5.2 Assessment of Significant Species / Communities

As per the assessment carried out within Table 5-1, the following species / communities have been deemed appropriate to be applied further detailed assessment due to projected potential levels of impacts likely to result from the proposal.

Flora

- *Callistemon linearifolius*
- *Diuris praecox* Newcastle Doubletailed Orchid
- *Eucalyptus parramattensis subsp. decadens* Drooping Red-gum
- *Tetratheca juncea* Black-eyed Susan

Endangered Ecological Communities

- Freshwater Wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions
- Swamp Oak Floodplain Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Themeda Grasslands on Seacliffs and Coastal Headlands of the NSW North Coast, Sydney Basin and South East Corner Bioregions

Fauna

- *Crinia tinnula* Wallum Froglet
- *Hoplocephalus bitorquatus* Pale-headed Snake
- *Hoplocephalus stephensii* Stephen's Banded Snake
- *Calyptorhynchus lathami* Glossy Black-Cockatoo
- *Xanthomyza phrygia* Regent Honeyeater
- *Lathamus discolor* Swift Parrot
- *Ninox strenua* Powerful Owl
- *Tyto novaehollandiae* Masked Owl
- *Pteropus poliocephalus* Grey-headed Flying-fox
- *Miniopterus schreibersii* Eastern Bentwing-bat
- *Miniopterus australis* Little Bentwing-bat
- *Mormopterus norfolkensis* Eastern Freetail-bat
- *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat
- *Falsistrellus tasmaniensis* Eastern False Pipistrelle

- *Myotis adversus* Large-footed Myotis
- *Scoteanax rueppellii* Greater Broad-nosed Bat

5.2.1 Threatened Flora

It should be recognised (as alluded to below) that potential habitat for unrecorded species does exist within the site, including in areas that were not intensively surveyed during these investigations. The following species were confirmed to exist during the studies either in or within close proximity to the development estate.

Callistemon linearifolius

C. linearifolius was identified within the Riparian Melaleuca Swamp Woodland (EEC – Swamp Sclerophyll Forest). This population was large and located within the conservation lands. This species has also been identified within two locations to the north of the Coal & Allied owned lands within riparian vegetation.

The entire population of this species will be retained within the conservation lands and to ensure the survival of this species into the future it is recommended that appropriate nutrient and sediment control measures be put into place to avoid any runoff from having adverse effects on this threatened flora species in areas adjacent to the development estates.

Diuris praecox

This species was recorded by DECCW Wildlife Atlas in two locations, one to the south of a tributary of Middle Camp Gully and to the west of the Dam within the Coastal Plains Smooth-barked Apple Forest, and one within the Narrabeen Wallarah Sheltered Grassy Forest in the South west of the site. The record south of Middle Camp Gully is within the development estate and some plants may be impacted upon by the development proposal. DECCW database atlas records are accurate to ± 1 km and therefore it is difficult to predict if the development may impact upon this species. Over 6 visits were made in the vicinity of this record to try to detect this particular record, but it could not be found. *Diuris praecox* is a difficult species to detect as it does not flower every year. Approximately 18.03 ha (4%) of potential habitat will be removed as part of the proposal and approximately 439.62 ha (96%) will be conserved within the conservation lands within the Catherine Hill Bay site. As the majority of the habitat will be conserved it is considered unlikely that any impact will be significant.

Eucalyptus parramattensis subsp. decadens

Several stunted individuals of this species were located within the Coastal Clay Heath on the northern headland of Middle Camp Beach. An addition two individuals were located to the west of the houses within the cleared area at Middle Camp. It is considered that this population is of high conservation significance as this species is usually restricted to sand deposits from the Cessnock LGA and Tomago sandbeds. Voucher specimens of this species were sent to the Royal Botanical Gardens in Sydney in which the identification was confirmed.

Removal of similar habitat (Coastal Clay Heath) is proposed within the development estate. Targeted searches for this species within the development estate did not locate any individuals of this species. Approximately 5.68 ha (7%) of potential habitat will be removed as part of the proposal and approximately 76.76 ha (93%) will be conserved within the conservation lands within the Catherine Hill Bay site. Therefore no known populations of this species will be removed as part of the proposal.

The entire population of this species will be retained within the conservation lands and to ensure the survival of this species into the future it is recommended that appropriate nutrient and sediment control measures be put into place to avoid any runoff from having adverse effects on this threatened flora species in areas adjacent to the development estates.

Tetratheca juncea

A large population (985 individuals) of this species was located within the development estate during the targeted surveys undertaken in September 2007. The population was widely distributed throughout the areas surveyed

Whilst a large population will be removed as part of the proposal over 7,057 (88%) individuals of this species will be reserved with the conservation lands within the Catherine Hill Bay site. This number is likely to increase as approximately 350 ha of potential habitat that has not been surveyed within the Catherine Hill Bay site. Larger populations are currently conserved within Wallarah National Park to the north of the site (over 9,900 individuals) and with further populations located by RPSHSO (2007) within Coal & Allied lands at Gwandalan and Nords Wharf, which will be protected in conservation reserves, the number conserved is likely to increase. Thus, in the Wallarah peninsula the total number of *Tetratheca juncea* totals over 49,000. Of these over 29,000 are to be conserved in conservation reserves. Such a large number of known plants protected in several disjunct but proximate conservation areas bode well for the long term security of the species within the locality. Therefore, as the large numbers of *Tetratheca juncea* and the majority of the habitat will be conserved it is considered unlikely that any impact will be significant.

Other Threatened Flora species

Several threatened flora species have potential habitat within the site and are considered as having at least a moderate potential to occur. No populations of these species could be found during targeted searches, the majority of these cryptic orchids were in flower at the time of the *Tetratheca juncea* surveys which were performed in September 2007. However, many of the orchids are either undescribed or do not flower each year and therefore it is possible that stands of these species may have not been detected within the proposed development estate. It is unlikely that any of the aforementioned species should be significantly impacted upon by proposed development given the large tracts of similar habitat that is to be retained as conservation lands in perpetuity.

5.2.2 Endangered Ecological Communities

All of the EEC's listed in Section 5 are present within the site. In some cases, only a very small amount of vegetation will be affected and any long-term discernable impacts are considered likely to be quite minimal. The impacts upon extant EEC's within the development estate are summarised below.

Freshwater Wetlands on Coastal Floodplains

This EEC occurs within the conservation lands of the Catherine Hill Bay site, and this community will be retained as part of the proposal. If nutrient and sediment control measures are put in place to mitigate runoff, prior to and during the construction phase, then this will ensure that any adverse impacts from the development will be avoided and thus a significant impact will not result. Therefore, it is unlikely that the development proposal will have a significant impact upon this EEC.

Swamp Oak Floodplain Forest

Two stands of this community are present within the site. The southern portion of this community is highly degraded, with the canopy of *Casuarina glauca* mostly removed from large incursions of Bitou and other pasture weeds. The northern portion of the vegetation community adjoins the development area and has a small risk of damage from urban runoff. If nutrient and sediment control measures are put in place to mitigate runoff, prior to and during the construction phase, then this will ensure that any adverse impacts from the development will be avoided and thus a significant impact will not result.

Swamp Sclerophyll Forest (includes both Swamp Mahogany – Paperbark Forest and Riparian Melaleuca Swamp Woodland communities)

Sections of this community are proposed to be removed in two areas, firstly in the drainage line to the west of Middle Camp. The second area occurs in the north east drainage line adjoining Flowers Drive. Approximately 2.04 ha (8%) of extent will be removed as part of the proposal and approximately 22.67 ha (92%) will be conserved within the conservation lands within the Catherine Hill Bay site. Given that the majority of this EEC (92%) will be reserved within the conservation lands, it is considered highly unlikely that removal of such a small area of this EEC will significantly compromise the viability of the local stand. Sections of the vegetation community adjoin and are dissected by the development footprint and have a small risk of damage from urban runoff. If nutrient and sediment control measures are put in place to mitigate runoff, prior to and during the construction phase, then this will ensure that any adverse impacts from the development will be avoided and thus a significant impact will not result.

Themeda Grasslands on Seacliffs and Coastal Headlands

A small degraded remnant of this EEC occurs within the development estate on the ridgetop to the west of Flowers Drive. Review of old aerial photographs from the 1960's reveal that this ridgetop has previously been cleared for mining purposes. The remnant is highly degraded with high densities of Whiskey Grass and other pasture weeds. However it is considered to be commensurate with a disturbed remnant of this EEC. Approximately 0.07 ha (6%) of potential habitat will be removed as part of the proposal and

approximately 1.09 ha (94%) of higher quality habitat will be conserved within the conservation lands within the Catherine Hill Bay site. Given that the majority of this EEC (94%), representing the greatest quality, will be reserved within the conservation lands, it is considered highly unlikely that removal of such a small area of this EEC will significantly compromise the viability of the local stand.

Low Woodland with Heathland on indurated Sand at Norah Head

Coastal Clay Heath vegetation community, in part, has some affinities with the EEC Low Woodland with Heathland on Indurated Sand at Norah Head. It is difficult to determine if any of this EEC occurs within the Catherine Hill Bay area, however some of the headlands contain hard setting sand and vegetation to 3m in height. The Scientific Determination for Low Woodland with Heathland EEC, lists 33 flora species which occur within this community and 16 (48%) occur with Coastal Clay Heath at Catherine Hill Bay.

Bell (2002) investigated this community, within the Wyong LGA, and found that a number of vegetation units occurred where the original community was mapped, at Norah Head, by Payne and Duncan (1999). These include, Narrabeen Impeded Wet Heath, Narrabeen Doyalson Coastal Woodland, Coastal Sand Robusta-Paperbark Swamp Forest and Coastal Sand Wallum Heath-Scrub. The map unit from the Wyong Vegetation Mapping which is most relevant within Catherine Hill Bay vegetation is the Coastal Sand Wallum Heath-Scrub. Two variants have been described within this variant, the type variant which corresponds to the Coastal Sand Wallum Heath Vegetation Community which was mapped as such within the Catherine Hill Bay site. The second variant is the Norah Head variant which is described as occurring on indurated sands or where a thin mantle of sand overlies bedrock material and is primarily comprised of heath. This variant is described as being dominated by clay-based heath species such as *Melaleuca nodosa*, *Banksia oblongifolia* and *Callistemon linearis* and various sedges (Bell 2002). This vegetation community could occur within the conservation lands within the Coastal Clay Heath vegetation community as thickets of *Melaleuca nodosa* were noted within several of the drainage depressions within this community. Bell (2002) comments that this Norah Head community has similarities to other Aeolian sand deposits elsewhere in the region and that there is insufficient data to clarify how strong these similarities are. He does note that parts of the vegetation at Norah Head are unique to Wyong Shire, and that the community is restricted to the creeklines and drainage depressions.

It is the opinion of the author that it is highly probable that portions of this EEC occur within the Coastal Clay Heath vegetation community. However the extent of the community will need further investigation when clear delineation of the EEC has been determined. Due to the change in development layout, all of the Coastal Clay Heath vegetation community that occurs within Catherine Hill Bay will be retained as part of the proposal. No part of the development proposal adjoins any of the Coastal Clay Heath vegetation community and therefore it is considered highly unlikely that this EEC will be impacted upon by the proposal.

5.2.3 Threatened Fauna

Wallum Froglet

Although this species was not recorded within the site there is moderate to high potential for it to exist in the lower drainage lines of Middle Camp Gully, particularly within swamp sclerophyll and wetland vegetation communities. Those lands within which this species is likely to occur will be retained within the current proposal as conservation lands. However, due to the downstream location of potential Wallum Froglet Habitat, with respect to the proposed development estate, there is potential for stormwater runoff from construction works to increase sediment loads to downstream wetland habitats and for the displacement of vegetation by manmade surfaces to increase water-flows, which may alter drainage channel profiles of wetland habitats. This combination of potential water derived impacts is likely to represent the Key Threatening Process (KTP) "Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands". Therefore, sediment and water management strategies will need to be incorporated into the planning, construction and occupation phases of the proposed development estate to ensure that potential impacts to downstream wetland habitats are prevented.

Pale-headed Snake

The habitats within which this species potentially occurs within the site will be retained within areas dedicated to conservation lands, and it is considered that no direct or indirect adverse impacts will affect it as a consequence of the proposed development estate. Therefore it is unlikely that the current proposal will threaten the viability of any potential local population of this species.

Stephen's Banded Snake

The habitats within which this species potentially occurs within the site will be retained within areas dedicated to conservation lands, and it is considered that no direct or indirect adverse impacts will affect it as a consequence of the proposed development estate. Therefore it is unlikely that the current proposal will threaten the viability of any potential local population of this species.

Glossy Black-Cockatoo

Potential foraging habitat for this species, in the form of *Allocasuarina sp*., is widespread within the site. Chewed *A. littoralis* cones were observed in the southwest of the site and at least two individuals were heard in the vicinity of trapping transect 21, where *A. torulos*a occurs within open forest habitats and *A. distyla* occurs in nearby heathland habitats. The habitats within which this species potentially occurs within the site will be retained within areas dedicated to conservation lands, and it is considered that no direct or indirect adverse impacts will affect it as a consequence of the proposed development estate. It is considered that the current proposal will ensure that locally occurring individuals or family groups of Glossy Black Cockatoos will benefit due to increases in conserved habitat. Therefore it is unlikely that the current proposal will threaten the viability of the local population of this species.

