this species has been recorded from rivers flowing east and south of the main dividing ranges. This species spends only part of its life cycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops but has also been found in muddy-bottomed, heavily silted habitat. Grayling migrate between freshwater streams and the ocean.	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
Amphibia							
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest. Associated with semi-permanent to ephemeral sand or rock based streams, where the soil is soft and sandy so that burrows can be constructed (OEH 2014b).	45	Unlikely	Unlikely
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	This species has been observed utilising a variety of natural and man-made waterbodies such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water. Fast flowing streams are not utilised for breeding purposes by this species. Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading. Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes— <i>Typha</i> sp. and spikerushes— <i>Eleocharis</i> sp.) adjacent to open grassland areas for foraging are preferable. Ponds that are typically inhabited tend to be free from predatory fish such as <i>Gambusia holbrooki</i> (Mosquito Fish) (OEH 2014b).	1	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Litoria brevipalmata</i>	Green Thighed Frog	V	—	Wet sclerophyll forest along the northern coast of NSW to Ourimbah. Also in a variety of habitats including dry to wet sclerophyll forest, rainforests and shrubland with a healthy understorey. Breeding aggregations occur in still water habitats such as grassy temporary to semi-permanent ponds and flooded ditches in late spring and summer (OEH 2014b).	1	Unlikely	Unlikely
<i>Litoria littlejohni</i>	Heath Frog	V	V	It appears to be restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during. Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. It hunts either in shrubs or on the ground. Breeding is triggered by heavy rain and can occur from late winter to autumn, but is most likely to occur in spring when conditions are favourable. Males call from low vegetation close to slow flowing pools. Eggs and tadpoles are mostly found in slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools (OEH 2014b).	None	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	A variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest that are generally characterised by deep leaf litter or thick cover from understorey vegetation. Breeding habitats are streams and occasionally springs. Usually found fairly close to permanent running water. Not known from streams disturbed by humans or still water environments (OEH 2014b).	2	Unlikely	Unlikely
<i>Mixophyes iteratus</i>	Giant Barred Frog	E1	E1	Found on forested slopes of the escarpment and adjacent ranges in riparian vegetation, subtropical and dry rainforest, wet sclerophyll forests and swamp sclerophyll forest. This species is associated with flowing streams with high water quality, though habitats may contain weed species. This species is not known from riparian vegetation disturbed by humans. During breeding eggs are kicked up onto an overhanging bank or the streams edge (OEH 2014b).	1	Unlikely	Unlikely
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	—	Red-crowned Toadlets are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings on Triassic sandstones of the Sydney Basin. Within these geological formations, this species mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop, but also occurring on plateaus or more level rock platforms along the ridgetop. Associated with open forest to coastal heath. Utilises small ephemeral drainage lines which feed water from the top of the ridge to the perennial	56	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				creeks below for breeding, and are not usually found in the vicinity of permanent water. Breeding sites are often characterised by clay-derived soils and generally found below the first sandstone escarpment in the talus slope (OEH 2014b).			
Reptilia							
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	Typical sites consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin. They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer. Some of the canopy tree species found to regularly co-occur at known sites include <i>Corymbia eximia</i> , <i>C. gummifera</i> , <i>Eucalyptus sieberi</i> , <i>E. punctata</i> and <i>E. piperita</i> (OEH 2014b).	None	Unlikely	Unlikely
<i>Varanus rosenbergi</i>	Heath Monitor	V	—	Associated with Sydney sandstone woodland and heath land. Rocks, hollow logs and burrows are utilised for shelter. Terrestrial termitaria are required for reproduction (OEH 2014b).	2	Unlikely	Unlikely
Aves (Diurnal Birds)							
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E1, Mi	Mostly occur in dry box-ironbark eucalypt woodland and dry sclerophyll forest associations, wherein they prefer the most fertile sites available, e.g. along creek flats, or in broad river valleys and foothills. In NSW, riparian forests containing <i>Casuarina cunninghamiana</i> (River Oak), and	2	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				with <i>Amyema cambagei</i> (Needle-leaf Mistletoe), are also important for feeding and breeding. At times of food shortage (e.g. when flowering fails in preferred habitats), Honeyeaters also use other woodland types and wet lowland coastal forest dominated by <i>Eucalyptus robusta</i> (Swamp Mahogany) or <i>E. maculata</i> (Spotted Gum). Regent Honeyeaters sometimes occur in coastal forest, especially in stands dominated by Swamp Mahogany and Spotted Gum, but also in those with Southern Mahogany <i>E. botryoides</i> , and in those on sandstone ranges with banksias in the understorey. They have been recorded in wooded farmland and urban areas with mature eucalypts. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (OEH 2014b)			
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E1	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats. Found along the east coast and in the Murray-Darling Basin, notably in floodplain wetlands of the Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers. Reedbeds, swamps, streams, estuaries. Favours permanent shallow waters, edges of pools and waterways, with tall, dense vegetation such as sedges, rushes and reeds on muddy or peaty substrate. Also occurs in Lignum <i>Muehlenbeckia florulenta</i> and Canegrass <i>Eragrostis australasica</i> on inland wetlands (OEH 2014b).	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	—	Associated with dry open woodland with grassy areas, dune scrubs, in savanna areas, the fringes of mangroves, golf courses and open forest / farmland. Forages in areas with fallen timber, leaf litter, little undergrowth and where the grass is short and patchy. Is thought to require large tracts of habitat to support breeding, in which there is a preference for relatively undisturbed in lightly disturbed (OEH 2014b).	18	Unlikely	Unlikely
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	—	During summer in dense, tall, wet forests of mountains and gullies, alpine woodlands. In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages. They sometimes inhabit woodland, farms and suburbs in autumn/winter (OEH 2014b).	7	Unlikely	Unlikely
<i>Calyptrorhynchus lathamii</i>	Glossy Black Cockatoo	V	—	Associated with a variety of forest types containing Allocasuarina species, usually reflecting the poor nutrient status of underlying soils. Intact drier forest types with less rugged landscapes are preferred. Nests in large trees with large hollows (OEH 2014b).	48	Potential	Potential
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	—	Varied Sittellas are endemic and widespread in mainland Australia. Varied Sittellas are found in eucalypt woodlands and forests throughout their range. They prefer rough-barked trees like stringybarks and ironbarks or mature trees with hollows or dead branches (OEH 2014b).	4	Potential	Potential

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E1	Habitat is characterised by dense, low vegetation and includes sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest, as well as open woodland with a heathy understorey. In northern NSW occurs in open forest with tussocky grass understorey. Age of habitat since fires (fire-age) is of paramount importance to this species (OEH 2014b).	None	No	No
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	—	In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy (OEH 2014b).	4	Potential	Potential
<i>Haematopus longirostris</i>	Pied Oystercatcher	E1	—	Roosts and forages on sandy beaches, sand banks, mudflats and estuaries (OEH 2014b).	4	No	No
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	V	—	Open forests, riverine woodlands, scrubs and heathlands (OEH 2014b).	1	Potential due to location of previous record close to subject site	Unlikely. While there is a record within 300 m of the subject site, the species prefers more inland areas

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Hieraaetus morphnoides</i>	Little Eagle	V	—	The Little Eagle is widespread in mainland Australia, central and eastern New Guinea. The Little Eagle is seen over woodland and forested The population of Little Eagle in NSW is considered to be a single population. This species was recently listed as vulnerable due to a moderate reduction in population size based on geographic distribution and habitat quality. It tends to avoid rainforest and heavy forest (OEH 2014b).	1	Unlikely	Unlikely
<i>Ixobrychus flavicollis</i>	Black Bittern	V	—	Occurs in both terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation. In areas with permanent water it may occur in flooded grassland, forest, woodland, rainforest and mangroves (OEH 2014b)	4	No	No
<i>Lathamus discolor</i>	Swift Parrot	E	E1, Ma	Breeds in Tasmania between September and January. Feeds mostly on nectar, mainly from eucalypts, but also eats psyllid insects and lerps, seeds and fruit. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), White Box (<i>E. albens</i>) and Forest Red Gum (<i>E. tereticornis</i>). Box-ironbark habitat in drainage lines, and coastal forest in NSW is thought to provide critical food resources during periods of drought or low food abundance elsewhere (OEH 2014b).	2	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Lophoictinia isura</i>	Square-tailed Kite	V	—	In coastal areas associated tropical and temperate forests and woodlands on fertile soils with an abundance of passerine birds. May be recorded inland along timbered watercourses. In NSW it is commonly associated with ridge or gully forests dominated by Woollybutt (<i>Eucalyptus logiflora</i>), Spotted Gum (<i>E. maculata</i>), or Peppermint Gum (<i>E. elata</i> , <i>E. smithii</i>) (OEH 2014b).	2	Unlikely	Unlikely
<i>Ninox connivens</i>	Barking Owl	V	—	Associated with a variety of habitats such as savanna woodland, open eucalypt forests, wetland and riverine forest. The habitat is typically dominated by Eucalypts (often Redgum species), however often dominated by Melaleuca species in the tropics. It usually roosts in dense foliage in large trees such as River She-oak (<i>Allocasuarina cunninghamiana</i>), other Casuarina and Allocasuarina, eucalypts, Angophora, Acacia and rainforest species from streamside gallery forests. It usually nests near watercourses or wetlands in large tree hollows with entrances averaging 2-29 metres above ground, depending on the forest or woodland structure and the canopy height (OEH 2014b).	3	Unlikely	Unlikely
<i>Ninox strenua</i>	Powerful Owl	V	—	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes. Large trees with hollows at least 0.5m deep are required for shelter and breeding (OEH 2014b).	37	Potential	Potential

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Pandion cristatus</i> (<i>Pandion haliaetus</i>)	Eastern Osprey	V	Ma, Mi	Associated with waterbodies including coastal waters, inlets, lakes, estuaries, beaches, offshore islands and sometimes along inland rivers. Osprey may nest on the ground, on sea cliffs or in trees. Osprey generally prefer emergent trees, often dead or partly dead with a broken off crown (OEH 2014b).	6	Unlikely	Unlikely
<i>Petroica boodang</i>	Scarlet Robin	V	—	The Scarlet Robin is found in south-eastern and south-western Australia, as well as on Norfolk Island. In Australia, it is found south of latitude 25°S, from south-eastern Queensland along the coast of New South Wales (and inland to western slopes of Great Dividing Range) to Victoria and Tasmania, and west to Eyre Peninsula, South Australia; it is also found in south-west Western Australia. The Scarlet Robin lives in open forests and woodlands in Australia, while it prefers rainforest habitats on Norfolk Island. During winter, it will visit more open habitats such as grasslands and will be seen in farmland and urban parks and gardens at this time (OEH 2014b).	1	Unlikely	Unlikely
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	—	Open woodlands dominated by mature eucalypts with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. This species avoids very wet areas (OEH 2014b).	2	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Ptilinopus superb</i>	Superb Fruit-Dove	V	—	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January. Will feed in adjacent mangroves or eucalypt forests (OEH 2014b).	1	Potential	Unlikely
<i>Rostratula benghalensis australis</i>	Painted Snipe (Australian subspecies)	E	E, Mi, Ma	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. Breeding is often in response to local conditions; generally occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (OEH 2014b).	None	No	No
<i>Tyto novaehollandiae</i>	Masked Owl	V	—	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland and especially the ecotone between wet and dry forest, and non-forest habitat. Known to utilise forest margins and isolated stands of trees within agricultural land and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (OEH 2014b).	9	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Tyto tenebricosa</i>	Sooty Owl	V	—	Sooty Owls are associated with tall wet old growth forest on fertile soil with a dense understorey and emergent tall Eucalyptus species. Pairs roost in the daytime amongst dense vegetation, in tree hollows and sometimes in caves. The Sooty Owl is typically associated with an abundant and diverse supply of prey items and a selection of large tree hollows (OEH 2014b).	58	Potential	Potential
Mammalia - terrestrial (excluding bats)							
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	—	The Eastern Pygmy Possum occurs in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath. Pygmy-Possums feed mostly on the pollen and nectar from banksias, eucalypts and understorey plants and will also eat insects, seeds and fruit. The presence of <i>Banksia</i> sp. and <i>Leptospermum</i> sp. are an important habitat feature. Small tree hollows are favoured as day nesting sites, but nests have also been found under bark, in old bird's nests and in the branch forks of tea-trees.	12	Potential	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests, more frequently recorded near the ecotones of closed and open forest and in NSW within 200km of the coast. Preferred habitat is mature wet forest, especially in areas with rainfall 600 mm/year. Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in. Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (OEH 2014b).	45	Potential	Potential
<i>Dasyurus viverrinus</i>	Eastern Quoll	Ex	V	Associated with a variety of habitats, including dry sclerophyll forest, shrub, heath land, riparian forests and agricultural areas. Requires features such as hollow logs and rock piles for shelter (OEH 2014b).	1	No	No
<i>Petaurus australis</i>	Yellow-bellied Glider	V	—	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter. Large hollows within mature trees are required for shelter, nesting and breeding (OEH 2014b).	9	Potential	Unlikely
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	—	Associated with dry hardwood forest and woodlands. Habitats typically include gum barked and high nectar producing species, including winter flower species. The presence of hollow bearing eucalypts is a critical habitat	8	Potential	Potential

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				value (OEH 2014b).			
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices (OEH 2014b).	None	No	No
<i>Phascolarctos cinereus</i>	Koala	V	V	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70%, with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: <i>Eucalyptus tereticornis</i> , <i>E. punctata</i> , <i>E. cypellocarpa</i> , <i>E. viminalis</i> (OEH 2014b).	6	Potential	Unlikely
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Associated with dry coastal heath and dry and wet sclerophyll forests with dense cover for shelter and adjacent more open areas for foraging (OEH 2014b).	3	Potential due to location of previous record close to subject site	Potential
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V	—	In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again (OEH 2014b).	1	Unlikely	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	—	V	This species has been recorded from Queensland to Tasmania, though with a sporadic and patchy distribution. Most records are coastal. However, populations have been recently recorded up to 400km inland. The species includes heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. In coastal populations the species seems to have a preference for sandy substrates, a heathy understorey of legumes less than one metre high and sparse ground litter. This species is generally recorded in regenerating burnt areas occurs that are one or two years post fire and rehabilitated sand-mined areas that are four to five years post-mining (OEH 2014b).	None	Unlikely	Unlikely
Mammalia - terrestrial (Bats)							
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests. This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (OEH 2014b).	None	Unlikely	Unlikely
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	—	Prefers moist habitats with trees taller than 20m. Roosts in tree hollows but has also been found roosting in buildings or under loose bark (OEH 2014b).	8	Potential	Potential
<i>Miniopterus australis</i>	Little Bentwing-bat	V	—	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal	25	Potential	Potential

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				forests. This species shelter in a range of structures including culverts, drains, mines and caves. Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found. Breeding occurs in caves, usually in association with <i>M. schreibersii</i> (OEH 2014b).			
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	—	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. It forages above and below the tree canopy on small insects. Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (OEH 2014b).	20	Potential	Potential
<i>Mormopterus norfolkensis</i>	East Coast Freetail Bat	V	—	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range. Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges. Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (OEH 2014b).	10	Potential	Potential
<i>Myotis macropus</i>	Southern Myotis, Large-footed Myotis	V	—	Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water. While roosting is most commonly associated with caves,	7	Potential	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains. However the species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and culverts are used (OEH 2014b).			
<i>Pteropus poliocephalus</i>	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (OEH 2014b).	20	Potential	Potential
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	—	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range, tending to be more frequently located in more productive forests. Within denser vegetation types use is made of natural and man-made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (OEH 2014b).	4	Potential	Potential
Migratory terrestrial species							
<i>Apus pacificus</i>	Fork-tailed Swift	—	Ma, Mi	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas (OEH 2014b).	None	Potential	Unlikely
<i>Sterna albifrons</i>	Little Tern	E	Ma, Mi	Almost exclusively coastal, preferring sheltered areas, however may occur several kilometres inland in harbours, inlets and rivers. Australian birds breed on sandy	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				beaches and sand spits (OEH 2014b).			
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	—	Ma, Mi	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas. Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (OEH 2014b).	None	No	No
<i>Hirundapus caudacutus</i>	White-throated Needletail	—	Mi	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (OEH 2014b).	None	Potential	Unlikely
<i>Merops ornatus</i>	Rainbow Bee-eater	—	Ma, Mi	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May. Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs. Nest is a chamber at the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting.	None	Unlikely	Unlikely
<i>Monarcha melanopsis</i>	Black-faced Monarch	—	Mi	Rainforest and eucalypt forests, feeding in tangled understorey (OEH 2014b).	None	Potential	Unlikely

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Monarcha trivirgatus</i>	Spectacled Monarch	—	Mi	Wet forests, mangroves (OEH 2014b).	None	Potential	Unlikely
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	—	Mi	Associated with drier eucalypt forests, absent from rainforests, open forests, often at height (OEH 2014b).	None	Unlikely	Unlikely
<i>Rhipidura rufifrons</i>	Rufous Fantail	—	Mi	The Rufous Fantail is a summer breeding migrant to southeastern Australia. The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation. Open country may be used by the Rufous Fantail during migration (OEH 2014b).	None	Potential	Unlikely
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E1	E1, Mi	SEE DIURNAL BIRDS ABOVE	None	SEE DIURNAL BIRDS ABOVE	
Migratory Wetland species							
<i>Ardea alba</i>	Great Egret	—	Mi	The Great Egret is common and widespread in Australia. It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats (OEH 2014b).	None	No	No
<i>Ardea ibis</i>	Cattle Egret	—	Mi	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments. Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
				dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (OEH 2014b).			
<i>Charadrius bicinctus</i>	Double-banded Plover	—	Mi	In Australia, the Double-banded Plover is found mainly on the east coast and Tasmania and is a regular visitor to Norfolk and Lord Howe Islands. It has been recorded occasionally in Western Australia. It is widespread throughout New Zealand. The Double-banded Plover is found on coastal beaches, mudflats, sewage farms, river banks, fields, dunes, upland tussock grasses and shingle (OEH 2014b)	None	No	No
<i>Gallinago hardwickii</i>	Latham's Snipe	—	Mi	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover. Occupies a variety of vegetation around wetlands including wetland grasses and open wooded swamps (OEH 2014b).	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	—	Mi	Grey-tailed Tattlers breed in Siberia and on passage are seen along the East Asian-Australasian Flyway (the migration route to Australia). They are more commonly seen in the north of Australia. Grey-tailed Tattlers are usually seen in small flocks on sheltered coasts with reefs and rock platforms or with intertidal mudflats. They are also found in intertidal rocky, coral or stony reefs, platforms and islets that are exposed at high tide, also shores of rock, shingle, gravel and shells and on intertidal mudflats in embayments, estuaries and coastal lagoons, especially those fringed with mangroves. (OEH 2014b)	None	No	No
<i>Limosa lapponica</i>	Bar-tailed Godwit	—	Mi	Mainly coastal, usually sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats. Breeds in Northern Russia, Scandinavia, NW Alaska.	None	No	No
<i>Numenius madagascariensis</i>	Eastern Curlew	—	Mi	Intertidal coastal mudflats, coastal lagoons, sandy spits. Breeds in Russia, NE China (OEH 2014b).	None	No	No
<i>Numenius minutus</i>	Little Curlew, Little Whimbrel	—	Mi	Known to breed in Siberia, with migrants arriving after early April. Southern migration begins in September following the Chinese coast and, after a staging in Mongolia, continues to Northern Australia and New Guinea. Outside of the breeding season, the species inhabits grasslands, open plains, parklands and mud-flats of Northern Australia (OEH 2014b).	None	No	No
<i>Numenius phaeopus</i>	Whimbrel	—	Mi	Intertidal coastal mudflats, river deltas and mangroves, occasionally sandy beaches. Breeds Siberia and Alaska (OEH 2014b).	None	No	No

