B.1 ECOLOGICAL MATTERS

B.1.3 KEY THREATENING PROCESSES

B.1.3.3 Predation by the Red Fox

The European Red Fox Vulpes vulpes is a highly proficient and adaptable predator, the management of which needs to be undertaken on an on-going basis and at a locality or regional scale.

As with most other predatory species, population sizes are largely a reflection of the density of prey species, which in the case of the Fox includes most small to medium vertebrates, as well as invertebrates. However, the population dynamics of the Red Fox are compounded by the fact that this species will also consume berries and other vegetative material, as well as scavenge on urban refuse.

Given the adaptability of the Red Fox, the actual impacts of any individual development on a local population of the species are difficult to gauge. However, neither the 'Moonee Waters' project per se (nor any other development) is likely in isolation to exacerbate the impacts of the Red Fox. The appropriate issue is the proper management of the development (including waste management), and the implementation of predator control programs at a local or regional scale.

It is recommended that a Fox control program be developed for the subject site in co-ordination with existing regional Fox control programs.

PREDATION BY THE RED FOX

The 'Moonee Waters' project CANNOT reasonably be considered likely to exacerbate predation by the Red Fox.

B.1.3.4 Predation by the Feral Cat

As with the Fox, Cats (both feral and domestic) are highly proficient and adaptable predators that will prey on any small to medium vertebrate, as well as invertebrates. The management of Feral Cats requires a similar approach to the management of Foxes, in that there is a requirement for an on-going, co-ordinated, regional approach.

Whilst there is some theoretical potential for the proposed 'Moonee Waters' project to exacerbate the KTP "predation by the feral cat", it cannot reasonably be anticipated that any such exacerbation would be significant given the long history of the development in the general locality. There is, therefore, likely to be a substantial Feral Cat population already present, and the 'Moonee Waters' project would not significantly contribute to that population.

Furthermore, given the measures identified below, the 'Moonee Waters' project is less likely to contribute to this problem than other developments in the vicinity. The control of Feral Cats and resolution of the Feral Cat problem is a matter requiring a broad local and regional approach, and one which cannot be resolved on a site-by-site basis.

In relation to Domestic Cats, educating residents about responsible pet ownership will assist in raising the public awareness of the impact of Cats on native fauna. Responsible pet ownership can be promoted by:

- educational pamphlets provided to new property owners within the subdivision;
- the provision of educational signage; and
- a requirement to micro-chip and neuter all Cats within the development (an achievable outcome given the 'community title' nature of the 'Moonee Waters' project).

PREDATION BY THE FERAL CAT

The 'Moonee Waters' project CANNOT reasonably be considered likely to exacerbate predation by the Feral Cat. Indeed, the project contains a Commitment to avoid any contribution to this KTP (by controls on Domestic Cats in the development), unlike ANY other development in the area. The 'Moonee Waters' project will NOT contribute to "predation by the Feral Cat".

B.1.4 THREATENED FAUNA

The DoP has required specific additional information regarding a number of threatened fauna species, all of which had been considered in detail in previous documentation (Gunninah 2006; Whelans Insites 2007). The locations of dedicated threatened species surveys are indicated in **Figure 17**, and the locations of all threatened species which have been recorded on the 'Moonee Waters' site are contained in **Figure 18**.

In addition, the DoP (in '**Attachment 1**') has requested a further 18 Section 5A Assessments of Significance for the project (**Appendix E**). Of those 18 species, only one (the Powerful Owl) has been recorded on the project site.

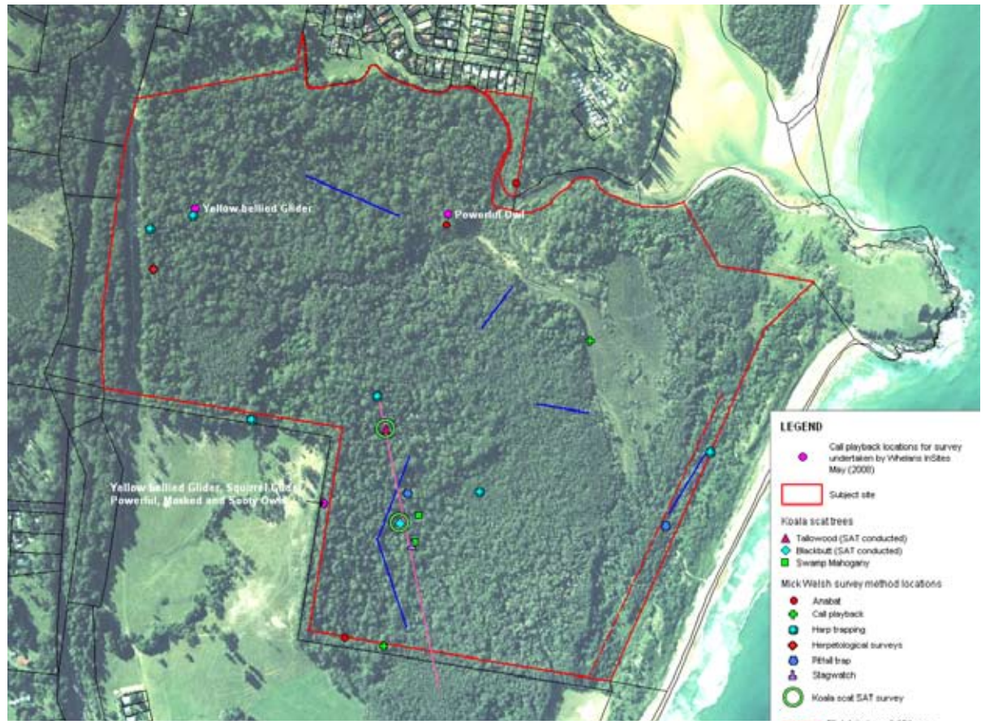


Figure 17 - *Field Surveys at Subject Site.*

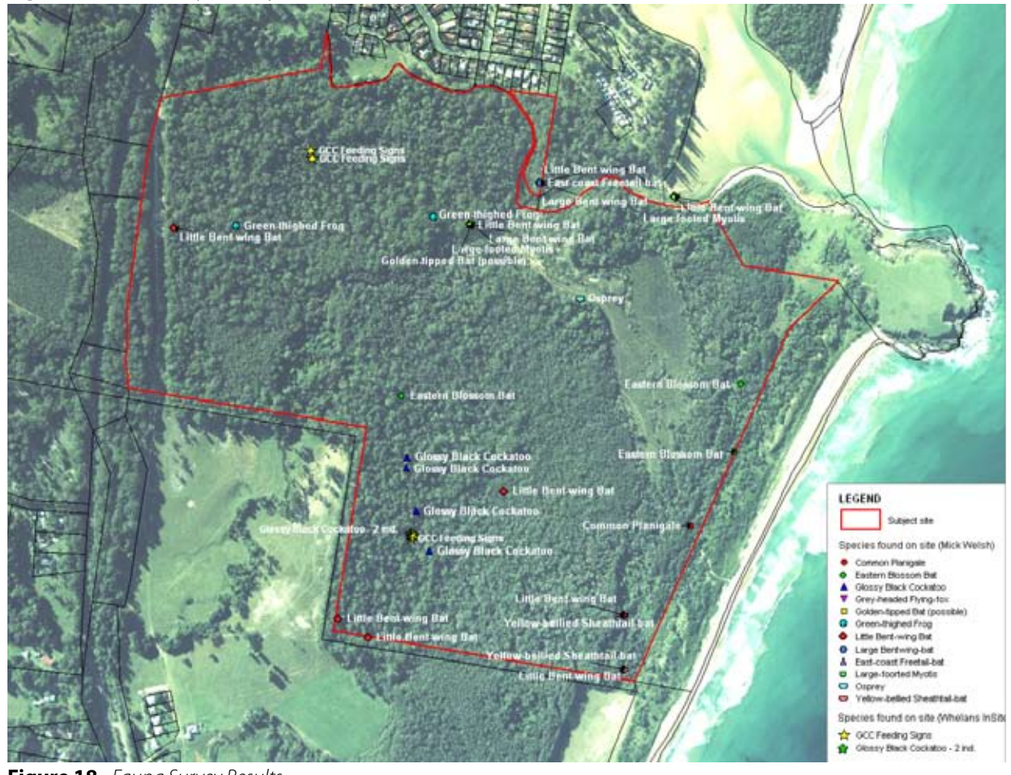


Figure 18 - *Fauna Survey Results.*

B.1 ECOLOGICAL MATTERS

B.1.4.1 Threatened Fauna Identified by DoP

Green-thighed Frog

Habitat for the Green-thighed Frog includes rainforest, wet sclerophyll forest, dry schlerophyll forest and open woodland. This species also occurs in vegetation that is patchy with partial re-growth or in selectively logged forests. Breeding ponds have been noted to have some overhanging or overshadowing vegetation, and are often located in clearings, paddocks or along bush tracks. The waterbodies that form breeding sites are most often transient ponds, formed from heavy rainfall in late spring and summer (Cogger 2000; Ehmann 1997). The water is therefore shallow, often lined with leaf litter, and can become warm on sunny days. All of the recorded breeding sites were modified or disturbed land, but close to relatively undisturbed vegetation (Ehmann 1997).

There are only three records of the Green-thighed Frog in the Coffs Harbour LGA (other than those on the subject site), but this is more likely due to a lack of appropriate survey effort than to either the rarity of the species or the distribution of suitable habitat.

The Green-thighed Frog was recorded in the drier forest communities in the northwest of the 'Moonee Waters' site and at the interface between the Dry Blackbutt Forest and the Swamp Forest communities (**Figure 18**). One record of this species was within the development footprint for the Northern Precinct, and the other to the southeast of the Precinct.

As discussed in the previous Report (Whelan Insites 2007), this species is likely to reside predominantly in moister areas of the site (particularly around the Swamp Forest communities), and utilise the drier areas during or after periods of rainfall. Suitable habitat for the species, therefore, includes the drier forest communities and the extensive adjoining Swamp Forest or moist forest vegetation.

The Conservation Area on the subject site will retain substantial habitat for the Green-thighed Frog, particularly along the northern tributary to Moonee Creek and along the slopes adjacent to Sugar Mill Creek, as well as in the vicinity of the SEPP 14 wetland. Areas of retained Dry Blackbutt Forest will continue to provide suitable breeding habitat for the species.