Regent Honeyeater

This species does not occur in the Central Coast and Lower Hunter Region on a continuous basis, as its stronghold is the western slopes of the Great Dividing Range. Nevertheless, Regent Honeyeaters are recorded in Swamp Sclerophyll vegetation communities and associated woodlands on an intermittent seasonal basis in the Lake Macquarie LGA when resources in the west or Lower Hunter are scarce. Potential foraging habitat for this species, in the form of *Eucalyptus robusta*, occurs along the lower reaches of drainage lines within the site. Some of the area within which *E. robusta* occurs within the site lies within the development estate lands and has potential to be adversely impacted upon by the current proposal. The potential loss of *E. robusta* may represent an incremental loss of coastal foraging habitat for this species. Therefore, it is recommended that *E. robusta* trees be retained within the current proposal where possible and where removal is unavoidable, that sufficient *E. robusta* be included within landscape planting schedules to offset potential losses.

Sooty Oystercatcher

This species was recorded flying between the headlands to the north and south of Catherine Hill Bay. A rocky shoreline species the Sooty Oystercatcher forages, roosts and sometimes breeds on rock shelf habitats. Habitat for this species occurs in the northeast extremity of the site where the shoreline is characterised by rock shelf habitats. These areas will be protected as conservation lands within the proposal.

Pied Oystercatcher

This species was recorded on the beach of Catherine Hill Bay. A sandy shoreline species the Pied Oystercatcher forages, roosts and breeds and on sandy shoreline habitats and sometimes roosts on rock shelf habitats. Habitat for this species occurs along the beaches of Catherine Hill Bay and to a lesser extent the rocky shoreline habitats in the sites northeast These areas will be protected as conservation lands within the proposal.

Swift Parrot

This species does not occur in the Central Coast and Lower Hunter Region on a continuous basis, as it only moves into South-eastern Australia during the winter months and spends the summer in Tasmania. Local records for this species occur at Nord's Wharf and on the Gwandalan peninsula. Potential foraging habitat for this species, in the form of *Eucalyptus robusta*, occurs along the lower reaches of drainage lines within the site. Some of the area within which *E. robust*a occurs within the site lies within the development estate lands and has potential to be adversely impacted upon by the current proposal. The potential loss of *E. robusta* may represent an incremental loss of coastal habitat for this species. Therefore, it is recommended that *E. robusta* trees be retained within the current proposal where possible and where removal is unavoidable, that sufficient *E. robusta* be included within landscape planting schedules to offset potential losses.

Powerful Owl

This species was recorded within open forest habitat in the southwest and northwest of the site during nocturnal fauna surveys. Furthermore, there are other records for this species on the Wallarah peninsula to the north and south of the site. Those areas within

the site, which are important as foraging or nesting habitat for this species will be retained as conservation lands within the current proposal. Therefore it is considered that the current proposal will benefit this species by securing local habitat.

Masked Owl

Although this species was not recorded within the site during nocturnal fauna surveys, there are two records for this species within the site in the southwest and in the north. Those areas within the site, which are important as foraging or nesting habitat for this species will be retained as conservation lands within the current proposal. Therefore it is considered that the current proposal will benefit this species by securing local habitat.
Grey-headed Flying Fox.

Although there is no indication that there are roosting camps for this bat in the vicinity of the site, this species was recorded within the site associated with flowering Swamp Mahogany (*Eucalyptus robusta*). Although this species is known to forage on the fruit and blossom of a relatively wide range of native tree species, there are few resources available in winter and during this season *E. robusta* may be important to this species. Some of the area within which *E. robusta* occurs within the site lies within the development estate lands and has potential to be adversely impacted upon by the current proposal. The potential loss of *E. robusta* may represent an incremental loss of coastal foraging habitat for this bat species. Therefore, it is recommended that *E. robusta* trees be retained within the current proposal where possible and where removal is unavoidable, that sufficient *E. robusta* be included within landscape planting schedules to offset potential losses.

Eastern Bentwing-Bat

Being a species that utilises a diverse range of woodland habitats for foraging, it is likely that this site will be regularly used as part of its foraging range. Potential roosting habitat is known within the site in the form of disused mine workings. Although it is likely that a small amount of foraging habitat for this bat will be modified during the development process, large areas of suitable foraging habitat will be retained as conservation land under the current proposal. The location identified as roosting habitat will not be affected by the current proposal, and foraging opportunities will continue to exist within the development estate. It is therefore unlikely that the current proposal will represent a significant threat to this species.

Little Bentwing-Bat

The survey recorded this bat within the site and it is likely to use areas of the site regularly as part of its foraging range. Potential roosting habitat is known within the site in the form of disused mine workings. Although it is likely that foraging habitat for this bat will be modified during the development process, large areas of suitable foraging habitat will be retained as conservation land under the current proposal. The location identified as roosting habitat will not be affected by the current proposal, and foraging opportunities will continue to exist within the development estate. It is therefore unlikely that the current proposal will represent a significant threat to this species.

Eastern Freetail-Bat

This bat was recorded within the site, and being a species that forages predominantly in dry woodlands and forests, it is likely to use this site regularly as part of its foraging range, and may use the abundant tree hollows as roosting habitat. Even though it is likely that foraging habitat for this bat will be modified during the development process, large areas of suitable foraging habitat will be retained as conservation lands under the current proposal, and foraging opportunities will continue to exist within the development estate. It is therefore unlikely that the current proposal will represent a significant threat to this species.

Yellow-bellied Sheathtail-Bat

This species was not recorded during the survey but is known to occur in the Central Coast Region within a range of woodland habitats. Due to its mobility and occurrence in the near-coastal districts to the south, it is likely that this species uses the site on at least an intermittent basis. Although it is likely that foraging and roosting habitat for this bat will be modified during the development process, large areas of suitable foraging habitat will be retained as conservation lands under the current proposal, and foraging opportunities will continue to exist within the development estate. It is therefore unlikely that the current proposal will represent a significant threat to this species.

Eastern False Pipistrelle

This species was not recorded during the survey but a record from Pulbah Island in Lake Macquarie strongly suggests that it is likely to uses the site on at least an intermittent basis. The occurrence of suitable woodland within the site provides potential roosting habitat. Although it is likely that foraging and roosting habitat for this bat will be modified during the development process, large areas of suitable foraging habitat will be retained as conservation lands under the current proposal, and foraging opportunities will continue to exist within the development estate. It is therefore unlikely that the current proposal will represent a significant threat to this species.

Large-footed Myotis

This bat has been recorded within the locality of the site and there are foraging opportunities within dams on the northern section of the site although no known roosting sites for this species exist within the site. Those areas representing potential foraging habitat will be retained within the current proposal, and it is therefore unlikely that the proposal will represent a significant threat to local populations of this species.

Greater Broad-nosed bat

Although not recorded during this survey, this species is relatively widespread in a broad range of habitats within the Lower Hunter Region. Due to its mobility and local occurrence at the southern end of Ruttleys Road, it is likely that this species uses the site on at least an intermittent basis. Although it is likely that foraging and roosting habitat for this bat will be modified during the development process, large areas of suitable foraging habitat will be retained as conservation lands under the current proposal, and foraging opportunities will continue to exist within the development estate. It is therefore unlikely that the current proposal will represent a significant threat to this species.

5.3 Key Threatening Process (KTP)

A Key Threatening Process (KTP) is defined in the TSC Act (1995) as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities. Something can be a threat if it:

- *adversely affects two or more threatened species, populations or ecological communities; or*
- *could cause species, populations or ecological communities that are not currently threatened to become threatened.*

Key Threatening Processes are listed in Schedule 3 of the TSC Act 1995. Those potentially applicable to the proposal are as follows:

1. Loss of Hollow-bearing trees;
2. Clearing of native vegetation;
3. Human-caused climate change;
4. Infection of native plants by *Phytophthora cinnamomi*;
5. Invasion of native plant communities by exotic perennial grasses;
6. Removal of dead wood and dead trees;
7. Predation by the Feral Cat;
8. Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
9. Invasion of Native Plant Communities by Bitou and Boneseed;
10. Exotic Vines and Scramblers;
11. *Lantana camara*; and
12. Predation by the European Fox.

1. Loss of Hollow-bearing trees

The proposed development will require the removal of some hollow-bearing trees and as such is considered as contributing to the Key Threatening Process "Removal of Hollow-bearing Trees". It is expected that only small numbers of hollow-bearing trees will be removed, due to the stunted or fragmented-remnant nature of woodland and forest areas occurring within the development estate. The most likely guild of threatened fauna that this KTP may potentially impact is threatened Microchiropteran bats and to a lesser extent gliders. This is due to the limited occurrence of medium to large hollows within the development estate lands. Habitats within the site regarded as most likely to be impacted upon are remnant open forest and stunted heath-woodland habitats.

Microchiropteran bats are unlikely to be significantly impacted upon, due to their mobility and abundant hollow-bearing trees throughout lands to be conserved within the site.
Squirrel Gliders were not recorded within the site although Sugar Gliders were and this trend, coupled with other survey effort within the local area, suggests that Squirrel Gliders prefer Scribbly Gum woodland habitats to the west and south of the site in preference to the forested habitats characterising the development estate lands.

Within the development estate lands there is no known occurrence of large hollow-bearing trees of sufficient size to represent nesting trees for Masked or Powerful Owls, which are

known to frequent the local area (Atlas of NSW Wildlife data, RPS ecologist per. obs.). Therefore it is considered unlikely that the removal of hollow-bearing trees from the development estate land will constitute a significant threat to locally occurring forest owl species.

It is considered that proposal is likely to represent a relatively small cumulative impact, with regard to this KTP, due in large part, to the greater abundance of similar and greater quality habitat that will be secured as conservation lands elsewhere within the site. Over time these lands will provide additional hollows.

2. Clearing of Native Vegetation

The proposed development will require the removal of native vegetation and as such is considered to contribute to the Key Threatening Process "Clearing of Native Vegetation". Vegetation that will be removed for the development estate occurs mostly within cleared areas, but small areas of native vegetation communities, including, LHCCREMS MU 30 Coastal Plains Smooth-barked Apple Woodland, MU 50 Coastal Sand Scrub, MU 48 Coastal Clay Heath, Narrabeen Wallarah Sheltered Grassy Forest, MU 42 Riparian Melaleuca Swamp Woodland and MU 37 Swamp Mahogany – Paperbark Forest. The aforementioned two LHCCREMS vegetation communities are equivalent to Swamp Sclerophyll Forest on Coastal Floodplains EEC (SSFCF). Approximately 2.04 of SSFCF EEC occur within the development estate and will be removed as part of the proposal. However, approximately 22 ha of SSFCF will be secured outside the development estate as conservation lands within the proposal. A degraded remnant of Themeda Grassland on Seafcliffs and Coastal Headlands (0.07ha or 6%) will be removed as part of the development. However, approximately 1.1 ha or 94% which is of better quality, will be retained within the conservation lands.

A number of threatened fauna potentially use these lands for foraging, including, Microchiropteran bats and particularly, nectivorous species such as flying-foxes, birds and arboreal mammals due to *E. robusta* within SSFCF EEC. As such removal of vegetation within the development estate has the potential to impact upon local populations of dependant species. Apart from hollow bearing trees, which are dealt with above, the development estate lands may represent foraging habitat for gliders (potentially Squirrel Glider), threatened Microchiropteran bats and Forest Owls. The loss of these relatively small areas of potential habitat for these threatened fauna species is not considered significant when compared with the much greater area of similar and greater quality habitat that will be secured as conservation lands within the current proposal.

Threatened flora species, which are considered to potentially have individuals displaced by the development estate are *Tetratheca juncea*, *Cryptostylis hunteriana* and *Diuris praecox*. However, there is abundant habitat of much greater quality throughout the site for each of these species that will be secured as conservation lands within the current proposal.

For all of these species and communities, it is considered that the removal of vegetation from within the site will not represent a significant impact upon locally occurring entities, in light of the much greater areas of similar or higher quality habitat that will be secured as

conservation lands within the current proposal, although vegetation removal must be viewed as an incremental loss of potential habitat for these species.

3. Human caused climate change

The proposal is likely to contribute to the Key Threatening Process "Human Caused Climate Change" as a result of clearing vegetation. It is considered that clearing and modification of the landscape would constitute only a minor incremental increase in the effects of this KTP. Thus the extent to which the proposal could contribute to this process is considered unlikely to be significant.

4. Infection of native plants by Phytophthora cinnamomi

Phytophora cinnamomi is a water mould (like a fungus) that attacks the roots of susceptible plants, in many cases killing the plants. In some native plant communities, epidemic disease can develop causing death of large numbers of plants.

P. cinnamomi may spread with the movement of infected soil or plant material by people, animals and may be transported by percolating through the soil, in creeks or storm runoff. People can also transport the fungus to new areas on dirt adhering to vehicles, items they are carrying or footwear.

Humans have the capacity to spread the fungus long distances and across barriers which sets us apart from the natural mechanisms which normally spread this water mould. Therefore, not a lot can be done to control the natural spread of the water mould or to destroy it, in native plant communities. Due to the use of heavy machinery that will be used for construction of the development estate there is opportunity for the KTP "Infection of native plants by Phytophthora cinnamomi". The transportation of *Phytophthora cinnamomi* from other areas may occur by the movement of soils attached to earth moving machinery. Precautionary measures such as clearing of machinery prior to clearing can help to limit the potential for this KTP to occur, and should be addressed in Environment Management plans generated for site construction activities.