Scientific name	Common name	Status		Habitat associations	Local records	Likelihood of Occurrence	
		TSC Act	EPBC Act			Pre-survey	Post-survey
<i>Pluvialis fulva</i>	Pacific Golden Plover	—	Mi	Breeds North Siberia, Alaska. Mainly coastal, beaches, mudflats and sandflats and other open areas such as recreational playing fields in Australia (OEH 2014b).	None	No	No
<i>Rostratula benghalensis s. lat.</i>	Painted Snipe	—	Mi	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. Breeding is often in response to local conditions; generally occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (OEH 2014b).	None	No	No

Appendix C Flora species recorded during site inspection

Scientific name	Common name
<i>Acacia decurrens</i>	Sydney Green Wattle
<i>Acacia longifolia</i>	Sydney Golden Wattle
<i>Acacia prominens</i>	Gosford Wattle
<i>Adiantum hispidulum</i>	Rough Maidenhair
<i>Ageratina adenophora</i> *	Crofton Weed
<i>Ageratina riparia</i> *	Mist Flower
<i>Allocasuarina torulosa</i>	Forest Oak
<i>Andropogon virginicus</i> *	Whiskey Grass
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Asparagus aethiopicus</i> *	Asparagus Weed
<i>Bidens pilosa</i> *	Cobbler's Pegs
<i>Breynia oblongifolia</i>	Breynia
<i>Briza maxima</i> *	Quaking Grass
<i>Centaurium tenuiflorum</i> *	
<i>Centella asiatica</i>	
<i>Ceratopetalum gummiferum</i>	Christmas Tree Bush
<i>Chlorophytum comosum</i> *	Spider Lilly
<i>Cinnamomum camphora</i> *	Camphor Laurel
<i>Cirsium vulgare</i> *	Spear Thistle
<i>Conyza</i> sp. *	Fleabane
<i>Cortaderia</i> sp. *	Pampas Grass
<i>Coreopsis lanceolata</i> *	
<i>Cotoneaster</i> sp. *	Cotoneaster
<i>Cyclosporum leptophyllum</i>	Slender Celery
<i>Cynodon dactylon</i>	Couch
<i>Daucus glochidiatus</i>	
<i>Desmodium varians</i>	
<i>Dianella caerulea</i> var. <i>caerulea</i>	Blue Flax Lilly

Scientific name	Common name
<i>Dianella caerulea</i> var. <i>producta</i>	Blue Flax Lilly
<i>Dichondra repens</i>	Kidney Weed
<i>Doryanthes excelsa</i>	Gynea Lilly
<i>Eragrostis curvula</i> *	African Lovegrass
<i>Erigeron karvinskianus</i> *	Mexican Daisy
<i>Erodium</i> sp. *	
<i>Erythrina x sykesii</i> *	Coral Tree
<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark
<i>Eucalyptus pilularis</i>	Blackbutt
<i>Eucalyptus</i> sp. 1	Unidentified smooth-barked Eucalypt
<i>Eucalyptus</i> sp. 2	Unidentified stringy-barked Eucalypt
<i>Geitonoplesium cymosum</i>	Scrambling Lilly
<i>Glochidion ferdinandi</i>	Cheese Tree
<i>Glycine microphylla</i>	
<i>Hakea salicifolia</i>	Willow-leaved Hakea
<i>Hypochaeris radicata</i> *	Catsear
<i>Imperata cylindrica</i>	Blady Grass
Iridaceae species *	Unidentified Iris species
<i>Juncus usitatus</i>	Common Rush
<i>Lachnagrostis aemula</i>	Blowngrass
<i>Lantana camara</i> *	Lantana
<i>Ligustrum lucidum</i> *	Large-leaved Privet
<i>Ligustrum sinense</i> *	Small-leaved Privet
<i>Lomandra longifolia</i>	Mat Rush
<i>Opismenus aemulus</i>	Basket Grass
<i>Pandorea pandorana</i>	Wonga Wonga Vine
<i>Phyllanthus tenellus</i> *	
<i>Pinus</i> sp. *	Pine Tree
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Plantago lanceolata</i> *	Lamb's Tongues
<i>Polygala myrtifolia</i> *	Myrtle-leaf Milkwort
<i>Polyscias sambucifolia</i>	Elderberry Panax

Scientific name	Common name
<i>Pratia purpurascens</i>	Whiteroot
<i>Pteridium esculentum</i>	Bracken
<i>Pyracantha</i> sp. *	Orange Thorn
<i>Rubus fruticosus</i> *	Blackberry
<i>Rytidosperma longifolia</i>	Long-leaved Wallaby Grass
<i>Setaria</i> sp. *	
<i>Themeda australis</i>	Kangaroo Grass
<i>Verbena bonariensis</i> *	Purpletop

* Denotes introduced species

Appendix D Fauna species recorded during site inspection

Scientific name	Common name
Birds	
<i>Acanthiza</i> sp.	Thornbills
<i>Alectura lathamii</i>	Australian Brush Turkey
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
<i>Corvus coronoides</i>	Australian Raven
<i>Manorina melanophrys</i>	Bell Minor
<i>Meliphaga lewinii</i>	Lewin's Honeyeater
<i>Pardalotus punctatus</i>	Spotted Pardalote
<i>Psophodes olivaceus</i>	Eastern Whipbird
<i>Strepera graculina</i>	Pied Currawong
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
Mammals	
<i>Macropus</i> sp.	Kangaroo/wallaby species
Reptiles	
<i>Eulamprus quoyii</i> /Egernia major??	Eastern Water-skink/Land Mullet??
<i>Lampropholis delicata</i>	Garden Sun-skink

Appendix E Assessments of Significance

EP&A Act Assessment of Significance (7-Part Test)

The Assessment of Significance (7-part test) is applied to species, populations and ecological communities listed on Schedules 1, 1A and 2 of the TSC Act and Schedules 4, 4A and 5 of the *Fisheries Management Act 1994*. The assessment sets out 7 factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). All factors must be considered and an overall conclusion made based on all factors in combination. An SIS is required if, through application of the 7-part test, an action is considered likely to have a significant impact on a threatened species, population or ecological community.

Threatened species, populations and ecological communities to be assessed under the EP&A Act, which have potential to occur within the subject site are:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo);
- *Daphoenositta chrysoptera* (Varied Sittella);
- *Glossopsitta pusilla* (Little Lorikeet);
- *Ninox strenua* (Powerful Owl);
- *Tyto tenebricosa* (Sooty Owl);
- *Dasyurus maculatus* (Spotted-tailed Quoll);
- *Petaurus norfolcensis* (Squirrel Glider);
- *Potorous tridactylus* (Long-nosed Potoroo);
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Miniopterus australis* (Little Bentwing-bat);
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat);
- *Mormopterus norfolkensis* (East Coast Freetail Bat);
- *Pteropus poliocephalus* (Grey-headed Flying-fox); and
- *Scoteanax rueppellii* (Greater Broad-nosed Bat).

The likelihood table (**Appendix B**) reflects a precautionary approach in identifying species that may occasionally utilise the subject site. However, for the purposes of the application of 7-part tests and based on the current footprint, only those species or their habitats that may be directly or indirectly impacted have been considered.

Due to similar habitat requirements and foraging resources, some species have been assessed in groups, with specific information for individual species highlighted where relevant. The species assessed in groups are:

- Forest owls (Powerful Owl and Sooty Owl);
- Primarily tree-roosting microbats (Eastern False Pipistrelle, East Coast Freetail Bat, and Greater Broad-nosed Bat); and
- Cave-roosting microbats (Little Bentwing-bat and Eastern Bentwing-bat).

Glossy Black Cockatoo

Glossy Black Cockatoo is listed as a vulnerable species under Schedule 2 of the TSC Act. It inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of She-oak species, particularly *Allocasuarina littoralis* (Black She-oak), *A. torulosa* (Forest She-oak) or Drooping *A. verticillata* (She-oak), occur. It feeds almost exclusively on the seeds of several species of *Casuarina* and *Allocasuarina* species (She-Oak), shredding the cones with its bill. The species is dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August.

Glossy Black Cockatoo is threatened by a number of processes including habitat clearing and fragmentation, loss of mature hollow bearing trees, inappropriate fire regimes which reduce its range and remove nesting and feeding resources, and illegal bird smuggling and egg-collecting.

Glossy Black Cockatoo was not recorded during the surveys, although there are 48 records within a 5 km radius of the subject site, and potential foraging habitat (*Allocasuarina torulosa*) was present in the subject site. There is potential that the subject site is used occasionally by this species to forage, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Factors likely to have an adverse effect on the life cycle of Glossy Black Cockatoo would include a substantial loss and/or fragmentation of foraging habitat, loss or degradation of suitable nesting and roosting habitat, and increases to the mortality rate of the species.

Suitable nesting habitat did not occur on site.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* which represents potential foraging habitat for Glossy Black Cockatoo.

The removal of a small number of *A. torulosa* trees is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. The impact area is contiguous with native vegetation, some of which is also likely to contain suitable foraging resources. Rumbalara Reserve is 53 ha alone and is contiguous with Katandra Reserve (232 ha). The amount of Narrabeen Coastal Blackbutt Forest (supporting *A. torulosa*) in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). The species is likely to use the subject site on an occasional basis as it is locally nomadic and would not be dependent on the foraging resources within the subject site. There are extensive areas of foraging habitat present for this species throughout the locality and LGA that the species would use. Closer to the subject site, foraging habitat is present in the adjacent Rumbalara Reserve. Impacts to Glossy Black Cockatoo habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Further, it is unlikely that the proposal would result in increases in mortality rates or contribute to inappropriate fire regimes that would impact on Glossy Black Cockatoo and its habitat and therefore the life cycle of the species.

However it is possible that the proposal could degrade adjacent habitat (e.g. through noise and light) to an extent that would impact on Glossy Black Cockatoo and its life cycle, if disturbances occurred during the species' breeding season. Glossy Black Cockatoo is likely to be susceptible to disturbance when nesting (primarily March to May). Forests NSW recognises this and has a number of general prescriptions to avoid impacts on Glossy Black-cockatoo nests including establishing exclusion zones of 200 m around known nest sites, with 300 m established during the breeding season. To avoid impacts of habitat degradation impacting on Glossy Black Cockatoo and its life cycle, construction works (which are temporary and short-term) would need to occur outside the species' breeding season. Alternatively, surveys could be undertaken to establish that no nests are present within 300 m of the subject site. If not within this distance, Glossy Black Cockatoo would be unlikely to be impacted.

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

Not applicable. Glossy Black Cockatoo is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable. Glossy Black Cockatoo is not an endangered ecological community.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* and mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*. *A. torulosa* is a preferred feed tree for Glossy Black Cockatoo and represents potential foraging habitat. The *Eucalyptus* and *Angophora* species in the subject site do not currently represent nesting and roosting habitat, but could potentially be nesting and roosting habitat in the future as individuals mature further and potentially form hollows.

The proposed loss of potential foraging habitat is minimal when considered in the context of the species' use of the subject site, mobility, small amount of habitat impacted, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis as it is locally nomadic and would not be dependent on the foraging resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest supporting foraging habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS

mapping). In the immediate vicinity of the subject site, foraging and breeding habitat will be retained in the adjacent Rumbalara Reserve and nearby Katandra Reserve which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Rumbalara Reserve is 53 ha alone and Katandra Reserve is 232 ha. Impacts to Glossy Black Cockatoo foraging and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Glossy Black Cockatoo is a highly mobile species that is locally nomadic and forages widely; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Glossy Black Cockatoo habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. The response of Glossy Black Cockatoo to noise and light disturbance is unclear. However, records of the species near urban areas indicate that individuals do not avoid these areas. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Glossy Black Cockatoo in the subject site is unlikely to be important to the species given no potential breeding habitat would be impacted and the availability of large areas of potential foraging habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan or threat abatement plan of relevance has been prepared for Glossy Black Cockatoo. Glossy Black Cockatoo has been assigned to the site-managed species stream under the Saving Our Species program of OEH. The active key management site assigned for Glossy Black Cockatoo lies in the Central West of NSW; it is not in the vicinity of the subject site.

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

Two key threatening process is relevant to this proposal with respect to Glossy Black Cockatoo: clearing of native vegetation, and loss of hollow-bearing trees. Whilst the proposal would increase the impact of these key threatening processes, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging habitat would be removed. The proposal would not result in the loss of any hollow-bearing trees suitable for the species.

Conclusion

Provided that surveys demonstrated that no nests of the species were present within 300 m of the subject site, or construction activities creating noise disturbance occurred outside Glossy Black Cockatoo's breeding season (March to May), the proposal is considered unlikely to have a significant impact on Glossy Black Cockatoo given that the proposed works:

- Would remove only a small area of potential foraging habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would not remove of any hollow-bearing trees representing nesting and roosting habitat;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction; and
- Would not isolate or fragment any currently connecting areas of habitat particularly given this species is locally nomadic and highly mobile.

Consequently, a SIS is not required for the proposal with respect to this species.

Varied Sittella

Varied Sittella is listed as a vulnerable species under Schedule 2 of the TSC Act. It is a small, short-tailed bird (10-11 cm long), that has a widespread range across mainland Australia, excluding some areas of the arid interior (Nullabor, Pilbara and Simpson Desert). The species inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. Varied Sittella feeds on arthropods gleaned from crevices in rough bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. The species builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and individuals often re-use the same fork or tree in successive years.

The species is threatened by habitat loss and the dominance of Noisy Minors in woodland patches. Threats also include habitat degradation through small-scale clearing for fencelines and road verges, rural tree decline, loss of paddock trees and connectivity, 'tidying up' on farms, and firewood collection.

Varied Sittella was not recorded during the surveys, although there are four records within a 5 km radius of the subject site, and potential foraging and breeding habitat in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Impacts likely to have an adverse effect on the life cycle of Varied Sittella would include impacts which resulted in the loss, degradation, or fragmentation of significant areas of forest and woodland habitat.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus* and *Angophora* species, including rough-barked species, and *Acacia* species. These represent potential foraging and breeding habitat for Varied Sittella.

The removal of *Eucalyptus*, *Angophora* and *Acacia* species is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. The impact area is contiguous with native vegetation, some of which is also likely to contain suitable foraging and breeding resources. Rumbalara Reserve is 53 ha alone and is contiguous with Katandra Reserve (232 ha). The amount of Narrabeen Coastal Blackbutt Forest supporting habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). Also, the species is likely to use the subject site on an occasional basis and would not be dependent on the foraging and breeding resources within the subject site. The removal of habitat would not significantly fragment Varied Sittella habitat.

There are extensive areas of foraging and breeding habitat present for this species throughout the locality and LGA. Closer to the subject site, foraging and breeding habitat is present in the adjacent Rumbalara Reserve. Impacts to Varied Sittella habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

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

Varied Sittella is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Varied Sittella is not an endangered ecological community.

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

- (i) The extent to which habitat is likely to be remove or modified as a result of the action proposed, and**

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus*, *Angophora*, and *Acacia* species, which represent potential foraging and breeding habitat.

The proposed loss of potential foraging habitat is minimal when considered in the context of the species' use of the subject site, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis and would not be dependent on the foraging and breeding resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging and breeding habitat will be retained in the adjacent Rumbalara Reserve and nearby Katandra Reserve which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Rumbalara Reserve is 53 ha alone and Katandra Reserve is 232 ha. Impacts to Varied Sittella foraging and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Varied Sittella does not move large

distances as it is sedentary but individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Varied Sittella habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. The response of Varied Sittella to noise and light disturbance is unclear. However, records of the species near urban areas indicate that individuals do not avoid these areas. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Varied Sittella in the subject site is unlikely to be important to the species given the availability of large areas of potential foraging and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan or threat abatement plan of relevance to Varied Sittella has been prepared.

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

One key threatening process is relevant to this proposal with respect to Varied Sittella: clearing of native vegetation. Whilst the proposal would increase the impact of this key threatening process, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging and breeding habitat would be removed.

Conclusion

The proposal is unlikely to have a significant impact on Varied Sittella given that the proposed works:

- Would remove only a small area of potential foraging and breeding habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to this species.

Little Lorikeet

Little Lorikeet is listed as a vulnerable species under Schedule 2 of the TSC Act. It is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. The species feeds mostly on nectar and pollen and forage primarily on Eucalypts in open woodland but also utilise other trees such as *Angophora* and *Melaleuca*.

The species is threatened by the extensive clearing of woodlands for agriculture, the loss of hollow-bearing trees, and competition with the introduced *Apis mellifera* (Honeybee).

Little Lorikeet was not recorded during the surveys, although there are four records within a 5 km radius of the subject site, and potential foraging and breeding habitat in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Impacts likely to have an adverse effect on the life cycle of Little Lorikeet would include impacts which resulted in the loss of significant areas of forest and woodland habitat, and the loss of hollow-bearing trees.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina*, and *Acacia* species. These represent potential foraging habitat for Little Lorikeet. No potential hollows were observed during survey, but if present, Eucalypts could contain potential breeding habitat.

The removal of mature *Eucalyptus*, *Angophora*, *Allocasuarina*, and *Acacia* species is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. The impact area is contiguous with native vegetation, some of which is also likely to contain suitable foraging and breeding resources. Rumbalara Reserve is 53 ha alone and is contiguous with Katandra Reserve (232 ha). The amount of Narrabeen Coastal Blackbutt Forest supporting habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). While there is potential for nesting habitat to be present in the subject site (small hollows potentially present in the broken-off branches of *Eucalyptus pilularis*; Little Lorikeet use hollows that are 3 cm in diameter), the number of these that would be lost, if present, would be low. Also, the species is likely to use the subject site on an occasional basis as it is locally nomadic and would not be dependent on the foraging and breeding resources within the subject site. The removal of habitat would not significantly fragment Little Lorikeet habitat.

There are extensive areas of foraging and breeding habitat present for this species throughout the locality and LGA. Closer to the subject site, foraging and breeding habitat is present in the adjacent Rumbalara Reserve. Impacts to Little Lorikeet habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site

Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

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

Little Lorikeet is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Little Lorikeet is not an endangered ecological community.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that will be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina* and *Acacia* species, which represent potential foraging and breeding habitat (no breeding habitat was observed but there are potential hollows present in the broken-off branches of *Eucalyptus pilularis*).

The proposed loss of potential foraging and breeding habitat is minimal when considered in the context of the species' use of the subject site, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis as it is locally nomadic and would not be dependent on the foraging and breeding resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that will be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging and breeding habitat will be retained in the adjacent Rumbalara Reserve and nearby Katandra Reserve which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Rumbalara Reserve is 53 ha and Katandra Reserve is 232 ha. Impacts to Little Lorikeet foraging and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Little Lorikeet is highly mobile and locally nomadic; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Little Lorikeet habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. The response of Little Lorikeet to noise and light disturbance is unclear. However, records of the species near urban areas indicate that individuals do not avoid these areas. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Little Lorikeet in the subject site is unlikely to be important to the species given the availability of large areas of potential foraging and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan or threat abatement plan of relevance to Little Lorikeet has been prepared.