The proposed 'Moonee Waters' development will not remove crucial or 'critical' habitat for this species, and will not impose a "significant effect" on the species. The removal of some potential habitat is not likely to affect the Green-thighed Frog in any significant manner.

The 'Moonee Waters' project is NOT likely to impose any significant adverse impact, or a "significant effect", on the Green-thighed Frog.

Osprey

An Osprey nest has been identified in a tree to the south of the subject site (on the North Sapphire beach development), approximately 60 metres from the subject site boundary. The Osprey normally builds its nest in an upper fork or broken trunk of a dead tree or in the dead crown of a live tree. Nests may be used in most years for at least 20 years (Marchant & Higgins 1993).

No Osprey nests have been recorded on the 'Moonee Waters' site, despite substantial survey efforts over a considerable period of time. Whilst a pair of Ospreys was recorded during field investigations undertaken in April 2006 (Gunninah 2006), roosting during the day on a stag above the tree canopy near the centre of the site, (adjacent to the SEPP 14 Wetland) no Osprey nest has been recorded within the 'Moonee Waters' site by any investigator to date. That pair may have been using the known nest to the south of the subject site (on the North Sapphire Beach land).

The proposed 'Moonee Waters' development will have no impact on the existing Osprey nest tree to the south. In addition, suitable trees for the Osprey will be retained within the Conservation Area, although no nesting by the Osprey has been observed on the subject site.

The 'Moonee Waters' proposal will NOT impose any adverse impacts on the Osprey.

Koala

Four Koala food trees, as listed in Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44), have been recorded on the subject site - the Forest Red Gum Eucalyptus tereticornis, Tallow-wood E. microcorys, Scribbly Gum E. signata and Swamp Mahogany E. robusta.

The majority of Swamp Mahogany and Forest Red Gums are located within the Conservation Area, whereas the development Precincts and adjoining retained areas of the dry forest communities support both the Scribbly Gum and Tallow-wood.

Surveys for Koalas on the subject site included 7 Koala scat transects and 2 SAT surveys by M Walsh (**Figure 18**), as well as many days of additional fauna surveys by Environmental Insites staff which included searches for Koalas and Koala scats.

No Koalas have been directly observed on the subject site during any of the investigations conducted by any investigators to date. However, a number of trees were located (predominantly in the southwestern part of the subject site in and around the Southern Precinct) with Koala scats.

The 'Moonee Waters' site appears to be of only limited value for Koalas, given the scarcity of records of this species over a very long period at this location and the relatively small number of Koala scats recorded on the site. The area in which Koala scats are most abundant is along the western edge of the SEPP wetland and in the adjacent drier forest near the Southern Precinct, although the numbers and densities of scats at this location does not indicate the presence of a substantial population of the Koala.

The retention of dry forest vegetation adjacent to the SEPP 14 wetland at this location will maintain the majority of the existing foraging resources for the Koala, and the Southern Precinct has been designed (with the maintenance of tree canopy and the exclusion of fences) to enable Koalas to move through the Precinct, to the extent that they currently do so.

The proposed development will remove some resources for Koalas, including some trees beneath which Koala scats have been recorded. However, substantial parts of the Conservation Area contain significant numbers of food tree species preferred by the Koala, including the Blackbutt, Tallow-wood, Swamp Mahogany and Forest Red Gum.

There is no substantial population of Koalas on the subject site or in the vicinity, and the proposal will both retain resources suitable for this species and (by the prohibition on fences within the Southern Precinct and in the eastern part of the Northern Precinct), facilitate Koala movements throughout the development, should they desire to do so.

The proposed 'Moonee Waters' project will impose NO significant or notable adverse impact on the Koala at this location.

Glossy-Black Cockatoo

During the most recent survey period, Glossy Black Cockatoos were observed feeding to the east of the Southern Precinct (**Figure 18**), in dry forest and along the margins of the moist forest types.

Some evidence of Glossy Black Cockatoo foraging has been recorded throughout the drier forest types on the subject site, although the level of Glossy Black Cockatoo foraging activity is low. However, substantial areas of dry forest with Black She-oaks are to be retained in the Conservation Area, and foraging resources for the Glossy Black Cockatoo will consequently be retained on the subject site.

Similarly, trees with large hollows are also to be retained, thus maintaining potential nesting habitat for this species (although no nesting Glossy Black Cockatoos have been recorded on the site).

The proposed development of the 'Moonee Waters' project will involve only limited removal of resources for the Glossy Black Cockatoo. Both foraging and nesting resources for this species will be retained throughout the subject site, including in extensive parts of the Conservation Area and within development footprints.

The 'Moonee Waters' project will involve only extremely LIMITED and INCONSEQUENTIAL impacts on the Glossy black Cockatoo.

Swift Parrot

The Swift Parrot has not been observed on the subject site, although the species is an occasional visitor to the Coffs Harbour district. The Swift Parrot migrates from Tasmania to the mainland during the cooler months (from May to August), and feeds on winter-flowering eucalypt species. The majority of these species, including the Swamp Mahogany, are located within the Conservation Area.

Given that the Swift Parrots which occur on the subject site at Moonee will have travelled from Tasmania to utilise the resources present, it cannot be considered as even vaguely likely that any such individuals will be likely to be adversely affected by inter alia "wire netting, fencing, windows, cars and cats" on the 'Moonee Waters' site.

There is NO conceivable possibility of the 'Moonee Waters' project having any adverse impact on the Swift Parrot.

Common Blossom Bat

The exact distance that the Common Blossom Bat travels in an evening is largely irrelevant with regard to the proposed development of the subject site at Moonee. Whilst Law (1993) notes that the commuting distance for the Common Blossom Bat can be up to 4km from roost-sites to heathland communities, this species has been recorded travelling up to 38km (B Law pers comm).

The relevant resources for the Common Blossom Bat on the subject site would principally consist of features associated with:

- the rainforest and dense moist communities located predominantly in the northeast (along Moonee Creek or in the centre of gullies including Sugar Mill Creek) for roosting purposes; and
- winter-flowering trees (particularly the Swamp Mahogany and Coast Banksia) which are located predominantly in the Swamp Communities and/or along the frontal dune, and virtually all of which will be retained.

The proposed development cannot be considered likely to have even the slight chance of imposing a "significant effect" on the Common Blossom Bat. This species is not regarded as of relevance or concern with respect to the proposed 'Moonee Waters' development.

There is NO likelihood of the 'Moonee Waters' project involving a significant impact, if indeed any impact, on the Common Blossom Bat.

Yellow-bellied Glider

The issues relating to the Yellow-bellied Glider have been addressed in previous documentation (Gunninah 2006) and in the supplementary Section 5A Assessment (**Appendix E**).

As discussed in previous documentation (Gunninah 2006; Whelans Insites 2007), the Yellow-bellied Glider is likely (if present) to be predominantly confined to the tall moist forest communities in the low-lying parts of the site. No Yellow-bellied Glider feed trees have been recorded on the subject site during any investigations, and the Conservation Area will retain substantial and significant areas of potentially suitable habitat for this species.

The 'Moonee Waters' development will not threaten the survival of even a single family or group of the Yellow-bellied Glider (if that species is present), and substantial suitable resources will be retained for this species. The proposed development will not be contrary to the Recovery Plan for the Yellowed-bellied Glider, and will provide suitable habitat and resources for this species.

The 'Moonee Waters' project will NOT adversely affect the Yellow-bellied Glider to a significant (if any) extent.

B.1 ECOLOGICAL MATTERS

B.1.4 THREATENED FAUNA (CON'D)

Microchiropteran Bats

Whilst it is possible that individuals of some threatened microchiopteran bats might be confined to a home range of 100ha or so, it is to be noted that the overwhelming majority of the subject site at Moonee (over 76ha) is to be retained as a dedicated Conservation Area.

It is not likely that those areas of the site subject to the proposed development activities (ie the Northern and Southern Precincts) would constitute either the sole area for any such threatened species or the most important part of the habitat for any such species. Indeed, it is not likely that even an individual of any such species would be reliant solely on those portions of the subject site identified for development purposes.

Furthermore, the proposed development has retained virtually all of the hollow-bearing trees on the site, and includes a commitment to the replacement of any trees and tree-hollows which need to be removed. As a consequence, the removal of vegetation which is required for the development Precincts at Moonee is not considered of potential significance in respect of the survival of any such species on the site.

The 'Moonee Waters' project will NOT adversely affect any microchiropteran bats to a significant (if any) extent.

Common Planigale

The Common Planigale typically utilises Swamp Forest communities with a dense sedge understory on the north coast of NSW. This species was recorded in the eastern part of the subject site in such vegetation, and is not likely to occur within the areas of the site proposed for development activities.

On the basis of the provision of dedicated and formed access pathways through the Conservation Area, and the measures to discourage people from leaving those formed tracks, it is not considered likely that any adverse impacts by people will be imposed upon Common Planigale habitats. Similiarly, given the considerations above with respect to the Red Fox and to Domestic and Feral Cats, it is not considered likely that the proposed 'Moonee Waters' development would have any adverse impact on the Common Planigale in that regard.

The 'Moonee Waters' project will impose NO adverse impacts at all on the Common Planigale.

Forest Owls

The owl pellets located in 2006 were sent to Barbara Triggs (the recognised fauna scat expert) for analysis. The prey items identified were those species which had been captured during the Elliot trapping program on the site. The owl pellets were from either a Masked Owl or a Powerful Owl, but Barbara Triggs preferred the Powerful Owl given that "the hair was damaged (by digestion) and the bones chewed in the manner of that owl".

Given the scarcity of arboreal mammal species recorded on the subject site, however, it is not likely that the Powerful Owl would forage on the site regularly, due to the lack of resources. In any case, the proposed development area of the subject site constitutes only a minute proportion of the home range of the species (based on DECC 2005).

The Preferred Project Plan for the 'Moonee Waters' project proposes to retain two broad corridors (up to 250m wide) through the site, in addition to retaining canopy trees throughout the development areas.

Given the use of urban environments by the Powerful Owl (and to a lesser extent) by the Masked Owl, and given the extent of the Conservation Area on the subject site and the extent of tree canopy to be retained in the development Precincts, it is not likely that the proposed development would adversely affect either of those forest owls.

The 'Moonee Waters' project will NOT impose any relevant adverse impact on the Forest Owls known for the locality, including the Powerful Owl and the Masked Owl.

