6 ENVIRONMENTAL ASSESSMENT

This section of the EA addresses the key issues of the development with regard to economic, social and environmental aspects. It provides an assessment and summary of the key issues of the development identified by the Director General's Environmental Assessment requirements.

6.1 STRATEGIC PLANNING

6.1.1 Strategic justification

Local

Our Living City Settlement Strategy (OLC) has been prepared by Council pursuant to clause 38(3) of the *North Coast Regional Environmental Plan 1988* (MNREP). The purpose of the OLC is to provide strategic justification to planned release areas within the Coffs Harbour LGA. The DoP have endorsed the OLC as an interim document to facilitate some short term matters to be progressed by Council. The OLC is discussed under section 4.1.4 above.

The OLC identifies land to the west of the subject land as a special investigation area for residential development, within a priority timeframe of 2006 - 2011. The short term priority of the investigation within this area suggests the appropriateness of the North Boambee Valley as a key growth area of the Coffs Harbour urban area. The subject land is located between existing residential development on the fringe of the Coffs Harbour urban area and the special investigation area of North Boambee Valley. The subject land provides short term potential for expansion of the Coffs Harbour urban area and consolidation of the two areas. Given the continued growth of the existing Lakes Estate and further residential development in this location, i.e. the Highlands Estate, it is considered that the subject land represents a suitable short term residential growth area.

The OLC identifies the need for an additional 15,499 dwellings for the Coffs Harbour LGA by 2031, to accommodated anticipated growth of the Shire. This calculation includes 6,336 dwellings within existing un-subdivided residential zoned land. It is noted that there is significant unzoned residential land within the Coffs Harbour LGA; however the location of the subject land on the fringe of existing development within zoned and undeveloped residential land represents orderly short term strategic planning of the Coffs Harbour LGA.

It should be noted that the OLC has been adopted as an 'interim document' by the DoP to allow short term priority actions to proceed. As a result, the OLC has no effect until finalisation of the *Mid North Coast Regional Strategy* and the adoption of the remainder of the OLC. Despite this, an 'in principle' consideration of the OLC provides strategic justification for the proposed development.

Regional

The draft Mid-North Coast Regional Strategy (MNCRS) was prepared by the DoP and released in December 2006. The draft MNCRS has been prepared to provide strategic direction for residential, commercial and industrial growth for the Mid-North Coast region for the next 25 years. The strategy identifies that the region has experienced a population growth of 70 per cent over the past 25 years and expects an increase of 91,000 or 27 per cent between 2006 and 2031.

The draft MNCRS identifies Coffs Harbour as a prominent location within the context of the Mid-North Coast and a key regional centre given its current population growth and location on the Pacific Highway.

A key element of the draft MNCRS is for efficient availability of residential land and housing to cope with future residential growth of the region. Coffs Harbour, Port Macquarie and Great Lakes/Taree are identified within the draft MNCRS as core residential growth areas with future growth anticipated being concentrated in these locations. It is also recognised that initiatives must be provided to manage coastal growth in an environmentally sensitive and efficient manner.

The changing age structure of the population is also acknowledged by the draft MNCRS as a critical element of residential development, with the median age of the region expected to increase from 41 to 55 by 2031. This provides additional emphasis on providing a range of dwelling types and opportunities within the region to accommodate the changing age structure and subsequent aspirations of the growing population.

The draft MNCRS identifies a required residential growth within the Mid-North Coast of 58,400 dwellings within the next 25 years to support the projected growth of the region. This growth will be concentrated on the four major regional centres of Taree, Port Macquarie, Coffs Harbour and Grafton. To provide effective implementation of this residential land settlement, local Councils will prepare Growth Areas in consultation with DoP. These growth areas will provide appropriate locations to accommodate the projected growth of the region and ensure effective strategic growth of the major locations.

The subject land is contained within the existing urban footprint of Coffs Harbour and within the proposed growth zone. Despite being included within the 'existing urban area' the site and North Boambee Valley in general provides opportunity for intensification of residential, commercial and industrial land. The growth area map identifies intensification of residential land west of the subject land above North Boambee Road, with land below North Boambee Road identified for future industrial growth. This is generally in accordance with existing development and land use and represents a logical growth pattern of North Boambee Valley west of the core urban area of Coffs Harbour.

The growth area map and strategy does not consider the impact of the proposed Pacific Highway by-pass which is likely to extend through the growth area. It is likely that the actual land use will be amended during consultation, and industrial development may be intensified surrounding the freeway corridor, with North Boambee Road representing a suitable linkage with the freeway.

6.1.2 Consistency with sustainability criteria (Draft Mid North Coast Strategy)

The draft Mid North Coast Regional Strategy has been discussed in greater detail earlier in this document. The following table demonstrates compliance with the sustainability criteria of the draft Mid North Coast Regional Strategy.

Table 16 - Compliance with sustainability criteria of draft Mid North Coast Regional Strategy

SUGGESTED THRESHOLD SUSTAINABILITY CRITERIA FOR DEFINING POTENTIAL DEVELOPMENT BOUNDARIES	MEASURABLE EXPLANATION OF CRITERIA	RESPONSE
1. Infrastructure Provision Mechanisms in place to ensure utilities, transport, open space and communication are provided in a timely and efficient way	▪ Development is consistent with the Mid North Coast Regional Strategy, any subregional strategy, the State Infrastructure Strategy and relevant section 117 directions. ▪ The provision of infrastructure (utilities, transport, open space and communications) is costed and economically feasible based on Government methodology for determining infrastructure development contributions. ▪ Preparedness to enter into development agreement.	The development is considered consistent with the draft MNCRS and has been discussed in greater detail elsewhere in this EA. The Our Living City settlement strategy is also relevant to the proposed development and it is considered the development is consistent with this interim strategy, as discussed earlier. The subdivision will be subject to relevant developer contributions as imposed by Council.
2. Access Accessible transport options for efficient and sustainable travel between homes, jobs, services and recreation to be existing or provided	▪ Accessibility of the area by public transport and/or appropriate road access in terms of: o Location/land use – to existing networks and related activity centres. o Network – the area's potential to be serviced by economically efficient transport services. o Catchment – the area's ability to contain, or form part of the larger urban area which contains adequate transport services. Capacity for land use/transport patterns to make a positive contribution to achievement of travel and vehicle use goals. ▪ No net negative impact on performance of existing subregional road, bus, rail, ferry and freight network.	The subdivision includes provision to provide equitable access for public transport for all allotments within the subdivision. Provisions are made to accommodate bus routes through the subject land and provide public transport linkages to employment, business and retail areas of Coffs Harbour. The subdivision is more likely to result in an improvement to the existing public transport network.

SUGGESTED THRESHOLD SUSTAINABILITY CRITERIA FOR DEFINING POTENTIAL DEVELOPMENT BOUNDARIES	MEASURABLE EXPLANATION OF CRITERIA	RESPONSE
3. Housing Diversity Provide a range of housing choices to ensure a broad population can be housed	▪ Contributes to the geographic market spread of housing supply, including any government targets established for aged, disabled or affordable housing.	The proposal provides a variety of residential allotments in terms of orientation, size and dimensions. This design facilitates a greater range of potential residential development including for mobility impaired persons and aged residents. The variety of allotment sizes within the subdivision facilitates potential development for affordable housing.
4. Employment Lands Provide regional/local employment opportunities to support the Mid North Coast's expanding role in the wider regional and NSW economies	▪ Maintain or improve the existing level of subregional employment self-containment. ▪ Meets subregional employment projections. o Employment-related land is provided in appropriately zoned areas.	The subdivision will provide for a potential growth in the permanent population of Coffs Harbour, with flow on effects to local industry and business.

SUGGESTED THRESHOLD SUSTAINABILITY CRITERIA FOR DEFINING POTENTIAL DEVELOPMENT BOUNDARIES	MEASURABLE EXPLANATION OF CRITERIA	RESPONSE
5. Avoidance of Risk Land use conflicts, and risk to human health and life, avoided	▪ No residential development within 1:100 floodplains. ▪ Avoidance of physically constrained land, e.g. o High slope. o Highly erodible. ▪ Avoidance of land use conflicts with adjacent existing or future land use as planned under relevant subregional or regional strategy. ▪ Where relevant available safe evacuation route (flood and bushfire).	Residential development is proposed within areas currently identified as being within the 1:100 floodplain. The design of the subdivision will provide fill to this area to allow future development to be constructed above the 1:100 year flood level. The north eastern portion of the land includes steep land, upwards of 20 per cent. Allotments within this portion of the site are proposed, with significant slope assessment undertaken to determine the feasibility of development in this location. A number of controls will be provided within the construction of the subdivision to ensure the development. The subject land is contained within an area wholly proposed for residential development. The Bushfire Risk Assessment prepared for the proposed development identifies suitable access points and secondary emergency egress points. The extent of flooding risk to the site is such that evacuation assessment is not necessary, and the majority of infrastructure within the estate would not be affected in a 1:100 year event.

SUGGESTED THRESHOLD SUSTAINABILITY CRITERIA FOR DEFINING POTENTIAL DEVELOPMENT BOUNDARIES	MEASURABLE EXPLANATION OF CRITERIA	RESPONSE
6. Natural Resources Natural resource limits not exceeded/environmental footprint minimised	▪ Demand for water within infrastructure capacity to supply water and does not place unacceptable pressure on environmental flows. ▪ Demonstrates most efficient/suitable use of land. o Avoids identified significant agricultural land o Avoids productive resource lands – extractive industries, coal, gas and other mining, and quarrying. ▪ Demand for energy does not place unacceptable pressure on infrastructure capacity to supply energy – requires demonstration of efficient and sustainable supply solution.	The development has been designed with an appropriate reticulated water supply system. The reticulated system supplied to the site currently was designed with regard to future peak capacity of the site and as such, the proposed increase generated by this development is considered acceptable for the system to absorb without detriment. Environmental flows will not be impacted by the water demand generated by the proposed development. The development includes land within the urban zoning, which is cleared and has been subject to previous agricultural activities. The subdivision maximises use of the urban land and retains all vegetation within the conservation areas, and the majority of vegetation outside these conservation areas. Where vegetation removal is unavoidable, offset planting will be provided at an acceptable rate determined by Council's DCP's. The land is not suitable for intensive agricultural land given its proximity to the urban area. The subject land is also zoned and preferred for residential development. The development will not impact upon existing agricultural land within the surrounding area. The design of the lots facilitates future energy efficient development of dwellings. Infrastructure for the proposed development is proposed to represent the most efficient and effective use of infrastructure with an aim to increase efficient and sustainable use of infrastructure.