5. Invasion of native plant communities by exotic perennial grasses

There is opportunity for the KTP "Invasion of native plant communities by exotic perennial grasses" to occur within the site due to the removal of vegetation and the exposing of underlying soils. For the most part, this KTP already occurs within much of the development estate land due to their predominantly cleared and disturbed nature. It is expected that those measures employed to reduce potential sediment and erosional impacts to surrounding areas will contribute to minimising the potential for this KTP to impact upon surrounding Conservation Lands.

6. Removal of dead wood and dead trees

During the clearing of vegetation within the site a number of dead trees are likely to be removed and this may represent opportunity for the KTP "Removal of dead trees and dead wood". Within the development estate land there is a relatively low incidence of these habitat attributes and it is unlikely that this KTP will represent a significant threat to threatened species occurring within the site, provided an ecologist is present during clearing works. Consideration should be given to selective relocation of dead trees and logs into conservation lands.

7. Predation by feral cats

The increase of residential development within the area has the potential to increase opportunities for the KTP "Predation by feral cats". This KTP is unlikely to significantly impact upon local wildlife provided responsible pet ownership is adopted.

8. Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands

The displacement of natural vegetation communities within residential development is likely to increase the opportunity for the KTP "Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands". This is due to increased water flows and runoff potentials as a consequence of water falling upon manmade surfaces. Of greatest risk with regard to this KTP are wetland vegetation assemblages including EEC's and fauna associated with these communities such as *Crinia tinnula* (Wallum Froglet) and other aquatic fauna. Impact to these threatened entities will be prevented by the implementation of sediment and water management plans during the planning and construction phases of development and suitable stormwater runoff treatment and control, coupled with riparian vegetation retention.

9. Invasion of Native Plant Communities by Bitou and Boneseed

This species is currently well established along the Coastal heath vegetation communities and it occurs sporadically throughout the dry sclerophyll forests within the site. This species occurs in dense thickets in conjunction with Lantana within the EEC Swamp Sclerophyll Forest (Swamp Mahogany Paperbark Forest) within the Middle Camp. There is a chance that this plant may spread at the edges of the development due to the removal of the canopy layer and exposing of underlying soils which contain high number of seeds. It is recommended that a weed management program be undertaken targeting this species to ensure that the development proposal does not increase the area of occupancy. It is recommended that any topsoil which is removed from the vicinity of any Bitou plants not be used for any of the landscaping areas and be disposed of according to guidelines set out by Council. It is expected that those measures employed to reduce potential sediment and erosional impacts to surrounding areas will contribute to minimising the potential for this KTP.

10. Exotic Vines and Scramblers

Three species of exotic vines which have been listed within this KTP are present within the site namely, *Ipomoea* cair*i*ca (Mile a minute), *Hedera helix* (English Ivy) and *Asparagus aethiopicus* (Asparagus Fern). The former two species occur within the EEC of Swamp Sclerophyll Forest on Coastal Floodplains (Swamp Mahogany Paperbark Forest). The densities of these species are low, however the proposed development estate adjoins this EEC and could promote the growth of these species without appropriate management plans. It is expected that those measures employed to reduce potential sediment and erosional impacts to surrounding areas will contribute to minimising the potential for this KTP. The remaining climber is present within a small area in the southern portion of the site, in the Narrabeen Wallarah Sheltered Grassy Forest, which has been previously cleared. Ipomoea cairica occurs with other weeds such as

Lantana and Bitou and it is recommended that weeding be undertaken to prevent the further spreading and thus exacerbation of this KTP.

11 Lantana camara

There is a small opportunity for *Lantana camara* to establish, due to the removal of canopy vegetation and the exposing of underlying soils. This exotic plant species already occurs within the site in relatively high densities in some areas. It is likely that the development will considerably reduce the incidence of Lantana within the development estate. Nevertheless there will still be opportunities for this KTP at the edges of the development without appropriate management. It is expected that those measures employed to reduce potential sediment and erosional impacts to surrounding areas will contribute to minimising the potential for this KTP.

12 Predation by the European Fox

The removal of vegetation and hence habitat for this species has the potential to increase habitat competition within retained areas and the Conservation Estates. As such this may contribute to an increase in the KTP "Predation by the European Fox". If appropriate management measures are employed by the land manager (currently Coal & Allied and DECCW in the long term) this KTP should not have a significant impact on the local wildlife.

No other KTP's are believed to be relevant to the current proposal.

5.4 SEPP 44 (Koala Habitat Protection)

This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.

5.4.1 First Consideration – Is the Land 'Potential Koala Habitat'?

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

> *"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".*

Four tree species listed in Schedule 2 of SEPP No. 44 – 'Koala Habitat Protection' occur on site, namely *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum), *E. punctata, E. robusta* (Swamp Mahogany) and *E. signata* (Scribbly Gum).

E. haemastoma occurs within Coastal Plains Scribbly Gum Woodland (CPSGW), of which only a small area occurs in the north of the site. *E. haemastoma* occurs within CPSGW at a density higher than 15% of total canopy area within the community and as such areas of CPSGW can be considered as 'Potential Koala Habitat' according to the provisions of SEPP 44 (Figure 4-1:).

E. punctata occurs within Narrabeen Wallarah Sheltered Grassy Forest (NWSGF) on the slopes of the south-western portion of the site. *E. punctata* occurs within NWSGF at a density higher than 15% of total canopy area within the community and as such areas of NWSGF can be considered as 'Potential Koala Habitat' according to the provisions of SEPP 44 (Figure 4-1:).

E. robusta occurs as the dominant canopy species within Swamp Mahogany – Paperbark Forest (SMPF), which is associated with the lower drainage lines of the site particularly where they flatten out into broad alluvial flats. As the dominant canopy species *E. robusta* occurs within SMPF at a density higher than 15% of total canopy area within the community and as such areas of SMPF can be considered as 'Potential Koala Habitat' according to the provisions of the SEPP (Figure 4-1:).

E. signata occurs within Coastal Plains Smooth-barked Apple Woodland (CPSBAW) in the site's north at densities greater than 15% of total canopy cover and as such these areas are considered to constitute 'Potential Koala Habitat' according to the provisions of SEPP 44 (Figure 4-1:).

5.4.2 Second Consideration – Is the Land 'Core Koala Habitat'?

Searches were made for any secondary indications of Koalas on the site including scats, scratches on tree trunks, scent markings on tree trunks, tracks in the soil and audible noises including territorial or mating calls, fighting and movement in the trees. Searches for direct observations of Koalas were also conducted during a nocturnal survey. No animals were noted on site and no secondary evidence of the presence of Koalas could be found. However, a Koala record exists 1km outside the site to the south, which represents a distance of some 1.8km from the most southerly extent of the proposed development estate. Nevertheless, given that no direct evidence of secondary indication of Koala presence was observed it is considered that no further provisions of this policy apply to the site.

5.5 SEPP 14 (Coastal Wetland)

Mapping of SEPP 14 'Coastal Wetlands' was consulted to determine if vegetation within the vicinity of the site might be deemed as Coastal Wetlands under the SEPP. SEPP 14 Coastal Wetlands were found to occur some 0.6km to the south of the site and some 1.6km to the south of the most southerly development estate. These wetlands do not occur within the same watershed of the site and, as such, will not be affected by the current proposal.

Therefore no further provisions of this policy apply to the site.

6 Development & Conservation Outcomes

The Lower Hunter Region's vegetation is of bio-geographic significance as it supports a transition between the northern and southern plant and animal assemblages. This north-south link is not evident elsewhere in the Hunter Valley. The Region also forms an east-west migratory pathway and a drought refuge for inland species.

The preservation of large vegetated areas that are linked to other similar areas has been recognised as fundamentally important to achieving long term regional biodiversity outcomes in the Lower Hunter region. The two most valued of these areas in the Lower Hunter contain large land areas owned and controlled by Coal & Allied. Firstly, is the green corridor that links the Watagans and Yengo National Parks with the coastal plains of the Tomago Sandbeds, Stockton Bight and Port Stephens. Secondly, the Wallarah Peninsula lands provide a regionally significant break between urban areas, and contain areas of high biodiversity, scenic amenity and heritage value.

The Coal & Allied lands to be dedicated form both large vegetated areas in their own right, and complete linkage of identified regional corridors in key areas.

In addition to their important strategic location in a wider landscape context, the conservation lands contain valuable biodiversity resources. They contain and will conserve a range of important vegetation communities, including areas of Endangered Ecological Communities (EEC) and other vegetation types that have been depleted in the region. Several threatened plant species have been recorded within the lands, including significant occurrences of *Tetratheca juncea* (Black-eyed Susan). Refer to Table 6-1: Vegetation Removal / Retention.

The diverse nature of both the landform settings, varying from coastal ranges forests and woodlands to coastal heath to wetlands, provides a diverse array of habitats and resources for native fauna. The conservation lands are known to contain important populations of numerous threatened fauna species, including birds, mammals and herpetofauna. The conservation of these lands will provide secure regional biodiversity gene pools, and also through linkages facilitate valuable genetic material exchange and other key processes associated with sustainable ecological population dynamics. Refer to Table 6-2: Habitat Removal / Retention.

In summary, the Coal & Allied conservation dedications provide outcomes that contribute to meeting the Environmental Protection goals outlined in the Sustainability Criteria contained within the Lower Hunter Regional Strategy. Such includes:

- Outcomes consistent with the Lower Hunter Regional Conservation Plan;
- Maintains/improves areas of regionally significant biodiversity;
- Maintains environmental areas for air & water quality; and
- Protects areas of Aboriginal cultural heritage value and historical heritage value.

These outcomes:

- Conserve in perpetuity key strategic parcels of land that complete long sought after regional biodiversity conservation corridors and buffer areas;
- Provide large intact areas of conserved habitat that will function as regional biodiversity gene pools;
- Protect an important array of vegetation communities, flora and fauna species, and natural landscape assets, including threatened species and EEC's;
- Contribute significantly to the successful implementation of the Lower Hunter Regional Conservation Plan; and
- Achieve additional conservation benefits within development estates via appropriate urban design and management practices.

Table 6-1 below depicts the vegetation removal and retention associated with the proposal. Table 6-2. outlines the quality of habitat that will be removed as part of the proposal and Figure 4-5 shows the habitat quality within the Catherine Hill Bay site.

The following headings have been utilised within the Vegetation Removal Tables.

'Vegetation Community' – Name of Vegetation Community which may be impacted upon by the proposal.

'TSC Act' – Provides the status of the species / community / population described with relation to the *TSC Act 1995*.

'EPBC Act' – Provides the status of the species / community / population described with relation to the *EPBC Act 1999*.

'Potential KTP' – Lists the Key Threatening Processes (KTP), which are listed within the *TSC Act 1995*, that have the potential to occur as a consequence of the proposal. Descriptions of potential KTP's and the likelihood of their occurrence within the proposal are presented in Section 5.3. These are as follows:

1. Loss of Hollow-bearing trees;
2. Clearing of native vegetation;
3. Human-caused climate change;
4. Infection of native plants by *Phytophthora cinnamomi*;
5. Invasion of native plant communities by exotic perennial grasses;
6. Removal of dead wood and dead trees;
7. Predation by the Feral Cat;
8. Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
9. Invasion of Native Plant Communities by Bitou and Boneseed;
10. Exotic Vines and Scramblers; and
11. *Lantana camara*.

'Area in Development Estate (Ha / %)' – Displays the area of vegetation that will be removed as part of the development estate.

'Area Conservation Land (Ha / %)' – Displays the area of vegetation that will be conserved for each of the delineated vegetation communities.

'Total Area' – Represents the total area of each vegetation community within the site, thus the sum of the preceding two columns.

'Comments' – Provides a brief discussion on the key characteristic of the vegetation where relevant.