Conclusions

Consideration of the potential impacts the proposed 'Moonee Waters' Preferred Project Plan (including construction of both the Northern and Southern Precincts and the provision of all relevant infrastructure) with respect to threatened biota has been an integral part of the evolution of the Preferred Project Plan.

With respect to the eight specified threatened fauna species (the Green-thighed Frog, Osprey, Koala, Glossy Black Cockatoo, Swift Parrot, Common Blossom Bat, Yellow-bellied Glider and Common Planigale) and the two additional groups of threatened fauna species (the microchirpron bats and the forest owls):

- detailed consideration had been provided with respect to these species in previous documentation (Gunninah 2006; Whelans Insites 2007);
- additional information has been made available in this Report in response to a request from the DoP for additional data or analysis/assessment; and
- the substantial contribution to biodiversity conservation by dedication of the 76.29ha of the Conservation Area on the 'Moonee Waters' site includes the retention of the majority of habitat and resources for all of those threatened biota.

It is NOT likely that the proposed 'Moonee Waters' development will impose any relevant adverse effect at all, on any of the threatened species which have been recorded on or which could occur on the 'Moonee Waters' site.

B.1.4.2 Section 5A Assessments of Significance

Eighteen additional Section 5A Assessments of Significance have been prepared, based on the Preferred Project Plan (Appendix F).

Based on the detailed consideration of the relevant factors of Section 5A of the EPA Act (the Section 5A Assessment of Significance), it has been determined that there is not "likely" to be a "significant effect" imposed on any "threatened species, populations or ecological communities, or their habitats" (Appendix F). That Assessment pertains to all of the threatened biota which have been considered (Gunninah 2006; Whelans Insites 2007; this Report) with respect to the two development Precincts identified in the Preferred Project Plan on the 'Moonee Waters' site.

In respect of all of those "threatened species" and "endangered ecological communities" known to occur on the subject site, the 'Moonee Waters' Preferred Project Plan is not "likely" to impose a "significant effect" given:

- the extent of vegetation to be reserved on the subject site itself (Figure 3);
- "endangered ecological communities" the retention of the overall majority of the (99.77%) within the substantial Conservation Area on the subject site (Figure 3);
- the dedication and management of the Conservation Area for biodiversity conservation purposes;
- the extreme unlikelihood of a "viable local population" of any "threatened species" or the "local occurrence" of any "endangered ecological community" being "placed at risk of extinction" (emphasis added). In this regard, it is critical to note that a reduction in the extent of or in the numbers of, or in the extent of habitat of, threatened biota cannot be regarded as representing a threat of a "risk of extinction" (emphasis added);
- the retention of habitat and resources for all of the relevant threatened biota which have been recorded on the subject site (Figure 3) or which could reasonably be expected to occur on the site on occasions;
- the small number of individuals of any species which would be likely to be affected by the proposed development;
- the extent of habitat elsewhere in the locality which would provide suitable resources for the viability and survival of any "viable local population" of the relevant threatened fauna and flora species; and
- the mobility of most of the threatened fauna species of relevance (Gunninah 2006).

A range of other threatened biota species could potentially occur on the subject site as individuals or in small groups on occasions. Consideration of Section 5A of the EP&A Act (Gunninah 2006) with respect to those additional biota also indicates that the proposed development is not "likely" to impose a "significant effect" on any of these "threatened species .. or their habitats" (Gunninah 2006).

The 'Moonee Waters' Preferred Project Plan will NOT impose a "significant effect" on any "threatened species, population or ecological community, or its habitat", pursuant to Section 5A of the EP&A Act because of the project design and the incorporation of relevant and sensitive impact amelioration measures in the proposal.

B.1 ECOLOGICAL MATTERS

B.1.5 BUFFER ZONES

The issue of "buffers", and the need or otherwise for "environmental buffers" between the development Precincts and the Conservation Area on the subject site at Moonee, has been addressed in considerable detail previously (Whelan Insites 2007).

The need for "environmental buffers" is generally inversely proportional to the environmental sensitivity and the intelligence of the development design in urban precincts, and to the adequacy of management measures which are incorporated into the development areas.

Doubtless, there is a need for "environmental buffers" to sensitive ecosystems and habitats where adjoining development or other land uses have not incorporated specific or appropriate management measures or design principles to protect the natural environment. Under such circumstances, there may be a requirement to absorb such adverse impacts from unsympathetic land uses, and to limit or control the imposition of adverse impacts (either direct or indirect) on the adjoining environment.

However, the requirement for "environmental buffers", and the size of any such "buffers", is dependent upon several factors, including:

- the design of the urban (or other) development;
- the incorporation of appropriate design features and management measures into any development to minimize, limit or avoid adverse impacts;
- the nature of the interaction between the development footprint and the conserved lands; and
- the provision of appropriate edge treatments.

The 'Moonee Waters' development incorporates an array of design elements and management measures which are specifically intended to minimize and avoid the imposition of adverse effects upon adjoining retained vegetation, and thereby to avoid the need for additional "environmental buffers".

In this respect, the 'Moonee Waters' development:

- contains the total width of the Asset Protection Zones (APZs) within the development footprints, including in the 20m wide peripheral road/swale system;
- provides for the retention of native trees and vegetation within the 20m road/swale reserve, thus providing a "buffer" to the adjoining retained vegetation;
- includes a peripheral swale system vegetated with native plants for the treatment and management of stormwater discharges, which will provide a further "buffer" to the retained vegetation;
- avoids the use of piped discharges of stormwater into the Conservation Area by the use of the peripheral swale system for the discharge of stormwater; and
- will provide appropriate fencing and educational signage, as well as dedicated access tracks through the Conservation Area, to prevent uncontrolled access into and disturbance of the vegetation within the Conservation Area.

The proposed development footprints are located at least 20m, and up to 250m, from the "endangered ecological communities" (EEC) on the site, with the minor exception of a small area of EEC on the southern side of the Northern Precinct (where a drainage line cuts into the dry forest). Similarly, the SEPP 14 wetland is located at least 20m from the nearest development footprint and generally much more (>100m), and the design features identified above will further protect the swamp communities and the SEPP 14 wetland.

There is no requirement for, nor any justification for any further "buffers" to areas of high biodiversity significance on the 'Moonee Waters' site, because of the project design and the proposed management of the site.

Both the Sainty Report and several of the government agency submissions to the revised 2007 Concept Plan for the proposed 'Moonee Waters' development have requested or required the provision of 50m wide "environmental buffers" around retained vegetation on the subject site and/or the EECs and the SEPP 14 wetland. These required "environmental buffers" are sought without any rationale or justification, and the requested width of 50m is arbitrary and, in the case of the proposed development, unnecessary.

Note that for most of the site the setback of the development footprint is greater than 50m from the EEC. This forms part of the Conservation Area to be protected.

As noted above, the development design has incorporated a range of specific measures intended precisely to minimise or avoid adverse impacts on adjoining native vegetation. There is to be no piped discharge of water, and all stormwater discharges will be treated prior to infiltration or discharge into the Conservation Area. Human access into the Conservation Area is to be controlled and managed.

Furthermore, other than in one small location adjacent to the Northern Precinct, the EECs are all separated from the development footprints by a band of dry forest vegetation, which will provide a "buffer" to those significant and more sensitive ecological communities (average width approximately 30m, **Figure 19**). There is no requirement for the provision of any further "environmental buffers" given the sensitive design and approach to the development site at Moonee.

ENVIRONMENTAL BUFFERS

The need for "environmental buffers" is essentially inversely proportional to the effort and intelligence applied to the development design. The 'Moonee Waters' Preferred Project Plan has been specifically designed, and will be appropriately managed, to provide adequate and acceptable "buffers" to relevant features, habitats and ecosystems.

There is NO requirement for any additional "buffers", and no justification for any such "buffers" has been provided by any commentator to date.

Figure 19 - *Development Separation.*

B.1 ECOLOGICAL MATTERS

B.1.6 SEPP 14 WETLAND

The 'Moonee Waters' Preferred Project Plan has specifically avoided impacts on the SEPP 14 Wetland located in the eastern part of the subject site (**Figure 20**), by:

- modifying the development footprint of the Southern Precinct to ensure that development is located at least 30m from the edge of the Wetland;
- providing a stormwater treatment and management design which avoids piped discharges and which uses bio-retention swales around the periphery of development with 'over-topping' to mimic existing hydrologic conditions; and
- dedicating the majority of the site, including all of the SEPP 14 Wetland, for biodiversity conservation purposes.

SEPP 14 WETLAND

The 'Moonee Waters' project does NOT encroach into or otherwise effect the SEPP 14 Wetland on the subject site.

The Preferred Project Plan will NOT adversely affect that SEP 14 wetland, ALL of which is contained within the Conservation Area on the site.

Figure 20 - *Wetland Separation.*

B.1.7 DRY FOREST COMMUNITIES

The Coffs Harbour Vegetation Strategy (2003) identifies most the subject site as containing vegetation of "High" and "Very High" value, including both the wet and dry forest communities.

The Strategy has six aims which relate to the 'triple bottom line' of economic, social and environmental sustainability, including:

- to protect the biodiversity of native vegetation and habitats of high conservation value, social or cultural significance;
- to promote and encourage partnerships between landowners, the wider community and governments through consultation and participation to sustainably manage, restore and rehabilitate remnant native vegetation, with justice;
- to develop and implement a consent and assessment process for native vegetation management appropriate to the local situation;
- to recognise the social and economic impacts of vegetation management;
- to protect and manage soil and water resources; and
- to establish and promote a framework for the continued development, implementation and monitoring of the Draft Local Vegetation Management Plan and planning procedures.

The proposed development will more than double the current extent of land zoned for conservation purposes on the site at Moonee. Approximately 43ha of "High" or "Very High" value vegetation that is currently zoned for urban development within the site will be added to the conservation reserve system as part of this development, in addition to the 33ha which was already zoned for conservation purposes. This is a target of the Draft Local Vegetation Management Plan for the LGA.

In addition, the Conservation Area is to be actively managed to reduce and prevent weed encroachment, to control and manage human access, and to ensure long-term conservation outcomes.