SUGGESTED THRESHOLD SUSTAINABILITY CRITERIA FOR DEFINING POTENTIAL DEVELOPMENT BOUNDARIES	MEASURABLE EXPLANATION OF CRITERIA	RESPONSE
7. Environmental Protection Protect and enhance biodiversity, air quality, heritage, and waterway health	▪ Consistent with government-approved Regional Conservation Plan (if available). ▪ Maintains or improves areas of regionally significant terrestrial and aquatic biodiversity (as mapped and agreed by DEC). This includes regionally significant vegetation communities, critical habitat, threatened species, populations, ecological communities and their habitats. ▪ Maintain or improve existing environmental condition for air quality. ▪ Maintain or improve existing environmental condition for water quality: o Consistent with community water quality objectives for recreational water use and river health (DEC and CMA). o Consistent with catchment and stormwater management planning (CMA and council). ▪ Protects areas of Aboriginal cultural heritage value (as agreed by DEC).	The development proposes to retain all identified as high ecological value. It is considered this land currently provides high value habitat for flora and fauna, and as such the proposed development has been designed to ensure this high value will be retained, and that future urban development will not compromise this location. The subdivision is anticipated to maintain the existing air quality and environmental water quality of the surrounding area. Areas of Aboriginal cultural heritage value have been identified and considered by the resultant subdivision design. The cultural heritage assessment has identified measures to preserve the heritage value of the site and these measures will be implemented.
8. Quality and Equity in Services Quality health, education, legal, recreational, cultural and community development and other government services are accessible	▪ Available and accessible services. o Do adequate services exist? o Are they at capacity or is some capacity available? o Has Government planned and budgeted for further service provision? o Developer funding for required service upgrade/access is available.	The subject land is located within close proximity to the Coffs Harbour urban area and maintains high accessibility via public transport, mobility networks and private vehicle transport. The high accessibility and variety of transport modes to these areas provides accessibility for all future residents to necessary community services, facilities and social infrastructure. Future development of the North Boambee Valley area is likely to include increased community and social infrastructure which will increase availability of services and access.

6.2 FLORA & FAUNA

6.2.1 Impacts

A Flora and Fauna Assessment (FFA) has been undertaken on the subject land to assess the impacts of the proposed subdivision. The FFA is attached as Appendix BB to this EA. The FFA has regard to the potential habitat provisions for a range of flora and fauna species and particularly that for Koalas.

The Flora and Fauna Assessment has been prepared using a comprehensive information and data review, as well as intensive site investigation and field survey. The preliminary investigations undertaken for the site included review of ecological information and data relevant to the site, including reviewing any literature or reports, as well as threatened species database records.

A field study was undertaken on 16 and 17 November 2007, including vegetation community validation and mapping, habitat assessment and targeted threatened flora surveys to determine the extent of Endangered Ecological Communities (EEC's) as well as determine potential habitat for threatened species and any opportunistic observations. No targeted fauna surveys were undertaken as the proposal seeks to avoid potential habitat for threatened fauna. Telephone discussions were held with DECC regarding the proposal and particularly with regards to the level of survey effort that would be required for the development. DECC advised that reporting would need to demonstrate why literature review, data audit, validation of vegetation communities and habitat assessment are considered adequate to understand the level of ecological importance of the site and that systematic survey would not be required. It is considered that Literature review, data audit, validation of vegetation communities and habitat assessment are considered adequate to understand the level of ecological importance of the site, and to formulate recommendations for avoidance of key values, minimisation of effects, and mitigation of potential impacts from adjoining development.

Proposed roads and Asset Protection Zones for the development are to be provided outside the densely vegetated areas of the site and areas adjacent to threatened species. Provision of Asset Protection Zones will not require vegetation removal as it has been assessed that the level of existing vegetation is adequate to provide for an appropriate buffer. Recommendations contained within the Statement of Commitments have been provided to ameliorate any impacts of vegetation clearing.

It has not been considered necessary to thoroughly survey the whole site to determine how the site contributes to the broader landscape. The development will involve minimal clearing of native vegetation within the site. The nature of vegetation, habitat and threatened flora surveys along with consideration of regional vegetation mapping and aerial photographs is considered sufficient to examine impacts and the contribution of the site to the landscape. To supplement this discussion, a review of regional DECC key corridors and Council vegetation and koala habitat mapping was also undertaken.

The site is defined by undulating terrain and portions of dense vegetation including remnant vegetation across almost half of the total site area. The site provides a potential habitat for a range of flora and fauna species. The FFA identified a total of 42 listed species, under both the *Environment Protection and Biodiversity Conservation Act 1999*

("the EPBC Act") and the *Threatened Species Conservation Act 1995* ("the TSC Act"), as potentially occurring on the site (see **Table 17** below).

Table 17 - Listed fauna species potentially occurring within the subject site Note: reproduced from Eco-Logical 2007 (Source: Eco-Logical 2007)

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Fauna				
Crinia tinnula	*Crinia tinnula*	Vulnerable		**No.** no suitable habitat.
Litoria brevipalmata	Green Thighed Frog	Vulnerable		**Potential in subject site.** The Lowland Rainforest offers some habitat potential for this species, though habitat fragmentation and adjoining historic landuse presents some limitation.
Mxophyes balbus	Stuttering Frog	Endangered	Vulnerable	**Potential in study area but not subject site.** The Lowland Rainforest offers some habitat potential for this species, though habitat fragmentation and adjoining historic land use presents some limitation.
Mxophyes iteratus	Giant Barred Frog	Endangered	Endangered	**Potential in study area but not subject site.** The Lowland Rainforest offers some habitat potential for this species, though habitat fragmentation and adjoining historic land use presents some limitation.
Emydura signata	Bellinger River Emydura		Vulnerable	**No.** site is outside of the known range of the species.
Emydura macquarii		Vulnerable		
Hoplocephalus stephensii	Stephen's Banded Snake	Vulnerable		**Potential in study area but not subject site.** The Lowland Rainforest offers some habitat potential for this species, though habitat fragmentation and adjoining historic land use presents some limitation.
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable		**Potential in study area but not subject site.** Forage habitat is available and records nearby. No evidence of foraging was observed.

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Coracina lineata	Barred Cuckoo-shrike	Vulnerable		**Potential in study area but not subject site.** The Lowland Rainforest offers some habitat potential for this species.
Cyclopsitta diophthalma coxeni	Coxen's Double-eyed Fig-Parrot	Endangered	Endangered	**Potential in study area but not subject site.** The Lowland Rainforest offers some habitat potential for this species.
Ephippiorhynchus asiaticus	Black-necked Stork	Endangered		**Potential in study area but not subject site.** The dams and wetland soak offers some suitable forage habitat during the transient lifecycle of the species.
Esacus neglectus	Beach Stone-curlew	Endangered		**No.** No suitable habitat
Grantiella picta	Painted Honeyeater	Vulnerable		**No.** No suitable habitat
Ixobrychus flavicollis	Black Bittern	Vulnerable		**No.** No suitable habitat
Lathamus discolor	Swift Parrot	Endangered	Endangered	**Unlikely**. Very limited favoured winter season flowering eucalypts and few local records.
Lophoictinia isura	Square-tailed Kite	Vulnerable		**Likely across study area including subject site.** Recorded near Sawtell and given the large home range of the species, the site is considered to offer a portion of the species forage habitat.
Pandion haliaetus	Osprey	Vulnerable		**Unlikely.** No suitable forage habitat.
Ptilinopus magnificus	Wompoo Fruit-Dove	Vulnerable		**Potential in study area but not subject site.** Lowland Rainforest offers suitable rainforest fruiting trees, shrubs and vines and records nearby.
Ptilinopus regina	Rose-crowned Fruit-Dove	Vulnerable		**Potential in study area but not subject site.** Lowland Rainforest offers suitable rainforest fruiting trees, shrubs and vines and records nearby.

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Rostratulabenghalensis australis	Painted Snipe (Australian subspecies)	Endangered	Endangered	**No.** no habitat
Todiramphus chloris	Collared Kingfisher	Vulnerable		**No.** no habitat
Turnix melanogaster	Black-breasted Button-quail	Endangered	Vulnerable	**Unlikely.** Not preferred habitat
Xanthomyza phrygia	Regent Honeyeater	Endangered	Endangered, Migratory	**Unlikely.** Very limited favoured winter season flowering eucalypts and few local records.
Ninox connivens	Barking Owl	Vulnerable		**Unlikely.** No local records.
Ninox strenua	Powerful Owl	Vulnerable		**Likely in study area but not subject site.** Potential habitat and records nearby.
Tyto capensis	Grass Owl	Vulnerable		**Unlikely.** No suitable habitat.
Tyto novaehollandiae	Masked Owl	Vulnerable		**Likely in study area but not subject site.** Potential habitat and records nearby.
Tyto tenebricosa	Sooty Owl	Vulnerable		**Likely in study area but not subject site.** Potential habitat and records nearby.
Aepyprymnus rufescens	Rufous Bettong	Vulnerable		**Unlikely.** Few local records and suitable habitat is fragmented.
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable		**Likely across study area including subject site.** Several records occur in the area and suitable forage and possibly dense habitat within the Lowland Rainforest is available.
Dasyurus maculates maculatus	Spotted-tailed Quoll (SE Mainland Population)		Endangered	
Petaurus australis	Yellow-bellied Glider	Vulnerable		**Potential across study area including subject site.** Suitably sized hollows and forage resources are available. No evidence of the species was identified on the site and the fragmented nature of the site reduces the likelihood to occur.

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Petaurus norfolcensis	Squirrel Glider	Vulnerable		**Potential across study area including subject site.** Suitably sized hollows and forage resources are available. No evidence of the species was identified on the site and the fragmented nature of the site reduces the likelihood to occur.
Petaurus norfolcensis	Squirrel Glider	Vulnerable		**Potential across study area including subject site.** Suitably sized hollows and forage resources are available. No evidence of the species was identified on the site and the fragmented nature of the site reduces the likelihood to occur.
Petrogale penicillata	Brush-tailed Rockwallaby	Endangered	Vulnerable	**No**
Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable		**Unlikely.** Some marginal habitat potential, though few local records.
Phascolarctos cinereus	Koala	Vulnerable		**Yes.** Three Koalas observed and scats identified across the site.
Planigale maculata	Common Planigale	Vulnerable		**Unlikely.** Marginal suitable habitat and no local records.
Potorous tridactylus	Long-nosed Potoroo	Vulnerable		**Potential in study area but not in subject site.** Recorded within 10 km of the study area. The Lowland Rainforest offers some potential habitat for this species.
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE Mainland Population)		Vulnerable	
Chalinolobus nigrogriseus	Hoary Bat	Vulnerable		**Potential within study area and subject site.** The Lowland Rainforest offers suitable habitat for this species.
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	**Likely in study area but not in subject site.** Suitable forage habitat available
Kerivoula papuensis	Golden-tipped Bat	Vulnerable		**Likely in study area but not in subject site.** Suitable forage habitat and possibly roost habitat available.

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Mniopterus australis	Little Bent-wing Bat	Vulnerable		**Likely across study area including subject site.** Suitable forage habitat available
Mniopterus schreibersii oceanensis	Eastern Bent-wing Bat	Vulnerable		**Likely across study area including subject site.** Suitable forage habitat available
Mormopterus norfolkensis	East Coast Freetail Bat	Vulnerable		**Likely across study area including subject site.** Suitable forage habitat available
Myotis adversus	Large-footed Myotis	Vulnerable		**Potential in study area but not in subject site.** Dams and water bodies offer some suitable forage habitat and suitable roosts are available
Pteropus poliocephalus	Grey-headed Flying-Fox	Vulnerable	Vulnerable	**Likely in study area but not in subject site.** Suitable forage habitat available.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable		**Likely across study area including subject site.** Suitable forage habitat available
Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable		**Likely in study area but not in subject site.** Suitable forage habitat and suitable roosts are available
Syconycteris australis	Common Blossom-bat	Vulnerable		**Unlikely.** No suitable forage habitat. Marginal roost habitat, though more likely to roost in coastal rainforest.
Phyllodes imperalis (Southern subspecies)	A moth	Endangered	Endangered	**Potential in study area but not in subject site.** Lowland Rainforest offers some suitable habitat.
Haliaeetus Leucogaster	White-bellied Sea-Eagle		Migratory	**No.**
Hirundapus caudacutus	White-throated Needletail		Migratory	**Likely across study area.** Likely to fly over the site.