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

Two key threatening processes are relevant to this proposal with respect to Little Lorikeet: clearing of native vegetation, and loss of hollow-bearing trees. Whilst the proposal would increase the impact of these key threatening processes, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging habitat would be removed. Hollows may not be present in the ends of *Eucalyptus pilularis* branches but had the potential to be; they were not observed during survey.

Conclusion

The proposal is unlikely to have a significant impact on Little Lorikeet given that the proposed works:

- Would remove only a small area of potential foraging and breeding habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental

Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;

- Would result in only temporary and short-term noise disturbance from construction; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to this species.

Forest Owls (Powerful Owl and Sooty Owl)

Powerful Owl

Powerful Owl is listed as a vulnerable species under Schedule 2 of the TSC Act. It is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria and occurs at low densities. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains.

Powerful Owl occurs primarily in densely vegetated gullies of open and tall open forest, but it is also found in a wider range of habitats, including forests and woodlands within the metropolitan regions of cities. However, optimal habitat requires large tracts of forest or woodland habitat, including a tall shrub layer and abundant hollows supporting high densities of arboreal marsupial prey species.

This species roosts in dense mid-canopy trees (such as *Syncarpia glomulifera* (Turpentine), She-oaks and rainforest trees), or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines. Nesting occurs from late autumn to mid-winter in large hollows (greater than 45 cm wide and greater than 100 cm deep) in eucalypts in unlogged, unburnt gullies and lower slopes within 100 m of streams or minor drainage lines. Nest trees are typically emergent trees, and are often the largest and oldest in a stand. Powerful Owls are faithful to traditional nesting hollows but can also use other hollows within the nesting gully.

Pairs of birds occupy large home ranges (300-1500 ha), utilising various portions of this area at different times, depending on the local abundance of arboreal mammals as a food source. Powerful Owls prey particularly on the Greater Glider and Ringtail Possum although the relative importance of prey items appears to vary regionally, with other prey such as *Petaurus breviceps* (Sugar Glider), *Trichosurus vulpecula* (Brushtail Possum), *Pteropus poliocephalus* (Grey-headed Flying-fox), insects and birds also used.

This species is threatened by a number of processes including loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development, which also affects the populations of arboreal prey species. Other threats include loss of hollow-bearing trees suitable for nesting, disturbance around nest sites (particularly during pre-laying, laying and downy chick stages), high frequency hazard reduction burning (affecting prey availability), secondary poisoning, road kills, and predation of fledglings by foxes, dogs and cats.

Powerful Owl was not recorded during the surveys, although there are 37 records within a 5 km radius of the subject site, and potential foraging and roosting habitat in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

Sooty Owl

Sooty Owl is listed as vulnerable under Schedule 2 of the TSC Act. It occurs primarily in densely vegetated east and southeast facing mountain gullies of open and tall wet forest and rainforests of the escarpment and coastal areas. This species is strongly associated with sheltered gullies, especially where there is a tall, dense understorey. Sooty Owls roost during the day in sheltered, dense vegetation (such as sub-canopy rainforest trees), in tree hollows or caves, cliff ledges and rock overhangs. Nest sites are usually hollows in live and old, eucalypt or rainforest species within 100 m of streams, but can be in caves. Hollows are in trees of at least 120 cm diameter at breast height, and are greater than 40 cm wide and 100 cm deep. Owls are faithful to traditional nesting hollows.

Sooty Owl home ranges are estimated to be from 200-800 ha according to habitat productivity. This species is a generalist predator of arboreal, and small terrestrial mammals such as the Ringtail Possum, Sugar Glider, Bush Rat and Brown Antechinus.

This species is threatened by a number of processes including loss of mature hollow-bearing trees, changes to forest and woodland structure, clearing of habitat for grazing, agriculture, forestry or other development and secondary poisoning. A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open grassy forests.

Sooty Owl was not recorded during the surveys, although there are 58 records within a 5 km radius of the subject site, and potential foraging and roosting habitat in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Factors likely to have an adverse effect on the life cycle of Powerful Owl and Sooty Owl would include a substantial loss and/or fragmentation of foraging habitat, loss or degradation of suitable nesting and roosting habitat, and increases to the mortality rate of the species. The life cycle of Sooty Owl would also be affected by regular burning of habitat.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* and mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*. These trees support prey species of Powerful Owl and Sooty Owl and so represent potential foraging habitat for the species. *Allocasuarina torulosa* represents potential (but marginal) roosting habitat for Powerful Owl. The *Eucalyptus* and *Angophora* trees in the subject site did not have large hollows suitable for the species. Thus there is no breeding habitat in the subject site.

The removal of trees is unlikely to have a significant impact on life cycle of these species such that viable local populations of the species would be placed at risk of extinction. There was no breeding habitat in the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). Both species of owl are likely to use the subject site on an occasional basis and would not be dependent on the foraging resources within the subject site. There are extensive areas of foraging and roosting habitat present for these species throughout the locality and LGA that the species would use. Closer to the subject site, foraging and roosting habitat is present in the adjacent Rumbalara Reserve. Rumbalara Reserve is 53 ha and Katandra Reserve is 232 ha. Impacts to owl habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

It is unlikely that the proposal would result in increases in mortality rates or contribute to inappropriate fire regimes that would impact on the owls and their habitat and therefore the life cycle of the species.

However it is possible that the proposal could degrade adjacent habitat (e.g. through noise and light) to an extent that would impact on Powerful Owl or Sooty Owl and their life cycles, if disturbances occurred during the species' breeding season. Powerful Owl is susceptible to disturbance when nesting, particularly during pre-laying, laying and downy chick stages (around April to July). Sooty Owl is likely to be susceptible also (the breeding season for Sooty Owl is unpredictable but peaks in autumn-winter i.e. April through to July, as well as early spring, around September and October). To avoid impacts of habitat degradation impacting on Powerful Owl and Sooty Owl and their life cycles, construction works (which are temporary and short-term) would need to occur outside the species' breeding season (or peak season in the case of Sooty Owl). Alternatively, surveys could be undertaken to establish that no suitable hollows are present in the vicinity of the subject site e.g. within 300 m. If not within this distance, Powerful Owl and Sooty Owl would be unlikely to be impacted.

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

Not applicable. Powerful Owl and Sooty Owl are not endangered populations.

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

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

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

Not applicable. Powerful Owl and Sooty Owl are not endangered ecological communities.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* and mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*. These trees support prey species of Powerful Owl and Sooty Owl and so represent potential foraging habitat for the species. *Allocasuarina torulosa* represents potential (but marginal) roosting habitat for Powerful Owl. The *Eucalyptus* and *Angophora* trees in the subject site did not have large hollows suitable for the species. Thus there is no breeding habitat in the subject site.

The proposed loss of potential foraging habitat is minimal when considered in the context of the species' use of the subject site, mobility, small amount of habitat impacted, and the large areas of habitat in the surrounding landscape. The species are likely to use the subject site on an occasional basis and would not be dependent on the foraging resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest supporting foraging habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging, roosting and breeding habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to Powerful Owl and Sooty Owl

foraging, roosting and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging, roosting and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Powerful Owl and Sooty Owl are highly mobile species that forage widely; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Powerful Owl and Sooty Owl habitat could be fragmented by the proposal due to these species avoiding areas of habitat degraded by noise and light disturbance. The response of Powerful Owl and Sooty Owl to noise and light disturbance is unclear. However, records of the species near urban areas indicate that individuals do not avoid these areas. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase during the day when the species is resting/less active. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Powerful Owl and Sooty Owl in the subject site is unlikely to be important to the species given no potential breeding habitat would be impacted and the availability of large areas of potential foraging habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for these species.

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

A recovery plan for the Large Forest Owls including Powerful and Sooty Owl was produced by the former Department of Environment and Conservation in 2006 with the following objectives or actions:

- Model and map owl habitat and validate with surveys;
- Monitor owl population parameters;
- Audit forestry prescriptions;
- Manage and protect habitat off reserves and state forests;
- Undertake research;

- Increase community awareness and involvement in owl conservation; and
- Provide organisational support and integration.

The proposed development would reduce a small area of potential foraging habitat which is inconsistent with the fourth objective. This objective expands to state that impacts on large forest owls and their habitats should be adequately assessed during the environmental assessment process, and that loss and fragmentation of significant owl habitat should be minimised and this habitat should be better protected and managed.

The area of habitat being removed is relatively small and as such it is expected that Powerful Owl and Sooty Owl would not be reliant on this habitat for survival, especially in the context of the significant area of undisturbed vegetation within the locality. The proposal would not result in the fragmentation of habitat.

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

Two key threatening processes are relevant to this proposal with respect to Powerful Owl and Sooty Owl: clearing of native vegetation, and loss of hollow-bearing trees. Whilst the proposal would increase the impact of this key threatening process, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging habitat would be removed. The proposal would not result in the loss of any hollow-bearing trees suitable for the two owl species.

Conclusion

Provided that surveys demonstrated that no breeding hollows of the species were present in the vicinity of the subject site e.g. within 300 m, or construction activities creating noise disturbance occurred outside the breeding season of Powerful Owl (around April to July) and Sooty Owl (peak season April through to July), the proposal is considered unlikely to have a significant impact on Powerful Owl and Sooty Owl given that the proposed works:

- Would remove only a small area of potential foraging habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would not impact on potential roosting habitat;
- Would not remove any hollow-bearing trees representing nesting/roosting habitat;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during daytime hours; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to these species.

Spotted-tailed Quoll

Spotted-tailed Quoll is listed under the TSC Act and the EPBC Act. It is a medium-sized marsupial carnivore with dark brown fur and white spots which are present on the body and tail. It occupies a range of environments within a disjunct distribution along the east coast of Australia, extending from south-eastern Queensland through NSW and Victoria to Tasmania.

This species is found in a variety of habitats, including sclerophyll forest and woodlands, coastal heathlands and rainforests. Occasional sightings are made in open country, grazing lands, rocky outcrops and other treeless areas. Preferred habitat is mature wet forest, especially in areas with rainfall 600 mm/year.

This species feeds on a wide variety of birds, reptiles, mammals and invertebrates and uses several 'latrines' within its territory for defecation. It is essentially terrestrial, but is also an agile climber. Nesting occurs in rock shelters, hollow logs, caves or tree hollows and they use numerous dens within the home range. Estimates of home ranges vary from 800 ha to 20 km². It is a highly mobile species and there are numerous records of overnight movements of several kilometers.

Spotted-tailed Quoll is threatened by a number of processes including fragmentation and degradation of habitat through clearing of native vegetation, logging and frequent fire. The loss of large hollow logs and other potential den sites is a major threat, as well as competition for food and predation by foxes and cats.

Spotted-tailed Quoll was not recorded during the surveys, although there are 45 records within a 5 km radius of the subject site, and potential foraging and sheltering habitat was present in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Factors likely to have an adverse effect on the life cycle of Spotted-tailed Quoll would include a substantial loss, fragmentation, or degradation of habitat, frequent fire, increases in competition for food resources, and increases to the mortality rate of the species.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* and mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*. Vegetation supports prey species and comprises sheltering habitat for Spotted-tailed Quoll, along with logs and rock piles (which also comprise potential breeding habitat). Therefore, vegetation and other elements to be removed represent potential foraging, sheltering and breeding habitat for Spotted-tailed Quoll.

The removal of potential foraging, sheltering and breeding habitat is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). The species is likely to use the subject site on an occasional basis and would not be dependent on the foraging, sheltering, and breeding resources within the subject site. There are extensive areas of foraging, sheltering, and breeding habitat present for this species throughout the locality and LGA that

the species would use. Closer to the subject site, foraging, sheltering, and breeding habitat is present in the adjacent Rumbalara Reserve. Rumbalara Reserve is 53 ha and is contiguous with Katandra Reserve (232 ha). Impacts to Spotted-tailed Quoll habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

It is unlikely that the proposal would result in increases in competition for food resources, increases in mortality rates, or contribute to frequent fire that would impact on Spotted-tailed Quoll and its habitat and therefore the life cycle of the species.

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

Not applicable. Spotted-tailed Quoll is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable. Spotted-tailed Quoll is not an endangered ecological community.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* and mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*. Vegetation supports prey species and comprises sheltering habitat for Spotted-tailed Quoll, along with logs and rock piles (which also comprise potential breeding habitat). Therefore, vegetation and other elements to be removed represent potential foraging, sheltering, and breeding habitat for Spotted-tailed Quoll.

The proposed loss of potential foraging, sheltering, and breeding habitat is minimal when considered in the context of the species' use of the subject site, mobility, small amount of habitat impacted, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis and would not be dependent on the resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest supporting foraging, sheltering, and breeding habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging, sheltering and breeding habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to Spotted-tailed

Quoll foraging, sheltering and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging, sheltering, and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Spotted-tailed Quoll is a highly mobile species able to move several kilometers in one night and forages widely; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Spotted-tailed Quoll habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. The response of Spotted-tailed Quoll to noise and light disturbance is unclear. However, records of the species near urban areas indicate that individuals do not avoid these areas. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase during the day when the species is resting/less active. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Spotted-tailed Quoll in the subject site is unlikely to be important to the species given the potential breeding habitat in the subject site is marginal, and the availability of large areas of potential foraging, sheltering and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan or threat abatement plan of relevance has been prepared for Spotted-tailed Quoll.

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

Two key threatening process is relevant to this proposal with respect to Spotted-tailed Quoll: clearing of native vegetation, and loss of hollow-bearing trees. Whilst the proposal would increase the impact of

these key threatening processes, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging, sheltering, and breeding habitat would be removed. The proposal would not result in the loss of any hollow-bearing trees suitable for the species.

Conclusion

The proposal is unlikely to have a significant impact on Spotted-tailed Quoll given that the proposed works:

- Would remove only a small area of potential foraging, sheltering and breeding habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would not remove any hollow-bearing trees representing sheltering and breeding habitat;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during day time hours; and
- Would not isolate or fragment any currently connecting areas of habitat particularly given this species is highly mobile.

Consequently, a SIS is not required for the proposal with respect to this species.

Squirrel Glider

Squirrel Glider is a vulnerable species listed under the TSC Act. It is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland, where it occurs in dry sclerophyll forest and woodland. Suitable habitat for this species requires abundant hollow-bearing trees and a mix of eucalypts including some smooth barked and winter flowering species.

Squirrel Glider is nocturnal and dependent upon hollows for shelter. It feeds on nectar, pollen, flowers, acacia gum and insects, but may also eat sap from feeding scars from other species of Glider.

This species is threatened by a number of processes including the loss and fragmentation of habitat through clearing, loss of hollow-bearing trees, depletion of food resources by inappropriate fire regimes and predation by foxes and cats.

Squirrel Glider was not recorded during the surveys, although there are eight records within a 5 km radius of the subject site, and potential foraging habitat in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Impacts likely to have an adverse effect on the life cycle of Squirrel Glider would include impacts which resulted in the loss of significant areas of forest and woodland habitat, the loss of hollow-bearing trees, inappropriate fire regimes, and increases in predation from foxes and cats.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus*, *Angophora*, and *Acacia* species. These represent potential foraging habitat for Squirrel Glider.

The removal of mature *Eucalyptus*, *Angophora*, and *Acacia* species is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. There was no breeding habitat in the subject site. The amount of Narrabeen Coastal Blackbutt Forest supporting habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). Also, the species is likely to use the subject site on an occasional basis and would not be dependent on the foraging resources within the subject site. The removal of habitat would not significantly fragment Squirrel Glider habitat.

There are extensive areas of foraging and breeding habitat present for this species throughout the locality and LGA. Closer to the subject site, foraging and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to Squirrel Glider habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

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

Squirrel Glider is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Squirrel Glider is not an endangered ecological community.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that will be lost includes mature *Eucalyptus*, *Angophora*, and *Acacia* species, which represent potential foraging habitat. No potential breeding habitat will be removed.

The proposed loss of potential foraging habitat is minimal when considered in the context of the species' use of the subject site, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis and would not be dependent on the foraging resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that will be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging and breeding habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to Squirrel Glider foraging and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity.

Also, the subject site is approximately 135 m long and 35 m wide. Squirrel Glider is relatively mobile; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Squirrel Glider habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. The response of Squirrel Glider to noise and light disturbance is unclear. However, noise impacts would be temporary and short-term, occurring mostly during the construction phase during the day when the species is resting/less active. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Squirrel Glider in the subject site is unlikely to be important to the species given the availability of large areas of potential foraging and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan or threat abatement plan of relevance to Squirrel Glider has been prepared.

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

Two key threatening processes are relevant to this proposal with respect to Squirrel Glider: clearing of native vegetation, and loss of hollow-bearing trees. Whilst the proposal would increase the impact of these key threatening processes, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging habitat will be removed. No hollows suitable for Squirrel Glider will be impacted.

Conclusion

The proposal is unlikely to have a significant impact on Squirrel Glider given that the proposed works:

- Would remove only a small area of potential foraging habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would not impact on any sheltering/breeding habitat (large hollows);
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during daytime hours; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to this species.

Long-nosed Potoroo

Long-nosed Potoroo is a vulnerable species listed under the TSC Act and EPBC Act. It is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and wet sclerophyll forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.

The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of Long-nosed Potoroo. The species also eats roots, tubers, insects and their larvae and other soft-bodied animals in the soil. It often digs small holes in the ground in a similar way to bandicoots. The species is mainly nocturnal, hiding by day in dense vegetation; however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2 and 5 ha. Breeding peaks typically occur in late winter to early summer and a single young is born per litter. Adults are capable of two reproductive bouts per year.

The species is threatened by a number of processes including the loss and fragmentation of habitat through clearing, logging and too frequent fire that reduce the availability and abundance of food resources, predation by foxes, dogs and cats.

Long-nosed Potoroo was not recorded during the surveys, although there are three records within a 5 km radius of the subject site, with one record within 300 m, and potential foraging habitat in the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Factors likely to have an adverse effect on the life cycle of Long-nosed Potoroo would include a substantial loss, fragmentation, or degradation of habitat, logging and frequent fire, and increases to the mortality rate of the species from increased predation.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*, as well as understorey vegetation. The vegetation and soil in the subject site supports the fruit-bodies of hypogeous fungi, as well as roots, tubers, insects and their larvae and other soft-bodied animals and comprises foraging habitat for Long-nosed Potoroo.

The removal of potential foraging habitat is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). The species is likely to use the subject site on an occasional basis as the understorey is not dense and does not contain the species the Long-nosed Potoroo is associated with; the species would not be dependent on the foraging resources within the subject site and foraging resources are likely to be marginal. There are extensive areas of foraging, sheltering, and breeding habitat present for this species throughout the locality and LGA that the species would use. Closer to the subject site, foraging, sheltering, and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with

Katandra Reserve (232 ha). Impacts to Long-nosed Potoroo habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

It is unlikely that the proposal would result in increases in mortality rates, or contribute to logging or frequent fire that would impact on Long-nosed Potoroo and its habitat and therefore the life cycle of the species.

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

Not applicable. Long-nosed Potoroo is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable. Long-nosed Potoroo is not an endangered ecological community.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*, as well as understorey vegetation. The vegetation and soil in the subject site supports the fruit-bodies of hypogeous fungi, as well as roots, tubers, insects and their larvae and other soft-bodied animals and comprises foraging habitat for Long-nosed Potoroo.