The management actions for "Very High" value vegetation acknowledge that "there may be circumstances where a triple bottom line assessment results in a community-preferred outcome requiring removal of very high value". The proposed development falls within this circumstance, and despite some vegetation being removed, the majority of the management actions and aims of the strategy will be met. This includes:

- securing the long-term conservation of "Very High Value" vegetation;
- the provision of a detailed assessment for the clearing of vegetation (Gunninah 2006; Insites 2007; the Preferred Project Plan Report);
- consultation with government agencies and the local community; and
- the retention of 99.77% of all "endangered ecological communities" on the subject site.

The forest ecosystem mapping which has been undertaken by the then NPWS (now the DECC) of northeastern NSW has been reviewed as part of the 'Moonee Waters' Preferred Project Plan, as requested by the DoP.

B.1 ECOLOGICAL MATTERS

B.1.7 DRY FOREST COMMUNITIES

The dry forest communities on the subject site are identified in that mapping as Map Unit 27 – Dry Heathy Blackbutt-Bloodwood Forest. That community occupies essentially all of the proposed Northern and Southern Precincts of the subject site at Moonee.

The Dry Heathy Blackbutt-Bloodwood Forest community is identified as generally occurring on the coastal lowlands of the north coast of NSW, associated with Clarence-Glengarry Sandstone substrates (NPWS 1999). This community has been modeled as having a pre-1750 distribution of 75,583ha. The extent of that community in 1999 was determined to be 46,638ha (or approximately 62% of that community in the pre-1750 condition).

The Turpentine Forest vegetation which has been identified on the site at Moonee does not constitute a separate or distinct plant community from the Dry Heathy Blackbutt-Bloodwood Open Forest. Rather, that partof the subject site has a relatively high density of Turpentine as a co-dominant canopy species within the open forest vegetation. It is, thus, a sub-type of the Dry Heathy Blackbutt-Bloodwood Forest type.

The proposed development of the Southern and Northern Precincts on the 'Moonee Waters' site will involve the removal of approximately 22ha of vegetation, almost exclusively of the Dry Heathy Blackbutt-Bloodwood forest type. That removal of vegetation constitutes just 0.047% of the current extent of the Dry Heathy Blackbutt-Bloodwood Forest type (NPWS 1999).

Approximately 16.47ha of the Dry Heathy Blackbutt-Bloodwood Open Forest (or 44% of that present on the site) is to be retained in the Conservation Area.

DRY FOREST COMMUNITIES

The dry forest types on the 'Moonee Waters' site are NOT listed as "endangered ecological communities". The dry forest type on the site is extremely well represented on the north coast, and the proposed development will NOT impose a significant impact on or involve a significant reduction to that forest type.

B.1.8 THREATENED FLORA

B.1.8.1 Rusty Plum and Moonee Quassia

Recent targeted surveys for the Rusty Plum Amorphospermum whitei failed to locate this species within the subject site or to its immediate north. A different species (Listea australis) which is very similar to the Rusty Plum and is easily confused with this species, was recorded on the site.

The Moonee Quassia has been recorded along the northern tributary to Moonee Creek (Gunninah 2006) and Coffs Harbour Council. Recent surveys recorded several plants within the Conservation Area along the northern boundary of the site, but no specimens have been recorded within the development area.

Neither the Moonee Quassia nor the Rusty Plum (if present) will be adversely affected by the proposed 'Moonee Waters' project. Some significant damage has already been done to individuals of the Moonee Quassia and its habitat. Those areas of the subject site which contain specimens of the Moonee Quassia and/or the Rusty Plum would be fenced as part the management regime for the Conservation Area, and rehabilitation works undertaken to protect those species and their habitat.

Thus, there will be no direct impacts from the development on the subject site on either the Moonee Quassia or the Rusty Plum (if present), or their habitats. Further, indirect impacts by uncontrolled human access will be prevented. Both of those plant species will, therefore, benefit from development of the subject site as proposed.

RUSTY PLUM & MOONEE QUASSIA

The 'Moonee Waters' Preferred Project Plan will provide a significant BENEFIT for the Moonee Quassia and the Rusty Plum (if present) by virtue of the active management and protection of individuals and habitat for these species in the Conservation Area.

B.1.8.2 Other Threatened Flora

Botanical surveys have been conducted widely over the 'Moonee Waters' subject site over a very long period. A range of biologists and ecologists have surveyed the site on numerous occasions since (and including) the surveys for the Moonee area in 1989 (Clancy 1989, 1990; Clancy & Clancy 1998; Fisher et al 1996; Gunninah 2006; Yarranbella undated; Whelans InSites 2007, this Report; Sainty et al 2007).

OTHER THREATENED PLANTS

NONE of the additional threatened plant species have been recorded on the 'Moonee Waters' site. In any case, all (or virtually all) of the relevant habitats for such species will be retained within the Conservation Area.

The 'Moonee Waters' project will impose NO significant (if indeed any) adverse impacts on these additional species.

SPECIES	LEGAL STATUS	HABITAT	NOTES
Leafless Tongue Orchid ***Cryptostylis hunteriana***	V (TSC Act) V (EPBC)	No well defined habitat preferences; known from a range of communities, including swamp-heath and woodland (DEC 2005). Larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black She-oak. Appears to prefer open areas in the understorey and is often found in association with the Large Tongue Orchid C. subulata and the Tartan Tongue Orchid C. erecta (DEC 2005).	Has not been recorded in the Coffs Harbour LGA. Has not been recorded in any survey of the subject site, nor in any surveys conducted by anybody on any site in the locality. Even if present, would doubtless occur in the extensive Conservation Area.
Southern Swamp Orchid ***Phaius australis***	E (TSC Act) E (EPBC)	Swampy grassland or swamp forest types, including rainforest and swamp eucalypt or paperbark forest. Mostly in coastal areas (DEC 2005).	This species has not been recorded on the subject site or in the locality. In any case, all potential habitat would be retained in Conservation Area.
Slender Screw Fern ***Lindsae incise***	E (TSC Act)	Dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. It is usually found in waterlogged or poorly drained sites along creeks, where ferns, sedges and shrubs grow thickly (DEC 2005).	This species has not been recorded on the subject site or in the locality. In any case, all potential habitat would be retained in Conservation Area.
Slender Marsdenia ***Marsdenia longiloba***	E (TSC Act) V (EPBC)	Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops (DEC 2005).	This species has not been recorded on the subject site or in the locality. In any case, all potential habitat would be retained in Conservation Area.
Rainforest Cassia ***Senna acclinis***	E (TSC Act)	Grows in or on the edges of subtropical and dry rainforest (DEC 2005).	This species has not been recorded on the subject site or in the locality. Sub-optimal potential habitat is present on the subject site, all of which would be retained in the Conservation Area.
Climbing Snake Fern ***Lygodium microphyllum***	None	Grows in rainforest, swamp forest or open forest (Harden 1990).	This species has not been recorded on the subject site or in the locality. In any case, all potential habitat would be retained in Conservation Area.

V – Vulnerable E - Endangered

B.1 ECOLOGICAL MATTERS

B.1.9 IMPACTS OF ACOUSTIC BARRIERS

There is no proposal to install acoustic barriers (mounding, bunding or noise walls) anywhere on the subject site at Moonee. As a consequence, there will be no impact arising from the installation of such barriers on the Conservation Area on the 'Moonee Waters' site.

Detailed assessment of the impacts of noise from the upgraded Highway on dwellings in the 'Moonee Waters' project, particularly in the Northern Precinct, would be made at the DA stage for that Precinct. That assessment would need to consider inter alia the detailed engineering design of the Highway (eg whether the carriageways are in cut, fill or 'at grade' adjacent to the Northern Precinct).

Any measures which may be required for acoustic protection for houses close to the Pacific Highway would be provided by design features associated with the dwellings, as indicated in Chapter B.7 of this Preferred Project Plan Report.

Further, in the event that acoustic barriers were deemed necessary, they should be constructed immediately adjacent to the Pacific Highway for two reasons:

- in order to be effective, bunds or noise walls need to be located as close as possible to the noise source; and
- the source of the problem (the 'noise') is the Highway. The solution should therefore be on the Highway Land.

ACOUSTIC BARRIERS

The 'Moonee Waters' Preferred Project Plan does NOT propose the provision of any acoustic barriers (mounding, bunding or noise walls) between the Northern Precinct and the upgraded Pacific Highway.

There will be NO impact of any such features on the 'Moonee Waters' Conservation Area.

B.1.10 CONCLUSION ON ECOLOGICAL MATTERS

The 'Moonee Waters' Preferred Project Plan has been predicated, since its inception, on the principle of using ecological constraints to determine the development footprint and development style. Generation of the Preferred Project Plan has embodied an approach which involves the identification of ecological biodiversity values on the subject site, and the subsequent determination of development footprints and development design features specifically to retain, maintain and enhance features of the natural environment.

The 'Moonee Waters' Preferred Project Plan achieves a 'Maintain or Improve' outcome by:

- maintaining 75% of the subject site (76.29ha) in its natural state for biodiversity conservation purposes;
- increasing the extent of conserved lands in the locality by 76ha;
- repairing damage to the natural habitat for at least on threatened plant species (the Moonee Quassia);
- preventing the ongoing degradation of or disturbance to retain vegetation threatened species habitats on the site; and
- committing to the rehabilitation of the retained vegetation.

The 'Moonee Waters' Preferred Project Plan has been developed in accordance with the principles of the Ecologically Sustainable Development by:

- retaining examples of all habitats and features on the subject site at Moonee;
- protecting approximately 75% of the site for biodiversity conservation purposes;
- enhancing areas of degraded or disturbed vegetation on the site;
- creating a development concept which facilitates an appropriate, sensitive and moderate urban design and also generates the base for a substantial biodiversity conservation value through dedication of 76ha of vegetated land; and
- achieving an appropriate balance between moderate and reasonable development aspirations and appropriate and reasonable biodiversity goals.

The 'Moonee Waters' Preferred Project Plan provides the best, the widest, the most viable and the ONLY managed 'wildlife corridors' in the immediate vicinity. In this regard:

- the Preferred Project Plan does NOT adversely affect any purported east-west 'wildlife corridors' at this location;
- the measures provided for within the Preferred Project Plan will maintain the broadest and most viable 'wildlife corridors' in the vicinity;
- the existing and proposed future infrastructure corridor (including the Pacific Highway) to the immediate west of the subject site provides a substantial and "formidable" barrier to wildlife movements, including by the restriction of underpasses to just one location (at the northwestern corner of the subject site); and
- private lands to the west of the infrastructure corridor are already highly fragmented and contain NO 'wildlife corridor' as wide as or as secure a those which are proposed on the 'Moonee Waters' site.