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Merops ornatus	Rainbow Bee-eater		Migratory	**Yes.** Observed on site.
Monarcha melanopsis	Black-faced Monarch		Migratory	**Potential in study area but not in subject site.** May utilise the Lowland Rainforest on the site.
Monarcha trivirgatus	Spectacled Monarch		Migratory	**Unlikely.** Limited suitable habitat.
Myiagra cyanoleuca	Satin Flycatcher		Migratory	**Unlikely.** Limited suitable habitat.
Rhipidura rufifrons	Rufous Fantail		Migratory	**Potential in study area but not in subject site.** May utilise the Lowland Rainforest and other forest communities on the site.
Xanthomyza phrygia	Regent Honeyeater	Endangered	Endangered, Migratory	
Ardea alba	Great Egret		Migratory	**Unlikely.** Limited suitable habitat.
Ardea ibis	Cattle Egret		Migratory	**Likely in study area but not in subject site.** Likely to utilise the site intermittently
Gallinago hardwickii	Latham's Snipe		Migratory	**Unlikely.** Limited suitable habitat.
Rostratula benghalensis s. lat.	Painted Snipe		Migratory	**Unlikely.** Limited suitable habitat.
FAUNA				
Acronychia littoralis	Scented Acronychia	Endangered	Endangered	**No.**
Alexfloydia repens		Endangered		**No.**
Amorphospermum whitei	Rusty Plum	Vulnerable	Endangered	**Yes, likely in study area but not in subject site.** The Lowland Rainforest association and edges offers suitable habitat for this species.
Arthraxon hispidus	Hairy Jointgrass	Vulnerable	Vulnerable	**Likely in subject site.** Open areas along forest edges, particularly adjoining rainforest remnants, offers suitable habitat for this species.

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Cynanchum elegans		Endangered	Endangered	**Unlikely.** Not recorded in locality and paucity of records in north coast region.
Eleocharis tetraquetra	Square-stemmed Spike Rush	Endangered		**Potential in study area but not in subject site.** The ephemeral wetland areas offer some suitable habitat for this poorly known species.
Lindsaea incisa	Slender Screw Fern	Endangered		**Potential in study area but not in subject site.** The stream side and parts of the site offers some suitable habitat.
Marsdenia longiloba	Slender Marsdenia	Endangered	Vulnerable	**Yes in study area but not in subject site.** The Lowland Rainforest association and edges offers suitable habitat for this species.
Parsonsia dorrigoensis		Vulnerable	Endangered	**Likely in study area but not in subject site.** The Lowland Rainforest association and edges offers suitable habitat for this species.
Persicaria elatior	Tall Knotweed	Vulnerable	Vulnerable	**Unlikely.** Not recorded in locality and paucity of records in north coast region.
Phaius australis	Swamp Orchid	Endangered	Endangered	**Potential in study area but not in subject site.** Some marginal habitat suitability within the Lowland Rainforest and in ephemeral wetland areas.
Pultenaea maritima		Vulnerable		**No.**
Quassia sp.1	'Mooney Creek' Quassia	Endangered	Endangered	**Unlikely.** Population is centred in areas north of Moonee Beach.
Sarcochilus fitzgeraldii	Ravine Orchid	Vulnerable	Vulnerable	**No.**
Sarcochilus hartmannii		Vulnerable	Vulnerable	**No.**
Senna acclinis	Rainforest Cassia	Endangered		**Potential in study area but not in subject site.** Few local records, but Lowland Rainforest offers some suitable habitat.
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	**No.**

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	OCCURING
Tylophora woollsii	Cryptic Forest Twiner	Endangered	Endangered	**Likely in study area but not in subject site.** The Lowland Rainforest association and edges offers suitable habitat for this species.
Zieria prostrata	Headland Zieria	Endangered	Endangered	**No.**
Zieria smithii	Low growing form of *Z. smithii,* Diggers Head population	Endangered		**No.**

A total of five vulnerable species, seven endangered species, and five migratory species listed in the EPBC Act were identified as potentially occurring within the subject land. Despite the potential for these 17 listed species, only three were observed during field investigations.

- *Rusty Plum (Endangered)*
- *Slender Marsdenia (Vulnerable)*
- *Rainbow Bee-eater (migratory)*

A total of 27 vulnerable species, ten endangered species, and one Endangered Ecological Community (EEC) were identified as potentially occurring within the subject land under the TSC Act. During field observations, only four species were identified and one Endangered Ecological Community.

- *Koala (Vulnerable)*
- *Rusty Plum (Vulnerable)*
- *Slender Marsdenia (Endangered)*
- *Lowland Rainforest (Endangered Ecological Community)*

To further determine the potential impacts of this development on the native flora and fauna of the subject land, a seven part test of significance has been undertaken as part of the Flora and Fauna assessment for the proposal (refer also to Appendix BB).

The seven part test has been undertaken with regard to species, populations and ecological communities listed with Schedules 1, 1A and 2 of the TSC Act and Schedules 4, 4A and 5 of the FM Act. The assessment under the seven part test sets out 7 factors which must be considered against the proposed development. In considering these factors, a proponent is able 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). A SIS is required when the seven part test determines that the development is likely to have a significant impact upon a threatened species, population or ecological community.

Based on the list species considered above, it can be determined that the species which may be directly affected by the proposal include:

- *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion*
- *Hairy Joint Grass (Arthraxon hispidus)*
- *Green-thighed Frog (Litoria brevipalmata)*
- *Square-tailed Kite (Lophoictinia isura)*
- *Spotted-tail Quoll (Dasyurus maculata)*
- *Yellow-bellied Glider (Petaurus australis)*
- *Squirrel Glider (Petaurus norfolcensis)*
- *Koala (Phascolarctos cinereus)*
- *Hoary Bat (Chalinolobus nigrogriseus)*

- *Little Bent-wing Bat (Miniopterus australis)*
- *Eastern Bent-wing Bat (Miniopterus schreibersii oceanensis)*
- *East Coast Freetail Bat (Mormopterus norfolkensis)*
- *Yellow-bellied Sheathtail-bat (Saccolaimu flaviventris)*

The seven part test is included within the FFA at Appendix BB to this EA report. The seven part test provides an assessment of each species against the seven factors to determine the potential impact to the species.

The development as proposed offers a design which seeks to avoid vegetated areas of the site, particularly within the north, east and western portions of the site. While there is some disturbance likely to these areas through the removal of vegetation, the areas required for clearing are limited and are identified as areas which exhibit existing disturbance. Consequently, the development will retain the majority of the existing vegetation on site, and in particular will retain the prominent areas of the site identified as high value habitat. The proposal also seeks to improve the connectivity of the habitat on site and the surrounding corridors through vegetation offset plantings and retention of key linkages to the east, north and west of the site.

The proposal also seeks to implement a number of techniques to enhance and improve the habitat value of the site, and ensure urban growth of the site is not detrimental to the habitat network and vegetation on site. Water sensitive urban design techniques will be implemented to ensure that increased run-off and potential pollutants associated with urban development will not detrimentally impact upon habitat or vegetation. The development also seeks to provide revegetation and rehabilitation strategies within areas where vegetation is removed, and in particular within the eastern portion of stage 2 which includes some filling works.

Based on the conclusions of the seven part test, it has been determined that it is considered unlikely that the proposal will have significant impacts to any of the species assessed, provided appropriate recommendations of this EA and attached FFA are implemented. Consequently, it is not considered that an SIS is necessary for this development.

6.2.2 Impacts of native vegetation clearing

The site includes portions of dense vegetation, contained within the 7A zoning across the subject land. As discussed above, this vegetation offers significant habitat value to a range of identified species. As a result, the proposal will retain the majority of existing native vegetation to ensure existing habitat provision and linkages are retained (see **Figure 37** below). The extent of vegetation removal is limited and isolated such that the major vegetation and habitat corridors are retained, specifically to the east of the site.

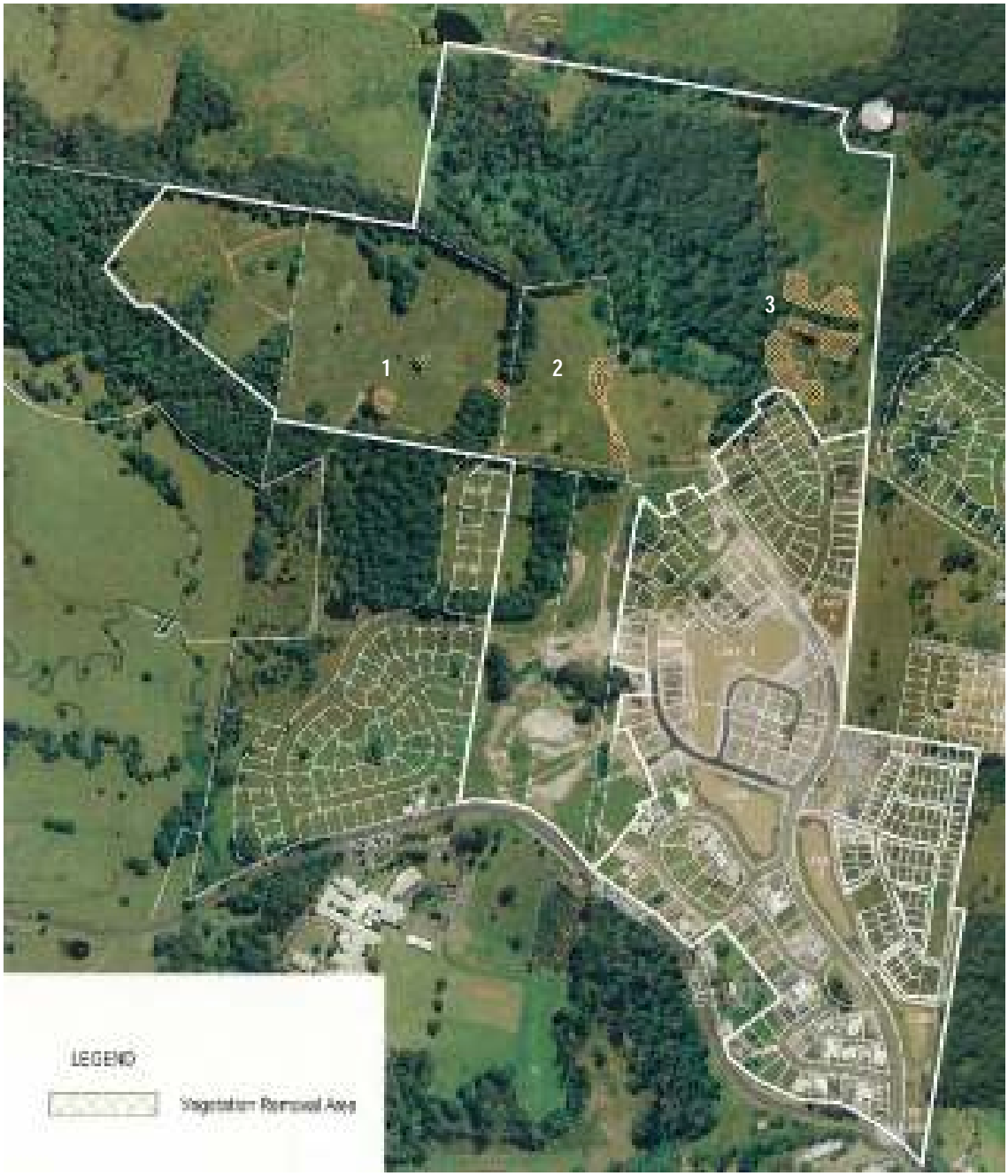

Figure 37 - Areas of vegetation removal (Source: CPG Australia 2009)