The proposed loss of potential foraging habitat is minimal when considered in the context of the species' use of the subject site, mobility, small amount of habitat impacted, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis and would not be dependent on the resources within the subject site. The understorey is not dense and does not contain the species the Long-nosed Potoroo is associated with; foraging resources are likely to be marginal. The amount of Narrabeen Coastal Blackbutt Forest supporting foraging habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging, sheltering and breeding habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to Long-nosed Potoroo foraging, sheltering and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site

Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging, sheltering, and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Long-nosed Potoroo would be able to traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Long-nosed Potoroo habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. The response of Long-nosed Potoroo to noise and light disturbance is unclear. However, noise impacts would be temporary and short-term, occurring mostly during the construction phase during the day when the species is resting/less active. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Long-nosed Potoroo in the subject site is unlikely to be important to the species given there is no breeding habitat in the subject site, foraging habitat is marginal, and the availability of large areas of potential foraging, sheltering and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan or threat abatement plan of relevance has been prepared for Long-nosed Potoroo. Long-nosed Potoroo has been assigned to the site-managed species stream under the Saving Our Species program of OEH. There are a number of active key management sites proposed for Long-nosed Potoroo. The closest is in the Dungog/Singleton LGA; it is not in the vicinity of the subject site.

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

One key threatening process is relevant to this proposal with respect to Long-nosed Potoroo: clearing of native vegetation. Whilst the proposal would increase the impact of this key threatening process, the

scale of the impact is not considered significant. Only 0.33 ha of potential marginal foraging habitat would be removed.

Conclusion

The proposal is unlikely to have a significant impact on Long-nosed Potoroo given that the proposed works:

- Would remove only a small area of potential marginal foraging habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during day time hours; and
- Would not isolate or fragment any currently connecting areas of habitat particularly given this species is highly mobile.

Consequently, a SIS is not required for the proposal with respect to this species.

Primarily tree-roosting microbats (Eastern False Pipistrelle Eastern Freetail-bat, and Greater Broad-nosed Bat)Eastern False Pipistrelle

Eastern False Pipistrelle is listed as vulnerable under Schedule 2 of the TSC Act. The species is wide-ranging, occurring along the southeast coast of Australia with records from South East Queensland, NSW, Victoria and Tasmania.

The species occurs in sclerophyll forests from the Great Dividing Range to the coast, and generally prefers wet habitats where trees are more than 20 m high. Roosting occurs in hollow trunks of eucalypt trees, usually in single sex colonies, but the species has been recorded roosting in caves under loose bark and occasionally in old wooden buildings. Their flight pattern is high and fast and they forage within or just below the tree canopy. They feed on a variety of prey including moths, rove beetles, weevils, plant bugs, flies and ants.

Eastern False Pipistrelle is threatened by a number of processes including loss of trees for foraging and hollow-bearing trees for roosting, disturbance to winter roosting and breeding sites, and application of pesticides in or adjacent to foraging areas.

Eastern False Pipistrelle was not recorded during the surveys as no targeted survey was undertaken, although there are eight records within a 5 km radius of the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

East Coast Freetail Bat

Eastern Freetail-bat is listed as vulnerable under Schedule 2 of the TSC Act. It is found along the east coast from south Queensland to southern NSW in dry eucalypt forests, woodlands, swamp forests and mangrove forests where they forage for insects among canopy gaps and on edges of vegetation and mainly roost in hollow-bearing trees. This species will utilise paddock trees and remnant vegetation in farmland where these are in proximity to larger forest remnants. This species usually forages within a few kilometres of its roost.

East Coast Freetail Bat is threatened by a number of processes including loss of trees for foraging and hollow-bearing trees for roosting, and application of pesticides in or adjacent to foraging areas.

East Coast Freetail Bat was not recorded during the surveys as no targeted survey was undertaken, although there are ten records within a 5 km radius of the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

Greater Broad-nosed Bat

Greater Broad-nosed Bat is listed as vulnerable under Schedule 2 of the TSC Act. It is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m.

The species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. It is a large bat that feeds on moths and

other large insects along edges of forest, cleared paddocks and tree-lined water courses at an altitude of 3 – 6 m. This species uses mostly tree hollows for roosting.

Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.

Greater Broad-nosed Bat is threatened by a number of processes including loss of trees for foraging and hollow-bearing trees for roosting, and application of pesticides in or adjacent to foraging areas. It is also threatened by changes to water regimes that impact food resources.

Greater Broad-nosed Bat was not recorded during the surveys as no targeted survey was undertaken, although there are four records within a 5 km radius of the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Impacts likely to have an adverse effect on the life cycle of tree-roosting microbats would include impacts which resulted in the loss of significant areas of forest and woodland foraging habitat, the loss of hollow-bearing trees, disturbance to roosts, and use of pesticides in or adjacent to foraging areas. Also, changes to natural water regimes could have an adverse effect on the life cycle of Greater Broad-nosed Bat.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina*, and *Acacia* species. These represent potential foraging and breeding habitat for tree-roosting microbats (there are potential hollows present in the broken-off branches of *Eucalyptus pilularis* but these were not observed during survey).

The removal of mature trees and mid-storey species is unlikely to have a significant impact on life cycle of these species such that viable local populations of the species would be placed at risk of extinction. The amount of Narrabeen Coastal Blackbutt Forest supporting habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). While roosting habitat may be present in the subject site (small hollows potentially present in the broken-off branches of *Eucalyptus pilularis*), the number of these that would be lost (if present) would be low. Also, tree-roosting microbats are likely to use the subject site on an occasional basis and would not be dependent on the foraging and breeding resources within the subject site. The removal of habitat would not significantly fragment tree-roosting microbat habitat.

There are extensive areas of foraging and breeding habitat present for tree-roosting microbats throughout the locality and LGA. Closer to the subject site, foraging and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to tree-roosting microbat habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and

impacts will most likely be negligible. The habitat of Greater Broad-nosed Bat along watercourses is unlikely to be impacted.

It is unlikely that the proposal would result in the use of pesticides that would impact on tree-roosting bats and their habitat and therefore the life cycle of the species. Also, it is unlikely that the proposal would degrade adjacent habitat (e.g. through noise and light) to an extent that would impact on tree-roosting microbats and their life cycles. Construction works would be temporary and short-term and occur during day light hours.

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

The tree-roosting microbats are not endangered populations.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

The tree-roosting microbats are not endangered ecological communities.

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

- (i) The extent to which habitat is likely to be remove or modified as a result of the action proposed, and**

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that will be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina* and *Acacia* species, which represent potential foraging and breeding habitat (there are potential hollows present in the broken-off branches of *Eucalyptus pilularis*).

The proposed loss of potential foraging and breeding habitat is minimal when considered in the context of tree-roosting microbats' use of the subject site, and the large areas of habitat in the surrounding landscape. Tree-roosting microbats are likely to use the subject site on an occasional basis and would not be dependent on the foraging and breeding resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that will be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging and breeding habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to tree-roosting microbat foraging and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible. The habitat of Greater Broad-nosed Bat along watercourses is unlikely to be impacted.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Tree-roosting microbats are highly mobile, including the slower flying Greater Broad-nosed Bat; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that tree-roosting microbat habitat could be fragmented by the proposal due to these species avoiding areas of habitat degraded by noise and light disturbance. The response of microbats to noise and light disturbance is unclear. Some species are attracted to artificial light while other species avoid artificial light. Microbats that listen for prey when foraging could be impacted by noise disturbance. However, records of the tree-roosting microbats near urban areas indicate that individuals do not avoid these areas. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase during daytime hours. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of tree-roosting microbats in the subject site is unlikely to be important to these species given the availability of large areas of potential foraging and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for tree-roosting microbats.

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

No recovery plan or threat abatement plan of relevance to the tree-hollow microbats has been prepared.

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

Two key threatening processes are relevant to this proposal with respect to the tree-hollow microbats: clearing of native vegetation, and loss of hollow-bearing trees. Whilst the proposal would increase the impact of these key threatening processes, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging and breeding habitat will be removed. Also, hollows may not be present in the ends of *Eucalyptus pilularis* branches; their presence was assumed.

Conclusion

The proposal is considered unlikely to have a significant impact on tree-hollow microbats given that the proposed works:

- Would remove only a small area of potential foraging and breeding habitat (if the latter were present; hollows were not observed during survey) relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during day time hours; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to these species.

Cave-roosting microbats (Little Bentwing-bat and Eastern Bentwing-bat)

Little Bentwing-bat

Little Bent-wing Bat is listed as a vulnerable species under Schedule 2 of the TSC Act. It occurs on the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.

Little Bentwing-bat roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day. It often shares roosting sites with the Eastern Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bat and appears to depend on the large colony to provide the high temperatures needed to rear its young. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. Only five nursery sites /maternity colonies are known in Australia.

Little Bent-wing Bat is threatened by a number of processes including loss of foraging habitat, damage to or disturbance of roosting caves (particularly during winter or breeding), application of pesticides in or adjacent to foraging areas, and predation by feral cats and foxes.

Little Bentwing-bat was not recorded during the surveys as no targeted survey was undertaken, although there are 25 records within a 5 km radius of the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

Eastern Bentwing-bat

Eastern Bent-wing Bat is listed as a vulnerable species under Schedule 2 of the TSC Act. This species occupies a range of forested environments (including wet and dry sclerophyll forests), along the coastal portion of eastern Australia, and through the Northern Territory and Kimberley area (subject to subdivision of this species).

This species has a fast, level flight exhibiting swift shallow dives. It forages from just above the tree canopy, to many times the canopy height in forested areas, and will utilise open areas where it is known to forage at lower levels. Moths appear to be the main dietary component. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Though individuals often use numerous roosts, it congregates in large numbers at a small number of nursery caves to breed and hibernate. Although roosting primarily occurs in caves, it has also been recorded in mines, culverts, stormwater channels, buildings, and occasionally tree-hollows. This species occupies a number of roosts within specific territorial ranges usually within 300 km of the maternity cave, and may travel large distances between roost sites.

Eastern Bent-wing Bat is threatened by a number of processes including loss of foraging habitat, damage to or disturbance of roosting caves (particularly during winter or breeding), application of pesticides in or adjacent to foraging areas, and predation by feral cats and foxes.

Eastern Bentwing-bat was not recorded during the surveys as no targeted survey was undertaken, although there are 20 records within a 5 km radius of the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Impacts likely to have an adverse effect on the life cycle of cave-roosting microbats would include impacts which resulted in the loss of significant areas of forest and woodland foraging habitat, the loss of caves and other roosting habitat, disturbance to roosts, and use of pesticides in or adjacent to foraging areas.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina*, and *Acacia* species. These represent potential foraging habitat for cave-roosting microbats.

The removal of mature trees and mid-storey species is unlikely to have a significant impact on life cycle of these species such that viable local populations of the species would be placed at risk of extinction. No roosting habitat or maternity caves would be impacted. The amount of Narrabeen Coastal Blackbutt Forest supporting habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). Also, the cave-roosting microbats are likely to use the subject site on an occasional basis and would not be dependent on the foraging and breeding resources within the subject site. The removal of habitat would not significantly fragment cave-roosting microbat habitat.

There are extensive areas of foraging and breeding habitat present for cave-roosting microbats throughout the locality and LGA. Closer to the subject site, foraging and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to cave-roosting microbat habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

It is unlikely that the proposal would result in the use of pesticides that would impact on cave-roosting bats and their habitat and therefore the life cycle of the species. Also, it is unlikely that the proposal would degrade adjacent habitat (e.g. through noise and light) to an extent that would impact on cave-roosting microbats and their life cycles. Construction works would be temporary and short-term and occur during day light hours.

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

The cave-roosting microbats are not endangered populations.

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

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

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

The cave-roosting microbats are not endangered ecological communities.

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

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

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that will be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina* and *Acacia* species, which represent potential foraging habitat. No roosting or breeding habitat would be impacted.

The proposed loss of potential foraging habitat is minimal when considered in the context of the cave-roosting microbats' use of the subject site, and the large areas of habitat in the surrounding landscape. Cave-roosting microbats are likely to use the subject site on an occasional basis and would not be dependent on the foraging and breeding resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). In the immediate vicinity of the subject site, foraging and breeding habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to cave-roosting microbat foraging and breeding habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging and breeding habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Cave-roosting microbats are highly mobile; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that cave-roosting microbat habitat could be fragmented by the proposal due to these species avoiding areas of habitat degraded by noise and light disturbance. The response of microbats to noise and light disturbance is unclear. Some species are attracted to artificial light while other species avoid artificial light. Microbats that listen for prey when foraging could be impacted by noise disturbance. However, records of the cave-roosting microbats near urban areas indicate that individuals do not avoid these areas. Eastern Bentwing-bat is often seen in urban areas around street lights. Also, noise impacts would be temporary and short-term, occurring mostly during the construction

phase during daytime hours. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The foraging habitat of cave-roosting microbats in the subject site is unlikely to be important to these species given the availability of large areas of potential foraging and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for cave-roosting microbats.

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

No recovery plan or threat abatement plan of relevance to the cave-hollow microbats has been prepared. The cave-roosting microbats have been assigned to the site-managed species stream under the Saving Our Species program of OEH. The proposed key management sites assigned for Eastern Bentwing-bat and Little Bentwing-bat are not in the vicinity of the subject site. The closest sites are in the Bega Valley/Gundagai/Guyra/Inverell area (Eastern Bentwing-bat only), and Armidale Dumaresq/Kempsey/ Nambucca/ Port Macquarie-Hastings area (both species).

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

One key threatening process is relevant to this proposal with respect to the cave-hollow microbats: clearing of native vegetation. Whilst the proposal would increase the impact of this key threatening process, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging habitat will be removed.

Conclusion

The proposal is considered unlikely to have a significant impact on cave-hollow microbats given that the proposed works:

- Would remove only a small area of potential foraging habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would not impact on roosting/breeding habitat;
- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during day time hours; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to these species.

Grey-headed Flying-fox

Grey-headed Flying-fox is generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops, and has been recorded as travelling long distances on feeding forays (up to 50 km). Fruits and flowering plants of a wide variety of species are the main food source.

The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed within 20 km of a regular food source and are generally close to water and along gullies. However, the species has been known to form camps in urban areas.

Key threats to the species are loss of roosting and foraging sites, electrocution on powerlines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans.

Grey-headed Flying-fox was not recorded during the surveys as no targeted survey was undertaken, although there are 20 records within a 5 km radius of the subject site. There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon the subject site.

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

Impacts likely to have an adverse effect on the life cycle of Grey-headed Flying-fox would include impacts which resulted in the loss of significant areas of foraging habitat, increases in the mortality rate, and increases in conflicts with human.

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina*, and *Acacia* species. These represent potential foraging habitat for Grey-headed Flying-fox. No camps will be impacted.

The removal of mature *Eucalyptus*, *Angophora*, *Allocasuarina*, and *Acacia* species is unlikely to have a significant impact on life cycle of this species such that a viable local population of the species would be placed at risk of extinction. The amount of Narrabeen Coastal Blackbutt Forest supporting habitat in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). *Eucalyptus pilularis*, the dominant Eucalyptus species in the subject site is not winter flowering. Also, the species is likely to use the subject site on an occasional basis as it is wide ranging and would not be dependent on the foraging resources within the subject site. The removal of habitat would not significantly fragment Grey-headed Flying-fox habitat.

There are extensive areas of foraging habitat present for this species throughout the locality and LGA. Closer to the subject site, foraging habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to Grey-headed Flying-fox habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

It is unlikely that the proposal would result in increases in mortality rates through heat stress or electrocution and therefore impact the life cycle of the species. Also, it is unlikely that the proposal would increase conflicts with humans it is unlikely it would contribute to Grey-headed Flying-fox starting a camp in the locality.

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

Grey-headed Flying-fox is not an endangered population.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Grey-headed Flying-fox is not an endangered ecological community.

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

- (i) The extent to which habitat is likely to be remove or modified as a result of the action proposed, and**

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that will be lost includes mature *Eucalyptus*, *Angophora*, *Allocasuarina* and *Acacia* species, which represent potential foraging habitat. No camps will be impacted.

The proposed loss of potential foraging habitat is minimal when considered in the context of the species' use of the subject site, and the large areas of habitat in the surrounding landscape. The species is likely to use the subject site on an occasional basis as it is wide ranging and would not be dependent on the foraging resources within the subject site. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that will be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). *Eucalyptus pilularis*, the dominant *Eucalyptus* species in the subject site is not winter flowering. In the immediate vicinity of the subject site, foraging habitat will be retained in the adjacent Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha) which is contiguous with Rumbalara Reserve, and Brisbane Water National Park. Impacts to Grey-headed Flying-fox foraging and habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts will most likely be negligible.

Some noise disturbance is expected to occur during the construction phase, degrading adjacent habitat in Rumbalara Reserve. The extent of this has not been quantified. However, noise impacts would be temporary and short-term, and it is likely that noise restrictions will be placed during construction.

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

The proposed development is unlikely to fragment or isolate areas of potential foraging habitat. Vegetation surrounding the subject site would be retained, maintaining habitat connectivity. Also, the subject site is approximately 135 m long and 35 m wide. Grey-headed Flying-fox is highly mobile and can travel up to 50 km in one night; individuals would easily traverse the length and width of the subject site to access areas of habitat around the subject site.

It is possible that Grey-headed Flying-fox habitat could be fragmented by the proposal due to the species avoiding areas of habitat degraded by noise and light disturbance. Grey-headed Flying-fox has been relocated from existing camp sites through noise disturbance. However, records of the species near urban areas indicate that individuals do not avoid these areas while foraging. Also, noise impacts would be temporary and short-term, occurring mostly during the construction phase during the day. Residences to the east and south of the proposal already exist. It is not considered the proposal would greatly add to existing disturbances.

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

The habitat of Grey-headed Flying-fox in the subject site is unlikely to be important to the species given the availability of large areas of potential foraging habitat available in the locality. Eucalyptus pilularis on the subject site is not winter flowering. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

There is currently a draft National Recovery Plan for the Grey-headed Flying-fox 2009. The proposal does not conflict with any of the proposed objectives.

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

One key threatening process is relevant to this proposal with respect to Grey-headed Flying-fox: clearing of native vegetation. Whilst the proposal would increase the impact of this key threatening process, the scale of the impact is not considered significant. Only 0.33 ha of potential foraging habitat will be removed.

Conclusion

The proposal is unlikely to have a significant impact on Grey-headed Flying-fox given that the proposed works:

- Would remove only a small area of potential foraging habitat relative to the amount available in the locality and Gosford LGA. Vegetation to be removed in the subject site represents 0.009% of the equivalent vegetation in the Gosford LGA;
- Would not impact on existing camps;

- Would be undertaken according to a Site Management Plan that includes a Sediment and Erosion Control Plan. The Sediment and Erosion Control Plan would be in accordance with the requirements set out in Gosford Council's DCP 2013 (Part 6 Environmental Controls – Erosion and Sediment Control), and would not impact on the adjacent Rumbalara Reserve, in accordance with SEPP 19;
- Would result in only temporary and short-term noise disturbance from construction during day time hours; and
- Would not isolate or fragment any currently connecting areas of habitat.

Consequently, a SIS is not required for the proposal with respect to this species.