Table 6-1: Vegetation Removal / Retention

Vegetation Community	1. TSC Act 2. EPBC Act 3. Other	Potential KTP	Vegetation Outcome (ha)		
			Area in Development Estate	Area in Conservation Land	Total Area
Coastal Plains Smooth-barked Apple Woodland		*1-7, 9, 11*	*7.46 (6%)*	*124.3 (94%)*	*131.75*
Narrabeen Wallarah Sheltered Grassy Forest		*1-7, 9-11*	*0.53 (1%)*	*175.17 (99%)*	*175.7*
Coastal Plains Scribbly Gum Woodland		*9, 11*	*0*	*36.08 (100%)*	*36.08*
Swamp Oak Rushland Forest	***EEC - SOFF***	***5, 7-9, 11***	***0***	***3.48 (100%)***	***3.48***
Swamp Mahogany – Paperbark Forest	***EEC - SSF***	***1-11***	***1.99 (10%)***	***18.03 (90%)***	***20.02***
Riparian Melaleuca Swamp Woodland	***EEC - SSF***	***5, 7-9, 11***	***0.33 (7%)***	***4.36 (93%)***	***4.69***
Coastal Foothills Spotted Gum - Ironbark Forest		*7, 9, 11*	*0*	*31.68 (100%)*	*31.68*
Freshwater Wetland Complex	***EEC - Freshwater Wetlands***	***9, 11***	***0***	***1.47 (100%)***	***1.47***
Apple – Palm Gully Forest		*1-4, 6, 9, 11*	*0.11 (1%)*	*13.97 (99%)*	*14.08*
Coastal Clay Heath		*1-5, 6, 9, 11*	*0*	*82.44 (100%)*	*82.44*
Themeda Grassland on Seacliffs and Coastal Headlands	***EEC - TGSCH***	***2-4, 7, 9, 11***	***0***	***1.17 (100%)***	***1.17***
Coastal Sand Wallum Heath		*9*	*0*	*8.62 (100%)*	*8.62*
Coastal Sand Wallum Woodland		*9*	*0*	1.82 (100%	1.82
Coastal Sand Scrub		2-7, 9	0	14.28 (100%)	14.28
Beach Spinifex		9	0	1.01 (100%)	1.01
Weeds and Cleared Areas		3-9, 11	15.3948%)	16.35 (52%)	31.74
Dam		5, 9, 11	0	0.3 (100%)	0.3

**NOTE: The 'Area in Development Estate" is based on the current masterplan, and should be viewed as a maximum figure. It is likely that some these figures will be reduced as a result of retention of areas of native vegetation within the final 'development area.*

Table 6-2: Habitat Removal / Retention

Habitat	Area in Development Estate (ha)	Area in Conservation Lands (ha)
1 – High	0.11	25.96
2 – Above Ave	5.79	458.50
3 – Average	4.79	17.09
4 – Below Ave	3.07	17.96
5 – Low	14.75	24.92
TOTALS	**28.51**	**544.43**

Note: The habitat quality has been delineated with reference to but does not follow the delineated vegetation community boundaries.

6.1 Key Thresholds Assessment (Part 3A)

As required by the Draft Guidelines for *Threatened Species Assessment* for Part 3A applications (DEC / DPI 2005), the following assessment of Key Thresholds (four in total) is provided for the proposed development estate at CHB.

This EAR has determined that whilst there will be a direct impact upon some individual threatened species due to the removal of vegetation, habitat retention within larger tracts of conservation offsets would ensure threatened species within the locality would not be significantly impacted .

The proposal is fundamental to achieving the outcomes of the Lower Hunter Regional Strategy and Lower Hunter Regional Conservation Plan. These guiding policies have been developed in consultation with local and state government agencies along with the wider community. As such planning has taken into account the environmental, economic and social parameters operating in the Lower Hunter. Therefore on a landscape scale these strategies coupled with this proposal deliver a sound and strategic environment conservation outcome for the region.

Best practice urban design has been incorporated into the concept plan in order to acknowledge, where possible, the corridor requirements of local and state government agencies and the wider community. The result, a matrix of linear riparian corridors, green buffers, patches of retained vegetation and public open space is provided by the proposed concept plan. Furthermore a hierarchy of roads has been proposed with appropriate treatment of adjacent parks and riparian corridors. Refer to the landscape documentation for more information.

1. Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

It is considered that the information presented within this document, and in particular the proposal that includes the proposed land dedication to NPWS for the site as detailed concept plan and this EAR, is likely to result in a maintained if not an improved outcome for biodiversity values within the region.

2. Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.

The threatened species, populations and ecological communities considered within the report occurring within the proposed development estate are well represented in the proposed dedication lands and wider locality, and are also represented or have potential habitat within other conservation offset lands and considered unlikely to reduce the long-term viability of a local population of species or endangered ecological community.

3. Whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.

The threatened species, populations and ecological communities considered within the report occurring within the proposed development estate are well represented in the proposed dedication lands and wider locality, and are also represented or have potential habitat within other conservation offset lands and considered unlikely to be placed at risk of extinction.

4. Whether or not the proposal will adversely affect critical habitat.

There is no declared "Critical Habitat" within the CHB site locality, and as such the proposal will not adversely affect any such habitat.

6.2 Offsetting Principles (Lower Hunter Regional Conservation Plan: Appendix 1)

In order to comply with the broader biodiversity objectives of the DGEARs, an assessment against the Offsetting Principles outlined within Appendix 1 of the Lower Hunter Regional Conservation Plan has been undertaken herewith.

1. Impacts must be avoided first by using prevention and mitigation measures. Offsets are then used to address remaining impacts.

The Development Estates have been selected within areas of previous disturbance and/or areas that represent an extension of the existing urban framework. The scope of the estates were also subject to extensive discussions with NSW Government, consultations with the community, Federal and NSW Government environmental agencies, independent hearings under the EP&A Act, urban design charrettes and public exhibition and refinement of proposals. As a consequence, mitigation of the impacts of the proposed development at

Catherine Hill Bay (Middle Camp) was undertaken through a reduction of the proposed development area via the removal of two development precincts following the aforementioned stakeholder consultation process, coupled with the commitment to mitigate unavoidable edge effects through best practice sensitive urban design. Furthermore, within the Development Estate sensitive environmental features (such as watercourses) have been identified and wherever possible retained. The net result being an increase in the proposed transfers of Coal & Allied conservation areas (conservation offsets) at Middle Camp to extend the overall area of the proposed, 'Conservation Reserve – South Wallarah Peninsula' sought under the Lower Hunter Regional Conservation Plan (LHRCP). While the independent hearing offered Coal & Allied the opportunity to extend the proposed development area at Middle Camp to maintain its proposed development yield that had been reduced though a proposal to establish a heritage conservation area, Coal & Allied declined that invitation and in so doing, avoided potential direct and indirect ecological impacts resulting from development.

All of the proposed development and conservation offsets are in accordance with the provisions of the Lower Hunter Regional Strategy (LHRS) and supporting LHRCP, noting here that the LHRCP cites the LHRS as a 'partner document', emphasising that the two

should be considered together and that is precisely what the Coal & Allied proposals do. The proposals improve biodiversity protection through transfer of proposed conservation lands from private to NSW Government ownership. Such lands have been identified within these planning and conservation documents and are fundamental to the success and achievement of the objectives and benchmarks therein therein as detailed within Appendix 2 of the LHRS and succinctly captured within the LHRCP executive summary.

2. All regulatory requirements must be met.

The proposal has considered the regulatory and statutory frameworks associated with the NSW Part 3A assessment process and beyond. The Environmental Assessment Report identifies and assesses the impacts associated with the ecological constraints and opportunities of the proposal. Other accompanying Environmental Assessment Reports identify and assess the impacts on Cultural Heritage, European Heritage, Contamination, Water Sensitive Urban Design and other relevant environmental impacts. All recommend actions to be taken to mitigate or compensate for such impacts have been duly considered within the concept master planning process and represent additional project benefits that are separate from the offset proposal.

Notably Coal & Allied's proposal has been approved by the Federal Minister for the Environment under the Environment Protection and Biodiversity Conservation Act. Importantly the proposal assessed herewith is consistent with that provided to the Minister for his consideration and determination. Refer to Appendix 7.

3. Offsets must never reward ongoing poor performance.

The proposed Development Estate lands are part of lands owned by Coal and Allied that are not required for their current or future mining operations. In part these lands have been utilised previously for mining and related activities and as such clearing has occurred.

The lands have not been the subject of unnecessary clearing and where mining activity has been undertaken on parts of the site it has largely been underground and as a consequence the overlying high biodiversity surface and vegetative cover has been preserved. The lands have been (and continue to be) managed by Coal and Allied such that they do not become an environmental burden and/or degrade adjacent lands.

The proposed development seeks to use industry best practice urban design and will be tested through the Part 3A assessment process.

As such the offsets will not be rewarding poor land management practices or poorly designed development proposals as they are of high biodiversity value as identified through the ecological assessment process and the environmental audit.

4. Offsets will complement other government programs.

The proposed offsets represent a significant conservation opportunity that will secure environmental assets, in perpetuity, that have been highly sought after under the NSW Government Lower Hunter Regional Strategy (LHRS) and specifically identified as highly valued assets in the LHRCP and DECCW 25 year Biodiversity Investment Layer.

In summary, the Coal & Allied conservation dedications provide outcomes that contribute to meeting the Environmental conservation goals outlined in the Sustainability Criteria contained within the LHRS. Such includes:

- Outcomes consistent with the Lower Hunter Regional Conservation Plan;
- Maintains/improves areas of regionally significant biodiversity;
- Maintains environmental areas for natural air & water quality; and
- Protects areas of Cultural heritage value and European heritage value.

These outcomes:

- Conserve in perpetuity key strategic parcels of land that complete long sought after regional biodiversity conservation corridors and buffer areas;
- Conserve in perpetuity significant areas of vegetation communities for which reservation targets have not been met in the Lower Hunter region;
- Provide large intact areas of conserved habitat that will function as regional biodiversity gene pools;
- Protect an important array of vegetation communities, flora and fauna species, and natural landscape assets, including threatened species and EEC's;
- Contribute significantly to the successful implementation of the Lower Hunter Regional Conservation Plan; and
- Achieve additional conservation benefits within development estates via appropriate urban design and management practices.

5. Offsets must be underpinned by sound ecological principles.

The Environmental Assessment as informed by this EAR has been underpinned by the DEC 2005 Draft Biodiversity Assessment Guidelines coupled with implementation of the precautionary principle of 'assumed presence' to ensure a holistic ecological assessment. Key principles in relation to the offset lands that have been considered include (but are not limited to):

- Issues of connectivity and fragmentation
- Landscape structure, species diversity, floristic composition, habitat type and availability
- Presence or absence of threatened species, population and ecological communities

known from the region

- Biodiversity enhancement coupled with long term viability
- Ecosystem structure and function as it relates to patch size and influences of disturbance, fragmentation, isolation and issues surrounding potential island biogeography.
- Benchmarks of 'like for like' and 'maintain or improve'
- Site and situation of offsets, within the available surplus lands, in order to maximise environmental conservation gains at a landscape scale through to individual species level.

The resultant offset proposal as documented by this ecological assessment being that, based on development estate approval, the offsets will secure a public asset which provides significant conservation benefits overall and positive outcomes for each of the abovementioned key principles.

6. Offsets should aim to result in a net improvement in biodiversity over time.

The Lower Hunter Region's vegetation is of bio-geographic significance as it supports a transition between the northern and southern plant and animal assemblages. This north-south link is not evident elsewhere in the Hunter Valley. The Region also forms an east-west migratory pathway and a drought refuge for inland species.

The preservation of large vegetated areas that are linked to other similar areas has been recognised as fundamentally important to achieving long term regional biodiversity outcomes in the Lower Hunter region. The Conservation Estates scheduled to be dedicated to the NSW Government by Coal and Allied under this proposal across the Wallarah Peninsula, provide a regionally significant break between urban areas, and contain areas of high biodiversity, scenic amenity and heritage value.

In addition to their important strategic location in a wider landscape context, the conservation lands contain valuable biodiversity resources. They contain and will conserve a range of important vegetation communities, including areas of Endangered Ecological Communities (EEC) and other vegetation types that have been depleted in the region. Several threatened plant species have been recorded within the lands, including significant occurrences of *Tetratheca juncea* (Black-eyed Susan) and *Angophora inopina* (Charmhaven Apple). Refer to Table 6-1. Given patch size of each individual Conservation Estate, issues generally associated with smaller conservation patches such as edge effects, fragmentation, corridor viability, maintenance of biodiversity etc are not considered to be major deleterious factors to be associated with this proposal. Furthermore the offsets will be managed under a Statement of Interim Management Intent (SIMI) and the NSW NPWS thereafter.

The diverse nature of both the landform settings, varying from coastal ranges forests and woodlands to coastal heath to wetlands, provides a diverse array of habitats and resources for native fauna. The conservation lands are known to contain important populations of numerous threatened fauna species, including birds, mammals and

herpetofauna. The conservation of these lands will provide secure regional biodiversity gene pools, and also through linkages facilitate valuable genetic material exchange and other key processes associated with sustainable ecological population dynamics.

7. Offsets must be enduring – they must offset the impact of the development for at least the period that the impact occurs.

The offset lands (Conservation Estates) will be dedicated to the NSW Government under the terms of a Voluntary Planning Agreement (VPA) that is legally enforceable and managed thereafter under NPWS Estate in perpetuity.

8. Offsets should be agreed prior to the impact occurring.

The nature and extent of the proposed offset has been subject to rigorous debate and assessment with the NSW Government, Community, Stakeholder Groups, Federal and NSW Government environmental agencies, independent hearings under the EP&A Act, urban design charrettes and public exhibition.

The offsets encompassed by the proposal will be formally agreed upon through the Part 3A process and form part of the overall approval. Thereafter the offsets will be dedicated to the NSW Government to become a public conservation asset under NPWS Estate. The offset land dedication will occur following registration of the Subdivision Plan which will occur three months after the SSS listing and Concept Plan approval.

9. Offsets must be quantifiable – the impacts and benefits must be reliably estimated.

- The ecological assessment has quantified the nature and extent of vegetation communities and floristic structures over the conservation estates notwithstanding the presence and/or potential presence of threatened species, populations and endangered ecological communities that will become a public conservation asset if the current proposal is approved.
- The offsets make a significant contribution to the achievement of conservation objectives sought under the LHRS and LHRCP.
- At Middle Camp 527 ha of high biodiversity offset lands (Conservation Estates) will be dedicated to the NSW Government through a voluntary planning agreement that is legally enforceable and managed thereafter under NPWS Estate in perpetuity. Development lands will be confined to 28 ha.
- The common edges of the development /conservation estates will be managed under a SIMI following land dedication for a period of up to 5 years prior to management hand over to the NSW NPWS who will have carriage of the lands thereafter.
- The conservation estates have been subject to an environmental audit that will along with the SIMI guide rehabilitation efforts over the offset.

