5.2.2 Targeted threatened fauna survey

A habitat-based fauna assessment was initially conducted on 21 January 2014 and again on the 28 November 2016 to identify the following fauna habitat features of the study area:

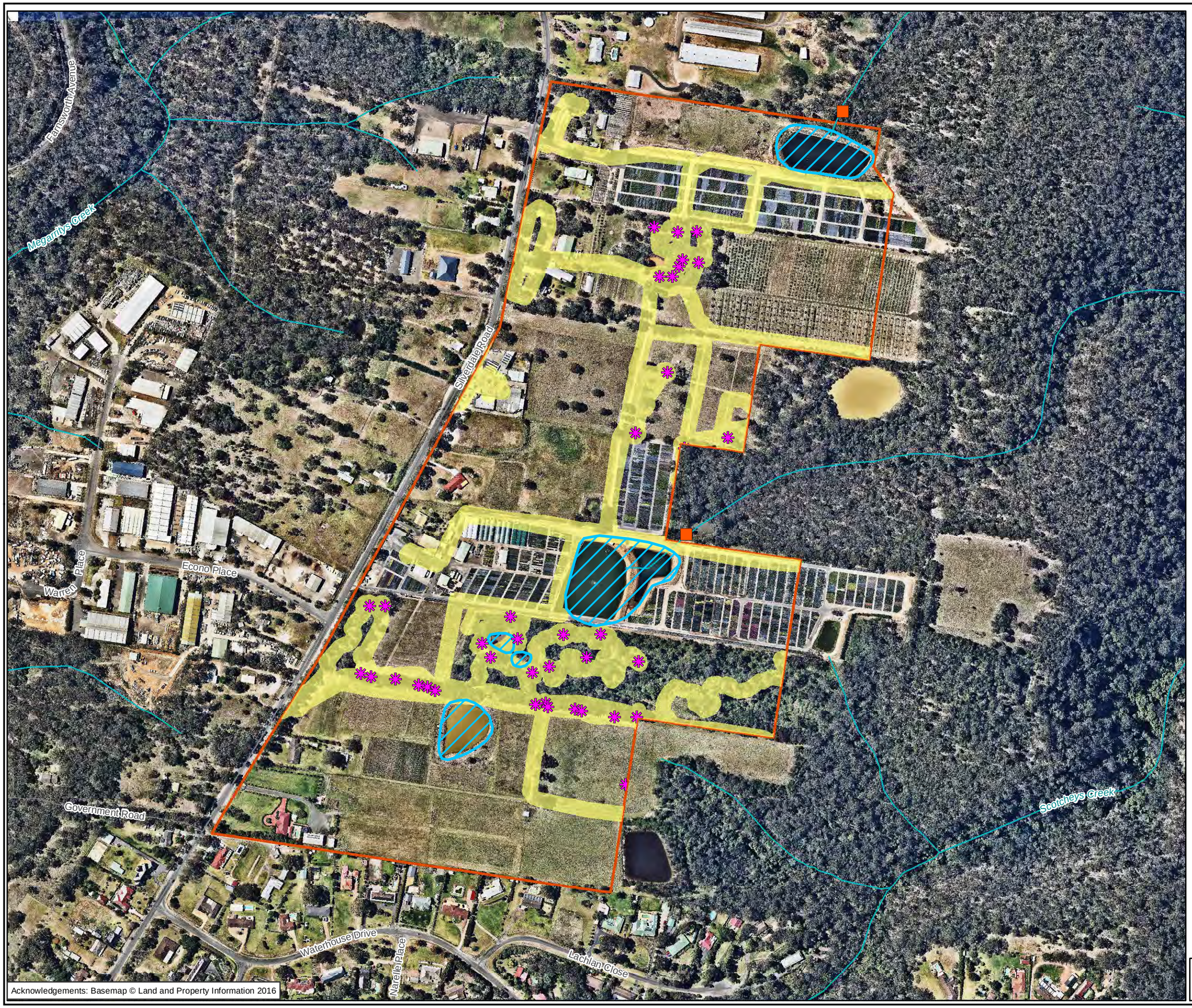
- Habitat trees including large hollow-bearing trees, availability of flowering shrubs, feed tree species such as *Allocasuarina* spp and recognised Koala feed trees.
- Creekline and dam condition.
- Quantity of ground litter and logs.
- Searches for indirect evidence, such as chew marks and scratches on trees, chewed cones of Allocasuarina spp., diggings, burrows, dens, tracks in wet mud on access tracks, nests and signs of wear around tree-hollows.