The 'Moonee Waters' Preferred Project Plan does NOT constitute a constraint to the functioning of any 'wildlife corridors' at this location.

The 'Moonee Waters' Preferred Project Plan will not impose significant adverse impacts upon any threatened biota, either on the subject site itself or in the immediate vicinity. The project protects the habitats of all threatened biota by the conservation, protection and subsequent dedication of over 76ha of native vegetation, containing all of the habitat requirements for threatened flora and fauna species known or likely to occur on the subject site. The Preferred Project Plan provides for the protection of 99.77% of the "endangered ecological communities" which are present, and has involved a design process which incorporates stormwater management and bushfire protection measures specifically to minimise adverse impacts upon the natural environment in the Conservation Area.

The 'Moonee Waters' Preferred Project Plan:

- involves only a small area of native vegetation being removed from the site, selected on the basis of its lower ecological and biodiversity conservation values;
- will retain examples of all native vegetation types and wildlife habitats or resources within the 76ha of the site to be retained for biodiversity conservation purposes;
- will result in NO net loss of hollow-bearing trees or tree-hollows;
- will not exacerbate the "key threatening processes" known as 'Predation by the European Fox' or 'Predation by the Feral Cat'; and
- will not involve the imposition of or exacerbation of any other "key threatening processes" listed on the TSC Act.

The 'Moonee Waters' Preferred Project Plan has been assessed in detail with respect to a substantial array of threatened fauna species known to occur on the subject site or which could possibly occur, as well as the relevant "endangered ecological communities" and threatened plants. The outcome of the substantial array of detailed and comprehensive Section 5A Assessments of Significance is that the Preferred Project Plan is not "likely" to impose a "significant effect" upon any "threatened species, population or ecological communities, or their habitats" .

The 'Moonee Waters' Preferred Project Plan has incorporated issues relating to "environmental buffers" by virtue of the project design and of the incorporation of appropriate measures into the project to avoid the imposition of adverse impacts on the adjoining vegetation. The Project provides for appropriate 'buffers' to sensitive vegetation or habitat, and by virtue of appropriate design and management will avoid the need for substantial 'buffers'.

The 'Moonee Waters' Preferred Project Plan incorporates appropriate 'buffers' into the project, and will impose NO adverse impacts upon sensitive and important areas of habitat within the subject site or nearby. There is no requirement for any additional "environmental buffers" for the project, and there has been no justification provided by any commentators for the provision of further buffers.

The 'Moonee Waters' Preferred Project Plan does NOT degrade or otherwise affect the SEPP 14 Wetland which is present on the subject site. The total area of that Wetland is contained within the Conservation Area proposed as part of the Preferred Project Plan.

The 'Moonee Waters' Preferred Project Plan involves the removal of only minute portion of any "endangered ecological community". None of the dry forest types which are present on the subject site are listed as "endangered ecological communities", and the dry forest vegetation which is to be removed for development is well represented on the north coast. Further, the proposal involves the retention of areas of that community, and the proposed Preferred Project Plan will NOT impose a significant impact on or involve a significant reduction of that forest type.

The 'Moonee Waters' Preferred Project Plan will provide a significant benefit for the Moonee Quassia and the Rusty Plum (if that latter species is present). That benefit will arise by virtue of the active management and protection of individuals and habitat for these species in the Conservation Area, and the removal of existing disturbance of and damage to the individuals and habitats of these species.

The 'Moonee Waters' Preferred Project Plan represents an appropriate, reasoned, and moderate balance between development opportunities on the subject site and the achievement of outstanding biodiversity conservation.

ECOLOGICAL MATTERS

The 'Moonee Waters' Preferred Project Plan has been RESPONSIVE to ecological issues and matters since its inception.

By virtue of design elements, impact amelioration measures and environmental management features of the Preferred Project Plan, there will be NO significant adverse impact posed on the natural environment or any ecological matters by the 'Moonee Waters' project.

B.2 ACCESS

B.2.1 ACCESS TO THE SITE

Access will ultimately be via the Collector Road connecting Split Solitary Road and Moonee Beach Road, Moonee beach interchanges to be constructed as part of the highway upgrade.

This access will be available either:

- When adjacent owners develop and construct the section of Collector Road through their land; or
- Forward funded by Hillview Heights estate. This is acceptable to adjacent owners to the north but at a significant cost penalty to Hillview Heights Estate.

Temporary access is however sought from the RTA to the highway until the highway is upgraded and/or until alternative access is available via the Collector Road. This is particularly desirable for construction access.

Council and the RTA do not support temporary access to the Pacific Highway (**Figure 21**). It is suggested by them that alternative access via the proposed Collector Road is available. This is not so in the sort term.

The RTA proposes to remove access to the residentially zoned site from the Highway without any alternative access being provided.

Council has a S94 Plan in place to finance the proposed "Collector Road" but this has no implementation mechanisms.

Thus, the proponent seeks temporary access in case of staging problems with local adjacent landowners.

The proponent is prepared to close the temporary access as soon as alternative access has been provided north and south on the Collector Road. This is included in the Statement of Commitments.

B.2.2 ACCESS TO MOONEE WATERS

Access will be available north and south via Collector Road once adjacent sites have developed. Alternatively a forward funding option can provide access to the north.

Nevertheless temporary access to the highway is sought until the highway is upgraded, primarily for construction traffic.

ACCESS TO MOONEE WATERS

Access to the north and south is NOT presently guaranteed until adjacent landowners develop. As a consequence, and until the Pacific Highway is upgraded, temporary access is sought from the Highway.

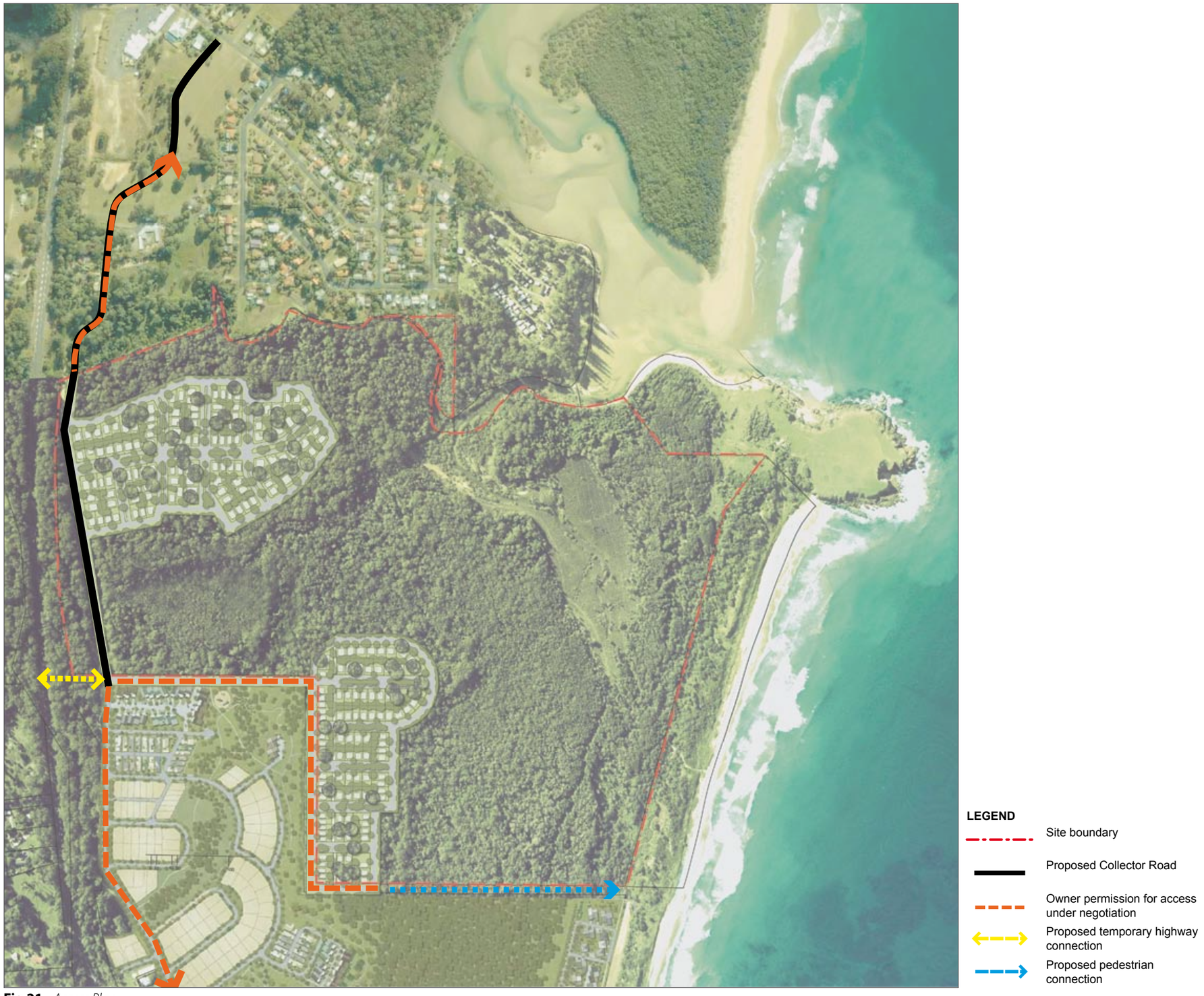


Fig 21 - *Access Plan*

B.3 OWNER'S CONSENT

Application has been made once more for Owner's Consent to open the Crown Road Reserve, following wide-ranging discussions with Department of Lands (DoL) representatives in Coffs Harbour (Kersten Tuckey and David Mcpherson). At this meeting general agreement was reached on issues raised in the DoL submission (see **Part E, Appendix F**).