10. Offsets must be targeted – they must offset impacts on a like-for-like or better basis.

The proposed conservation offsets:

- provide a like for like environmental outcome at a minimum (refer to Table 6-1 and Table 6-2);
- are situated within areas and contain vegetation communities that are identified by the LHRCP as extant having a reservation target that is not met;
- provide the single largest contribution to the South Wallarah Peninsula Conservation Reserve sought by the LHRS and LHRCP;
- contain and will conserve a range of important vegetation communities, including areas of EECs and other vegetation types that have been depleted in the region;
- contain known threatened flora and fauna species of significance at the state and national level;
- provide a diverse array of habitats and resources for native fauna including coastal range forests, woodlands, heathlands and wetlands; and
- will provide secure regional biodiversity gene pools, and through linkages facilitate valuable genetic material exchange and other key processes associated with sustainable ecological population dynamics.

11. Offsets must be located appropriately – they must offset the impact in the same region.

The proposed offsets are:

- located within adjacent areas to the Development Estates;
- within the same IBRA Bio-region and sub-region as the Development Estate occurs;
- large patches of vegetated land contiguous with large vegetated areas extant from the locality;
- representative of the impact areas, hence providing a valuable biodiversity resource. They contain and will conserve a range of important vegetation communities, including areas of Endangered Ecological Communities (EEC) and other vegetation types that have been depleted in the region; and
- not subject to edge effects, fragmentation, issues of corridor viability, maintenance of biodiversity realted to disturbance due to their individual patch size.

12. Offsets must be supplementary – they must be beyond existing requirements and not already be funded under another scheme.

The offsets represented by the Conservation Estates are currently private freehold lands that are not part of any existing NSW Government or other scheme. As stated in point 4 above the lands have been identified under several NSW Government conservation initiatives only.

13. Offsets and their actions must be enforceable – through development consent conditions, licence conditions, conservation agreements or a contract.

The offset lands (Conservation Estates) will be dedicated to the NSW Government through a voluntary planning agreement that is legally enforceable and managed thereafter under NPWS Estate in perpetuity.

The dedication will be supported by a SIMI (Statement of Interim Management Intent) that will focus on the mitigation and rehabilitation of existing edge effects and internal fragmentation for a period the lesser of 5 years form commencement of works or until all lots are sold relative to each development area precinct.

7 Recommendations

The following recommendations have been outlined to ensure that the ecological impact of the proposed development estate is minimised as far as possible.

- Foremost, the management of the development and conservation land interface is critical to ensure that no direct or indirect impacts occur in the short and long term on dedicated conservation lands. As such, appropriate management plans should be prepared and implemented within the development framework in consultation with the NSW NPWS.
- The minimum amount of clearing should take place as a general objective of the project, particularly within those areas that currently contain identified native vegetation communities. These areas have been described within this report. This is especially important within or near those areas identified as containing vegetation consistent with EEC's.
- It is recommended that a Tetratheca juncea management plan be prepared to ensure the conservation and long term survival of this threatened species within both the retained areas of the development estate and the conservation lands.
- Mature and / or hollow-bearing trees should be retained wherever feasible within the development framework.
- Pre-clearing inspections should be undertaken by an ecologist in wooded areas where threatened fauna species have been recorded or are considered likely to occur. This is particularly important in areas where threatened fauna have been noted during recent surveys either breeding or nest-building. No breeding attempts should be disrupted during the course of the project, particularly by threatened fauna.
- During the construction phase, for any tree removal within forested areas, and in particular where hollow-bearing trees may be removed, all works should be supervised by an ecologist to recover any native fauna that are potentially displaced. Furthermore, where such risks occur, site-specific ecological advice should be sought to minimise impacts during the entire process. A clearing protocol should be adopted for the removal of trees containing suitable habitat hollows as follows (this is considered as a guideline, variations on the methods employed may be required to accommodate site specific factors):
  - » All hollow bearing trees are to be flagged by an ecologist prior to the commencement of works on site.
  - » Underscrubbing of the entire site should be carried out by a 4x4 tractor with a slashing deck, this will minimise the establishment of degradation processes and leave a layer of mulch to aid in soil retention in the event of adverse weather. At this time felling of non habitat trees can take place, however a matrix of trees must be maintained to allow animal movement into the designated refuge area.
  - » After a period of two weeks, clearing of habitat trees should commence. Clearing must be carried out moving from the fringe of the matrix towards the refuge area. Trees should be 'soft felled' and inspected immediately by an ecologist for displaced fauna. All trees must be left for a minimum of two nights prior to being

moved to a stockpile, to allow resident fauna to vacate tree hollows.

Note: Clearing should ideally take place outside of the dominant breeding seasons of resident fauna, preferably during late Autumn and Winter.

- Species selection for future landscaping works and seed stock for revegetation should be limited to locally occurring native species to maintain local genetic diversity. This should include *Eucalyptus robusta* and other regionally significant species.
- Appropriate vegetation, habitat and bushfire management plans should be included under an overarching Environmental Management Plan.
- Where possible, earthworks (and certainly all works in the vicinity of drainage lines) should be undertaken during appropriate (i.e. dry) weather conditions. This will ensure that any potential erosion events will be intercepted and that downstream impacts are minimised within any of the drainage lines. This will help to maintain existing habitat characteristics for native fauna in those areas, including those for threatened species.
- Nutrient and sediment control devices should be erected pre-clearing and post-construction works in sensitive areas where degradation processes may be triggered such as areas adjacent to watercourses until suitable rehabilitation has occurred to maintain surface integrity. Furthermore, stockpiles should be subject to individual sediment and nutrient control devices.

8 Conclusion

The detailed studies undertaken herewith have confirmed that development of a small portion of the site as a whole will provide a mechanism for adequate ecological outcomes within the proposed conservation lands for the vast majority of species and communities contained therein. The quantum of the offset lands, when viewed holistically with proximate existing and proposed conservation reserve areas, provides a robust long-term outcome for all species and communities. Furthermore, suitable actions are proposed to minimise potentially deleterious permanent and ongoing impacts to the conservation lands.

The field and desktop studies have recorded the following parameters of ecological significance within both the conservation lands and the development estate:

- native vegetation commensurate with those listed as EEC's;
- threatened flora species recorded within and adjacent to the proposed development;
- threatened fauna species recorded within and adjacent to the proposed development;
- habitat for threatened flora and fauna species known from within and adjacent to the proposed development; and
- other areas containing native vegetation with varying degrees of modification / degradation.

With these potential ecological issues noted, a series of recommendations have been outlined previously in this report, to aid in the reduction of potential impacts associated with the proposal.

Given that the measures have been taken to avoid ecological impacts and that where native vegetation may be affected, efforts have been made to avoid particularly sensitive areas where practical, it is considered unlikely that any significant impacts would occur upon threatened species, communities or populations. The large areas of conservation lands that have been set aside as part of the development provide excellent ecological outcomes across the site. As a result of conservation of these offset lands coupled with other large land parcel dedications in the locality, a large vegetation corridor will be created across the Wallarah Peninsula. These conservation lands will link three state conservation areas of Lake Munmorah State Conservation Area, Lake Macquarie State Conservation Area and Wallarah National Park. This large tract of native vegetation will provide habitat for a wide variety of native flora and fauna.

Therefore, it has been concluded that the proposed development should not significantly impact upon threatened or regionally significant flora and fauna, ecological communities or populations. The implementation of operative environmental management practices should also ensure that the ecological impact of the project is minimised.

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Appendix 1

DGEAR's

Director-General's Requirements

Section 75F of the Environmental Planning and Assessment Act 1979

Project	**Concept Plan (MP10_0089):** for a residential subdivision of the Middle Camp site for up to 222 dwellings across approximately 28 hectares and the dedication of approximately 527 hectares for conservation.
Site	**Middle Camp** Lot 202 DP 702669, Lot 2030 DP 841175, Lot 6 DP 746077, Lot 5 DP 736170, Lot 12 DP 854197, Lot 223 DP 1102989, Lot 16 DP 755266 and Lots 9 and 10 Section D DP 163.
Proponent	Coal & Allied Industries Pty Ltd
Date of Issue	19 August 2010
Date of Expiration	(2 years from date of issue)
General Requirements	The Environmental Assessment (EA) must include: (1) An executive summary. (2) A detailed description of the project including the: (a) strategic justification for the project; (b) alternatives considered; and (c) various components and stages of the project in detail (and should include infrastructure staging). (3) A consideration of the following with any variations to be justified: (a) all relevant State Environmental Planning Policies (with particular regard to *SEPP Major Development 2005, SEPP 44, SEPP 55, SEPP 71, SEPP (Infrastructure) 2007,* and *SEPP (Mining, Petroleum Production and Extractive Industries) 2007*; (b) applicable planning instruments; and (c) relevant legislation and policies, including the *NSW Coastal Policy 1997, Lower Hunter Regional Strategy*, and *Lower Hunter Regional Conservation Plan.* (4) A consideration of the proposal and cumulative impacts in relation to the development of other future urban land identified in the *Lower Hunter Regional Strategy.* (5) A draft Statement of Commitments, outlining specific commitments to the project's management, mitigation and monitoring measures with a clear identification of the timing and responsibility for these measures. (6) A conclusion justifying the project, taking into consideration the environmental impacts of the proposal, mitigation measures to address these impacts, the cumulative impacts of the proposal, the suitability of the site, and whether or not the project is in the public interest. (7) An outline of development contributions applicable to the site between (i) the Proponent and Lake Macquarie Council; (ii) the Proponent and State Government agencies for State infrastructure in accordance with *Planning Circular PS 07-018*; and (iii) if relevant, any public benefits to be provided with the development. (8) A signed statement from the author of the EA certifying that the information contained in the report is neither false nor misleading. (9) A report from a quantity surveyor identifying the correct capital investment value for the concept plan and the four project applications.
Key Assessment Requirements	**Urban design and built form** (1) Provide an assessment against the *Coastal Design Guidelines for NSW* and *NSW Coastal Policy* (1997). (2) Propose development controls and design guidelines for the site which ensure that the future development responds to the site location appropriately.

(3) Provide details of the proposed treatment of all public domain areas.
(4) Identify opportunities to link the proposed development to the existing urban areas, including through appropriate pedestrian and cycleway connections.
(5) Address the principles of Crime Prevention Through Environmental Design.

Coastal Foreshore and Public Access

(1) Outline measures to protect and enhance existing public access through the site to and along the foreshore and provide, where appropriate, new opportunities for public access that is compatible with the natural attributes of the coastal foreshore.

Biodiversity impact

(1) Identify the potential impact of the development on threatened species and their habitats having regard to the *draft Threatened Species Assessment Guidelines* (DEC July 2005), and outline measures proposed to avoid or mitigate impacts on threatened species and their habitat.
(2) Demonstrate that biodiversity impacts can be appropriately offset in accordance with the NSW Government's policy for 'improvement or maintenance' of biodiversity values.
(3) Address the impact of the development on wetlands identified under State Environmental Planning Policy No. 14 – Coastal Wetlands.
(4) Consider and identify measures to manage interface impacts on land proposed to be dedicated for conservation.
(5) Provide an assessment of the cumulative impacts on biodiversity of the proposed development, and other development proposed in the area.
(6) Demonstrate consistency with the approval granted by the Commonwealth Department of Environment, Water, Arts and Heritage under the *Environmental Protection and Biodiversity Conservation Act 1999.*

Transport and Accessibility

(1) Prepare a Traffic Study in accordance with RTA's *Guide Traffic Generating Developments* that includes (but is not limited to) the following:
    (a) an identification of all relevant vehicular traffic routes and intersection for access to/from the area;
    (b) current traffic counts for all of the above traffic routes and intersections;
    (c) the anticipated vehicular traffic generated from the proposed development and associated trip distribution on the road network;
    (d) consideration of the traffic impact on the existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated;
    (e) an analysis of the cumulative traffic and transport impacts of the development taking into consideration other proposed developments;
    (f) details of necessary road network infrastructure upgrades required to maintain existing levels of service both on the local and classified road network;
    (g) an intersection analysis, using SIDRA or similar traffic model, as well as a micro simulation model to determine the need for intersection and mid block capacity upgrades and to ensure traffic signal co-ordination;
    (h) proposed pedestrian and cycleway access within and to the site that connects to all relevant transport services, nearby settlements, and other key off-site locations having regard to the *NSW Planning Guidelines for Walking and Cycling* (2004), and the

	NSW Bike Plan (2010); (i) timing of delivery of proposed transport infrastructure including road and intersection upgrades, pedestrian and cycle paths, and public transport infrastructure; and (j) consideration of impacts on existing property access. (2) Assess the proposal against the objectives of the Integrating Land Use and Transport policy package. **Noise impacts** (1) Assess noise impacts in accordance with the *Environmental Criteria for Road Traffic Noise* (EPA, 1999), and outline any proposed measures to mitigate or manage impacts. **Mining Activities** (1) Identify the requirements of previous consents, approvals, lease arrangements, and current legal and financial responsibilities in relation to the mine operation and closure and the impact approvals will have on these arrangements. (2) Provide a risk analysis examining the risk factors associated with the former mining use of the site and what effects it may have on future development, including mine subsidence. (3) Identify measures that would be implemented to avoid, minimise or remediate potential subsidence issues encountered on the site. (4) Investigate the impacts of future mining activities. **Heritage** (1) Provide an archaeological assessment and heritage impact statement in accordance with NSW Heritage Office guidelines. The statement should assess the impacts of the application on the area and any significant components of the site, including indigenous heritage. (2) Provide an assessment in accordance with the d*raft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005). **Water quality** (1) Provide appropriate detailed information on the drainage and stormwater management measures to be incorporated on site including: on site stormwater detention; water sensitive urban design measures; and drainage infrastructure. (2) Identify future management arrangements for proposed stormwater infrastructure, including where relevant, in consultation with Council. (3) Assess the impact of the proposal on the hydrology of the site and surrounding area including impacts on surface water, groundwater, the sea or any nearby beach, or an estuary, a coastal lake, a coastal creek or other similar body of water, or a rock platform. **Flooding** (1) Develop suitable flood planning levels for the proposed development and identify flood evacuation requirements for land up to the Probable Maximum Flood level. Demonstrate consistency with the *NSW Floodplain Development Manual: the management of flood liable land (2005)*, the *DECCW Floodplain Risk Management Guideline – Practical Consideration of Climate Change*, the *NSW Sea Level Rise Policy Statement (DECCW 2009),* and *Draft NSW Coastal Planning Guideline: Adapting to Sea Level Rise* (Department of Planning 2009). **Visual** (1) Assess and provide mitigation measures in response to potential visual impacts of the project in the context of adjoining development, impact on any heritage items (on-site or in the vicinity) and the development as viewed from publicly accessible areas and the natural environment.