Appendix F EPBC Significance Assessments

The EPBC Act Administrative Guidelines on Significance set out ‘Significant Impact Criteria’ that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of NES.

Specific ‘Significant Impact Criteria’ are provided for each matter of NES except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Threatened species to be assessed under the EPBC Act, which may have potential to occur within the subject site include:

- *Dasyurus maculatus* (Spotted-tailed Quoll);
- *Potorous tridactylus* (Long-nosed Potoroo); and
- *Pteropus poliocephalus* (Grey-headed Flying-fox).

The likelihood table (**Appendix B**) reflects a precautionary approach in identifying species that may occasionally utilise the subject site. However, for the purposes of the application of Significance Assessments and based on the current footprint, only those species or their habitats that may be directly or indirectly impacted have been considered.

Spotted-tailed Quoll

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of a population;

The Project proposes to remove 0.33 ha of native and exotic vegetation comprising Narrabeen Coastal Blackbutt Forest in the subject site. Vegetation that would be lost includes mature individuals of *A. torulosa* and mature *Eucalyptus* and *Angophora* species, primarily *Eucalyptus pilularis*. Vegetation supports prey species and comprises sheltering habitat for Spotted-tailed Quoll, along with logs and rock piles (which also comprise potential breeding habitat). Therefore, vegetation and other elements to be removed represent potential foraging, sheltering and breeding habitat for Spotted-tailed Quoll.

Despite the removal of potential foraging, sheltering and breeding habitat, it is unlikely this will lead to a long-term decrease in the size of a Spotted-tailed Quoll population. The amount of Narrabeen Coastal Blackbutt Forest in the subject site that would be lost represents 0.009% of the community present in the Gosford LGA (3,877 ha of the equivalent community, Coastal Narrabeen Shrub Forest, has been mapped in the LGA; REMS mapping). The species is likely to use the subject site on an occasional basis and would not be dependent on the foraging, sheltering, and breeding resources within the subject site. There are extensive areas of foraging, sheltering, and breeding habitat present for this species throughout the locality and LGA that the species would use. Closer to the subject site, foraging, sheltering, and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to Spotted-tailed Quoll habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 2: reduce the area of occupancy of the species;

The area of potential foraging, sheltering and breeding habitat of Spotted-tailed Quoll that would be removed would be approximately 0.33 ha. The potential habitat comprises a minimal amount of foraging, sheltering and breeding resource available to the species, particularly given the range of this highly mobile species. The proposal would not remove habitat in an area representing the limit of the species' range. Thus, the proposal would not significantly reduce the area of occupancy of this species.

Criterion 3: fragment an existing population into two or more populations;

Potential foraging, sheltering and breeding habitat of Spotted-tailed Quoll that would be removed is located adjacent to a road and residential development. However, vegetation around the subject site would remain and this vegetation is part of a contiguous patch of vegetation (Rumbalara Reserve, 53 ha, is contiguous with Katandra Reserve, 232 ha). As such, the loss of habitat would not result in the fragmentation or isolation of habitat for Spotted-tailed Quoll, which would fragment an existing population into two or more populations.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposal would result in the removal of approximately 0.33 ha of potential foraging, sheltering and breeding habitat for Spotted-tailed Quoll. Habitat that would be removed is not likely to be habitat critical to the survival of the species given potential breeding habitat in the subject site is marginal, and the availability of large areas of potential foraging, sheltering and breeding habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve. Thus, the proposal will not adversely affect habitat critical to the survival of the species.

Criterion 5: disrupt the breeding cycle of a population;

The works would be unlikely to impact on or disrupt the breeding cycle of Spotted-tailed Quoll. Potential breeding habitat for the species in the subject site is marginal so it is unlikely breeding habitat would be directly impacted. The amount of foraging and sheltering habitat that would be removed is considered minimal, so removal of this habitat, if used during the breeding season, would not significantly impact on the species, particularly since large areas of similar habitat will remain in the locality.

Criterion 6: modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will remove approximately 0.33 ha of potential foraging, sheltering and breeding habitat for Spotted-tailed Quoll. However, this amount of habitat is considered to be minimal; it would not decrease the availability of habitat to the extent the species is likely to decline. There are extensive areas of foraging, sheltering, and breeding habitat present for this species throughout the locality and LGA that the species would use. Closer to the subject site, foraging, sheltering, and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to Spotted-tailed Quoll habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 7: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are harmful to Spotted-tailed Quoll becoming established in its habitat. Impacts to Spotted-tailed Quoll habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 8: introduce disease that may cause species to decline; or

No diseases are known which may cause Spotted-tailed Quoll to decline. Even so, the proposed work would be unlikely to introduce a disease.

Criterion 9: interfere with the recovery of the species

Spotted-tailed Quoll is threatened by the loss of habitat and the proposal would remove some potential foraging, sheltering and breeding habitat. However, the breeding habitat in the subject site is marginal, and the amount that will be removed minimal, particularly in the context of remaining habitat present in the locality. As such, the proposal is unlikely to interfere with the recovery of the species.

Long-nosed Potoroo

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

The Long-nosed Potoroo population that would potentially be using the subject site is not considered to be an important population as the population is not at the limit of the species' range at the subject site, and is unlikely to be a key source population for breeding or dispersal. There are only three records of Long-nosed Potoroo within a 5 km radius of the subject site. As such, the proposal will not lead to a long-term decrease in the size of an important population of Long-nosed Potoroo.

Criterion 2: reduce the area of occupancy of an important population;

The Long-nosed Potoroo population that would potentially be using the subject site is not considered to be an important population as the population is not at the limit of the species' range at the subject site, and is unlikely to be a key source population for breeding or dispersal. There are only three records of Long-nosed Potoroo within a 5 km radius of the subject site. As such, the proposal will not reduce the area of occupancy of an important population of Long-nosed Potoroo.

Criterion 3: fragment an existing important population into two or more populations;

The Long-nosed Potoroo population that would potentially be using the subject site is not considered to be an important population as the population is not at the limit of the species' range at the subject site, and is unlikely to be a key source population for breeding or dispersal. There are only three records of Long-nosed Potoroo within a 5 km radius of the subject site. As such, the proposal will not fragment an existing important population of Long-nosed Potoroo into two or more populations.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposal would result in the removal of approximately 0.33 ha of potential foraging habitat for Long-nosed Potoroo. Habitat that would be removed is not likely to be habitat critical to the survival of the species given there is no breeding habitat in the subject site, and foraging habitat is marginal. Also, there are large areas of potential foraging, sheltering and breeding habitat available in the locality (53 ha in Rumbalara Reserve and 232 ha in Katandra Reserve). The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent Rumbalara Reserve and nearby Katandra Reserve. Thus, the proposal will not adversely affect habitat critical to the survival of the species.

Criterion 5: disrupt the breeding cycle of an important population;

The works would be unlikely to impact on or disrupt the breeding cycle of Long-nosed Potoroo. There is no breeding habitat for the species in the subject site. The amount of foraging habitat that would be removed is considered minimal, and it is also considered to be marginal, so removal of this habitat, if used during the breeding season, would not significantly impact on the species, particularly since large areas of similar habitat will remain in the locality.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal would remove approximately 0.33 ha of potential foraging habitat for Long-nosed Potoroo. However, this amount of habitat is considered to be minimal; it would not decrease the availability of habitat to the extent the species is likely to decline. The species is likely to use the subject site on an occasional basis as the understorey is not dense and does not contain the species the Long-nosed Potoroo is associated with; the species would not be dependent on the foraging resources within the subject site and foraging resources are likely to be marginal. There are extensive areas of foraging, sheltering, and breeding habitat present for this species throughout the locality and LGA that the species would use. Closer to the subject site, foraging, sheltering, and breeding habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to Long-nosed Potoroo habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are harmful to Long-nosed Potoroo becoming established in its habitat. Impacts to Long-nosed Potoroo habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 8: introduce disease that may cause the species to decline; or

No diseases are known which may cause Long-nosed Potoroo to decline. Even so, the proposed work would be unlikely to introduce a disease.

Criterion 9: interfere substantially with the recovery of the species

Long-nosed Potoroo is threatened by the loss of habitat and the proposal would remove some potential foraging habitat. However, no breeding habitat is present in the subject site, foraging habitat is marginal, and the amount that will be removed minimal, particularly in the context of remaining habitat present in the locality. As such, the proposal is unlikely to interfere with the recovery of the species.

Grey-headed Flying-fox

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

The Grey-headed Flying-fox population that would potentially be using the subject site is not considered to be an important population as the population is not at the limit of the species' range at the subject site, and is unlikely to be a key source population for breeding or dispersal. There are only 20 records of Grey-headed Flying-fox within a 5 km radius of the subject site and there are no nearby camps. As such, the proposal will not lead to a long-term decrease in the size of an important population of Grey-headed Flying-fox.

Criterion 2: reduce the area of occupancy of an important population;

The Grey-headed Flying-fox population that would potentially be using the subject site is not considered to be an important population as the population is not at the limit of the species' range at the subject site, and is unlikely to be a key source population for breeding or dispersal. There are only 20 records of Grey-headed Flying-fox within a 5 km radius of the subject site and there are no nearby camps. As such, the proposal will not reduce the area of occupancy of an important population of Grey-headed Flying-fox.

Criterion 3: fragment an existing important population into two or more populations;

The Grey-headed Flying-fox population that would potentially be using the subject site is not considered to be an important population as the population is not at the limit of the species' range at the subject site, and is unlikely to be a key source population for breeding or dispersal. There are only 20 records of Grey-headed Flying-fox within a 5 km radius of the subject site and there are no nearby camps. As such, the proposal will not fragment an existing important population Grey-headed Flying-fox into two or more populations.

Criterion 4: adversely affect habitat critical to the survival of a species;

According to the draft National Recovery Plan for the Grey-headed Flying-fox 2009, foraging habitat critical to the survival of the species is habitat that is:

- productive during winter and spring, when food bottlenecks have been identified;
- known to support populations of >30,000 individuals within an area of 50 km radius (the maximum foraging distance of an adult);
- productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (September to May);
- productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes (months vary between regions); and
- known to support a continuously occupied camp.

Foraging habitat in the subject site is productive during spring so could be thought of as foraging habitat critical to the survival of the species. However, the amount that would be removed is minimal and there are large areas of potential foraging habitat available in the locality. The vegetation community in the subject site is widespread and adequately reserved within the Gosford LGA including in the adjacent

Rumbalara Reserve (53 ha) and nearby Katandra Reserve (232 ha). Thus, the proposal will not adversely affect foraging habitat critical to the survival of the species.

Given there is no camp in the subject site, no roosting habitat critical to the survival of the species will be impacted.

Criterion 5: disrupt the breeding cycle of an important population;

The works would be unlikely to impact on or disrupt the breeding cycle of Grey-headed Flying-fox. There is no camp in the subject site. The amount of foraging habitat that would be removed is considered minimal, so removal of this habitat, if used during the breeding season, would not significantly impact on the species, particularly since large areas of similar habitat will remain in the locality.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal would remove approximately 0.33 ha of potential foraging habitat for Grey-headed Flying-fox. However, this amount of habitat is considered to be minimal; it would not decrease the availability of habitat to the extent the species is likely to decline. The species is likely to use the subject site on an occasional basis. There are extensive areas of foraging habitat present for this species throughout the locality and LGA that the species would use. Closer to the subject site, foraging habitat is present in the adjacent Rumbalara Reserve (53 ha) which is contiguous with Katandra Reserve (232 ha). Impacts to Grey-headed Flying-fox habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are harmful to Grey-headed Flying-fox becoming established in its habitat. Impacts to Grey-headed Flying-fox habitat within Rumbalara Reserve would be minimised through methods employed to contain disturbance from construction (as outlined in the Site Management Plan) to the vegetation and flora and fauna habitat within Rumbalara Reserve. It is noted that erosion of soils, the siltation of streams and waterways, and the spread of weeds and exotic plants must not occur within the adjacent Rumbalara Reserve, in accordance with SEPP 19, so controls will be strictly enforced and impacts to the reserve will be negligible.

Criterion 8: introduce disease that may cause the species to decline; or

Grey-headed Flying-foxes are reservoirs of three recently-described zoonotic diseases. The proposed work would be unlikely to introduce a disease.

Criterion 9: interfere substantially with the recovery of the species

Grey-headed Flying-fox is threatened by the loss of habitat and the proposal would remove some potential foraging habitat. However, no camp is present in the subject site, and the amount of foraging habitat that will be removed minimal, particularly in the context of remaining habitat present in the locality. As such, the proposal is unlikely to interfere with the recovery of the species.

**HEAD OFFICE**

Suite 4, Level 1
2-4 Merton Street
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

COFFS HARBOUR

35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

DARWIN

16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601
F 08 8941 1220

SYDNEY

Level 6
299 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9264 0717

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

BRISBANE

Suite 1 Level 3
471 Adelaide Street
Brisbane QLD 4000
T 07 3503 7191
F 07 3854 0310

ST GEORGES BASIN

8/128 Island Point Road
St Georges Basin NSW 2540
T 02 4443 5555
F 02 4443 6655

NAROOMA

5/20 Cauty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

MUDGEES

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1230
F 02 6372 9230

GOSFORD

Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

1300 646 131
www.ecoaus.com.au



Arboricultural impact assessment

For

Proposed development at 70 John Whiteway Drive, Gosford

Prepared for

Integral Financial Pty Ltd
C/-DEM Architects
Level 8, 15 Help Street,
Chatswood NSW 2067

By

Michael Shaw
Dip Hort (Arboriculture) AQF5
MAA/ISA

27 January 2015

Contents

1. Executive summary	3
2. Introduction	3
3. Brief.....	3
4. Scope.....	3
5. The proposed development.....	4
6. Site description	4
7. Site visit details	5
8. Main documents utilised	5
9. Location of site and focus area	6
10. Methodology.....	7
10.2. All tree assessments were carried out utilising the following methods.....	7
10.3. Measurements and observations were taken using.....	7
11. Discussion.....	8
12. Tree protection zone information	12
13. Activities prohibited within the Tree Protection Zone	13
References	14
Author details.....	14
Qualifications and experience	15
Appendix 1 Visual Tree Assessment Method (VTA).....	16
Appendix 2 Tree AZ.....	17
Appendix 3 Aerial view of site with tree locations and ground floor overlay	18
Appendix 4 Tree survey data table	19
Appendix 5 Photos	26

1. Executive summary

- 1.1. A residential apartment development and associated infrastructure is proposed to be constructed on a site that has been unutilised for several years.
- 1.2. There are many trees on the site that will be affected by the proposal.
- 1.3. From the 57 individual trees assessed and recorded at this site, 7 trees will be unaffected by the proposal if managed as recommended in this report both before, and during the construction phase.

2. Introduction

- 2.1. A residential apartment development and associated infrastructure is proposed to be constructed on a site which has been unutilised for several years.
- 2.2. The proposed development will require the removal of most of the existing trees on site.
- 2.3. The purpose of this report is to assess all trees that may be affected by the proposed development as planned, to evaluate the impact of the proposed development on the trees and to provide management advice for trees to be retained.

3. Brief

- 3.1. I am instructed by Alex Beeston from DEM Architects to assess trees at or near to 70 John Whiteway Drive, Gosford that will be potentially affected by the proposed development, and to provide a report document containing relevant details about existing trees and to provide appropriate management recommendations for the trees to be retained in the context of the proposed development.

4. Scope

- 4.1. Trees within and close to the subject site that may be affected by the proposed development have been assessed visually from ground level in accordance with Mattheck and Breloer's Visual tree assessment methodology.
- 4.2. Due to the large number of trees and difficulty of access to certain sections of the site, the author focused on, recorded and tagged individually, only more notable trees with a diameter at breast height (DBH) of 25cm or larger that would be worthy of consideration for retention.

- 4.3. Young trees less than 10 years old with a DBH of less than 25cm, saplings, exempt species or trees that have been considered unworthy of influencing the proposed design have generally not been recorded.
- 4.4. No excavation or invasive testing was conducted as a part of the visual tree assessment.
- 4.5. Appropriate management recommendations have been provided to protect trees to be retained during the construction phase of the proposed development.

5. The proposed development

- 5.1. The proposed development is for the construction of a residential apartment building and associated infrastructure and landscaping.
- 5.2. There are many trees currently on or near the site that will be affected by the development with the great majority of existing trees requiring removal if the development proceeds as planned.
- 5.3. Some, good quality, larger trees at the North Eastern corner section of the site will be unaffected by the development if properly protected.

6. Site description

- 6.1. The site of the proposal is on the eastern side of a roughly North/South oriented ridgeline located approximately 500m to the south east of the Gosford CBD.
- 6.2. The site has been unused for several years and is in an unkempt and overgrown state.
- 6.3. The western perimeter of the site which runs along John Whiteway Drive consists of a steeply sloping overgrown section with sandstone ledges, small cliffs and many native and introduced shrubs and trees.
- 6.4. The centre, flat section of the site was cleared several years ago and is now populated by approximately 100 mostly native tree saplings. An open drain and a wire fence forms the eastern perimeter of this section.
- 6.5. The eastern section of the site is located on the eastern side of the wire fence which has been installed as a safety measure to prevent access to the very steeply sloping batter which leads down to the car park of the existing residential apartment infrastructure.
- 6.6. Most of the recorded and assessed trees are located in the eastern and western section with the many saplings located in the centre section not being recorded.

7. Site visit details

- 7.1. Three unaccompanied site visits were conducted by the author on 28 November, 03 and 17 December 2014 for the purposes of data collection and tree assessment.
- 7.2. During this visit, data was collected and assessments undertaken for the subject trees in relation to the proposed development.
- 7.3. All assessed trees have been tagged on site with a numbered aluminium tag and nail.
- 7.4. The weather at the time of the site inspections was fine and the effect of wind was negligible.