Detailed fauna field surveys were subsequently conducted throughout the development site on 29 November 2016, 1 December 2016 and 12 December 2016 (Figure 8). A summary of fauna survey effort is provided in Table 9.

Table 9 Summary of fauna survey effort.

Survey method	Target species	Description of survey methodology	Date	Survey effort
Random meanders and transects	All threatened fauna species	A number of random meanders and transects were completed in suitable habitat for threatened species across four days. The purpose of these surveys is to search opportunistically for threatened fauna species including such as woodland birds and frogs. Specific microhabitats, including dams, feed trees and structurally intact moderate/good condition vegetation were targeted.	21 January 2014, 28 November 2016 and 1 and 12 December 2016.	32 person hours
Tree assessment	Forest Owls Woodland birds Large hollow-nesting Cockatoos Hollow-nesting parrots Little Eagle Microbats Koala Little Eagle (platform nests)	An assessment of potential habitat trees was undertaken across the study area to identify the following: • Large hollow-bearing trees • Nests • Availability of flowering shrubs • Feed tree species such as Allocasuarina sp. • Size and suitability of potential tree hollows	21 January 2014 and 28 November 2016.	16 person hours

Survey method	Target species	Description of survey methodology	Date	Survey effort
Searching at the base of trees	Cumberland Plain Land Snail, Koala	The base of trees was searched to determine the presence of Koala scats and the Cumberland Plain Land Snail. Searches included raking back the leaf litter at the base of trees for Koala scats or signs of Cumberland Plain Land Snail (both live individuals and shells). Searching for Koala scats focused on areas in the central and eastern portions of the study area where Grey Gum were dominant as these are key feed tree species for the Koala. The ground below the tree canopy was carefully searched to detect any scat on the surface. The leaf litter and bark was then scraped back to locate any older scat that had become buried. It was intended that the Spot Assessment Technique (SAT) was applied following the detection of scat however, no scat was located within the development site.	1 and 12 December 2016.	16 Person Hours
Waterbody habitat assessment	Green and Golden Bell Frog	All dams were visually inspected for potential habitat for Green and Golden Bell Frog. A brief diurnal search of vegetation and other microhabitat features was undertaken where these features were present.	1 and 12 December 2016.	4 person hours
Call playback	Red-crowned Toadlet	Call playback using loud noises such as clapping, yelling and the elicitation of the species' call was undertaken at the two first order streams located within the development site in conjunction with visual encounter surveys.	21 January 2014, 28 November 2016 and 1 and 12 December 2016.	2 person hours
Aural call recognition	Woodland birds Large hollow-nesting cockatoos Hollow-nesting parrots Amphibians	Opportunistic aural detection of species during walked surveys in areas where bird or amphibian activity was observed to be high and calls could be heard.	21 January 2014, 28 November 2016 and 1 and 12 December 2016.	32 person hours



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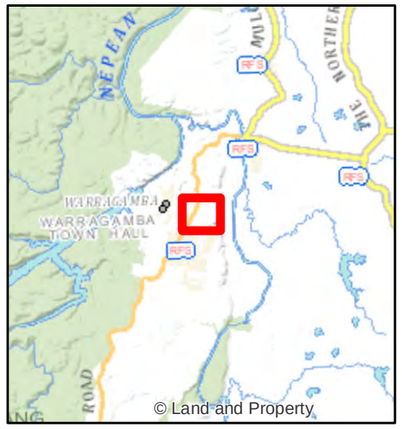

Legend

- Development site

Fauna survey effort

- Spot search for Cumberland Plain Land Snail and Koala scats
- Call playback
- Diurnal survey transects
- Waterbody habitat assessment

Figure 8: Fauna survey effort and habitat across the development site

0 40 80 120 160 200

Metres
Scale: 1:4,500 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 22832
Date: 26 April 2017
Checked by: KJR. Drawn by: ANP. Last edited by: apritchard
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5.3 Ecosystem credit species

A list of ecosystem credit species predicted to occur within the development site, based on the PCTs present and generated by the calculator associated with the BBAM, along with an assessment of whether they occur within the study area is provided in Table 10. The potential for these species to occur within the development site was assessed in accordance with Section 6.3 of the BBAM.