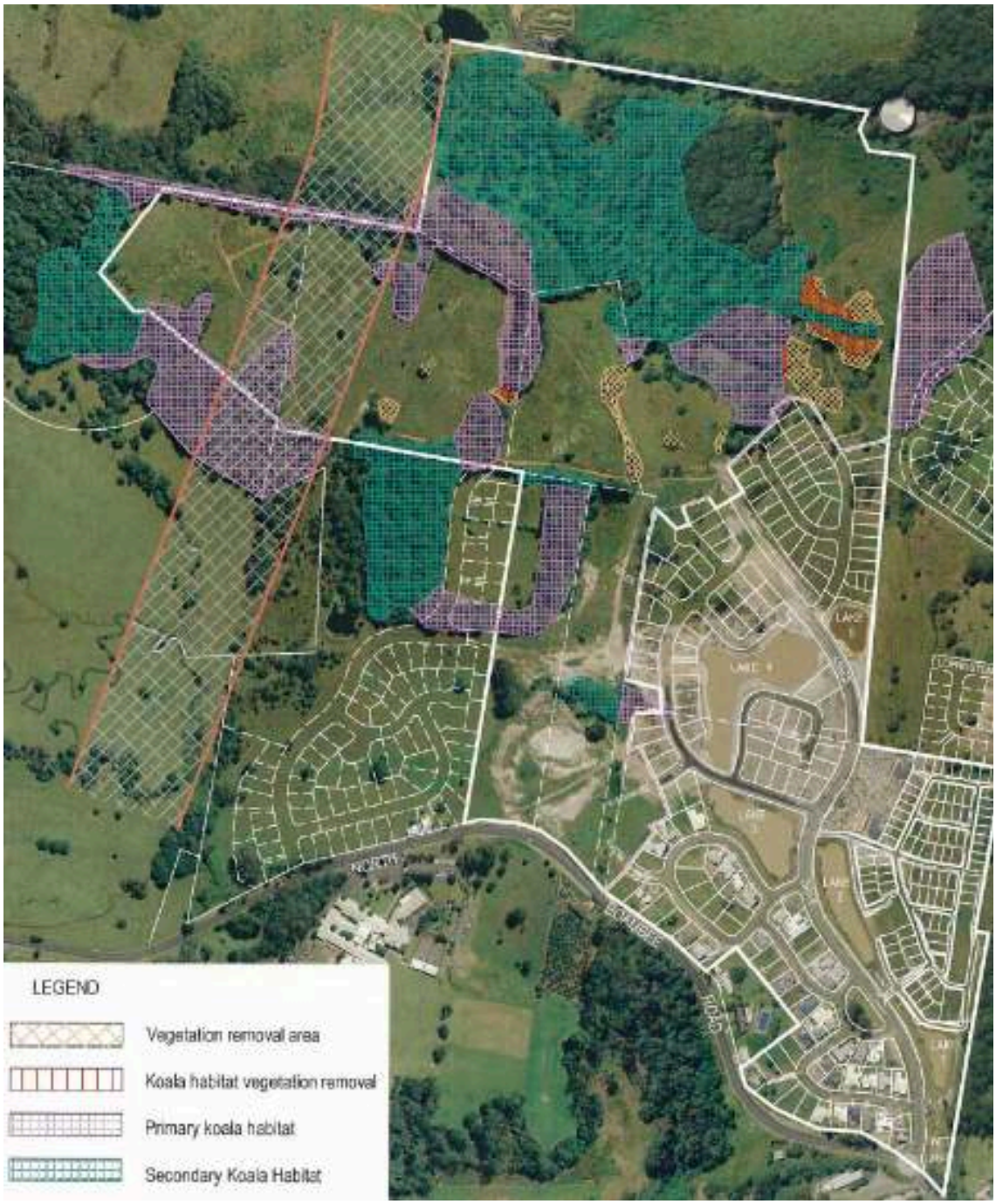

Figure 38 - Areas of vegetation removal (Source: CPG Australia 2009)

The majority of vegetation clearing is isolated to the eastern portion of the site, identified as location 3 in **Figure 37** above. This area is identified as having a significant link to vegetation to the east of the site. As such, the subdivision design has ensured that a link can be retained in this location. The subdivision layout has ensured that the prominent vegetation in this location is retained and reinforced as a linkage. Roads which extend through this link are designed as 'slow points' and utilise existing breaks in the vegetation.

Location 2 involves removal of a narrow strip of vegetation along a small ridgeline. The strip extends from the densely vegetated northern portion to the identified corridor to the north west of the existing Lakes Estate. The narrow strip is identified as a mapped corridor, however is less densely vegetated than the more prominent corridor to the west.

Location 1 involves several small areas of clearing to permit roads and servicing areas. This area of clearing involves some minor removal of vegetation from the existing western link corridor.

The FFA also provided an assessment of the ecological constraints to development. This included Koala habitat, habitat and vegetation corridors, EEC's, wet areas, hollow bearing trees and high value vegetation. The following figures demonstrate the extent of ecological constraints within the subject land.

Figure 39 - Vegetation removal in context to the subdivision layout (Source: CPG Australia 2009)

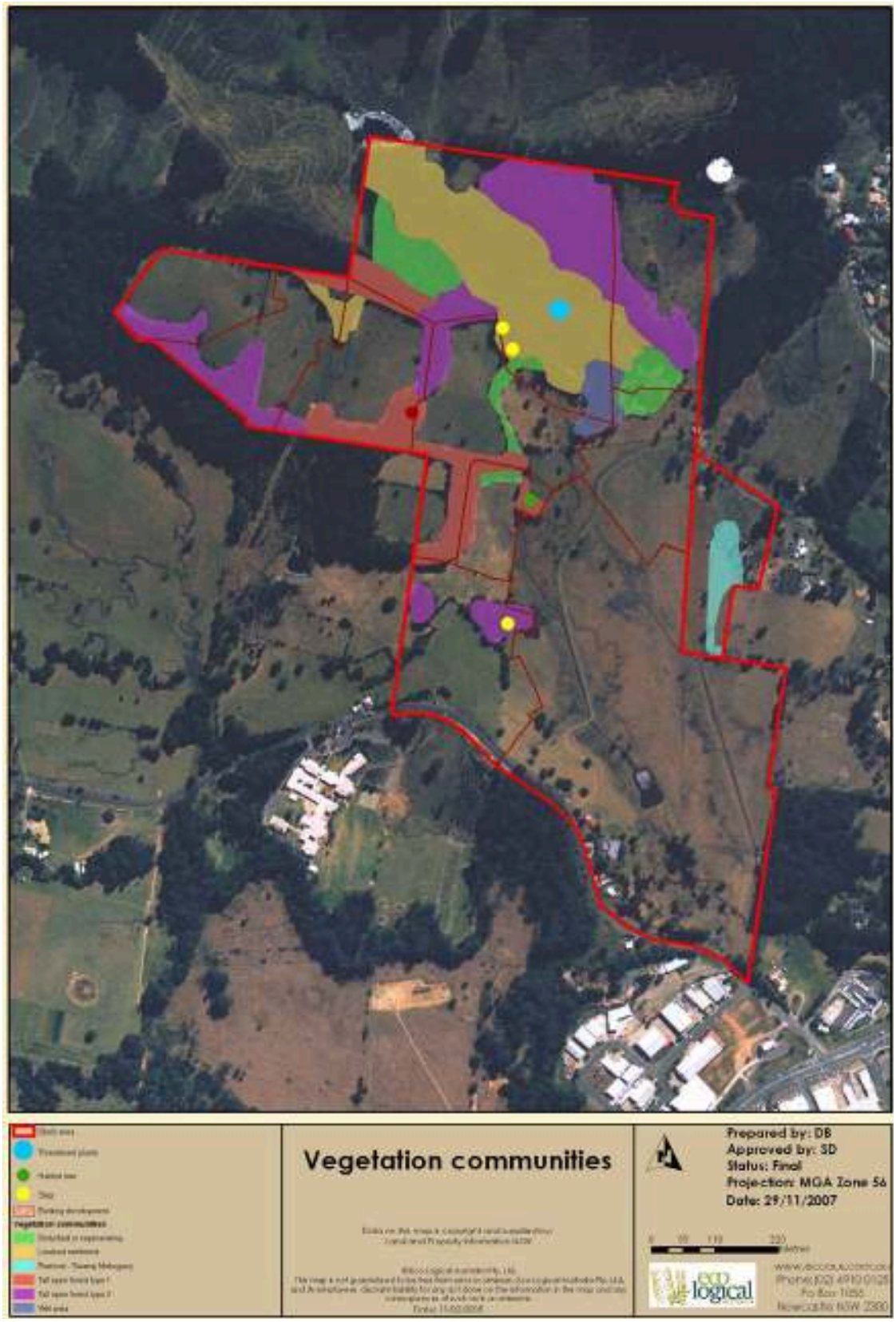

Figure 40 - Vegetation communities identified within the subject site (Source: Eco-Logical Australia 2007)

Figure 41 - Koala Habitat areas identified within the subject site (Source: Eco-Logical Australia 2007)

Figure 42 - Vegetation corridors identified within the subject site (Source: Eco-Logical Australia 2007)

Figure 43 – Endangered Ecological Communities identified within the subject site (Source: Eco-Logical Australia 2007)

Figure 44 – Wet areas identified within the subject site (Source: Eco-Logical Australia 2007)

Figure 45 – Location of tree hollows and hollow bearing communities within the subject site (Source: Eco-Logical Australia 2007)