In summary, DoL seems to be able to provide Owner's Consent to open the Crown Road based on the following:

- The proponent does not propose using the causeway track through the wetland for vehicular access, and are prepared to contribute to creation of an enhanced pedestrian pathway along this track to the beach. Appropriate parking arrangements will need to be negotiated;
- The south eastern corner of development has been relocated away from the SEPP 14 Wetland boundary;
- Rutile Road is to be transferred to Council prior to DA approval;
- The location and standard of walking tracks through "Conservation Area" is to be negotiated with DoL, Council, DECC, DOP along with location, type and management of local parks, picnic areas, lookouts and parking areas prior to DA approval. It should be recognised that there are different positions held by (and within) different authorities about levels of public access to and through the "Conservation Area";
- The developer is prepared to transfer/dedicate areas of Moonee Beach – Green Point walking track as a component of the "Conservation Area" to guarantee pedestrian access as requested by DoL;
- A Management Plan will be prepared to accompany the DA;
- The developer is prepared to dedicate land (subject to development approval of areas set out in **Figure 22)** for use as Conservation Area to be owned and managed in association with the adjacent reserve by Council and the State Government; and
- The final resolution as to the final extent of road to be opened is to be determined (in consultation with Department of Lands, Council & DOP) prior to DA.

Owners consent able to be obtained.

B.4 CONSERVATION AREA MANAGEMENT

Council have advised that they are prepared to take ownership and responsibility for management of the "Conservation Area". The Department and other authorities support this. The developer is prepared to agree to this in exchange for proposed development rights as set out in **Figure 22**.

It should be noted however that the raw land value of the residential zoned land is substantial and thus the proponent suggests that the proposed development area is the very minimum in return for such a significant dedication (76 ha of land as Conservation Area including 21.7 ha of land zoned residential).

The Conservation Area can be dedicated to Council or conserved under community title. Recent discussions with Council and DECC indicate a wilingness by those authorities to accept dedication and further joint management of the Conservation Area.

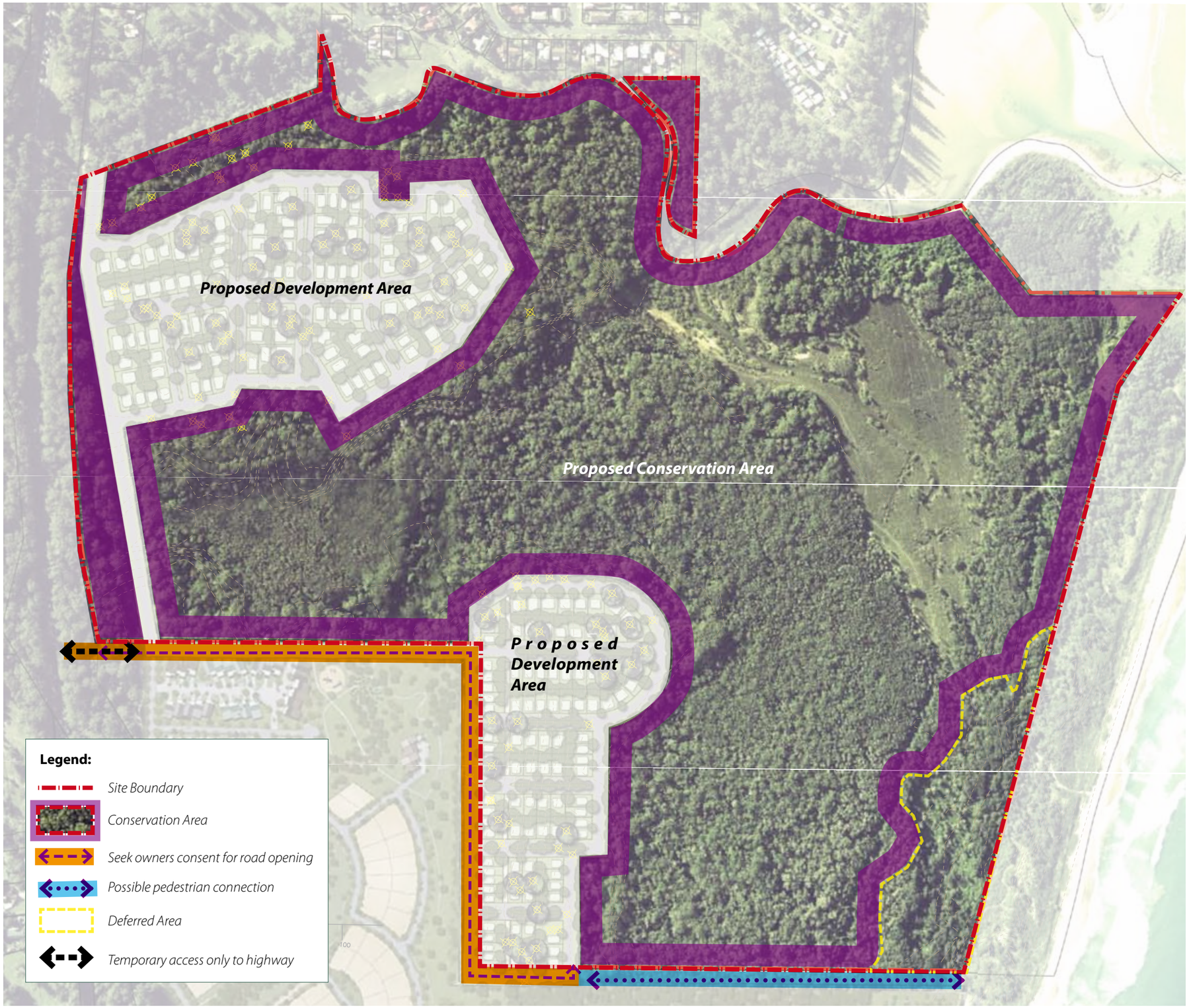


Figure 22 - *"Conservation" Area*

B.5 CLIMATE CHANGE AND SEA LEVEL RISE

Our Consultants (see **Section C.5 Water Cycle Management**) note that the DECC Guidelines for consideration of climate change were released in November 2007, which post-dated their previous Report and assessment of climate change impacts on flood behaviour.

The DECC Guideline recommend sensitivity testing of the full range of IPCC and CSIRO predictions for sea level rise on the NSW coastline. It does not recommend adoption of a particular level.

This should be considered in the light of the NSW Government Floodplain Development Policy which requires assessment of the appropriate flood management response given consideration of the whole range of social, economic and environmental aspects. It recommends against unnecessary sterilisation of land.

The IPCC formulated a range of world condition scenarios relating to population, greenhouse gas production and environmental conditions. The best, average and worst case scenarios predicted sea level rises up to 2100 of 0.18m, 0.55m and 0.91m respectively for the NSW coast (including CSIRO derived extra factors for the NSW coast).

The predicted 100 year ARI flood levels in Moonee Creek and the ocean dominated floodplain of Sugar Mill Creek in 2100 under these scenarios would conservatively range from approximately RL 2.8m AHD to RL 3.5m AHD (see **Figure 23**).

Our consultants Report (**Appendix H**) therefore recommends minimum habitable floor levels of RL 3.6m AHD which would provide a 100mm freeboard if the worst case sea level rise eventuated in 2100 (ie the floor level would not be inundated).

Only minor localised filling would be required to ensure that the development area is above a level of RL 3.6m AHD (see **Section C.6**).

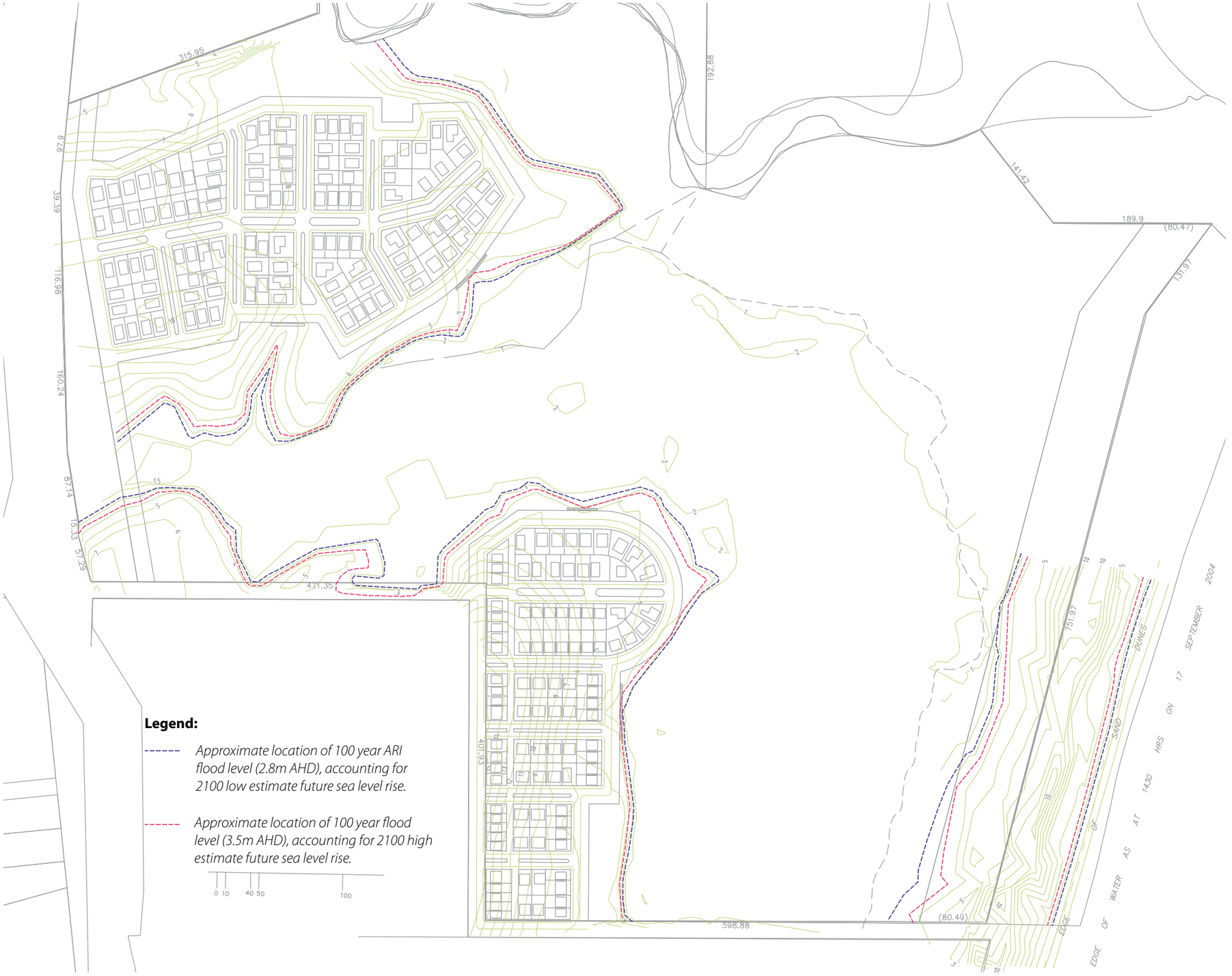


Fig 23 - *Map of Development Areas and 100 Year Flood (2100 High / Low Estimates.*

CLIMATE CHANGE AND SEA LEVEL RISE

The whole of both Development Precincts at 'Moonee Waters' will have minimum habitable floor levels of RL 3.6m AHD. This is 100mm ABOVE the WORST case scenario for flooding and sea level rises.