Table 10 Assessment of ecosystem credit species within the study area

Common name	Scientific name	Habitat on site	Threatened species offset multiplier	Justification
Barking Owl	*Ninox connivens*	Yes	3	Presence of species cannot be discounted
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis subsp. gularis*	Yes	1.3	Presence of species cannot be discounted
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus subsp. victoriae*	Yes	2	Presence of species cannot be discounted
Bush Stone-curlew	*Burhinus grallarius*	Yes	2.6	Presence of species cannot be discounted
Diamond Firetail	*Stagonopleura guttata*	Yes	1.3	Presence of species cannot be discounted
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Yes	2.2	Presence of species cannot be discounted
Eastern Freetail-bat	*Mormopterus norfolkensis*	Yes	2.2	Presence of species cannot be discounted
Flame Robin	*Petroica phoenicea*	Yes	1.3	Presence of species cannot be discounted
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Yes	2	Presence of species cannot be discounted
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Yes	1.8	Presence of species cannot be discounted
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Yes	2.2	Presence of species cannot be discounted
Hooded Robin (south-eastern form)	*Melanodryas cucullata subsp. cucullata*	Yes	1.7	Presence of species cannot be discounted
Little Eagle	*Hieraaetus morphnoides*	Yes	1.4	Presence of species cannot be discounted
Little Lorikeet	*Glossopsitta*	Yes	1.7	Presence of species cannot be discounted

Common name	Scientific name	Habitat on site	Threatened species offset multiplier	Justification
	pusilla			
Masked Owl	*Tyto novaehollandiae*	Yes	3	Presence of species cannot be discounted
Painted Honeyeater	*Grantiella picta*	Yes	1.3	Presence of species cannot be discounted
Powerful Owl	*Ninox strenua*	Yes	3	Presence of species cannot be discounted
Scarlet Robin	*Petroica boodang*	Yes	1.7	Presence of species cannot be discounted
Speckled Warbler	*Chthonicola sagittata*	Yes	2.6	Presence of species cannot be discounted
Spotted-tailed Quoll	*Dasyurus maculatus*	Yes	2.6	Presence of species cannot be discounted
Square-tailed Kite	*Lophoictinia isura*	Yes	1.4	Presence of species cannot be discounted
Swift Parrot	*Lathamus discolor*	Yes	1.3	Presence of species cannot be discounted
Turquoise Parrot	*Neophema pulchella*	Yes	1.8	Presence of species cannot be discounted
Varied Sittella	*Daphoenositta chrysoptera*	Yes	1.3	Presence of species cannot be discounted
Yellow-bellied Glider	*Petaurus australis*	No	2.3	Suitable habitat for this species in the form of tall open forests containing large tree hollows is not present within the development site. No feed tree scarring recorded during targeted surveys and there are no records of the species on the Atlas of NSW Wildlife in relation to the study area.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Yes	2.2	Presence of species cannot be discounted

The presence of most species could not be discounted using the methodology outlined in Section 6.3 of the BBAM. One species, Yellow-bellied Glider, was not considered to be present within the development site in accordance with Section 6.3.1.9 of the BBAM as no habitat components for the species were present within the vegetation zones of the development site (see rationale above in Table 10 above). It was assumed that all remaining species could occur within the development site.

As 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest is a CEEC, the CEEC multiplier will be used to determine the number of ecosystem credits required for impacts to this PCT rather than the above species offset multipliers. As such, no species multipliers have been adjusted.

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5.4 Species credit species

5.4.1 Flora species

A list of species credit species (flora) predicted to occur within the study area, based on the PCTs present, along with an assessment of whether the study area provides suitable habitat and whether the species will be impacted by the development is provided in Table 11. The potential for a species to occur within the development site was assessed in accordance with Section 6.5 of the BBAM. Those species with habitat present in the development site were targeted during targeted surveys.