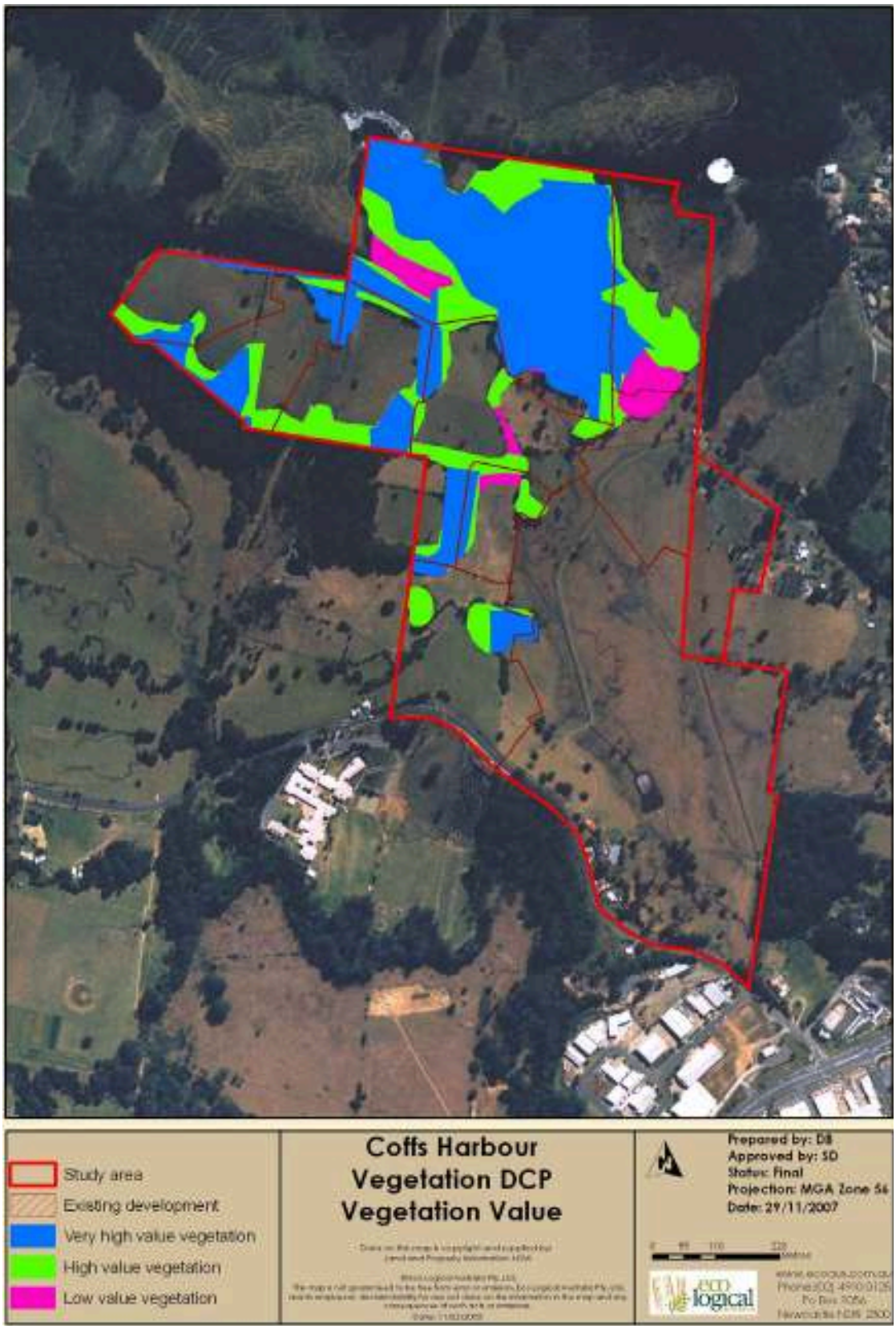

Figure 46 - Vegetation values within the subject site based on Coffs Harbour Vegetation DCP (Source: Eco-Logical Australia 2007)

Figure 47 - Combined environmentally constrained land within the subject site (Source: Eco-Logical Australia 2007)

Potential Edge Effects

The proposal has also had regard to edge effects to habitat and vegetation corridors as a result of increased urban development. The site contains a number of prominent corridors, particularly in the north west and east of the subject site. Potential edge effects in this instance include weeds, domestic animals, human disturbance and changed microclimates as a result of urban expansion.

To minimise potential edge effects to vegetation corridors and habitats, the subdivision design has had regard to providing corridors which are as wide as possible and include buffers where possible, to minimise human disturbance. Roads are used as buffers between proposed lots and dense vegetation, with slow points included to slow traffic and reduce impact along corridors, or where roads traverse corridors. Prominent vegetation corridors have been retained within the site, with these retained corridors provided with adequate buffers to ensure limited impact from increased development.

The species of most concern within the subject site are Koala, squirrel glider, yellow-bellied glider, long-nosed potoroo and some frog species. The habitat corridors and linkages within the site are identified as an important network for these species. In this instance, management of the corridors through retention of vegetation and implementation of buffers along these corridors and habitat areas will improve habitat availability and function.

Koala habitat and movement is identified as a key consideration for the site. Movement is primarily provided through existing corridors, with identified primary and secondary Koala habitat also retained. Koala proof fencing is proposed within the site to ensure domestic animals do not enter the areas of significant vegetation and habitat value, and also ensure a separation between the urban development of the site and the Koala habitat. Proposed covenants for the estate include prohibition of domestic animals outside private open space areas of dwellings unless leashed, and requirements for all domestic animals to be registered with Council.

Vegetation Offsets

The development of the subdivision will involve some vegetation removal within the subject site. The development proposes to revegetate the site through offset plantings in accordance with the Coffs Harbour Vegetation DCP. The offsets are also proposed to improve the corridors and linkages within the site.

The subdivision is designed to minimise removal of vegetation, particularly within the Very High and High value areas within the site. The subdivision is likely to result in the removal of some trees for provision of roads through the estate. The road design, and subdivision layout, proposes narrow roads to reduce traffic speed and movements, as well as provide protection to natural habitat and corridors. As such the development will offset any displaced trees elsewhere within the subdivision, and where possible will seek to provide revegetation which consolidates with the existing conservation areas, densely vegetated areas and primary and secondary koala habitat corridors.

The proposal involves limited vegetation removal within primary Koala habitat areas, with only very limited removal required within the north eastern portion of the site. The removal of vegetation occurs on the edge of the primary Koala habitat area, and is not

considered likely to result in fragmentation to the Koala habitat network. Removed trees will be offset in accordance with KPoM and CHVDCP, elsewhere within the subject site. The proposed offsets will be located within the northern portion of the site to consolidate with the existing high value vegetation and habitat network.

6.2.3 Conservation & wildlife corridors

The design of the subdivision incorporates vegetation linkages to benefit flora and fauna connectivity and fauna linkages. The retention of the majority of vegetation also ensures continued population of the observed species within the subject land through retention of required habitat. The subject land has a number of significant vegetation corridors within the site which have potential for habitat linkages. Much of this vegetation is defined as sub-regional habitat corridors (see Section 4 of Appendix BB).

Corridors

The site contains three mapped corridors and a portion of the sub-regional key corridor (see **Figure 42** above). The largest corridor extends along the western boundary of existing Lot 2 DP607602 and within the access 'handle' of existing Lot 10 DP1071628, and then extends both north west and north east through existing Lot 10, linking with the large portion of vegetation in the northern portion of the subject land. The corridor includes prominent areas of existing vegetation and varies in width between 30 and 70 metres and weaves for a length of around 600 metres.

Two other mapped corridors exist within the subject land. A small area of approximately 100 metres in length and 80 metres in width extends from the adjoining land to the east across the western boundary of the subject land. This portion includes scattered to dense covering of vegetation between the remnant vegetation in the northern portion of the site, and dense vegetation within adjoining land to the west. The third mapped corridor is located within the central portion of existing Lot 10 DP1071628, and extends along a vegetated ridgeline for approximately 180 metres at a varied width of between 15 and 50 metres.

The subregional key corridor exists as a broad overlay within the North Boambee Valley. The corridor generally encompasses the Bonville Creek environs to the south of North Boambee Road, and splays north to include the western and northern portion of the subject land. All vegetation contained within the areas identified by either mapped or subregional corridors will be retained under the proposed subdivision design.

The design of the subdivision has recognised these importance linkages, and the rationale of the design is to provide a dual open space and conservation area which provides a continuous habitat 'link' across the subject land. The effectiveness of the linkages is further enhanced by the substantial width of the corridors and the buffering applied. This design reduces external impacts from residential development surrounding the corridors such as domestic animals, human impact, weeds and exotic species and changed periphery environment. The three main species of Koala, squirrel glider, long nosed potoroo and frogs, can be adequately accommodated within the habitat linkages.

Endangered Ecological Communities

One Endangered Ecological Community ("EEC") has been identified on site, being the endangered ecological community *Lowland Rainforest on Floodplain in the New South*

Wales North Coast Bioregion. This community is listed as an EEC under the TSC Act and occupies approximately 8.5ha of the study area, being the vegetated northern portion of the site (see Figure above). This area is generally contained within the 7A zone of the site.

The lowland rainforest EEC provides habitat for two threatened species listed on both the TSC Act and EPBC Act; rusty plum and slender marsdenia (see **Table 17** above). In addition, the EEC offers potential habitat for a further 18 threatened species listed under either the TSC Act or EPBC Act, as well as a further two species listed as migratory under the EPBC Act that have the potential to occur on the site.

Key threats to the community are identified as clearing and fragmentation of the habitat for development and agriculture, invasion of community by introduced weeds particularly exotic vines and lantana, degradation of habitat by fire, degradation of habitat by grazing stock and dumping of rubbish within rainforest remnants.

The proposed development has been designed to retain the land and vegetation identified as an EEC within the subject land. In addition, the subdivision incorporates measures to ensure the potential 'edge effects' from residential development are reduced. The eastern extent of the EEC is likely to maintain an interface with stage 3 of the subdivision. In areas where an interface with the EEC is maintained, the internal road network is provided as a buffer between residential allotments and the EEC. The road is designed as a 'slow point' to reduce potential traffic conflict with the EEC. This design allows an adequate buffer to be established between the residential allotments and the EEC, and reduce potential land use conflicts.

6.2.4 Conservation of riparian corridor & aquatic habitats

Several watercourses are contained within the subject land, with the most prominent riparian corridor being Newports Creek to the south of North Boambee Road, external of the subject land some 100 metres south at its closest point. The watercourses within the subject land provide for collection of surface water run-off and are contained within heavily vegetated conservation area. The proposal will not include any removal of vegetation or modification of landforms within the conservation area, and the interface of the subdivision with the conservation area edge is designed to reduce the direct impacts of residential development upon the riparian areas and habitat.

Some filling will be required on the eastern portion of stage 2, which exists as a lower area collecting run-off from the higher portions of the site to the north. Run-off will be diverted along an existing large drainage channel which runs parallel with Lakes Drive between stage 2 and existing Lake 5. The modifications made to this area are not considered likely to detrimentally affect aquatic habitats, given the conservation area provides for greater habitat value and quality, and will not be developed.

6.2.5 Biodiversity Conservation Lands Spatial layer

The Biodiversity Conservation Lands Spatial layer ("the BCLS layer") has been prepared by the DECC, to provide clarity of biodiversity constraints along the Mid North Coast. The BCLS layer operates at three levels, state significance, regional significance and local significance. Council has advised that the BCLS layer will form the basis of environmental protection under the new Coffs Harbour LEP currently under preparation.

During preparation of this EA, contact was made with DECC's Coffs Harbour office to ascertain the implications of the BCLS layer in context to the proposed subdivision. DECC advised that the BCLS layer was not specifically designed for use in private development situations, but as an additional tool for local and state Government. Despite this, the proposed subdivision has had consideration to the BCLS layer and is considered to be consistent.

6.3 PROPOSED CONSERVATION AREAS

6.3.1 Ownership & management

Portions of the subject land are provided with dense native vegetation and subsequently zoned as 7A – Environment Protection under the Coffs Harbour LEP. This land is proposed to be contained within a 15.33 hectare residue allotment (Lot 198) of the subdivision to retain the existing habitat value of the site and identified habitat corridors, as well as to provide natural open space areas which enhance the residential amenity of the site. The residual 7A area of the site will be managed by the proponent to ensure a high standard of maintenance and protection of the sensitive and high value environmental areas of the subject land.