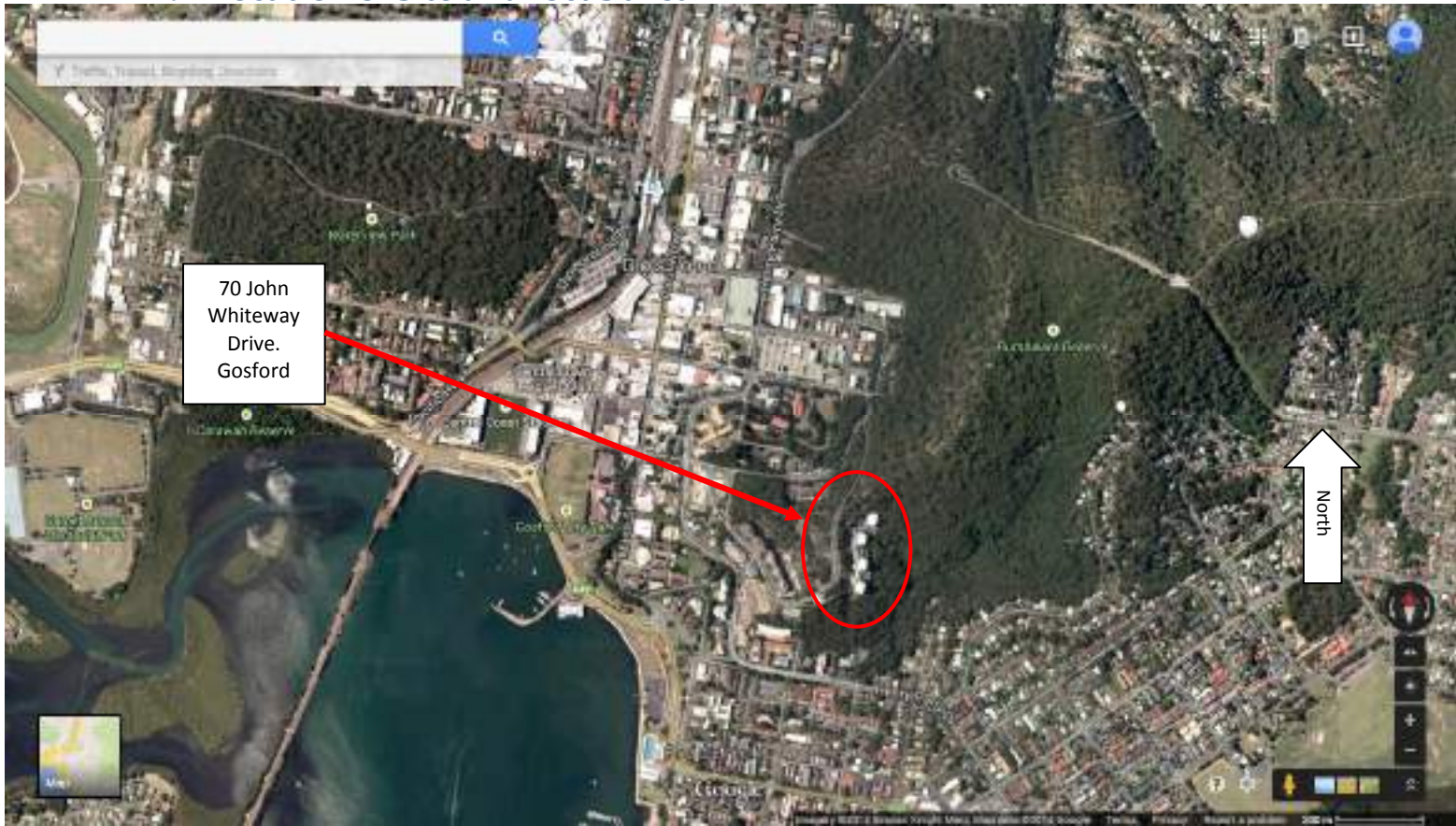
8. Main documents utilised

- 8.1. The following documents were the main reference documents utilised in the production of this report. The documents were provided for the author's information by Alex Beeston from DEM Architects

- Series of plans from arsk**1200**[-02]26Nov2014 to **1207**
- Plans from arsk**2100 and 2500**[-02]26Nov2014
- PreliminaryArchitecturalDrawings-11Nov2014
- La—0501[A03]27Jan2015
- SurveyPlan

These documents were provided to the author in electronic format via email.

9. Location of site and focus area



10. Methodology

10.1. Assessments were conducted as to the health, vigour, viability and safety of the trees in the context of their current situation and in relation to their proposed future situation.

10.2. All tree assessments were carried out utilising the following methods

- Visual Tree Assessment Method (VTA) (Mattheck and Breloer,)
- TreeAZ (Barrell Tree Consultancy)
- No aerial inspections, root excavations or soil sampling were conducted as part of this assessment
- Tree identification was based on visual inspection of features available at the time of inspection. A complete taxonomical process of identification was not conducted; therefore, the identification of trees in this document represents the probable identity of the species.

10.3. Measurements and observations were taken using

- Positioning and data recording conducted using an Ashtech Mobile Mapper GPS PDA device.
- Binoculars and naked eye
- Estimation was used to determine the DBH (measurements taken at approx 1.4 metres or Diameter at Breast Height DBH)
- Tree height was estimated
- Digital camera

11. Discussion

Most of the trees on site will require removal due to location either within the building envelope or close enough to proposed works to suffer an unsustainable encroachment.

All trees from 1 through to 53 with the exception of trees 18, 19 and 20 will require removal for the development to proceed as planned.

Trees 54, 55, 56 and 57 may also be retained.

Details of all assessed and recorded trees can be found at Appendix 4 Tree survey data table.

The trees which may be retained are discussed in detail below.

- 11.1. **Tree 18** is a mature *Eucalyptus saligna* (Sydney blue gum) which displays good form and vigour.
- 11.2. This tree will experience a minor encroachment of approximately 4% from construction of the North East Corner of the proposed structure
- 11.3. This tree should be protected by a compliant tree protection zone (TPZ) in the form of a tree protection fence which is to be installed to the dimensions provided at Appendix 4 in accordance with section 4 of AS4970-2009 and activities within the tree protection zone (TPZ) are also to be in accordance with the standard and section 12 and 13 of this report
- 11.4. The TPZ for this tree is to be constructed to the largest diameter possible (12m radius where practicable) that enables work to proceed and extended to a larger radius where possible to offset the minor encroachment that will be experienced by the construction of the building structure.
- 11.5. This tree may require pruning on the western side of the canopy in order to accommodate the proposed structure and avoid conflict between the tree and the structure.
- 11.6. Any required pruning is to occur prior to the erection of the TPZ and is to be conducted by a minimum certificate 3 qualified arborist.
- 11.7. **Tree 19** is a semi mature *Eucalyptus pilularis* (Blackbutt) which displays good form and vigour.
- 11.8. This tree will be unaffected by the proposed development if adequately protected within a larger TPZ containing trees 18 and 20.

- 11.9. **Tree 20** is a mature *Eucalyptus saligna* (Sydney blue gum) which displays good form and vigour.
- 11.10. This tree will be unaffected by the proposed development if adequately protected within a larger TPZ containing trees 18 and 19.
- 11.11. **Note - Trees 18, 19 and 20** may be protected by one large TPZ which is installed to the appropriate dimensions required to satisfactorily accommodate each individual tree's radial space requirements.
- 11.12. **Tree 50** is a mature *Eucalyptus pilularis* which is located approximately 3.8 metres away from the proposed access driveway at the closest point. Construction of this driveway will mean that this tree will suffer an unsustainable encroachment of approximately 24% of its TPZ. This tree will require removal if the development proceeds as planned.
- 11.13. **Tree 54** is a mature *Eucalyptus pilularis* (Blackbutt) which displays good form and vigour and is worthy of protection and retention.
- 11.14. This tree appears to be located in the Gosford Council owned reserve to the North of the site.
- 11.15. This tree is located 12m from the outer edge of the proposed road and therefore, will suffer no encroachment.
- 11.16. This tree shall be protected by a compliant tree protection zone (TPZ) in the form of a tree protection fence which is to be installed to the dimensions provided at Appendix 4 in accordance with section 4 of AS4970-2009 and activities within the tree protection zone (TPZ) are also to be in accordance with the standard and section 12 and 13 of this report.

- 11.17. **Tree 55** is a mature *Eucalyptus pilularis* (Blackbutt) which displays good form and vigour and is worthy of protection and retention.
- 11.18. This tree is located 6.5m from the outer edge of the proposed road and footpath and therefore, will suffer a minimal encroachment of approximately 4.5%.
- 11.19. This tree shall be protected by a compliant tree protection zone (TPZ) in the form of a tree protection fence which is to be installed to the dimensions provided at Appendix 4 in accordance with section 4 of AS4970-2009 and activities within the tree protection zone (TPZ) are also to be in accordance with the standard and section 12 and 13 of this report.
- 11.20. **Tree 56** is a mature *Eucalyptus pilularis* (Blackbutt) which displays good form and vigour and is worthy of protection and retention.
- 11.21. This tree is located approximately 6m from the outer edge of the proposed pedestrian pathway and therefore, will suffer a minimal encroachment of approximately 6%.
- 11.22. This tree shall be protected by a compliant tree protection zone (TPZ) in the form of a tree protection fence which is to be installed to the dimensions provided at Appendix 4 in accordance with section 4 of AS4970-2009 and activities within the tree protection zone (TPZ) are also to be in accordance with the standard and section 12 and 13 of this report.
- 11.23. **Tree 57** is a mature *Angophora floribunda* (Rough barked apple) which displays good form and vigour and is worthy of protection and retention.
- 11.24. This tree is located approximately 2 metres to the west of tree 56 and will suffer no encroachment from proposed works.
- 11.25. This tree shall be protected by a compliant tree protection zone (TPZ) in the form of a tree protection fence which is to be installed to the dimensions provided at Appendix 4 in accordance with section 4 of AS4970-2009 and activities within the tree protection zone (TPZ) are also to be in accordance with the standard and section 12 and 13 of this report.
- 11.26. **Note - Trees 54, 55, 56 and 57** may be protected by one large TPZ which is installed to the appropriate dimensions required to satisfactorily accommodate each individual tree's radial space requirements.

Images of some of the subject trees are provided at Appendix 5 Photos

All trees to be retained shall be protected in accordance with specific recommendations contained in this report and also in accordance with AS4970-2009 *Protection of trees on development sites*.

12. Tree protection zone information

- 12.1. **TPZ-** (Tree protection zone) the tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.
- 12.2. **SRZ-** (Structural root zone) The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.
- 12.3. **All trees** to be retained should be protected by a physical TPZ exclusion zone to the radius from the trunk calculated in accordance with section 4 of AS 4970-2009 and provided at the Tree survey data table Appendix in this report. *(It is strongly recommended that a copy of this standard is obtained by the project manager as a reference before any work commences on site).*
- 12.4. Tree protection zones shall be established in accordance with *Section 4 of AS 4970-2009* before commencement of any other construction work. This will include trunk, branch and ground protection if considered necessary by the project arborist and also placement of appropriate and compliant TPZ signage to the physical TPZ fence.
- 12.5. The TPZ shall remain until the completion of all construction related activity.
- 12.6. Any pruning and tree works recommended are to be conducted by a certificate 3 (minimum) qualified and experienced arborist and work is to be conducted according to AS4373: *Pruning of Amenity Trees*.
- 12.7. Establishment and erection of tree protection zone and signage should be inspected and certified by the project arborist to ensure compliance with the standard.

- 12.8. **Unless approved by the project arborist beforehand, No activity as detailed in section 4.2 of AS 4970-2009 Protection of trees on development sites and Section 12 and 13 of this report is to occur within the TPZ.**

- 12.9. **Any and all work to be conducted within the TPZ of the subject tree is to be conducted using sensitive methods in consultation with or supervision by an AQF level 5 qualified consulting arborist. This AQF5 arborist shall be consulted before commencement of any work within the TPZ to determine appropriate methodology to be used.**

13. Activities prohibited within the Tree Protection Zone

- Modification of existing soil levels
- Excavations and trenching
- Cultivation of the soil
- Mechanical removal of vegetation
- Soil disturbance
- Movement of natural rock
- Storage of materials, plant or equipment
- Erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials
- Disposal of waste materials and chemicals
- Lighting fires
- Refuelling
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree.

Any construction related work required to occur within the TPZ of retained trees shall be conducted in consultation with the project arborist.

References

- Gosford Chapter_6.6_Preservation_of_Trees_or_Vegetation
- Standards Australia (2009) "AS4970: Protection of trees on development sites"
- Standards Australia (2007) "AS4373: Pruning of Amenity Trees"
- Google earth.com
- maps.six.nsw.gov.au/
- http://www.treetec.net.au/TPZ_SRZ_DBH_calculator.php
- Mattheck, C., Breloer, H (1994) The Body Language of Trees- A handbook for failure analysis . HMSO, London.

Author details

Michael Shaw

20 Honeysuckle St

Umina Beach NSW 2257

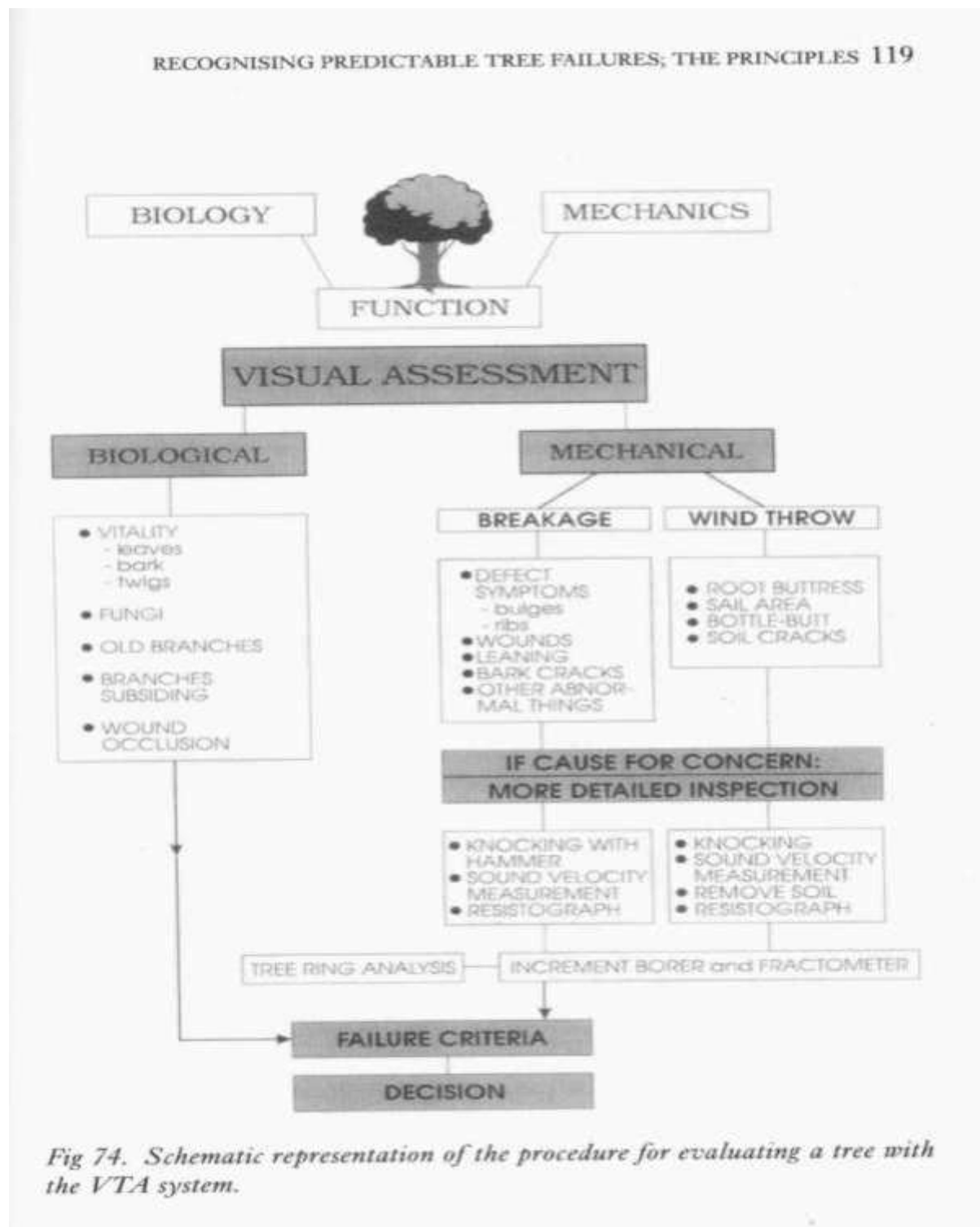
Telephone 0403 391147

Email michaelshaw@optusnet.com.au

Qualifications and experience

- AQF level 5 Diploma of Horticulture (Arboriculture)
- Tree preservation officer Lane Cove Council (August 2014 -)
- Licensed QTRA practitioner (quantitative tree risk assessment)
- Qualified ISA tree risk assessment practitioner
- Tree assessment officer Port Stephens Council, September 2009 – Dec 2011
- Member of Arboriculture Australia
- Member of International society of arboriculture
- VTA (visual tree assessment) workshop March 2011 and March 2013
- ISA 87th annual Conference delegate, Parramatta NSW July 2011.
- Matheny & Clark “Arboriculture” Seminar. Melbourne November 2009
- Specialising in arboriculture and tree assessment from Feb 2008
- Certificate 3 Horticulture (Parks and gardens)
- Working in horticultural industry from April 2004

Appendix 1 Visual Tree Assessment Method (VTA)



Mattheck and Breloer "The body language of trees" Ninth impression 2007 P196

Appendix 2 Tree AZ

Z**Category Z: Unimportant trees not worthy of being a material constraint**

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure

Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people

Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. severe structural damage to surfacing and buildings, etc

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population

Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorisation hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

A**Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint**

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorisation hierarchy and should be given the most weight in any selection process.

Barrell Tree Consultancy

Appendix 3 Aerial view of site with tree locations and ground floor overlay



Appendix 4 Tree survey data table

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
1	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	50	6	2.6	Medium	15-20	10-15m	A		Y	
2	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	50	7.7	2.8	Medium	15-20	10-15m	A	co dominant from base	Y	
3	<i>Angophora floribunda</i>		Semi mature	Medium 15-40	45	5.4	2.5	Medium	10_15	10-15m	Z	tip dieback/minor decline	Y	
4	<i>Eucalyptus paniculata</i>		Semi mature	Long >40	45	5.4	2.5	Medium	10_15	10-15m	A		Y	
5	<i>Eucalyptus paniculata</i>		Semi mature	Long >40	45	5.4	2.5	Medium	10_15	10-15m	A		Y	
6	<i>Eucalyptus teriticornis</i>		Semi mature	Short 5-15	35	4.2	2.3	Medium	10_15	6-10m	Z	declining	Y	
7	<i>Eucalyptus saligna</i>		Semi mature	Long >40	30	3.6	2.1	Medium	10_15	6-10m	A		Y	
8	<i>Eucalyptus saligna</i>		Semi mature	Long >40	30	4.2	2.3	Medium	10_15	6-10m	A		Y	
9	<i>Eucalyptus crebra</i>		Mature	Long >40	60	7.2	2.8	Medium	10_15	6-10m	A1		Y	
10	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	55	6.6	2.7	Medium	10_15	10-15m	A		Y	
11	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	55	6.6	2.7	Medium	10_15	6-10m	A1	located in concrete batter	Y	

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
12	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	40	3.6	2.1	Medium	15-20	10-15m	A1	located top of concrete batter	Y	
13	<i>Eucalyptus saligna</i>		Mature	Short 5-15	100	12	3.4	Medium	15-20	15-20m	Z	located top of concrete batter/ fungal fruiting bodies/tip dieback/ decline	Y	
14	<i>Eucalyptus pilularis</i>		Semi mature	Medium 15-40	30 20 20	4.8	2.4	Medium	10_15	6-10m	Z	located top of concrete batter/tri dominant from base/one trunk dead	Y	
15	<i>Eucalyptus saligna</i>		Semi mature	Long >40	40	3.6	2.1	Medium	15-20	6-10m	A	located top of concrete batter	Y	
16	<i>Eucalyptus saligna</i>		Semi mature	Long >40	40	3.6	2.1	Medium	15-20	6-10m	A	located top of embankment/approx 10 <i>Casuarina glauca</i> ESE of this tree down steep bank all with dbh less than 20cm	Y	
17	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	40	3.6	2.1	Medium	15-20	6-10m	A1	located top of embankment/within building envelope. remove	Y	
18	<i>Eucalyptus saligna</i>		Mature	Long >40	100	12	3.4	Medium	15-20	15-20m	A1	located top of embankment/pruning west side of canopy if retained/ Protect and retain	N	Y