B.6 BUSHFIRE PROTECTION

A review of the Department's response by our Bushfire Consultant is appended (see **Part E, Appendix G**).

In summary, the design of both precincts permits APZs to be located within the width of the perimeter road reserve and building setback with a fuel managed corridor along the access road to the southern precinct and to the Collector Road. The lots will also be managed as an APZ whilst retaining much of the tree canopy to preserve habitat connectivity (covenant on title).

The management of the perimeter APZ will be either the responsibility of the Community Association (if Community Title is used) or Council (who will own both the roads and the Conservation Area) if not.

The fuel management corridor to the access (Crown) road and the Collector Road should be managed by the owner (Community Association or Council) in accordance with a Fire Management Plan.

The subdivision layout provides for 8m perimeter roads thus complying with / deemed to comply provisions of planning for Bushfire Protection (see **Figures 24 and 25a, 25b** over).

The proponent's Bushfire Protection Assessment recommends:

- A fuel managed corridor between the Collector Road and the highway in accordance with Moonee Waters Fire Management Plan. This entails removal of accumulated ground fuel. The eastern side of the corridor will be fuel managed to a width of 20m indry forest.
- A 30m wide managed corridor in dry forest is proposed along the northern side of the Crown Road access to the southern precinct in accordance with the Moonee Waters Fire Management Plan, managed by the owner (Council or the Community Association). Note that this area has a relatively low value according to Sainty.
- The management protocols will represent a Strategic Fire Advantage Zone (SFAZ) with the prescribed methods of management being hazard reduction burning every 7-8 years in accordance with management protocol is contained in "Bushfire Environment Assessment Code for Asset Protection and Strategic Fire Advantage Zones". The management protocols will not have any (significant) ecological impact on either the vegetation within the managed corridor or the adjacent Conservation Areas.
- Temporary emergency egress is required onto the Pacific Highway only until the Collector Road is completed to the north and south.
- The proposed development provides for APZs in excess of deemed to comply widths required by "Planning for Bushfire protection 2006", with no impact on ecology.
- Emergency egress from the southern precinct to the adjacent North Sapphire Beach Development is not strictly necessary given the proposed treatment of the Crown Road but will enhance the safety/security system in the future if achieved and will allow a reduction in the width of fuel free corridor to the road reservation only. It will thus be pursued with adjacent owner.