The open space areas are designed with specific regard to the habitat and species value of the vegetation, and as such measures such as Koala friendly fences, domestic animal proof fences and narrow slow roadways are proposed to be implemented along these portions of the subdivision to reduce potential impact from future residential use.

Internally, the proposal does not include any changes to these vegetated portions of land, and it is considered that ongoing maintenance of these areas will be undertaken as necessary.

6.4 WATER CYCLE MANAGEMENT AND WATERCOURSES

6.4.1 Integrated Water Cycle Management

The Lakes Estate has been designed to incorporate a detention system consisting of five lakes and a wetland (see **Figure 48** below). The basis of this design is to provide for permanent water storage which allows treatment of nutrients and also provides for amenity within the subdivision. The system was designed to accommodate increased run-off from a 30 per cent increase in impervious areas in the lower catchment areas and 10 per cent increase in impervious areas in the upper catchment areas under the early stages of the Lakes Estate subdivision based on the *North Boambee Valley Detention Ponds Environmental Impact Statement* ("NBVEIS") prepared for Council by Gutteridge, Haskins and Davey Pty Ltd ("GHD Pty Ltd"). The detention system was also designed to achieve flood retardation and water quality criteria as defined by the NBVEIS. A Stormwater Constraints Assessment has been prepared to identify an Integrated Water Cycle Management system including water sensitive urban design principles, and is located at Appendix FF.

Figure 48 - Existing Lakes Estate detention system (Source: CPG Australia 2009)

The proposal includes land within two catchment areas, being the existing Lakes Estate catchment to the east, and the second being the western catchment on the western aspect of the ridgeline. The majority of the proposed development, 32 hectares, is included within the eastern catchment, with the remaining 4.5 hectares contained within the western catchment.

The 32 hectares of development within the eastern catchment is in addition to the 22 hectares already developed and includes an additional two stages of development. To allow the increase in development to be accommodated within the existing lake and wetland detention system, the impervious area of development sites has been calculated at 30 per cent for the each lot within the proposed subdivision, and only 20 per cent in the steeper slopes of stage 3. Surface water run-off from this portion of the land will be contained within the existing lake and wetland system constructed in the lower south eastern portion of the subject land. The existing detention system of five lakes and a single wetland has been determined to be adequate to accommodate the runoff generated by increased development. The original lake system was designed for a full capacity of the eastern catchment area which will be reached following full development of the eastern portion of the subdivision. A channel is also proposed between Lake 5

and the eastern boundary of stage 2 to allow flood waters to be directed to the lake system and away from development within the eastern portion of stage 2.

The western catchment includes only 4.5 hectares of the proposed subdivision. The NBVEIS proposed construction of two detention ponds within this western catchment to trap and store stormwater runoff and treat the stormwater flows within the wetland. The two ponds are to be constructed in accordance with the ponds proposed, and subsequently approved, under the NBVEIS. This design includes a detention pond adjacent, and partially overlapping the adjoining approved subdivision (identified as DA 711-06), and a dry detention basin further west. The dry detention basin is located within the proposed highway corridor.

The Stormwater Constraints Assessment identifies construction of the stormwater detention pond adjacent to DA 711-06 can provide a whole of catchment solution to proposed lots in the western portion of stage 2. This design would also accommodate stormwater from future development within the 'western catchment'.

6.4.2 Surface & groundwater hydrology

The subject land contains several watercourses which extend down slope from the higher land to the north. A low lying area exists within the eastern portion of stage 2, adjacent to existing development of the Lakes Estate. In the eastern catchment, the majority of the development is proposed on the upper slopes and is above the 1 in 100 year flood level. Stage 3 in the north eastern corner of the subject land contains slopes in excess of 20 per cent and presents a potential risk to surface water and groundwater through increased sedimentation of water ways, particularly during construction of the subdivision. The proposal includes careful consideration of this portion of the land, with construction of the road infrastructure and future dwellings to include sediment control measures prepared as part of the overall construction management plan. This will include measures to reduce the movement of sediment down slope. Occupation of the site will also include measures to reduce potential for surface water run-off to increase sediment movement. Retaining walls will be provided for future dwellings within this location, and the internal road network will include small vegetated swales to remove sediment within surface water run-off. The reduction in transport of sediment is particularly important in this instance as the subject land has been identified to have acidic soils.

The remaining eastern catchment is generally undulating, and the proposed stormwater drainage system is considered capable of ensuring surface water run-off is treated effectively. Sedimentation from these areas is considered negligible. The Lakes Estate is designed with a five ponds and single wetland. This system will collect the stormwater from the eastern catchment and provide a treatment system to maintain surface and groundwater quality. The system has been designed and constructed with regard to the NBVEIS.

The existing lake and wetland system is designed to accommodate a peak occupancy of the eastern catchment. The Stormwater Constraints Assessment (Appendix FF) calculated the potential increase in surface water as a result of full development. The levels were slightly less than the peak AHD levels of the lake and wetland systems. The outfall of the development will not change, with increased drainage accommodated within

the lake system. The development is likely to utilise the existing drainage system more efficiently. In terms of surface water quality, the lake and wetland system includes treatment systems which have been designed for peak development of the eastern catchment. Given the proposal does not exceed the peak levels of each lake and wetland; the increased surface water can be satisfactorily treated.

The western catchment includes approximately 4.5 hectares of gently undulating land within stage 2, and several allotments along the western extent of stage 1. The potential for sediment movement within this location is considered minor given the gentle undulation of the land. The western catchment is currently undeveloped, and as such there are no water detention systems constructed. The adjoining subdivision to the south west of the subject land (DA 711-06) is currently under construction and includes a new drainage reserve and pond to treat and contain stormwater to an appropriate quality. The extent of development within the western portion of stage 2 will drain to the south and utilise the proposed drainage reserve and pond. This detention pond was recommended in the NBVEIS and designed with regard to full development of the catchment. As such it is anticipated that proposed drainage reserve and pond is adequate to absorb the additional stormwater generated by this development, and will provide a 'whole of catchment' solution to the future development west of the subject land. The design of the western portion of the subject land is based on a 30 per cent impervious area for each developed lot, and 100 per cent impervious are for the roads.

The modelling of the western catchment indicated a potentially localise increases in peak discharges at the downstream boundary of stage 2 during the 1 in 100 year storm event. In addition, potential further increases in peak flood depths by 80 millimetres were calculated downstream of the site. These conclusions were also determined during preparation of the NBVEIS in 1997. The proposed pond was designed as a nutrient control system as opposed to water detention such as the lake and wetland system to the east. The calculation determined a minor modification to the original spill way design from 8.5m AHD to 10m AHD, the post development outfalls from the proposed development and the adjoining development (DA 711-06) could be reduced to a level lower than pre development. As such, it is considered this modification should be made to ensure development outfalls are reduced, and to ensure surface water is appropriately treated prior to outfall.

A detailed hydrology assessment for the proposed subdivision is contained within the Stormwater Constraints Assessment at **Appendix FF**.

6.5 NATURAL HAZARDS & CONTAMINATION

6.5.1 Contamination

The subject land is located within an area previously occupied by a variety of land uses. The previous use of the site for banana plantations produced scope for potential soil contamination.

The preliminary assessment prepared for the subdivision in 2006 stated:

> *The historic use of two sections on the subject land for banana plantations indicate the potential for contamination by pesticide residues, principally*

arsenic, aldrin and dieldrin. The Coffey's report provides some tests results that indicate arsenic levels above the guideline levels, which might indicate potential contamination on the site. The levels were however considered to be manageable by on site remediation measures which include vertical soil mixing. The outcome of the report therefore found that residential development of the site was feasible.

A Geotechnical Assessment of the site has been prepared to determine the extent of soil contamination with the subject land. This assessment is attached at Appendix CC to this EA report.

The Geotechnical Assessment initially identified three Areas of Concern (AEC) (see **Figure 49** below). These areas included the portions of the land previously used for banana plantations, packing sheds and ancillary buildings to the banana plantations and all existing and former building sites. The Geotechnical Assessment identified the following potential for contaminants.

Banana Plantations and Packing Sheds

- metals (specifically arsenic and lead) used in pesticides.
- organochlorine pesticides (OCPs).

Existing and former buildings

- metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc, mercury).
- OCPs & organophosphorous pesticides (OPPs).
- Asbestos containing construction materials.

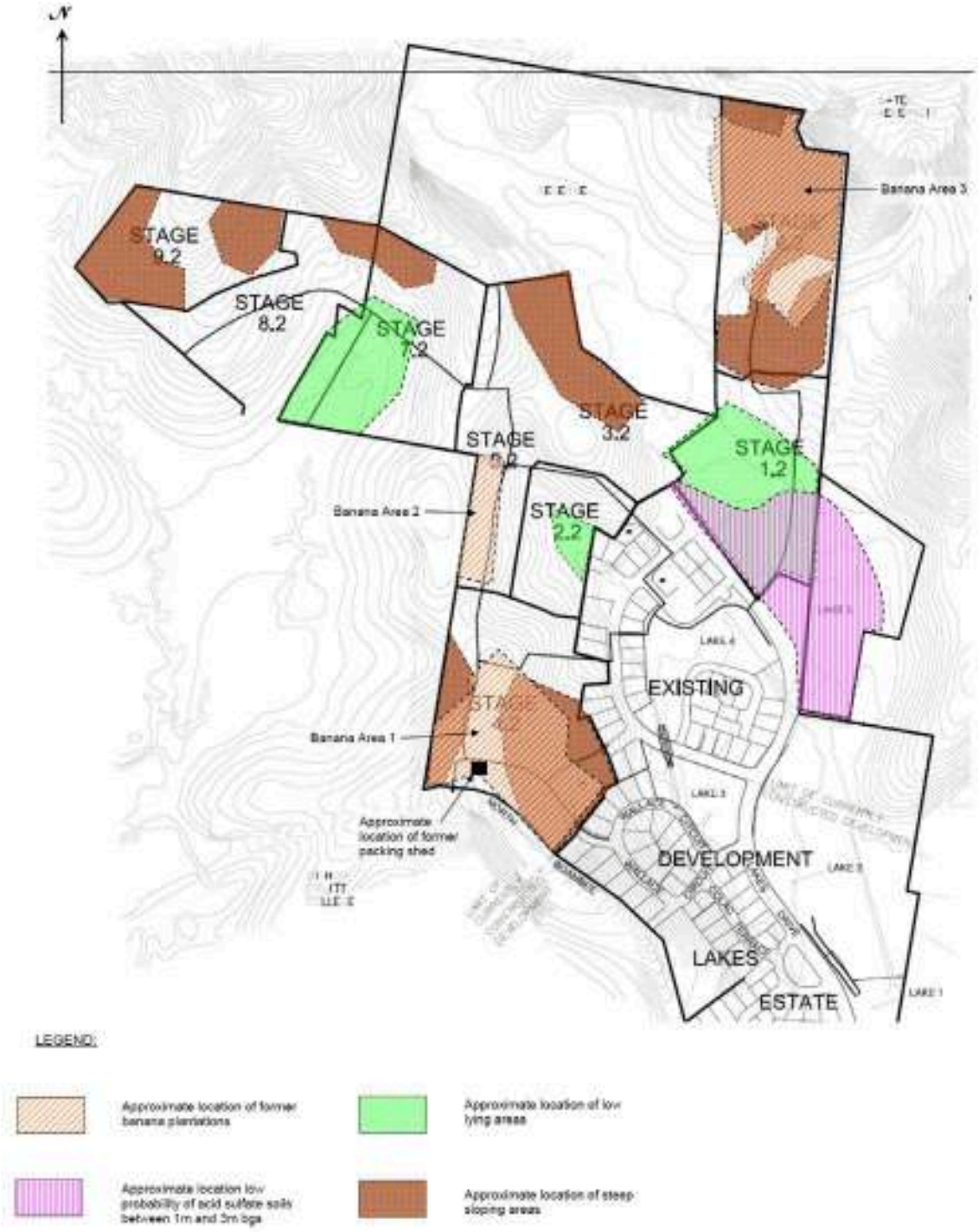

Figure 49 - Potential areas of concern (Source: Coffey Geotechnics 2008)

A field investigation was undertaken in accordance with the *Guidelines for Assessing Banana Plantations* prepared by the NSW EPA in 1997. This field investigation involved sampling of the three 'areas of concern' at depths of 0 to 75 mm and 0 to 150 mm. The samples were assessed for all potential contaminants. Section 7.4 of the Geotechnical Assessment attached, summarises the results of the laboratory testing.