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
19	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	50	6	2.6	Medium	15-20	10-15m	A	located top of embankment/good form/ Protect and retain	N	Y
20	<i>Eucalyptus saligna</i>		Mature	Long >40	90	10.8	3.2	Medium	15-20	15-20m	A	located top of embankment/ Protect and retain	N	Y
21	<i>Angophora floribunda</i>		Semi mature	Long >40	20	2.4	2	Medium	05-Oct	6-10m	A		Y	
22	<i>Erythrina x sykesii</i>		Semi mature	Long >40	multi			Medium	10_15	6-10m	Z	exempt/remove	Y	
23	<i>Eucalyptus saligna</i>		Semi mature	Long >40	60	7.2	2.8	Medium	10_15	6-10m	A	A floribunda sapling at w base	Y	
24	<i>Eucalyptus saligna</i>		Mature	Long >40	60 30	8.4	2.9	Medium	15-20	10-15m	A	co dominant from base	Y	
25	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	40	4.8	2.4	Medium	10_15	6-10m	A	semi mature declining E saligna at eastern base of this tree	Y	
26	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	30	3.6	2.1	Medium	10_15	6-10m	A		Y	
27	<i>Eucalyptus saligna</i>		Mature	Short 5-15	80	9.6	3.1	Medium	10_15	10-15m	Z	large vertical canker 1-4m/ fungal fruiting bodies and hollow at base/previous major failures/remove	Y	
28	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	40	4.8	2.4	Medium	10_15	6-10m	A		Y	

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
29	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	30	3.6	2.1	Medium	10_15	6-10m	A	Several <i>Doryanthes excelsa</i> and <i>Ceratopetalum gummiferum</i> located near this tree and in this general area	Y	
30	<i>Eucalyptus resinifera</i>		Young	Long >40	15	2	2	Medium	10_15	4-6m	A		Y	
31	<i>Angophora floribunda</i>		Semi mature	Long >40	15	2	2	Medium	10_15	4-6m	A		Y	
31a	<i>Ceratopetalum gummiferum</i>	not tagged	Semi mature	Long >40	multi	3	2	Medium	0-5	4-6m	A		Y	
31b	<i>Ceratopetalum gummiferum</i>	not tagged	Semi mature	Long >40	multi	3	2	Medium	0-5	4-6m	A		Y	
31c	<i>Ceratopetalum gummiferum</i>	not tagged	Semi mature	Long >40	multi	3	2	Medium	0-5	4-6m	A		Y	
32	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	50	6	2.6	Medium	15-20	10-15m	A1		Y	
33	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	55	6.6	2.7	Medium	15-20	10-15m	A1		Y	
34	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	35	4.2	2.3	Medium	10_15	6-10m	A	young <i>A floribunda</i> 1m NW	Y	
35	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	50 40	7.8	2.8	Medium	15-20	10-15m	A1	co dominant from base	Y	

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
36	<i>Casuarina glauca</i>		Mature	Medium 15-40	30	3.6	2.1	Medium	5_10	6-10m	A		Y	
37	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	60	7.2	2.8	Medium	15-20	10-15m	A1		Y	
38	<i>Eucalyptus crebra</i>		Semi mature	Long >40	20	2.4	2	Medium	15-20	4-6m	A	rubbing against 37 north scaffold	Y	
39	<i>Eucalyptus saligna</i>		Semi mature	Long >40	35	4.2	2.3	Medium	15-20	4-6m	A		Y	
40	<i>Eucalyptus punctata</i>		Semi mature	Long >40	35	4.2	2.3	Medium	10_15	4-6m	A		Y	
41	<i>Eucalyptus pilularis</i>		Young	Long >40	30	3.6	2.1	Medium	15-20	4-6m	A		Y	
42	<i>Casuarina glauca</i>		Mature	Medium 15-40	30	3.6	2.1	Medium	10_15	4-6m	A		Y	
43	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	60	7.2	2.8	Medium	15-20	10-15m	A1	outside fence corner	Y	
44	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	35	4.2	2.3	Medium	10_15	6-10m	A	multi trunked from 1.5m	Y	
45	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	25	3	2	Medium	5_10	6-10m	A	A floribunda sapling at base	Y	
46	<i>Angophora floribunda</i>		Semi mature	Long >40	30	3.6	2.1	Medium	5_10	6-10m	A		Y	
47	<i>Angophora floribunda</i>		Semi mature	Long >40	30 20	4.2	2.3	Medium	5_10	6-10m	A		Y	
48	<i>Eucalyptus pilularis</i>		Young	Long >40	30	3.6	2.1	Medium	10_15	6-10m	A		Y	

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
49	<i>Eucalyptus beyeriana</i>		Semi mature	Long >40	40	4.8	2.4	Medium	10_15	6-10m	A		Y	
50	<i>Eucalyptus pilularis</i>		Mature	Long >40	100	12	3.4	Medium	15-20	15-20m	A1	24% encroachment from proposed access road	Y	
51	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	45	5.4	2.5	Medium	15-20	6-10m	A		Y	
52	<i>Eucalyptus pilularis</i>		Semi mature	Long >40	45	5.4	2.5	Medium	15-20	6-10m	A		Y	
53	<i>Angophora floribunda</i>		Semi mature	Long >40	35	4.2	2.3	Medium	10_15	6-10m	A		Y	
54	<i>Eucalyptus pilularis</i>	next to Rumbalara Reserve sign	Mature	Long >40	85	10.2	3.2	Medium	25-30	15-20m	A1	Protect and retain.	N	Y
55	<i>Eucalyptus pilularis</i>		Mature	Medium 15-40	100	12	3.4	Medium	20-25	15-20	A	significant basal cavity/hollow east base. Minor 4.5% encroachment. Protect and retain	N	Y
56	<i>Eucalyptus pilularis</i>		Mature	Medium 15-40	85	10.2	3.2	Medium	15-20	15-20	A	Basal cavity. 2m east of 57. 6% encroachment. Protect and retain	N	Y

Tree #	Species	Notes	Age class	Estimated life expectancy	DBH cm	Required TPZ radius m	Required SRZ radius m	Landscape significance (STARS)	Height m	Radial crown spread	TreeAZ	Comments and management recommendations	Removal required	Retain
57	<i>Angophora floribunda</i>		Mature	Medium 15-40	35	4.2	2.3	Medium	10-15	6-10	A	mild phototropism to west caused by suppression from 56.	N	Y

Appendix 5 Photos





Tree 54



View towards
north east
showing trees at
top of steep
cement batter



View towards
south, south west
showing trees on
overgrown
embankment



View towards
west showing
trees on
embankment



Page intentionally left blank



Bushfire Protection Assessment

Proposed multi-unit development – 70 John Whiteway Drive, Gosford

Prepared for
DEM Australia Pty Ltd / Integral Financial Pty Ltd

20 January 2015





DOCUMENT TRACKING

Item	Detail
Project Name	Bushfire Protection Assessment: Proposed multi-unit development – 70 John Whiteway Drive, Gosford
Project Number	708
Project Manager	Daniel Copland (02) 4302 1224 Suite 5, 1-5 Baker Street, Gosford NSW 2250
Prepared by	Daniel Copland (FPAA BPAD-A Certified Practitioner No. BPD-PA-28853)
Reviewed by	David Peterson (FPAA BPAD-A Certified Practitioner No. BPD-PA-18882)
Approved by	David Peterson
Status	Final
Version Number	1
Last saved on	20 January 2015

This report should be cited as 'Eco Logical Australia 12 January 2014. Bushfire Protection Assessment: Proposed multi-unit development – 70 John Whiteway Drive, Gosford. Prepared for DEM Australia / Integral Financial.'

Disclaimer

This document may only be used for the purpose for which it was commissioned and in accordance with the contract between Eco Logical Australia Pty Ltd and DEM Australia / Integral Financial. The scope of services was defined in consultation with DEM Australia / Integral Financial, by time and budgetary constraints imposed by the client, and the availability of reports and other data on the subject area. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information.

Eco Logical Australia Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.

Bushfire template 12/8/13

Contents

1	Property and proposal	1
1.1	Background.....	1
1.2	Location and description of subject land	2
1.3	Description of proposal.....	2
2	Bushfire threat assessment	5
2.1	Vegetation types	5
2.2	Effective slope	5
3	Asset protection zones	6
3.1	APZ Requirements	6
3.2	APZ maintenance plan	7
4	Utilities and access	9
4.1	Water supply.....	9
4.2	Gas and electrical supplies.....	9
4.3	Access	9
5	Construction standard	10
6	Assessment of environmental issues	13
7	Recommendations and conclusion	14
	References	15

List of figures

Figure 1: Location of the subject site3

Figure 2: Proposed development Site Plan and building footprint4

Figure 3: Bushfire Hazard Assessment and Asset Protection Zones for development proposal8

Figure 4: Bushfire Attack Level (BAL) assessment of development proposal 12

List of tables

Table 1: Threat assessment, APZ and category of bushfire attack 6

1 Property and proposal

Street or property name:	70 John Whiteway Drive		
Suburb, town or locality:	Gosford	Postcode:	2250
Lot and DP:	Lot 100 DP 1066540		
Local Government Area:	Gosford City Council		
Type of area:	Urban ☒		
Type of development:	Residential multi-unit development		

1.1 Background

DEM Australia Pty Ltd, on behalf of Integral Financial Pty Ltd, commissioned Eco Logical Australia Pty Ltd (ELA) to prepare a bushfire protection assessment (BPA) for a proposed five storey residential development at 70 John Whiteway Drive, Gosford (hereafter referred to as the subject land).

The site is subject to a previous Development Application (DA) consent for a four storey residential development. Substantial commencement has occurred, with the current DA consent considered still valid (DA19775/2003). The new DA is seeking to increase from 40 Units to 75 Units by changing unit mix on typical floors as well as adding one extra floor and one extra basement carpark within the extent of the current approved building footprint.

The development constitutes Integrated Development and the subject land is identified as bushfire prone land by Council, as it is within 100 metres of significant stands of bushland that have the potential to sustain a bushfire or contribute to bushfire attack. Section 91A *Environmental Planning and Assessment Act 1979* requires a bushfire assessment of development proposals of this nature on bushfire prone land following the process and methodology set out within s100B *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2008* and the NSW Rural Fire Service (RFS) document *Planning for Bush Fire Protection 2006* (PBP).

This assessment demonstrates that complete compliance of the development proposal with the above specifications and requirements is unable to be achieved due to the highly constrained nature of the subject site. However, the existing valid consent for a similar development within the subject site had minimal consideration of potential bushfire impacts and recommended mitigation measures. By contrast, the implementation of the recommendations within this report, in accordance with the intent of the abovementioned RFS requirements, provides for a much improved bushfire protection outcome to be achieved for the subject site, than if the existing development consent is completed.

This assessment has been prepared by the ELA Senior Bushfire Consultant Daniel Copland (FPAA BPAD-A Certified Practitioner No. BPD-PA-28853). Daniel is recognised by the NSW Rural Fire Service as a qualified consultant in bushfire risk assessment.

A site inspection was carried out on the 8th December, 2014.

1.2 Location and description of subject land

The subject land is located within the suburb of Gosford on the Central Coast of NSW, and is within the Gosford City Council Local Government Area. It is bound by existing residential development including a number of recently constructed multi-unit developments, especially to the east, south east, south and further to the west. John Whiteway Drive is situated immediately to the west, with areas of unmanaged vegetation within private lands further to the west. It is intended for these areas to be developed in the near future.

The remaining areas of the site, especially to the north, north east and part east, are bound by Rumbalara Reserve, which is a council-owned, forested reserve and situated on very steep topography and present the main hazard to the proposed development.

Figure 1 shows the subject land and the location of the proposed development in relation to the nearest bush fire prone vegetation to the north and west.

1.3 Description of proposal

The proposed development will occur within 1 existing residential lot and will result in the creation of 75 units (1-3 bedrooms) within a five (5) storey building and associated basement car parking.

Figure 2 shows the proposed development.

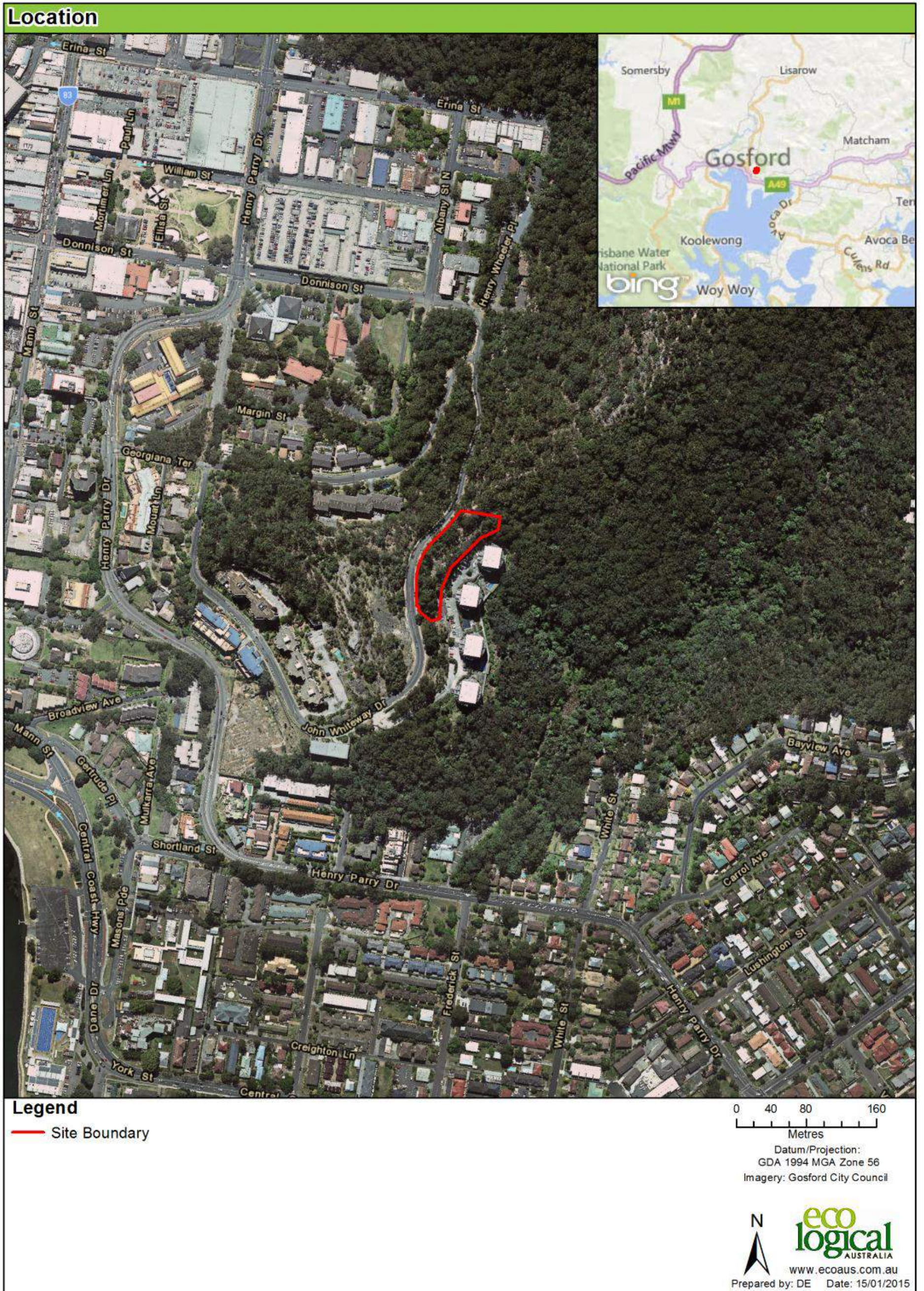


Figure 1: Location of the subject site

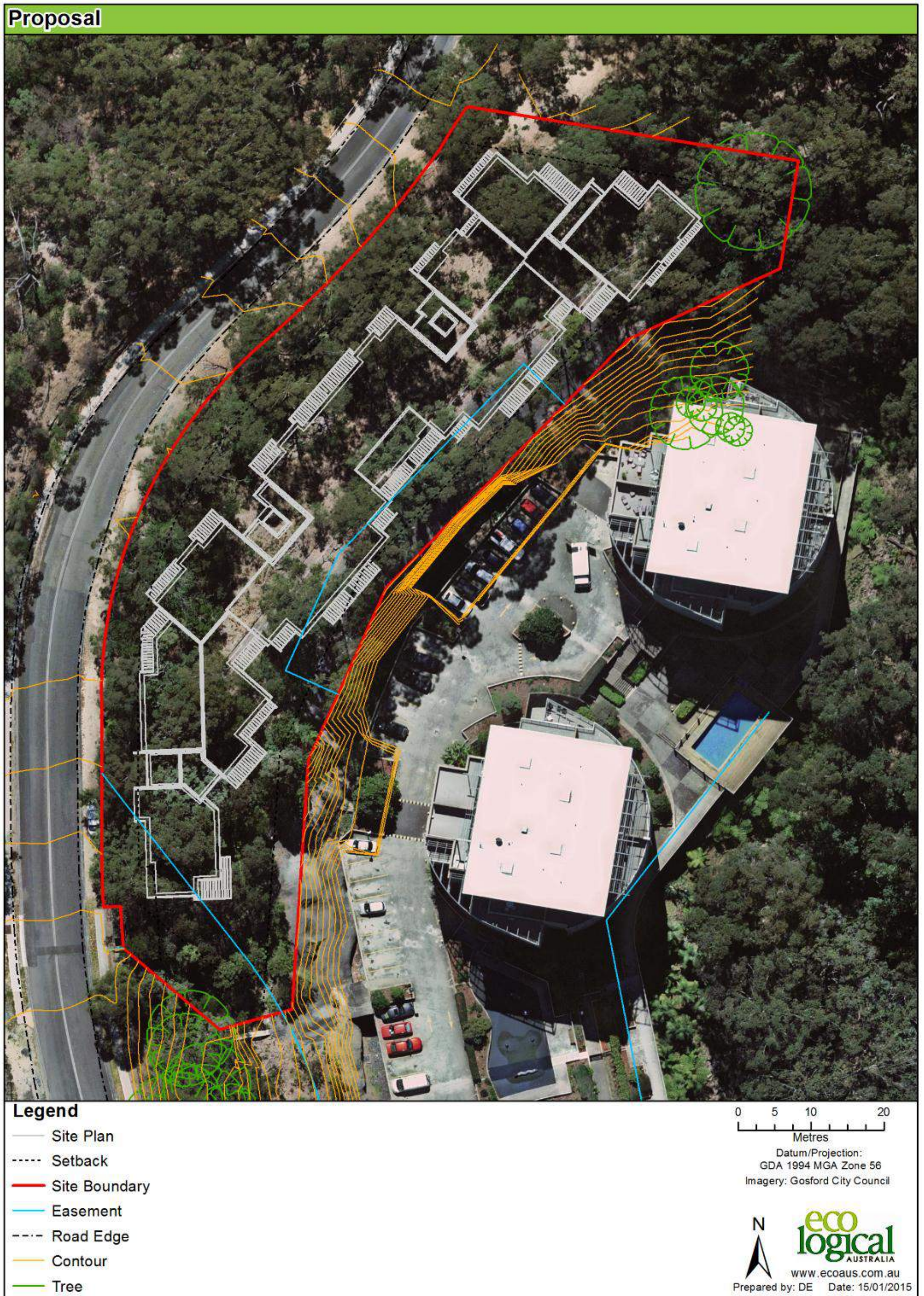


Figure 2: Proposed development Site Plan and building footprint

2 Bushfire threat assessment

The subject land is identified as bush fire prone land by Gosford City Council. As the proposal involves a multi-unit development the following assessment is prepared in accordance with Section 100B of the *Rural Fires Act 1997* and *Planning for Bush Fire Protection 2006* (RFS 2006), herein referred to as PBP.