	Bushfire (1) Identify how the proposed concept plan addresses the requirements of *Planning for Bush Fire Protection* and *Australian Standard 3959 (Building in Bush Fire Prone Areas)*. (2) Outline ongoing management arrangements of any proposed APZs, including through negotiation with relevant agencies where APZs are proposed to be located on land to be dedicated for a public purpose. **Infrastructure and utilities** (1) Identify and address the impacts of additional demand created by the development on existing infrastructure including public transport, open space, and recreation facilities, retail facilities and other social and community facilities. Identify the need for additional facilities through negotiation with State or local government agencies. This should inform the scope of proposed State and local infrastructure contributions. (2) Prepare a utility and infrastructure servicing report and plan for the Site that includes (but is not limited to): (a) Identification and assessment of the capacity of existing utility and infrastructure servicing the site; and (b) Identification and assessment of all necessary augmentation works to service the site and whether these works can sustain this and other development foreshadowed for the Wallarah Peninsula shown in the *Lower Hunter Regional Strategy*. **Ecologically Sustainable Development** (1) Demonstrate how the development will commit to ESD principles in design, construction and ongoing operation phases. (2) Demonstrate that the development is capable of achieving the requirements of BASIX. **Site preparation works** (1) Identify the likely extent of site preparation works with respect to cut and fill activities to cater for the proposed residential development. In particular, assess how the proposed built form will respond to final levels of the site and demonstrate consideration to minimise the extent of cut and fill required. **Subdivision** (1) Provide a subdivision plan to identify all covenants, easements and notations proposed for each title, for the proposed subdivision to facilitate transfer of lands to Government agencies. **Future public land** (1) Identify any proposed open space or conservation land, and arrangements for ownership and control, management and maintenance, funding, public access, revegetation and rehabilitation works and bushfire management.
Consultation Requirements	An appropriate and justified level of consultation should be undertaken. Where consultation has already been undertaken this should be documented in the EA. Consultation must be undertaken with the following relevant agencies: *a) Agencies and other authorities:* • Lake Macquarie Council • Wyong Shire Council • Hunter Water • Catchment Management Authority - Hunter – Central Rivers • NSW Department of Industry and Investment • NSW Department of Environment, Climate Change and Water • NSW Office of Water

	• Transport NSW • Roads and Traffic Authority • NSW Emergency Service agencies, namely NSW Police Department, the Ambulance Service of NSW, the State Emergency Service, NSW Rural Fire Service, and NSW Fire Brigades • All utility providers • Relevant Local Aboriginal Land Councils The consultation process and the issues raised should be described in the Environmental Assessment.
Deemed refusal period	60 days

Appendix 2

Flora Species List

	Community Represented
1	Coastal Plains Smooth-barked Apple Woodland
2	Narabeen Wallarah Sheltered Grassy Woodland
3	Coastal Plains Scribbly Gum Woodland
4	**Swamp Oak Rushland Forest (EEC)**
5	**Swamp Mahogany – Paperbark Forest (EEC)**
6	**Riparian Melaleuca Swamp Woodland (EEC)**
7	Coastal Foothills Spotted Gum – Ironbark Forest
8	**Freshwater Wetland Complex (EEC)**
9	Apple-Palm Gully Forest
10	Coastal Clay Heath
11	**Themeda Grassland on Seacliffs and Coastal Headlands (EEC)**
12	Coastal Sand Wallum Heath
13	Coastal Sand Wallum Woodland
14	Coastal Sand Scrub
15	Beach Spinifex
16	Weeds and Cleared Areas
17	Dam

Scientific Name	Common Name	Vegetation Community Number																	*Scientific Name*
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
CLASS FILICOPSIDA (FERNS)																			CLASS FILICOPSIDA (FERNS)
ADIANTACEAE																			ADIANTACEAE
Adiantum aethiopicum	Common Maidenhair Fern		X			X	X	X	X	X								X	*Adiantum aethiopicum*
Adiantum formosum	Giant Maidenhair Fern	X				X	X			X									*Adiantum formosum*
AZOLLACEAE																			AZOLLACEAE
Azolla pinnata	Ferny Azolla								X										*Azolla pinnata*
BLECHNACEAE																			BLECHNACEAE
Blechnum cartilagineum	Gristle Fern	X						X											*Blechnum cartilagineum*
Blechnum indicum	Swamp Water Fern		X			X		X	X	X									*Blechnum indicum*
Blechnum nudum	-					X	X		X										*Blechnum nudum*
Doodia aspera	Rasp Fern		X				X	X		X									*Doodia aspera*
CYATHEACEAE																			CYATHEACEAE
Cyathea cooperi	Straw Treefern	X							X										*Cyathea cooperi*
DAVALLIACEAE																			DAVALLIACEAE
**Nephrolepis cordifolia*	Fishbone Fern																X		**Nephrolepis cordifolia*
DENNSTAEDTIACEAE																			DENNSTAEDTIACEAE
Hypolepis muelleri	Harsh Ground fern									X									*Hypolepis muelleri*
Pteridium esculentum	Bracken Fern	X	X			X	X	X		X	X		X	X			X	X	*Pteridium esculentum*

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
DICKSONIACEAE																			DICKSONIACEAE
Calochlaena dubia	False Bracken Fern	X						X	X	X									*Calochlaena dubia*
GLEICHENIACEAE																			GLEICHENIACEAE
Gleichenia dicarpa	Pouched Coral Fern					X			X										*Gleichenia dicarpa*
LINDSAEACEAE																			LINDSAEACEAE
Lindsaea linearis	Screw Fern	X		X							X			X					*Lindsaea linearis*
Lindsaea microphylla	Lacy Wedge-fern			X															*Lindsaea microphylla*
POLYPODIACEAE																			POLYPODIACEAE
Platycerium bifurcatum ssp. *bifurcatum*	Elk Horn							X											*Platycerium bifurcatum* ssp. *bifurcatum*
Pyrrosia rupestris	Rock Felt-fern		X																*Pyrrosia rupestris*
SCHIZACEAE																			SCHIZACEAE
Schizaea bifida	Forked Comb Fern	X																	*Schizaea dichotoma*
SINOPTERIDACEAE																			SINOPTERIDACEAE
Chelianthes distans																			*Chelianthes distans*
Cheilanthes sieberi ssp. *sieberi*	Mulga Fern		X														X		*Cheilanthes sieberi* ssp. *sieberi*
Pellaea falcata	Sickle Fern		X																*Pellaea falcata*
CLASS CYCADOPSIDA (CYCADS)																			CLASS CYCADOPSIDA (CYCADS)
ZAMIACEAE																			ZAMIACEAE
Macrozamia communis	Burrawang	X	X	X		X		X		X			X	X					*Macrozamia communis*
Macrozamia spiralis								X											*Macrozamia spiralis*
CLASS CONIFEROPSIDA (CONIFERS)																			CLASS CONIFEROPSIDA (CONIFERS)
CUPRESSACEAE																			CUPRESSACEAE
**Cupressus* sp.	Cypress																X		**Cupressus* sp.
PINACEAE																			PINACEAE
**Pinus radiata*	Radiata Pine																X		**Pinus radiata*
CLASS MAGNOLIOPSIDA (FLOWERING PLANTS)																			CLASS MAGNOLIOPSIDA (FLOWERING PLANTS)
SUBCLASS MAGNOLIIDAE (Dicotyledons)																			SUBCLASS MAGNOLIIDAE (Dicotyledons)
ACANTHACEAE																			ACANTHACEAE
Brunoniella australis	Blue Trumpet	X						X											*Brunoniella australis*
Pseuderanthemum variabile	Pastel Flower		X					X		X									*Pseuderanthemum variabile*
AIZOACEAE																			AIZOACEAE
Carpobrotus glaucescens	Pig Face														X	X			*Carpobrotus glaucescens*
AMARANTHACEAE																			AMARANTHACEAE
Alternanthera denticulata	Lesser Joyweed								X										*Alternanthera denticulata*
APIACEAE																			APIACEAE
Actinotus helianthi	Flannel Flower										X								*Actinotus helianthi*

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Actinotus minor				X															*Actinotus minor*
Centella asiatica	Swamp Pennywort		X		X	X	X	X	X										*Centella asiatica*
**Ciclospermum leptophyllum*	Slender Celery																X		**Ciclospermum leptophyllum*
**Hydrocotyle bonariensis*	Kurnell Curse					X			X						X	X		X	**Hydrocotyle bonariensis*
Hydrocotyle geraniifolia	Forest Pennywort									X									*Hydrocotyle geraniifolia*
Hydrocotyle peduncularis			X			X	X		X	X		X							*Hydrocotyle peduncularis*
Platysace linearifolia	Carrot Tops													X					*Platysace linearifolia*
Trachymene incisa									X	X									*Trachymene incisa*
Xanthosia pilosa	Wooly Xanthosia		X										X	X					*Xanthosia pilosa*
APOCYNACEAE																			APOCYNACEAE
Parsonsia straminea var. *straminea*	Monkey Rope		X			X	X	X		X									*Parsonsia straminea* var. *straminea*
ARALIACEAE																			ARALIACEAE
**Hedera helix*	English Ivy					X													**Hedera helix*
Polyscias sambucifolia	Elderberry Panax	X	X			X		X											*Polyscias sambucifolia*
ASCLEPIADACEAE																			ASCLEPIADACEAE
Marsdenia rostrata	Common Milk Vine					X				X									*Marsdenia rostrata*
Marsdenia suaveolens	Sweet-scented Doubah	X				X	X												*Marsdenia suaveolens*
ASTERACEAE																			ASTERACEAE
**Ageratina adenophora*	Crofton Weed					X		X									X		**Ageratina adenophora*
**Aster subulatus*	Wild Aster												X						**Aster subulatus*
**Bidens pilosa*	Cobbler's Pegs														X		X	X	**Bidens pilosa*
Cassinia uncata	Bent Cassinia												X						*Cassinia uncata*
**Chrysanthemoides monilifera* ssp. *Rotundata*	Bitou Bush	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	**Chrysanthemoides monilifera* ssp. *rotundata*
**Cirsium vulgare*	Spear Thistle														X		X		**Cirsium vulgare*
**Conyza bonariensis*	Flaxleaf Fleabane																X		**Conyza bonariensis*
**Gnaphalium sphaericatum*	Cudweed																X		**Gnaphalium sphaericatum*
**Hypochoeris glabra*	Smooth Cat's Ear																X		**Hypochoeris glabra*
**Hypochoeris radicata*	Cat's Ear			X		X		X			X				X		X	X	**Hypochoeris radicata*
Lagenifera stipitata			X	X				X											*Lagenifera stipitata*
**Onopordum acanthium*	Scotch Thistle																X		**Onopordum acanthium*
Ozothamnus diosmifolium	Everlasting													X					*Ozothamnus diosmifolium*
Ozothamnus ferrugineus	Tree Everlasting												X						*Ozothamnus ferrugineus*
**Senecio madagascariensis*	Fireweed	X	X					X							X		X	X	**Senecio madagascariensis*
Sigesbeckia orientalis	Indian-weed										X								*Sigesbeckia orientalis*
**Sonchus oleraceus*	Common Sowthistle																X		**Sonchus oleraceus*
**Soliva sessilis*	Bindi																X		**Soliva sessilis*
**Taraxacum officinale*	Dandelion																X		**Taraxacum officinale*
Vernonia cinerea		X						X											*Vernonia cinerea*
BIGNONIACEAE																			BIGNONIACEAE
Pandorea pandorana	Wonga Wonga Vine	X	X			X	X	X			X								*Pandorea pandorana*
BRASSICACEAE																			BRASSICACEAE
**Cakile edentula*	American Sea Rocket														X	X			**Cakile edentula*
CAESALPINIOIDEAE																			CAESALPINIOIDEAE
**Senna pendula* var. *glabrata*	Winter Senna	X				X					X						X	X	**Senna pendula* var. *glabrata*