The Assessment found that each of the three banana plantation areas had a concentration of arsenic within the soil which is above the residential end use and provisional photo toxicity criteria. Area 3 exhibited concentrations of Dieldrin which was identified in two samples, with the house area indicating some marginally elevated zinc concentrations.

Given the results of the Geotechnical Assessment, the proposal will involve some remediation work to the identified contamination areas. Further testing of the area surrounding the former packing sheds will be undertaken a greater density and with regard to further potential chemicals based on the historic usage of the site. Further testing will also be undertaken within the former banana plantation areas to ascertain the extent of Dieldrin and arsenic contamination.

The EA has considered the requirements of SEPP 55 (see **Section 4.2.6** above) in context to this development and determined that the proposal is consistent with requirements of SEPP 55.

At this stage, only preliminary testing has been undertaken on site with this project application seeking deferral of additional testing until approval. This is expressed within the Statement of Commitments within this EA.

Remediation work on site will be determined from further testing of the site prior to construction, and will be based on the vertical extent of the contamination and the proposed use of the affected sites. The remediation techniques will involve the following methods. The most appropriate method will be selected depending upon the status of the contamination of the particular location, effectiveness and regard to the future use and potential impact on residential development.

1. Removal of Source, which involves excavating contaminated soil and disposing to landfill.
2. Vertical Mixing, which involves the blending of soil where it is suitable to blend contaminated soil with un-contaminated soil to reduce the contaminants to a suitable level.
3. Encapsulation, which involves the capping or burying of contaminated soil beneath areas of pavement, hardstand areas, buildings or maintained public open space.

6.5.2 Acid Sulphate Soils

An Environmental Site Assessment ("the Site Assessment") for the site has been prepared by Coffey Geotechnical and is attached as Appendix CC to this report. The purpose of the Assessment report was to provide a Preliminary Geotechnical, Acid Sulphate Soil, and Environmental (Contamination Status) Assessment.

Figure 50 - Identified areas of Acid Sulphate Soils within the subject land (Source: CPG Australia 2009)

Acid sulphate soils are recognised as a considerable environmental issue. Soils in this category typically contain significant concentrations of iron sulphide (pyrite) which when exposed to air will oxidise and can generate of sulphuric acid. It has been identified by the Site Assessment that approximately 4.5 hectares of the subject land is located in an area of low probability of containing acid sulphate soils occurring between 1m and 3m depth below the ground surface.

Testing of the site involved initial 'screening' of eleven samples for the presence of ASS using laboratory methods 21Af and 21Bf and Acid Sulphate Soil Laboratory Methods Guidelines. This initial screening indicated:

- Each soil sample was recorded to have an initial acidic composition.
- Oxidation with hydrogen peroxide produced a pH reduction of greater than 1.5 units in 12 of the 30 samples tested, creating a pH of 3 or less in 6 of the samples (ASTP1 0.5-0.8m, ASTP3 0.5- 0.7m, ASTP6 0.0-0.2m, ASTP7 0.6 t0 0.8m, ASTP8 1.0-1.3m and ASTP11 1.0-1.3m. The negative pH 'shift' and soil

samples within a peroxide solution recording a pH below 3 can indicate the presence of potential acid sulphate soil.

A further 22 samples were taken to were selected for Suspension Peroxide Oxidation – Combined Acidity and Sulphate (SPOCAS) analysis to confirm the presence of acid sulphate soils. The results of the screening and samples are attached within the Site Assessment at Appendix CC.

The results obtained for the site assessment concluded that the subject land is unlikely to have pyritic sulfur, but may contain organic sulfur. As a result, it is unlikely that the subject land is affected by ASS. Despite this, the Site Assessment identified the subject land does contain acidic soil and a Management Plan for the site may be required. The Site Assessment states:

Acidic soils are unlikely to cause significant harm to the environment, as the production of acid is slow and is unlikely to leach from the soils in significant quantities in their natural state. Should the soils be disturbed and be washed into waterways then acidification of the water can occur. Acidic soils can have a negative effect on vegetation growth, especially vegetation that is not native to Australia, and concrete footings can also be corroded by acidic soils. (emphasis added)

The Site Assessment recommends that if deemed necessary by regulatory agencies, a Management Plan be prepared to either provide a sediment control plan for the site, or treat the acidic soil with lime. Coffey's recommend the actual form of the Management procedure depends '*on the need to implement a sediment control plan for the development, and/or the volumes of materials that may be excavated and treated with lime'*. Considering this recommendation and the scope of the subdivision, it is recommended that a sediment control plan be adopted in this instance. Given that the site is relatively undulating and has steep locations, it is considered a comprehensive Management Plan will be required, particularly in regard to soil and water. It is recommended that the scope of this plan is expanded to incorporate management of acidic soils to prevent entry to surrounding waterways.

6.5.3 Bushfire

A Bushfire Risk Assessment ("the BFRA") has been prepared in support of the proposed development. The BFRA report is attached at Appendix AA to this report.

The subject land maintains undulating terrain with light to dense vegetation contained across the steeper slopes of the subject land. The remaining vegetation is generally consistent with that of the 7(a) zone with surrounding residential land mostly cleared of vegetation. The concentration of dense vegetation and steep and undulating terrain affords almost all of the land as bushfire prone. The following figures demonstrate the proposed subdivision in context with the bushfire prone areas of the site.

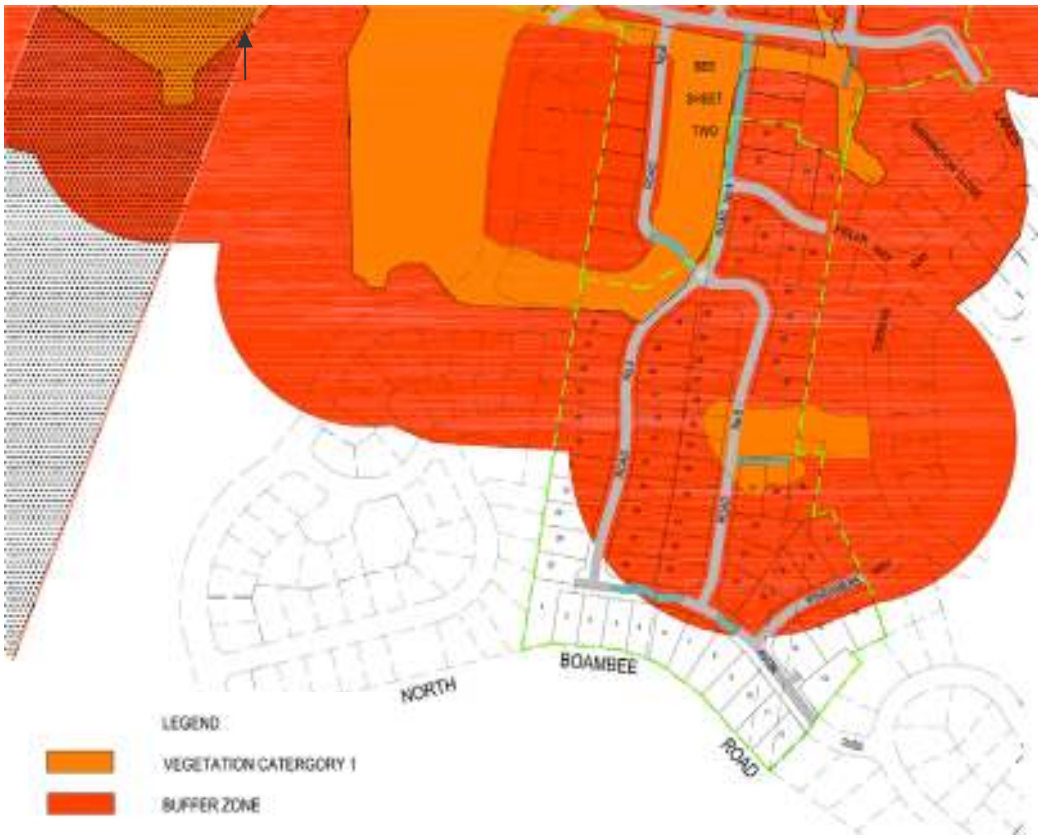

Figure 51 - Stage 1 of the proposed development in context to the Coffs Harbour Bushfire Prone Land Map. (Source: CPG Australia 2009)

Figure 52 - Stage 2 of the proposed development in context to the Coffs Harbour Bushfire Prone Land Map. (Source: CPG Australia 2009)