A number of flora species were identified as candidate species for further assessment, in accordance with Section 6.5 of the BBAM. Targeted surveys for these species carried out as outlined in Table 11 detected one threatened flora species, Juniper-leaved Grevillea *Grevillea juniperina* subsp. *juniperina*, within the development site. Juniper-leaved Grevillea is listed as Vulnerable under the TSC Act and the OEH Threatened Species Profile Database (TSPD) states that up to five individuals can be removed with a negligible loss in the Hawkesbury-Nepean Catchment.

While the BioBanking calculator did not specify targeted survey for this species, five individuals were detected in the southern and middle portions of the study area areas experiencing some level of past and ongoing disturbance (see previous Figure 7). OEH have recognised that physical disturbance of the soil appears to result in an increase in seedling recruitment and the species has a tendency to colonise mechanically disturbed areas (OEH 2017).

Table 11 Species credit species (flora) and status within the study area.

Common name	Scientific name	Habitat present in the study area	Justification	Recorded during targeted surveys	Impacted by development?
Acacia gordonii	*Acacia gordonii*	No	*Acacia gordonii* occurs in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops. These habitat types are not present within the development site.	No	No
Bargo Geebung	*Persoonia bargoensis*	Yes	The study area is just within the known range of the species. Targeted survey was undertaken across the development site in December 2016 in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No Bargo Geebung were recorded.	No	No
Brown Pomaderris	*Pomaderris brunnea*	No	Brown Pomaderris is found in a very limited area and the study area is considered to be predicted habitat rather than known habitat. Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Habitat not present in development site, although targeted survey was undertaken in and adjacent to unnamed tributaries.	No	No
Bynoe's Wattle	*Acacia bynoeana*	No	Bynoe's Wattle has not been previously recorded within 5km and is considered to be predicted habitat rather than known habitat. Grows in heath or dry sclerophyll forest on sandy soils, disturbed trail margins or recently burnt patches. These habitat types are not present within the development site.	No	No
Deane's Paperbark	*Melaleuca deanei*	Yes	Deane's Paperbark has not been previously recorded within 5km. Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species. Targeted surveys did not record this species in the upper reaches of drainage lines or riparian zones.	No	No

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Common name	Scientific name	Habitat present in the study area	Justification	Recorded during targeted surveys	Impacted by development?
Dillwynia tenuifolia	*Dillwynia tenuifolia*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species. Targeted surveys did not record this species in the upper reaches of drainage lines or riparian zones.	No	No
***Dillwynia tenuifolia* (a shrub) population, Kemps Creek**	*Dillwynia tenuifolia - endangered population Kemps Creek*	No	Referring to the Kemps Creek endangered population which is not in the study area.	No	No
Downy Wattle	*Acacia pubescens*	Yes	Occurs in moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the development site. Targeted surveys did not record this species in the upper reaches of drainage lines or riparian zones.	No	No
Epacris purpurascens* subsp. *purpurascens	*Epacris purpurascens* subsp. *purpurascens*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species. Targeted survey was undertaken across the study area in December 2016 in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No *Epacris purpurascens* subsp. *purpurascens* was recorded.	No	No
***Eucalyptus* sp. Cattai**	*Eucalyptus* sp. Cattai	No	*Eucalyptus* sp Cattai occurs on sandy soils derived from laterised clays over sandstone. These habitat types are not present within the development site.	No	No
Grevillea parviflora* subsp. *supplicans	*Grevillea parviflora* subsp. *supplicans*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species. Targeted survey was undertaken across the study area in December 2016 in accordance	No	No

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Common name	Scientific name	Habitat present in the study area	Justification	Recorded during targeted surveys	Impacted by development?
			with the NSW Guide to Surveying Threatened Plants (OEH 2016). No *Grevillea parviflora subsp. supplicans* was recorded.		
Gyrostemon thesioides	*Gyrostemon thesioides*	No	*Gyrostemon thesoides* occurs on hill sides and riverbanks in fine sandy soils derived from laterised clays over sandstone. These habitat types are not present within the development site.	No	No
Hairy Geebung	*Persoonia hirsuta*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species, although it usually associated with sandy soils. Targeted survey was undertaken across the study area in December 2016 in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No Hairy Geebung was recorded.	No	No
Juniper-leaved Grevillea	*Grevillea juniperina* subsp. *juniperina*	Yes	Five individuals in two separate locations were recorded during targeted surveys. Located on the edges of moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open.	Yes	Yes
Leucopogon fletcheri* subsp. *fletcheri	*Leucopogon fletcheri* subsp. *fletcheri*	No	Occurs in clayey lateritic soils in dry eucalypt woodland or in shrubland. These habitat types are not present within the development site.	No	No
***Marsdenia viridiflora* subsp. *viridiflora* in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith**	*Marsdenia viridiflora* subsp. *viridiflora* - *endangered population*	No	Referring to the endangered population which occurs outside of the Wollondilly LGA and is not applicable to the study area.	No	No