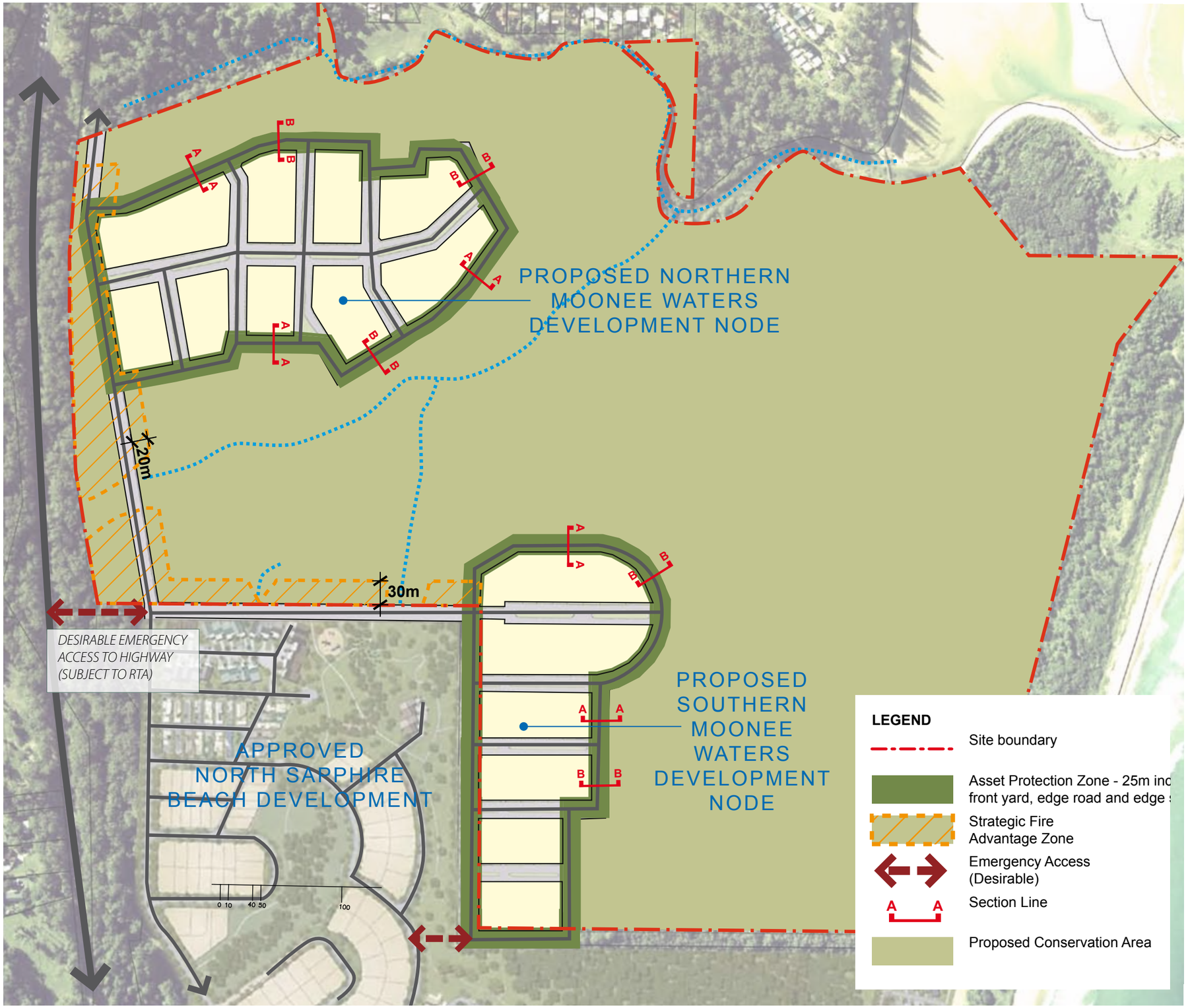


Figure 24 - *Emergency Access and APZ*

B.6 BUSHFIRE PROTECTION

ASSET PROTECTION ZONES / EDGE TREATMENT

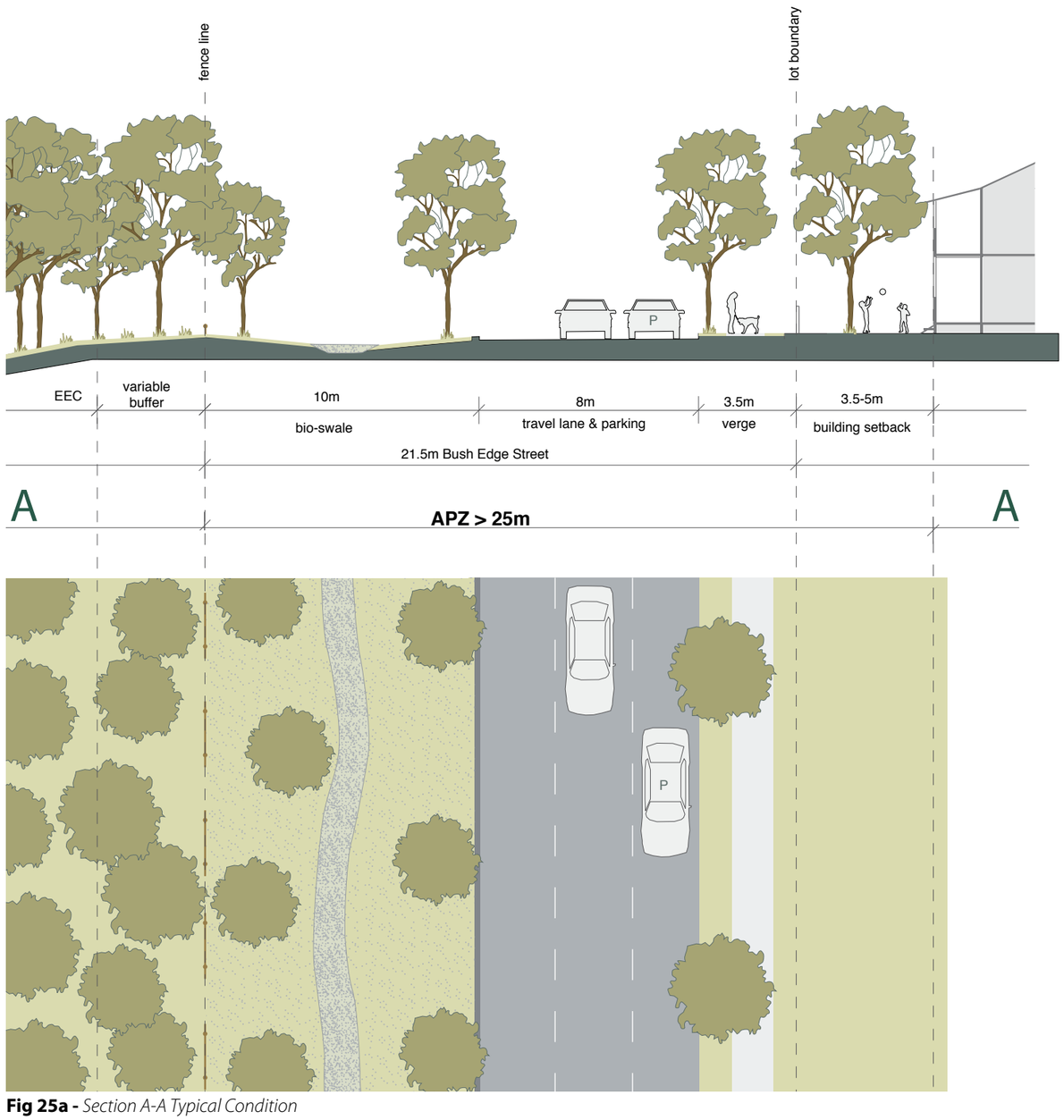
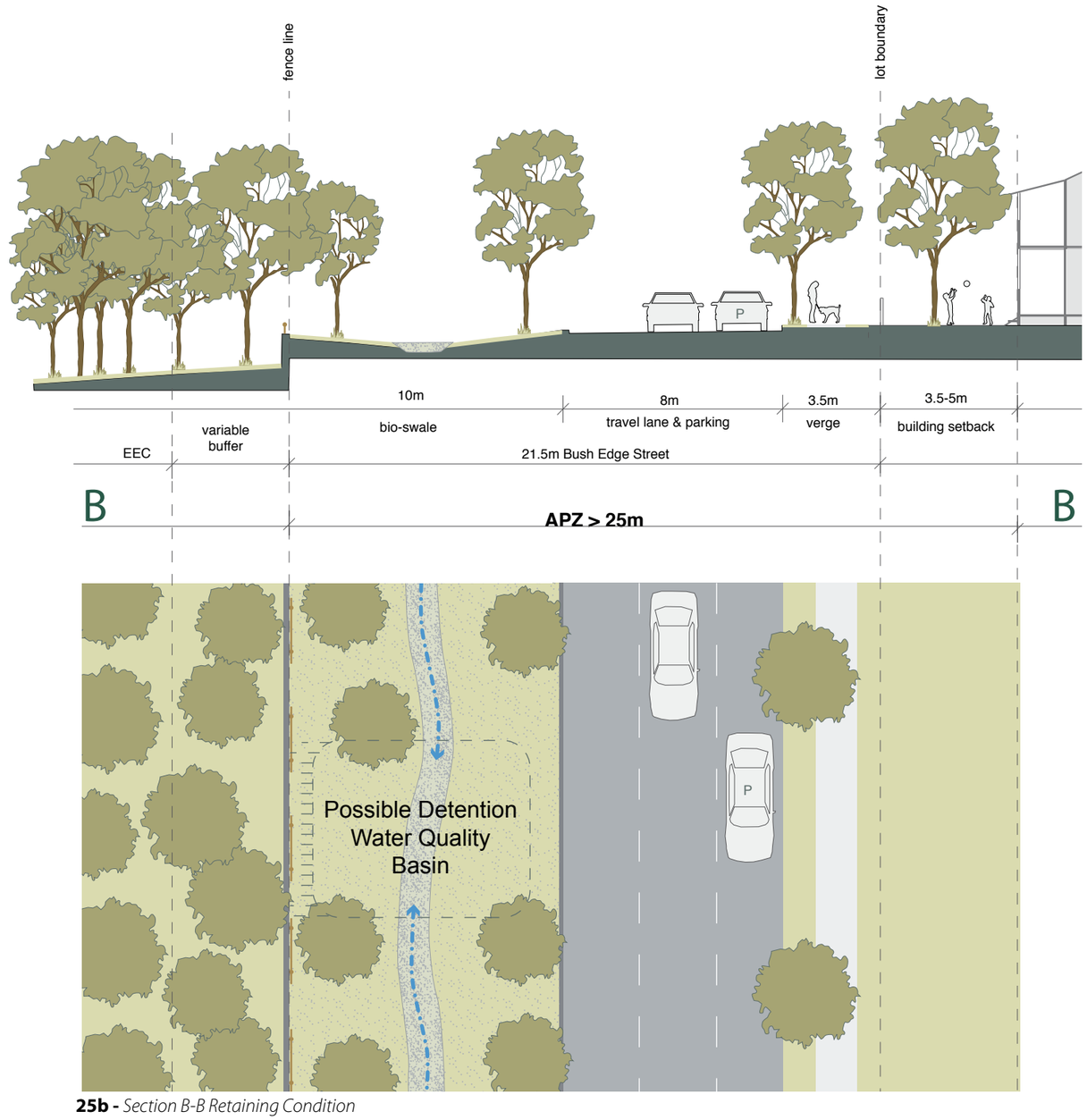


Fig 25a - *Section A-A Typical Condition*

Typical section through APZ showing front yard, road section and drainage bio-swale to exclusion fence at edge of Conservation Area.



25b - *Section B-B Retaining Condition*

Section through APZ featuring retaining wall to provide edge treatment to Conservation Area (no intrusion of batters) where fill is required.

BUSHFIRE PROTECTION

The 'Moonee Waters' Preferred Project Plan provides adequate bushfire protection measures with MINIMAL and INCONSEQUENTIAL impacts on the natural environment.

The Asset Protection Zones for both Development Precincts are contained ENTIRELY within the Precinct footprints. The Strategic Fire Advantage Zones along the access roads require only SENSITIVE fuel reduction measures in the dry forest types ONLY.

B.7 NOISE IMPACTS

B.7.1 NOISE IMPACT OF HIGHWAY UPGRADE

There will be noise impact from the Pacific Highway on dwellings in the Northern Precinct (**Figure 26**). No mounding has been contemplated due to the potential impact of batters on existing vegetation. Sound walls, if required, should be as close as possible to the noise source to optimise efficiency. Without detailed information as to the Highway upgrade route and levels, it is not possible to accurately determine whether noise walls will be necessary, whether they would be effective and where or how large they should be.

Development is a minimum of 70-100m away from the Highway, and is screened by dense forest.

Any development close to the Highway noise source is likely to require some noise mitigation. It is proposed that this be addressed at the DA stage when more information is available from the RTA. In this context, it is expected that dwellings closest to the Highway upgrade will require special noise mitigation measures (orientation, acoustic mass, double/triple glazing, insulation, screen walls etc).

B.7.2 NOISE AMELIORATION SUMMARY

- Highway noise will impact the western part of the Northern Precinct.
- Precise impacts are unknown until Highway construction data are available.
- After concept approval, but prior to DA, a detailed Noise Assessment will be carried out which will address noise impacts and possible mitigation measures.
- Mitigation can be achieved either at source (by construction of noise walls) or at dwellings (achieved by orientation, screening, insulation, double/triple glazing, sound walls or a mix of the above).

The Assessment will specify detailed mitigation measures for all residential properties in order to achieve internal acoustic comfort to Australian Standards.

NOISE IMPACTS

Noise impacts from the Pacific Highway can readily be ameliorated through dwelling design. Detailed assessment of noise impacts is proposed at the DA stage. NO impacts will be posed on the Conservation Area.

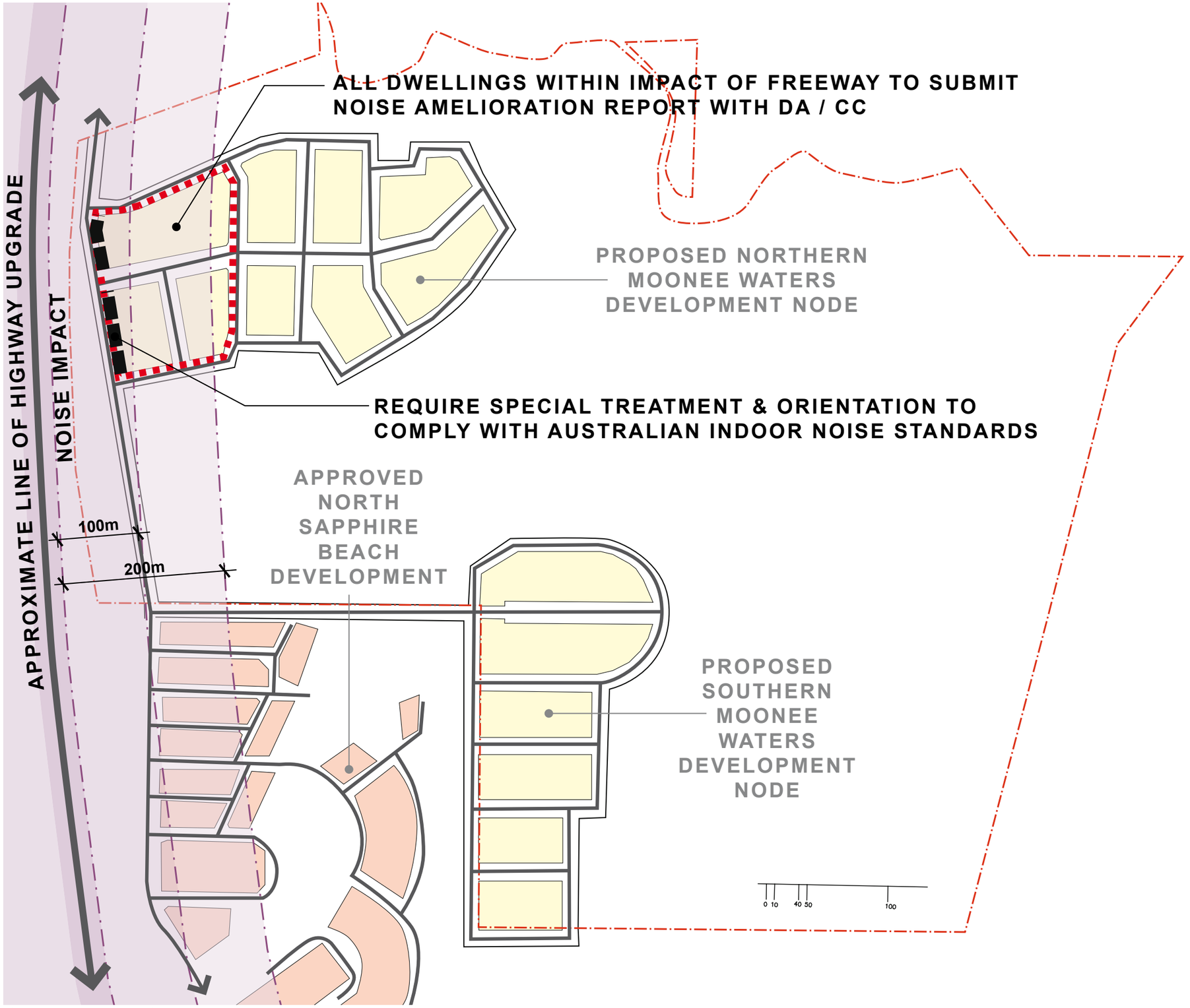


Fig 26 - *Noise Treatment Plan*