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CARYOPHYLLACEAE																			CARYOPHYLLACEAE
**Cerastium holosteoides*	Mouse-ear Chickweed																X		**Cerastium holosteoides*
CASUARINACEAE																			CASUARINACEAE
Allocasuarina distyla											X	X							*Allocasuarina distyla*
Allocasuarina littoralis	Black She-oak	X	X				X	X		X	X								*Allocasuarina littoralis*
Allocasuarina torulosa	Forest Oak		X							X									*Allocasuarina torulosa*
Casuarina glauca	Swamp She-oak				X										X				*Casuarina glauca*
CELASTRACEAE																			CELASTRACEAE
Cassine australis var. australis	Red Olive Plum							X		X									*Cassine australis var. australis*
Maytenus silvestris			X					X											*Maytenus silvestris*
CLUSIACEAE																			CLUSIACEAE
Hypericum gramineum	St Johns Wort										X	X							*Hypericum gramineum*
CONVOLVULACEAE																			CONVOLVULACEAE
Dichondra repens	Kidney Weed	X	X			X	X	X	X	X									*Dichondra repens*
**Ipomoea cairica*	Mile-a-minute		X																**Ipomoea cairica*
Polymeria calycina	Swamp Bindweed	X						X											*Polymeria calycina*
CUNONIACEAE																			CUNONIACEAE
Ceratopetalum gummiferum	New South Wales Christmas Bush		X							X									*Ceratopetalum gummiferum*
DILLENIACEAE																			DILLENIACEAE
Hibbertia aspera	Rough Guinea Flower	X	X					X			X	X							*Hibbertia aspera*
Hibbertia dentata	Twining Guinea Flower	X	X			X	X	X		X									*Hibbertia dentata*
Hibbertia diffusa											X	X							*Hibbertia diffusa*
Hibbertia empetrifolia	Trailing Guinea Flower		X										X						*Hibbertia empetrifolia*
Hibbertia obtusifolia	Grey Guinea Flower		X					X					X	X					*Hibbertia obtusifolia*
Hibbertia pedunculata													X						*Hibbertia pedunculata*
Hibbertia scandens	Golden Guinea Flower					X		X							X				*Hibbertia scandens*
Hibbertia sp.		X																	*Hibbertia* sp.
DROSERACEAE																			DROSERACEAE
Drosera peltata	Sundew	X		X				X			X								*Drosera peltata*
Drosera spatulata	Sundew							X					X						*Drosera spatulata*
ELAEOCARPACEAE																			ELAEOCARPACEAE
Elaeocarpus reticulatus	Blueberry Ash	X	X			X		X		X									*Elaeocarpus reticulatus*
EPACRIDACEAE																			EPACRIDACEAE
Arotriche divaricata		X	X	X			X	X			X	X							*Arotriche divaricata*
Astroloma humifusum	Cranberry Heath										X	X							*Astroloma humifusum*
Astroloma pinifolium											X								*Astroloma pinifolium*
Epacris pulchella	NSW Coral Heath	X		X							X	X		X					*Epacris pulchella*
Leucopogon ericoides	Bearded Heath										X	X	X	X					*Leucopogon ericoides*
Leucopogon esquamatus											X								*Leucopogon esquamatus*
Leucopogon juniperinus	Bearded Heath										X	X	X	X					*Leucopogon juniperinus*
Leucopogon lanceolatus	Lance Beard-heath	X	X			X		X											*Leucopogon lanceolatus*
Leucopogon parviflorus															X	X			*Leucopogon parviflorus*
Lissanthe strigosa	Native Cranberry	X	X					X			X								*Lissanthe strigosa*

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Melichrus procumbens	Jam Tarts			X							X								*Melichrus procumbens*
Monotoca elliptica	Tree Broom-heath		X								X								*Monotoca elliptica*
Monotoca scoparia		X	X	X							X	X	X						*Monotoca scoparia*
Styphelia viridus ssp. *viridus*														X					*Styphelia viridus* ssp. *viridus*
Woolsia pungens	Snow Wreath			X							X	X							*Woolsia pungens*
EUPHORBIACEAE																			EUPHORBIACEAE
Breynia oblongifolia	Breynia		X	X		X		X		X				X					*Breynia oblongifolia*
**Euphorbia peplus*	Petty Spurge																X		**Euphorbia peplus*
Glochidion ferdinandi	Cheese Tree	X	X			X	X	X		X	X				X			X	*Glochidion ferdinandi*
Omalanthus populifolius	Bleeding Heart					X												X	*Omalanthus populifolius*
Phyllanthus hirtellus	Thyme Spurge	X	X					X			X								*Phyllanthus hirtellus*
Poranthera corymbosa		X																	*Poranthera corymbosa*
Poranthera microphylla	Small Poranthera	X																	*Poranthera microphylla*
Ricinocarpus pinifolius	Wedding Bush												X	X					*Ricinocarpus pinifolius*
FABOIDEAE																			FABOIDEAE
Bossiaea heterophylla	Variable Bossiaea			X															*Bossiaea heterophylla*
Bossiaea scolopendria				X							X								*Bossiaea scolopendria*
Daviesia ulicifolia	Gorse Bitter-pea	X						X											*Daviesia ulicifolia*
Desmodium rhytidophyllum			X				X	X											*Desmodium rhytidophyllum*
Desmodium varians		X	X				X												*Desmodium varians*
Dillwynia retorta	Heathy Parrot Pea	X		X							X		X	X					*Dillwynia retorta*
**Erythrina* x *sykesii*	Coral Tree					X											X	X	**Erythrina* x *sykesii*
Glycine clandestina	Love Creeper	X	X					X			X								*Glycine clandestina*
Glycine tabacina	Love Creeper	X	X					X											*Glycine tabacina*
Gompholobium latifolium	Broad-leaf Wedge-pea	X																	*Gompholobium latifolium*
Gompholobium pinnatum	Pinnate Wedge Pea		X								X								*Gompholobium pinnatum*
Hardenbergia violacea	False Sarsaparilla	X	X	X				X						X					*Hardenbergia violacea*
Hovea linearis		X		X				X			X			X					*Hovea linearis*
Jacksonia scoparia	Dogwood		X																*Jacksonia scoparia*
Kennedia rubicunda	Dusky Coral Pea	X						X							X				*Kennedia rubicunda*
Mirbelia rubifolia		X	X	X							X								*Mirbelia rubifolia*
Phyllota phylicoides	Heath Phyllota											X	X						*Phyllota phylicoides*
Podolobium ilicifolium	Native Holly	X	X	X				X											*Podolobium ilicifolium*
Podolobium scandens			X								X								*Podolobium scandens*
Pultenaea daphnoides		X	X	X				X						X					*Pultenaea daphnoides*
Pultenaea euchila											X	X							*Pultenaea euchila*
Pultenaea paleacea		X		X				X			X	X							*Pultenaea paleacea*
Pultenaea retusa				X															*Pultenaea retusa*
Pultenea villosa		X	X			X	X	X			X	X		X					*Pultenea villosa*
**Trifolium repens*	White Clover																X		**Trifolium repens*
**Trifolium dubium*	Yellow Suckling Clover																X		**Trifolium dubium*
**Vicia sativa*	Common Vetch																X		**Vicia sativa*
Viminaria juncea	Golden Spray	X																	*Viminaria juncea*
GENTIANACEAE																			
**Centaurium tenuiflorum*																	X		**Centaurium tenuiflorum*
GERANIACEAE																			GERANIACEAE
Geranium homeanum	Cranesbill					X	X		X										*Geranium homeanum*
Geranium solanderi var. *solanderi*	Native Geranium					X	X		X										*Geranium solanderi* var. *solanderi*
Pelargoruim sp.	Geranium														X				*Pelargoruim* sp.

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GOODENIACEAE																			GOODENIACEAE
Dampiera stricta		X									X			X					*Dampiera stricta*
Goodenia heterophylla	Variable-leaved Goodenia	X	X	X				X											*Goodenia heterophylla*
Goodenia ovata	Hop Goodenia							X											*Goodenia ovata*
Goodenia paniculata	Swamp Goodenia	X											X						*Goodenia paniculata*
Scaveola calendulacea	Scented Fan Flower														X	X			*Scaveola calendulacea*
HALORAGACEAE																			HALORAGACEAE
Gonocarpus micranthus ssp. *ramosissimus*			X								X								*Gonocarpus micranthus* ssp. *ramosissimus*
Gonocarpus tetragynus	Poverty Raspwort	X	X	X				X											*Gonocarpus tetragynus*
Gonocarpus teucrioides	Germander Raspwort							X			X	X		X					*Gonocarpus teucrioides*
HYDROCHARITACEAE																			HYDROCHARITACEAE
Ottelia ovalifolia	Swamp Lily								X								X		*Ottelia ovalifolia*
LAMIACEAE																			LAMIACEAE
Plectranthus parviflorus							X			X									*Plectranthus parviflorus*
Westringia fruiticosa	Coast Westringia							X			X	X			X				*Westringia fruiticosa*
LAURACEAE																			LAURACEAE
Cassytha glabella forma *glabella*	Slender Devil's Twine										X	X	X						*Cassytha glabella* forma *glabella*
Cassytha pubescens	Common Devil's Twine					X		X			X	X							*Cassytha pubescens*
**Cinnamomum camphora*	Camphor Laurel					X		X									X	X	**Cinnamomum camphora*
Cryptocarya microneura	Murrogun						X	X											*Cryptocarya microneura*
LOBELIACEAE																			LOBELIACEAE
Pratia purpurascens	White Root	X	X	X		X	X	X	X	X					X				*Pratia purpurascens*
LOGANIACEAE																			LOGANIACEAE
Logania albiflora										X									*Logania albiflora*
Mitrasacme paradoxa	Mitrewort													X					*Mitrasacme paradoxa*
LORANTHACEAE																			LORANTHACEAE
Dendropthoe vitellina	Mistletoe	X	X																*Dendropthoe vitellina*
Muellerina eucalyptoides	Mistletoe	X	X					X									X		*Muellerina eucalyptoides*
MALVACEAE																			MALVACEAE
**Modiola caroliniana*	Red-flowered Mallow																X		**Modiola caroliniana*
**Sida rhombifolia*	Paddy's Lucerne																X		**Sida rhombifolia*
MELIACEAE																			MELIACEAE
Synoum glandulosum	Scentless Rosewood					X	X			X									*Synoum glandulosum*
MENISPERMACEAE																			MENISPERMACEAE
Sarcopetalum harveyanum	Pearl Vine					X	X	X		X									*Sarcopetalum harveyanum*
Stephania japonica var. *discolor*	Snake Vine					X		X		X									*Stephania japonica* var. *discolor*
MIMOSOIDEAE																			MIMOSOIDEAE
Acacia brownii	Brown’s Wattle	X	X	X															*Acacia brownii*
Acacia filicifolia		X															X		*Acacia filicifolia*
Acacia floribunda	White Sally	X	X																*Acacia floribunda*