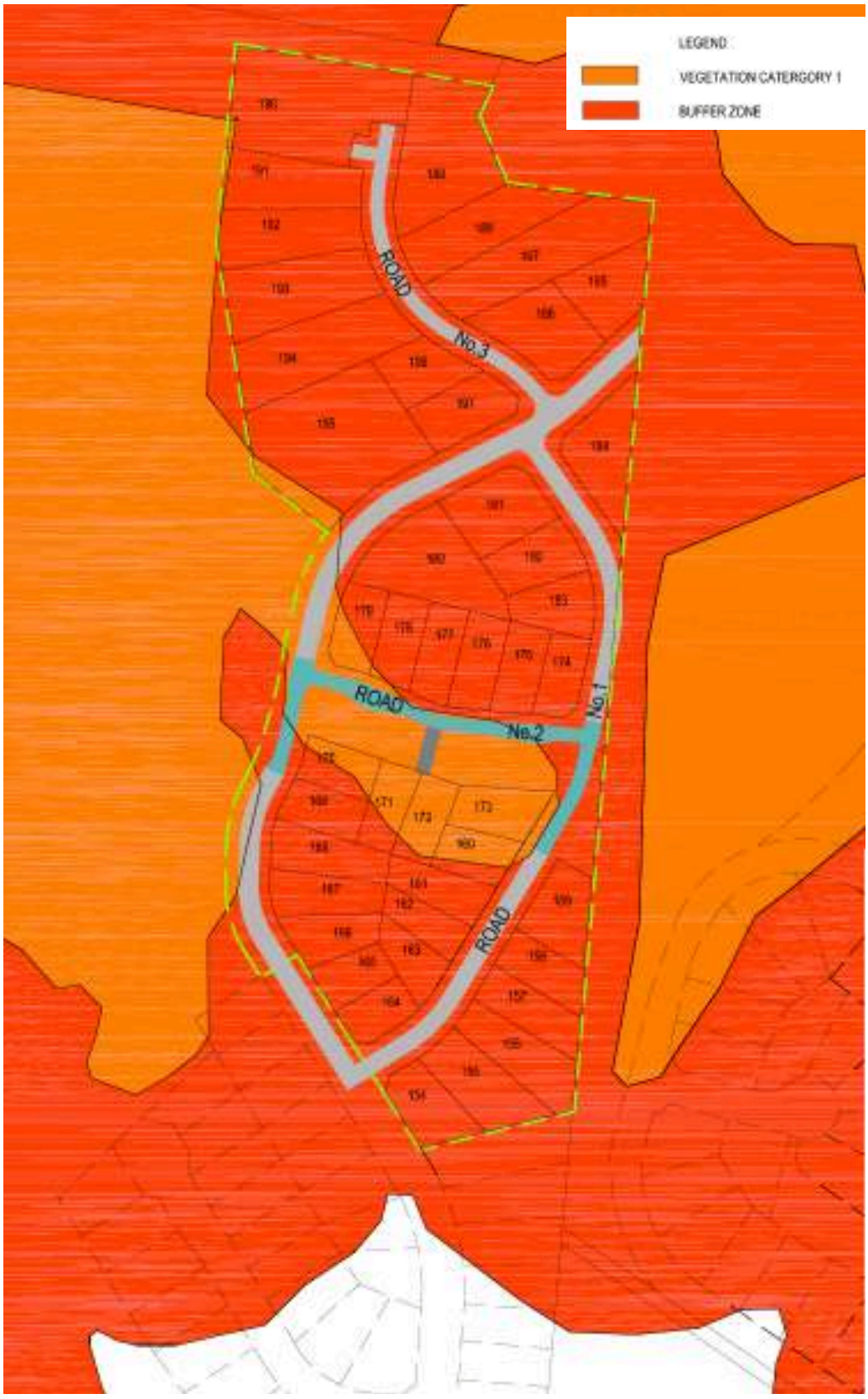

Figure 53 - Stage 3 of the proposed development in context to the Coffs Harbour Bushfire Prone Land Map. (Source: CPG Australia 2009)

The purpose of the BFRA is to provide recommendations based on the *Planning for Bushfire Protection 2006* guidelines for the formation of Asset Protection Zones (APZ) as well as Bushfire attack and construction standards for habitable buildings within the designated bushfire prone land.

Asset Protection Zones

The Asset Protection Zone is a setback for the proposal from the bushfire hazard. The APZ can have two portions, the Inner Protection Area and the Outer Protection, or one of the two. The purpose of the APZ is to allow a defendable space between the bushfire hazard and the proposed development.

The BFRA identified appropriate APZ's for all areas of the subdivision based on:

- Type of vegetation contained within 140 metres of the development;
- Predominant vegetation formation; and
- Effective slope of land.

The subject land was classified as the 'northern', 'western' and 'north-eastern' precincts, for ease of identifying appropriate APZ's. In identifying the APZ's it has been determined that no vegetation removal is necessary, given adequate APZ's can be established within the existing conditions of the site. The internal road network has been designed with the road providing a buffer to the bushfire hazard which increases the cleared APZ area, and also provides improved defendable space.

Southern Precinct

The BFRA concluded that the 7A Environmental Protection Zone in adjoining land south of North Boambee Road provided a bushfire hazard to lots 1 to 7 which are within 100 metres of the edge of the tall open forest contained within the 7A zone. A 20 metre APZ from this hazard must be established for these allotments, which can be adequately accommodated within the width of North Boambee Road, see attached BFRA at Appendix AA. Level 3 construction will also be required for future dwellings within the proposed allotments.

A habitat corridor is also contained through the central northern portion of southern precinct and is proposed for Koala Habitat. The corridor has a width of less than 50 metres and is classified as 'Rainforest', as such affording the adjoining lots a minimum requirement of a 10 metre APZ from the central corridor. This is easily accommodated within the perimeter roads and the front building setbacks.

Western Precinct

A habitat corridor is proposed through the centre of the western precinct and presents a bushfire hazard given the location of tall open forest vegetation within its extent. As with other proposed Koala Habitat corridors within the estate, it is proposed at a width of 50 metres and requires a minimum 10 metre APZ. This width is accommodated within the perimeter roads and the front building setback.

The vegetated land within the subject land and within 7A zoned land provides a bushfire hazard to the northern fringe of development within stage 2. An APZ of between 10 and 30 metres is required along this interface for proposed allotments.

North-eastern precinct

A managed habitat corridor is proposed within this precinct and links the proposed subdivision with the existing development to the east. The understorey will be managed by reduction of understorey vegetation and ground fuels. This corridor provides additional bushfire risk. Lots adjoining this interface will be provided with an 8 metre wide APZ with an access driveway contained within this APZ.

A significant concentration of vegetation across steep terrain is located to the south west and west of this precinct and defined as the 7A Environmental Protection zone. As a result, lots along the northern portion of this interface have been designed at a larger size and will have a fire trail provided to link between the internal road network and an existing fire trail to the north of the precinct. This fire trail will extend between future residential development and the vegetation hazard within a 30 metre wide APZ. The lower western interface will be provided with a 10 metre wide APZ to the adjoining lowland rainforest vegetation.

The north and north eastern interfaces adjoin the steepest point of the subject land and will provide a 20 metre APZ buffer with the lower eastern interface proposed with an 8 metre wide APZ

Bushfire attack (construction standards)

Future residential development within the subdivision will be located within bushfire prone land and must comply with the Building Code of Australia to *ensure risk of ignition from a bushfire is minimised while the fire front passes* (Australian Bushfire Protection Planners 2008).

More rigid assessment of the actual construction standards will be provided during design and construction of the subdivision and future dwellings on site, however the BFRA recommends the following standards be met by the subdivision:

Table 18 - Required constructions standards under AS3959 - 1999

PROPOSED LAND	CONSTRUCTION STANDARD
Buildings on lots exposed to threat of Bushfire risk from Habitat Corridors or the adjoining 7A zone and of which are provided with an APZ (as discussed above).	Level 3 *in accordance with A.S 3959 – 1999 – Construction of buildings in Bushfire Prone Land*
Buildings located within 100 metres of a bushfire risk interface.	Level 1 (Minimum) *in accordance with A.S 3959 – 1999 – Construction of buildings in Bushfire Prone Land*

In essence, the majority of the future dwellings within subdivision should be constructed at a minimum construction standard of Level 1 in accordance with A.S 3959 – 1999 – Construction of buildings in Bushfire Prone Land.

Water supply for fire fighting purposes

The proponent recognises the need for effective water supply provisions to be established to ensure safety to future development in the event of a bushfire.

The proposed subdivision will be serviced by a reticulated water supply which will be extended from its current extent within the existing residential development south of the

subject land. This water supply will be extended and provided throughout the subdivision in accordance with A.S 2419.1 to ensure a water supply main is provided in addition to hydrants at regular intervals throughout the subdivision.

During construction of the subdivision, fire hydrants will be provided such that a tanker can park within a maximum distance of 20 metres from the hydrant. The locations of the hydrants will also ensure future habitable buildings will be located such that a fire at the furthest extremity can be attacked by fire-fighters using two 30 metre hose lines and a 10 metre water jet and a clear unobstructed path between the hydrant and the most distant point of the building will not exceed 90 metres.

Access for fire fighting purposes

Public roads

The public road system is a key element of the overall design of the subdivision and has been designed to ensure safe, efficient movement of vehicles within the proposed subdivision. The public road system will be constructed based on the specifications contained with Section 4.1.3(a) of the *Planning for Bushfire Protection 2006*.

The design of the local roads through the subdivision are proposed to have a formed width of 8.0 metres and the internal road width will be 6.5 metres with defined parking bays provided clear of the formed road width. The proposed roads through the habitat corridors, shown as blue on the subdivision plans, are designed

Fire trail

A fire trail is necessary to provide an access track between the bushfire hazard and the future dwellings on site to allow fire personnel to access a defendable space between the hazard and future dwellings. A fire trail exists along the northern boundary of the subject land and a new section of the fire trail will be established along the western extent of proposed Lots 190 to 195. An access gate will be fitted to prevent unauthorised entry where the fire trail links with the public road network,

The fire trail has been designed with dimensions of 4 metre carriageway width and 1 metre verge either side of the carriageway. The trail will be maintained to ensure a vertical distance of 4 metres is clear of obstructions for the full length of the trail.

Figure 54 - Location of fire trails within the subject land (shown as orange line).

Emergency response access/egress

The subdivision layout and proposed internal road network is designed with looping roads affording alternate access and egress routes from residential allotments to the main collector road of Lakes Drive.

6.5.4 Geotechnical

The subject land is contained within the North Boambee Valley area west of the Coffs Harbour CBD. The land rises gently from North Boambee Valley on the southern boundary the north west and north east corners of the site. A lower portion of land is contained through centre of the site and contains dense vegetation.

The land contains areas of land which maintain slopes greater than 10 degrees and are proposed for residential development. A Geotechnical Assessment is included within the Environmental Site Assessment prepared by Coffey Geotechnical and is attached as Appendix CC to this report. The Geotechnical Assessment provided a consideration of

future building works on steep sloping land, areas of gentle surface slope and deep soil profiles, and shallow bedrock.

The undulating nature of the site lends itself to the potential for erosion and soil instability. The Geotechnical Assessment identified a significant cover of colluvial soil over sloping ground, which is indicative that the site is likely to be subject to soil creep. The Geotechnical Assessment yielded no evidence of past deep seated instability on the subject land and as a result, however it will be important for each house site to be further inspected for evidence of possible deep seated instability during preparation for construction.

Clearing and preparation of the site for future dwellings increases the potential for the site to be further eroded by run-off. The design of the subdivision is such that vegetation is encouraged to be retained, particularly on the higher slopes. The Geotechnical Assessment reinforces this design element and suggests that vegetation removal should be minimised where possible to enhance the binding of surface soils and reduction in soil moisture to increase soil strength. The Geotechnical Assessment also notes the existence of springs may exacerbate the erosion and attention should paid to the lower slopes through northern portion of the site.

Construction on steep slopes

The subject land contains a number of locations within the proposed subdivision which maintain gradients of 10 degrees or greater. Construction of the subdivision and future dwellings will be undertaken in these locations with consideration of the potential for near surface 'soil creep' within the colluvium.

The Geotechnical Assessment recommends future dwellings be constructed as pole type with piles extending into the bedrock below the colluvium. Proposed Lots 185 – 197 will be required to include pole housing construction (see **Section 6.7.9**, **Figure 66** and **Figure 67**).

Given the land is subject to some soil creep, future piles will be designed with consideration of the potential for lateral loading caused by soil creep. The designs will include piles into the bedrock to provide greater support. It is also recommended that future dwellings on lots with slope greater than 10 per cent include pole house designs. It is considered that all dwellings proposed on land with slope greater than 15 per cent include pole housing designs.

Steep land also has considerable potential for post development erosion to intensify if the land is not managed effectively. Cut and fill techniques are discouraged on the steep slopes above 10 degrees. Should such designs be required for future residential development, they will be supported by retaining structures which allow effective drainage away from the critical areas of the retaining structures and at the crest of slopes. Given the future development is external of the developer of the subdivision, it is recommended all future dwellings on steep land provide a site specific stability assessment prior to construction approval, taking into account the landform and nature of the specific residence.