2.1 Vegetation types

In accord with PBP the predominant vegetation class has been calculated for a distance of at least 140 metres of the proposed development and the slope class 'most significantly affecting fire behaviour' has been determined for a distance of at least 100 metres in all directions. The predominant vegetation and effective slope assessments are shown in **Table 1**.

The vegetation that would be considered the bushfire hazard largely surrounds the subject site, being situated from the south west, to the north and north east and around to the south east as seen in **Figure 2**. For the purposes of applying PBP, this vegetation is categorised as 'Forest'.

Additionally, there are some small areas of disturbed / modified vegetation to the south west of the site, and a narrow roadside corridor of vegetation immediately to the south of the site. These areas have been classified as 'Grassland' and 'Low-hazard' (limited fire run corridor) respectively, in accordance with PBP 2006 and as shown in **Table 1**.

2.2 Effective slope

In accord with PBP, the slope that would most significantly influence fire behaviour was determined over a distance of 100 metres from the boundary of the proposed development where the vegetation was found. This assessment was made during a site inspection.

The land slopes very steeply away from John Whiteway Drive and the subject site to both the east and west. A hilltop area is situated upslope from the subject site to the south west, where the topography plateaus before dropping away steeply to further vegetation and then residential development further to the west.

The areas of significant hazard to the west, north west, and also to the north east and east are situated on very steep slopes ranging from 18-30 degrees downslope, with some localised variations being much steeper, including natural vertical rock faces in some areas.

The predominant slope for the key hazards areas is shown within **Figure 3**. The predominant slope influencing the potential bushfire impacts upon the subject site are considered to be 'greater than 18 degrees downslope', in accordance with PBP.

3 Asset protection zones

3.1 APZ Requirements

Table A2.4 of PBP has been used to determine the width of Asset Protection Zones (APZ) using the vegetation and slope data identified in **Section 2**.

Table 1 and **Figure 3** show the proposed APZ.

Table 1: Threat assessment, APZ and category of bushfire attack

Direction from envelope	Slope ¹	Vegetation ²	PBP required APZ ³	Available APZ	Comments
West / North west / North east / East / South east	>18° downslope	Forest	60m	5-20m* <i>(*Unable to comply – proposes an overall improved bushfire outcome)</i>	APZ provided by combination of internal building setbacks, existing residential development and managed landscaping.
South West	5-10° downslope	Forest / Grassland	35m	15-20m* <i>(*Unable to comply – proposes an overall improved bushfire outcome)</i>	APZ provided by combination of internal building setbacks, existing residential development, existing roads and pathways and managed landscaping.
South	Upslope / level (Crossslope)	Low-hazard (Forest corridor)	10m	5m* <i>(*Unable to comply – proposes an overall improved bushfire outcome)</i>	APZ provided by combination of internal building setbacks and managed landscaping.
<i>All other directions</i>	<i>Managed land</i>				

¹ Slope most significantly influencing the fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

² Predominant vegetation is identified, according to PBP and “Where a mix of vegetation types exist the type providing the greater hazard is said to be predominate”.

³ Assessment according to Table A2.4 of PBP

3.2 APZ maintenance plan

The required APZs are unable to be achieved, however ongoing management of the entire subject site and retained landscaping will be required.

Any landscaping within the site should give consideration to the following:

- No tree or tree canopy is to occur within 2 m of the dwelling roofline.
- The presence of a few shrubs or trees in the APZ is acceptable provided that they:
 - o are well spread out and do not form a continuous canopy
 - o are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period
 - o are located far enough away from the building so that they will not ignite the building by direct flame contact or radiant heat emission.
- Any landscaping or plantings should preferably be local endemic mesic species or other low flammability species.
- A minimal ground fuel is to be maintained to include less than 4 tonnes per hectare of fine fuel (fine fuel means ANY dead or living vegetation of <6 mm in diameter e.g. twigs less than a pencil in thickness. 4 t/ha is equivalent to a 1 cm thick layer of leaf litter).
- Any structures storing combustible materials such as firewood (e.g. sheds) must be sealed to prevent entry of burning debris.



Figure 3: Bushfire Hazard Assessment and Asset Protection Zones for development proposal

4 Utilities and access

4.1 Water supply

The subject land is currently serviced by reticulated water with several hydrants located on along the opposite side of John Whiteway Drive. The existing hydrants are situated at regular intervals, including at adjacent to the south western, central western and north western portions of the site.

Importantly, the entirety of the proposed development will be located within 70 metres of these hydrants. These arrangements are considered adequate and comply with PBP, therefore no further water supply requirements are necessary.

4.2 Gas and electrical supplies

The existing electricity supply to the subject is located underground and complies with PBP.

Any gas services are to be installed and maintained in accordance with *Australian Standard AS/NZS 1596 'The storage and handling of LP Gas'* (Standards Australia 2008).

4.3 Access

The development is accessed by the existing John Whiteway Drive which is a two lane road that is a minimum 10 metres in width. The proposed units will be located within 70 metres of this road and a fire involving the development would be attended to by fire appliances from the hardstand surface of John Whiteway Drive.

The abovementioned access arrangements are considered adequate and comply with PBP, therefore no further access requirements are necessary.

5 Construction standard

The building construction standard is based on the determination of the Bushfire Attack Level (BAL) in accordance with Method 1 of *Australian Standard AS 3959-2009 'Construction of buildings in bushfire-prone areas'* (Standards Australia 2009). The BAL is based on known vegetation type, effective slope and managed separation distance between the development and the bushfire hazard.

As demonstrated in **Table 1** and **Figure 4**, the development is affected by BAL FZ – flame zone. In accordance with AS 3959-2009 the flame zone extends 50 metres from the managed edge of the bushland. Therefore, due to the multiple directions of bushfire attack to the subject site, the entire proposed development is considered to be in the flame zone.

The implementation of complying BAL-FZ construction measures is considered to be a key bushfire protection measure in off-setting the shortfall within the compliant APZs and in providing an overall improved bushfire protection outcome for the current development proposal. The previous approval for the subject site required the implementation of the previous 'Level 3' construction (under AS3959-1999), which has an approximate equivalence to BAL-29 requirements within the current Standard. Therefore the implementation of BAL-FZ construction (as outlined below) to the entire building provides a significantly improved protection outcome.

In NSW the BAL FZ requirements of AS 3959-2009 are not accepted as a deemed-to-satisfy set of provisions for construction in the flame zone. NSW Rural Fire Service requires the following for construction in the flame zone, with a variation to AS 3959-2009 for windows and doors:

- New construction shall comply with Section 9 (BAL-FZ) AS 3959-2009. However, any material, element of construction or system when tested to the method described in *Australian Standard AS 1530.8.2 'Methods for fire tests on building materials, components and structures Part 8.2: Tests on elements of construction for buildings exposed to simulated bushfire attack—Large flaming sources'* (Standards Australia 2007) shall comply with Clause 13.8 of that Standard except that flaming of the specimen is not permitted;
- Windows assemblies shall comply with modified Section 9 of AS 3959-2009 (as above) or the following:
 - i. They shall be completely protected by a non-combustible and non perforated bushfire shutter that complies with Section 3.7 of AS 3959-2009 excluding parts (e) & (f); *and*
 - ii. They shall comply with the following:
 - a) Window frames and hardware shall be metal;
 - b) Glazing shall be toughened glass, minimum 6 mm;
 - c) Seals to stiles, head and sills or thresholds shall be manufactured from materials having a flammability index no greater than 5; and
 - d) The openable portion of the window shall be screened internally or externally with a mesh with a maximum aperture of 2 mm, made from corrosion resistant steel or bronze. The frame supporting the mesh shall be metal;
- External Doors (not including garage doors) shall comply with modified Section 9 of AS 3959-2009 (as above) or the following:
 - i. They shall be completely protected by a non-combustible and non perforated bushfire shutter that complies with Section 3.7 of AS 3959-2009 excluding parts (e) & (f); *and*

- ii. They shall comply with the following:
 - a) Doors shall be non-combustible;
 - b) Externally fitted hardware that supports the panel in its function of opening and closing shall be metal;
 - c) Where doors incorporate glazing, the glazing shall be toughened glass minimum 6 mm;
 - d) Seals to stiles, head and sills or thresholds shall be manufactured from silicone;
 - e) Doorframes shall be metal;
 - f) Doors shall be tight fitting to the doorframe or an abutting door; and
 - g) Weather strips, draught excluders or draught seals shall be installed if applicable.

Furthermore, the provisions of Section 3 '*Construction General*' of AS3959-2009 are also required for the proposed development where applicable.

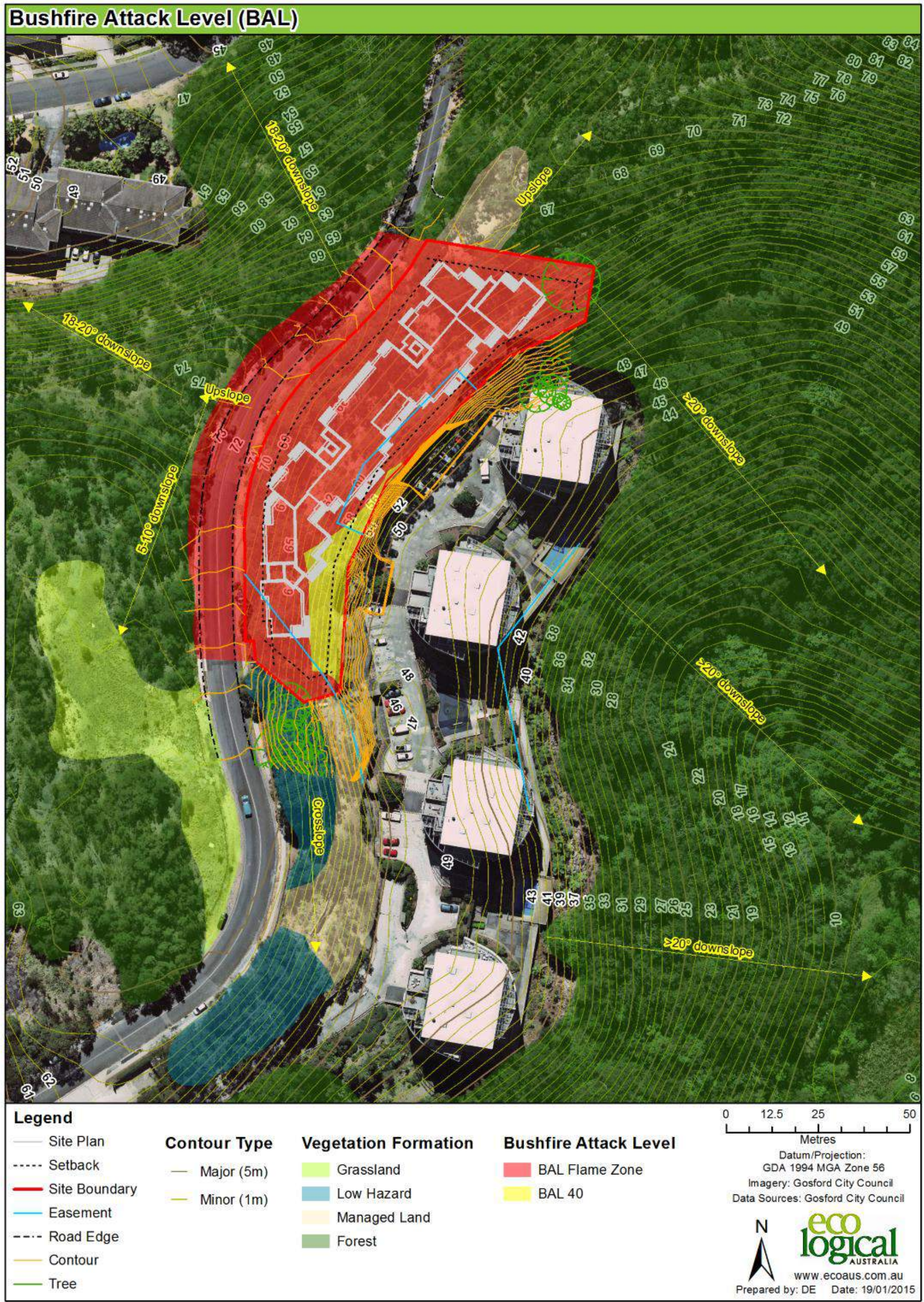


Figure 4: Bushfire Attack Level (BAL) assessment of development proposal

6 Assessment of environmental issues

At the time of assessment, there were no known significant environmental features, threatened species or Aboriginal relics identified under the *Threatened Species Conservation Act 1995* or the *National Parks Act 1974* that will affect or be affected by the bushfire protection proposals in this report.

Gosford City Council is the determining authority for this development; they will assess more thoroughly any potential environmental and heritage issues.

7 Recommendations and conclusion

This assessment demonstrates that complete compliance of the development proposal with the above specifications and requirements of *Planning for Bush Fire Protection 2006* is unable to be achieved due to the highly constrained nature of the subject site. However, the existing valid consent for a similar development within the subject site had minimal consideration of potential bushfire impacts and recommended mitigation measures. By contrast, the implementation of the recommendations within this report, in accordance with the intent of the abovementioned RFS requirements, provides for a much improved bushfire protection outcome to be achieved for the subject site, than if the existing development consent is completed.

The presence of forest on steep downslopes around the subject land could produce radiant heat intensities and flame lengths such that the proposed development will be located within the 'Flame Zone'. With the application of *AS 3959-2009 Construction of buildings in bushfire-prone areas* BAL-FZ construction provisions as varied by NSW Rural Fire Service, the proposed development will be able to provide an overall improved bushfire protection outcome, compared to the existing approved arrangements.

The following recommendations have been made within this report:

- 1) The vegetation, fuels and landscaping within the subject land are to be maintained to meet the intent and objectives of the performance requirements of an Inner Protection Area (IPA) as described within PBP and **Section 3** of this report.
- 2) Any gas services are to be installed and maintained in accordance with AS/NZS 1596:2008 (**Section 4**).
- 3) The entirety of the proposed development is to be constructed to comply with AS 3959-2009 BAL-FZ, with the applicable NSW variation as listed in **Section 5** of this report.

In the author's professional opinion, the bushfire protection measures demonstrated in this report provide for an improved bushfire protection outcome to be achieved, as per *Planning for Bush Fire Protection 2006*, and allows for the issue of a Bush Fire Safety Authority.



Daniel Copland
Senior Bushfire Consultant
FPAA BPAD-Level 3 Certified Practitioner (BPD-L3-28853)

References

NSW Rural Fire Service (RFS). 2006. *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners* including the 2010 Appendix 3 Addendum. Australian Government Publishing Service, Canberra.

Standards Australia. 2005. *Fire hydrant installations - System design, installation and commissioning*, AS 2419.1, Fourth edition 2005, SAI Global, Sydney

Standards Australia. 2008. *The storage and handling of LP Gas*, AS/NZS 1596:2008, Fourth edition 2005, SAI Global, Sydney.

Standards Australia. 2009. *Construction of buildings in bushfire-prone areas*, AS 3959-2009. SAI Global, Sydney.

**HEAD OFFICE**

Suite 4, Level 1
2-4 Merton Street
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

COFFS HARBOUR

35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

DARWIN

16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601

SYDNEY

Level 6
299 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9264 0717

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

BRISBANE

PO Box 1422
Fortitude Valley QLD 4006
T 07 3503 7193

ST GEORGES BASIN

8/128 Island Point Road
St Georges Basin NSW 2540
T 02 4443 5555
F 02 4443 6655

NAROOMA

5/20 Cauty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

MUDGEES

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1230
F 02 6372 9230

GOSFORD

Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

1300 646 131
www.ecoaus.com.au



dem

Crime Prevention through Environmental Design Checklist

Prepared by:

DEM (Aust) Pty Ltd

On behalf of:

Taskin Satici

Project:

**Lot 100, 70 John Whiteway Drive, Gosford
Residential Development**

dem (aust) pty ltd
level 8 15 help street
chatswood nsw 2067 australia
t: (02) 8966 6000 f: (02) 8966 6111

Lot 100, 70 John Whiteway Drive, Gosford

Crime Prevention through Environmental Design Checklist



dem

Site Address:

Lot 100, 70 John Whiteway Drive, Gosford

Building and other structures existing on site:

Vacant Land

Description of Proposal:

3 adjoining apartment blocks consisting of 75 apartments with 2 linked levels of basement car parking, associated landscape and civil works

The following checklist has been developed to ensure the appropriate design principles are met as outlined in the objectives and controls in part 4.1.3.5 of the Safety & Security of The Gosford DCP.

Crime Prevention through Environmental Design Checklist



Building Design		
Will the building be clearly identified by street number from the street?	yes	
Are entries clearly identifiable from the street?	yes	
Do outdoor living spaces adjoin main communal/public spaces?	yes	
Are indoor and outdoor living spaces connected and integrated?	yes	
If located on a corner, does the proposal relate satisfactorily to both streets?	yes	
Is lighting adequate to enable natural surveillance, particularly in entrances /exits, pathways and car parks?	yes	
Do building materials provide an appropriate level of security?	yes	
Are pathways direct and with permeable barriers?	yes	
Landscaping and Private Open Space		
Are selected new plant species compatible with Council's Street Tree Policy and the intended use of the space in which they are located?	yes	Refer to landscape drawings
Do selected new plant species allow for natural surveillance of the street, private open space, pedestrian's pathways and car parks?	yes	
Does fence design maximise natural surveillance from the street to the building an visa-versa?	yes	
Have architectural elements such as down pipes, carports and large trees that facilitate access been avoided next to upper storey windows or balconies?	yes	
Does the landscape proposal for the front yard provide a safe, semi-private and pleasant living environment?	yes	
Does the landscape proposal for the front yard allow surveillance of the street?	yes	
Does the landscape proposal for the front yard help define dwelling entry points?	yes	
If the site is on a corner, does the fence respect both frontages and avoid having an overbearing appearance?	n/a	
Has adequate lighting been provided in possible places for intruders to hide?	yes	Lighting design to be finalised in CC stage
Is adequate security lighting provided in general?	yes	Lighting design to be finalised in CC stage
Has a landscape plan been issued that addresses the above issues been submitted?	yes	

Crime Prevention through Environmental Design Checklist



Vehicular Access & Car Parking		
Does the parking provision comply with the Gosford City Council DCP Chapter 7.1 – Car Parking	yes	Refer to the Traffic Management Report
Is parking satisfactorily integrated with the building and landscape design?	yes	
Is access to lifts, stairwells and pedestrian pathways clearly visible?	yes	
Do basement car parking areas have adequate lighting?	yes	Lighting design to be finalised in CC stage
Are parking areas clearly identified by signage, which is visible, easy to read and simple to understand?	yes	
Have entry and exit points been kept to a minimum?	yes	
Solar Design & Energy Efficiency		
Has the use of energy efficient lamps, fittings and switches been considered in the design?	yes	Refer Basics Report
Site Service & Facilities		
Have relevant utility authorities been contacted to ascertain their requirements?	yes	
Is access to lifts and stairwells clearly visible from the building entry?	yes	
Is the garbage and recyclable material area adequately located and lit?	yes	Refer to Waste Management Report