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Acacia implexa	Hickory	X						X											*Acacia implexa*
Acacia irrorata ssp. *irrorata*		X	X			X	X										X	X	*Acacia irrorata* ssp. *irrorata*
Acacia longifolia var. *longifolia*	Sydney Golden Wattle	X	X	X		X		X			X	X		X		X	X		*Acacia longifolia* var. *longifolia*
Acacia longifolia var. *sophorae*	Coastal Wattle				X										X	X			*Acacia longifolia* var. *sophorae*
Acacia maidenii	Maiden's Wattle						X	X		X									*Acacia maidenii*
Acacia myrtifolia	Myrtle Wattle	X									X	X			X				*Acacia myrtifolia*
Acacia parramattensis	Parramatta Green Wattle	X								X							X		*Acacia parramattensis*
**Acacia podalyriifolia* (QLD sp.)	Queensland Silver Wattle	X																	**Acacia podalyriifolia* (QLD sp.)
**Acacia salinga* (WA sp.)	Golden Wreath Wattle	X	X																**Acacia salinga* (WA sp.)
Acacia suaveolens	Sweet-scented Wattle		X	X				X			X		X	X					*Acacia suaveolens*
Acacia terminalis	Sunshine Wattle	X		X				X			X								*Acacia terminalis*
Acacia ulicifolia	Prickly Moses	X						X			X			X					*Acacia ulicifolia*
MONIMIACEAE																			MONIMIACEAE
Wilkiea huegeliana	Wilkiea									X									*Wilkiea huegeliana*
MORACEAE																			MORACEAE
Ficus rubiginosa	Port Jackson Fig					X											X		*Ficus rubiginosa*
MYRSINACEAE																			MYRSINACEAE
Rapanea howittana	Brush Muttonwood		X																*Rapanea howittana*
Rapanea variabilis	Muttonwood	X	X			X	X			X									*Rapanea variabilis*
MYRTACEAE																			MYRTACEAE
Acmena smithii	Lilly Pilly		X			X	X	X		X	X								*Acmena smithii*
Angophora costata	Smooth-barked Apple	X	X	X		X		X		X	X		X	X					*Angophora costata*
***Callistemon linearifolius* (V)**							X												***Callistemon linearifolius* (V)**
Callistemon linearis	Narrow-leaved Bottlebrush										X								*Callistemon linearis*
Callistemon rigidus	Stiff Bottlebrush							X			X								*Callistemon rigidus*
Callistemon salignus	Willow Bottlebrush	X	X			X	X	X	X	X									*Callistemon salignus*
Corymbia gummifera	Red Bloodwood	X	X	X		X		X			X		X	X					*Corymbia gummifera*
Corymbia maculata	Spotted Gum						X	X											*Corymbia maculata*
Eucalyptus acmenoides	White Mahogany						X	X											*Eucalyptus acmenoides*
Eucalyptus capitellata	Brown Stringybark	X		X		X		X			X								*Eucalyptus capitellata*
Eucalyptus globoidea	White Stringybark		X																*Eucalyptus globoidea*
Eucalyptus haemastoma	Scribbly Gum	X		X							X								*Eucalyptus haemastoma*
Eucalyptus paniculata ssp. *paniculata*	Grey Ironbark	X	X				X	X											*Eucalyptus paniculata* ssp. *paniculata*
***Eucalyptus parramattensis* subsp. *decadens* (V)**	**Drooping Red Gum**																		***Eucalyptus parramattensis* subsp. *decadens* (V)**
Eucalyptus piperita	Sydney Peppermint	X	X			X		X		X									*Eucalyptus piperita*
Eucalyptus propinqua	Small-fruited Grey Gum						X												*Eucalyptus propinqua*
Eucalyptus punctata	Grey Gum	X	X				X	X									X		*Eucalyptus punctata*
Eucalyptus resinifera ssp *resinifera*	Red Mahogany	X						X		X	X								*Eucalyptus resinifera* ssp *resinifera*
Eucalyptus robusta	Swamp Mahogany					X				X							X		*Eucalyptus robusta*
Eucalyptus signata	Scribbly Gum																X		*Eucalyptus signata*
Eucalyptus umbra ssp *umbra*	Broad-leaved White Mahogany	X	X	X				X			X		X	X	X				*Eucalyptus umbra* ssp *umbra*
Kunzea capitata	Pink Kunzea			X							X	X							*Kunzea capitata*
Leptospermum juniperinum	Prickly Tea-tree					X													*Leptospermum juniperinum*
Leptospermum laevigatum	Coastal Tea-tree										X			X	X				*Leptospermum laevigatum*
Leptospermum parvifolium	Small-leaved Tea-tree															X			*Leptospermum parvifolium*
Leptospermum polygalifolium	Lemon-scented Tea-Tree	X	X			X		X		X	X		X	X					*Leptospermum polygalifolium*
Leptospermum trinervium	Paperbark Tea-tree	X									X		X						*Leptospermum trinervium*

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Melaleuca ericifolia	Swamp Paperbark				X				X										*Melaleuca ericifolia*
Melaleuca linearifolia	Snow-in-summer				X	X	X			X									*Melaleuca linearifolia*
Melaleuca nodosa	Ball Honeymyrtle					X		X	X		X	X							*Melaleuca nodosa*
Melaleuca quinquenervia	Broad-leafed Paperbark					X													*Melaleuca quinquenervia*
Melaleuca sieberi	Sieber's Paperbark						X	X											*Melaleuca sieberi*
Melaleuca styphelioides	Prickly-leaved Paperbark					X	X		X	X									*Melaleuca styphelioides*
Rhodamnia rubescens	Scrub Turpentine							X											*Rhodamnia rubescens*
Syncarpia glomulifera	Turpentine						X	X		X									*Syncarpia glomulifera*
OCHNACEAE																			OCHNACEAE
**Ochna serrulata*	Ochna						X			X									**Ochna serrulata*
OLEACEAE																			OLEACEAE
**Ligustrum sinense*	Small-leaved Privett																X	X	**Ligustrum sinense*
Notelaea longifolia	Mock Olive	X	X				X	X		X									*Notelaea longifolia*
Notelaea ovata	Mock Olive						X												*Notelaea ovata*
Notelaea venosa										X									*Notelaea venosa*
OXALIDACEAE																			OXALIDACEAE
**Oxalis latifolia*	Pink Shamrock	X															X		**Oxalis latifolia*
Oxalis perennans		X	X			X						X							*Oxalis perennans*
PASSIFLORACEAE																			PASSIFLORACEAE
**Passiflora subpeltata*																	X		**Passiflora subpeltata*
Passiflora herbertiana								X											*Passiflora herbertiana*
PITTOSPORACEAE																			PITTOSPORACEAE
Billardiera scandens	Apple Berry	X	X					X			X			X					*Billardiera scandens*
Bursaria spinosa	Blackthorn	X	X				X	X						X					*Bursaria spinosa*
Citriobatus pauciflorus	Orange Thorn		X					X											*Citriobatus pauciflorus*
Pittosporum revolutum	Rough-fruit Pittosporum							X											*Pittosporum revolutum*
Pittosporum undulatum	Sweet Pittosporum		X			X		X									X	X	*Pittosporum undulatum*
PLANTAGINACEAE																			PLANTAGINACEAE
**Plantago lanceolata*	Lamb's Tongues	X	X														X		**Plantago lanceolata*
POLYGALACEAE																			POLYGALACEAE
Comesperma ericinum	Matchheads	X		X									X	X					*Comesperma ericinum*
**Polygala myrtifolia*	Butterfly Bush																X		**Polygala myrtifolia*
POLYGONACEAE																			POLYGONACEAE
Muehlenbeckia gracillima	Slender Lignum							X											*Muehlenbeckia gracillima*
Persicaria decipiens	Japanese Knotweed								X										*Persicaria decipiens*
Persicaria hydropiper	Water Pepper								X										*Persicaria hydropiper*
PRIMULACEAE																			PRIMULACEAE
**Anagallis arvensis*	Scarlet Pimpernel																X		**Anagallis arvensis*
**Anagallis arvensis* var. *caerulea*	Blue Pimpernel																X		**Anagallis arvensis* var. *caerulea*
PROTEACEAE																			PROTEACEAE
Banksia aemula	Wallum Banksia												X	X					*Banksia aemula*
Banksia integrifolia subsp. *integrifolia*	Coastal Banksia										X	X		X	X	X			*Banksia integrifolia* subsp. *integrifolia*
Banksia oblongifolia		X		X							X			X					*Banksia oblongifolia*

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Banksia serrata	Old Man Banksia			X		X					X		X	X					*Banksia serrata*
Banksia spinulosa var. *collina*	Hair-pin Banksia	X	X	X		X		X			X			X	X				*Banksia spinulosa* var. *collina*
Conospermum ellipticum	Smoke Bush												X	X					*Conospermum ellipticum*
Grevillea sericea	Pink Spider Flower	X	X	X							X								*Grevillea sericea*
Hakea bakerana		X		X															*Hakea bakeriana*
Hakea dactyloides	Broad-leaved Hakea	X		X							X	X							*Hakea dactyloides*
Hakea salicifolia subsp. *salicifolia*	Willow-leaved Hakea	X																	*Hakea salicifolia* subsp. *salicifolia*
Hakea teretifolia	Dagger Hakea										X	X			X				*Hakea teretifolia*
Isopogon anemonifolius	Drumsticks	X		X							X		X	X					*Isopogon anemonifolius*
Lambertia formosa	Mountain Devils	X	X	X							X	X		X					*Lambertia formosa*
Lomatia silaifolia	Crinkle Bush	X	X					X											*Lomatia silaifolia*
Persoonia lanceolata ssp. *lanceolata*	Lance-leaved Geebung										X	X		X					*Persoonia lanceolata* ssp. *lanceolata*
Persoonia levis	Smooth Geebung	X	X	X				X			X		X	X					*Persoonia levis*
Persoonia linearis	Narrow-leaved Geebung	X	X	X				X											*Persoonia linearis*
Petrophile pulchella	Conesticks										X								*Petrophile pulchella*
Xylomelum pyriforme	Woody Pear		X								X								*Xylomelum pyriforme*
RANUNCULACEAE																			RANUNCULACEAE
Clematis aristata	Old Man's Beard		X				X							X					*Clematis aristata*
Clematis glycinoides	Forest Clematis	X	X																*Clematis glycinoides*
Ranunculus inundatus	River Buttercup						X		X	X							X	X	*Ranunculus inundatus*
RHAMNACEAE																			RHAMNACEAE
Alphitonia excelsa	Red Ash							X											*Alphitonia excelsa*
Pomaderris ferruginea	Rusty Pomaderris							X											*Pomaderris ferruginea*
Pomaderris lanigera	Woolly Pomaderris										X	X							*Pomaderris lanigera*
ROSACEAE																			ROSACEAE
Rubus hillii	Broad-leaved Bramble									X									*Rubus hillii*
Rubus parvifolius	Native Raspberry									X									*Rubus parvifolius*
**Rubus ulmifolius*	Blackberry							X											**Rubus ulmifolius*
RUBIACEAE																			RUBIACEAE
Morinda jasminoides	Jasmine Morinda									X									*Morinda jasminoides*
Pomax umbellata	Pomax		X					X						X					*Pomax umbellata*
**Richardia brasiliensis*	Mexican Clover														X		X		**Richardia brasiliensis*
RUTACEAE																			RUTACEAE
Boronia polygalifolia	Milkwort Boronia										X	X							*Boronia polygalifolia*
**Citrus sinensis*	Orange Tree																X		**Citrus sinensis*
Correa reflexa	Common Correa	X				X								X					*Correa reflexa*
Philotheca salisfolia				X							X		X	X					*Philotheca salisfolia*
Zieria smithii	Sandfly Zieria	X	X					X											*Zieria smithii*
SANTALACEAE																			SANTALACEAE
Exocarpus cupressiformis	Cherry Ballart	X	X	X		X													*Exocarpus cupressiformis*
SAPINDACEAE																			SAPINDACEAE
Dodonaea triquetra	Common Hop Bush	X	X								X			X					*Dodonaea triquetra*
Guioa semiglauca	Guioa									X									*Guioa semiglauca*
SCROPHULARIACEAE																			SCROPHULARIACEAE
Veronica plebeia	Speedwell	X	X					X											*Veronica plebeia*

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SOLANACEAE																			SOLANACEAE
**Solanum mauritanum*	Wild Tobacco																X		**Solanum mauritanum*
Solanum prinophyllum	Forest Nightshade	X																	*Solanum prinophyllum*
STERCULIACEAE																			STERCULIACEAE
Lasiopetulum parviflorum	Rusty Petals										X	X			X				*Lasiopetulum parviflorum*
STYLIDIACEAE																			STYLIDIACEAE
Stylidium graminifolium	Trigger Plant							X			X								*Stylidium graminifolium*
THYMELAEACEAE																			THYMELAEACEAE
Pimelea linifolia ssp. *linifolia*	Slender Rice Flower	X									X	X		X					*Pimelea linifolia* ssp. *linifolia*
TREMANDRACEAE																			TREMANDRACEAE
***Tetratheca juncea* (V) (EV)**	**Black-eyed Susan**	X		X									X						***Tetratheca juncea* (V) (EV)**
Tetratheca thymifolia													X	X					*Tetratheca thymifolia*
VERBENACEAE																			VERBENACEAE
Clerodendrum tomentosum	Hairy Clerodendrum	X						X		X									*Clerodendrum tomentosum*
**Lantana camara*	Lantana	X	X		X	X	X	X		X	X				X	X	X	X	**Lantana camara*
**Verbena bonariensis*	Purple-Top				X			X									X	X	**Verbena bonariensis*
VIOLACEAE																			VIOLACEAE
Viola betonicifolia	Purple Violet	X																	*Viola betonicifolia*
Viola hederacea	Native Violet	X	X			X		X	X	X									*Viola hederacea*
VITACEAE																			VITACEAE
Cayratia clematidea	Slender Grape	X	X					X											*Cayratia clematidea*
Cissus antarctica	Kangaroo Grape	X					X												*Cissus antarctica*
Cissus hypoglauca	Water Vine					X		X		X									*Cissus hypoglauca*
SUBCLASS LILIIDAE (Monocotyledons)																			SUBCLASS LILIIDAE (Monocotyledons)
ANTHERICACEAE																			ANTHERICACEAE
Tricoryne elatior	Yellow Rush-lily	X	X					X											*Tricoryne elatior*
ARACEAE																			ARACEAE
Gymnostachys anceps	Settlers Flax	X	X			X		X		X									*Gymnostachys anceps*
**Zantedeschia aethiopica*	Arum Lily					X			X										**Zantedeschia aethiopica*
ARECACEAE																			ARECACEAE
Livistonia australis	Cabbage-tree Palm	X	X			X		X		X									*Livistonia australis*
ASPARAGACEAE																			ASPARAGACEAE
**Protasparagus aethiopicus*	Asparagus Fern					X											X		**Protasparagus aethiopicus*
COLCHICACEAE																			COLCHICACEAE
Burchardia umbellata	Milkmaids	X																	*Burchardia umbellata*
COMMELINACEAE																			COMMELINACEAE
Commelina cyanea	Hairy Wandering Jew																X		*Commelina cyanea*