Common name	Scientific name	Habitat present in the study area	Justification	Recorded during targeted surveys	Impacted by development?
local government areas					
Matted Bush-pea	*Pultenaea pedunculata*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species. Targeted survey was undertaken across the study area in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No individuals were recorded.	No	No
Mittagong Geebung	*Persoonia glaucescens*	No	Grows in woodland to dry sclerophyll forest on clayey and gravely laterite. While these habitats are present in the proposed E3 zone vegetation types, they are absent from the development site.	No	No
Nodding Geebung	*Persoonia nutans*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species within shale sandstone transition communities. Targeted survey was undertaken across the study area in December 2016 in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No Nodding Geebung was recorded.	No	No
Pimelea curviflora* subsp. *curviflora	*Pimelea curviflora* subsp. *curviflora*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species within shale sandstone transition soils, however targeted survey was undertaken across the study area in December 2016 in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No *Pimelea curviflora subsp. curviflora* was recorded.	No	No
Small-flower	*Grevillea parviflora*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395	No	No

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Common name	Scientific name	Habitat present in the study area	Justification	Recorded during targeted surveys	Impacted by development?
Grevillea	subsp. *parviflora*		- Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species, however targeted survey was undertaken across the study area in December 2016 in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No *Grevillea parviflora subsp. parviflora* was recorded.		
Sydney Plains Greenhood	*Pterostylis saxicola*	No	Associated with sandstone rock shelves. No habitat within the study area.	No	No
Tetratheca glandulosa	*Tetratheca glandulosa*	Yes	Moderate/good, medium and sections of moderate/good, poor 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest has potential to support the species within shale sandstone transition soils, however targeted survey was undertaken across the study area in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). No *Tetratheca glandulosa* was recorded.	No	No
Woronora Beard-heath	*Leucopogon exolasius*	No	Prefers rocky hillsides along creek banks such as that occurring along the upper Georges River area and in Heathcote National Park. These habitat types are not present within the development site.	No	No

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5.4.2 Fauna species

A list of species credit species (fauna) predicted to occur within the study area, based on the PCTs present, along with an assessment of whether the study area provides suitable habitat and whether the species will be impacted by the development is provided in Table 12. The potential for a species to occur within the development site was assessed in accordance with Section 6.5 of the BBAM.

A number of fauna species were identified as candidate species for further assessment, in accordance with Section 6.5 of the BBAM. Targeted surveys for these species detected one threatened fauna species, the Cumberland Plain Land Snail, in the development site.

The Cumberland Plain Land Snail is listed as endangered under the TSC Act but is not listed under the EPBC Act. The species was recorded in several locations throughout the development site (and adjacent E3 zone) as live individuals and as shells or shell fragments (Figure 9). All records were identified using the following resources:

- A review of the land snail genus *Meridolum* (Gastropoda: Camaenidae) from central New South Wales, Australia (Clark 2009).
- Environmental Impact Assessment Guidelines Cumberland Plain Large Land Snail *Meridolum corneovirens* (Pfeiffer 1851) (NPWS 2000).
- Australian Land Snails Volume 1: A Field Guide to Eastern Australian Species (Stanisic et al. 2010).

Individuals were located either in leaf litter accumulations or grass tussocks at or in proximity to large canopy trees in the 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest PCT. Habitat polygons were drawn around areas known to contain the species or where leaf litter accumulations or grass tussocks were observed in the field. Areas of 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest that were excluded from the mapping lacked the required habitat features for the species and were subject to ongoing disturbance regimes including slashing or heavy weed loads.

Plate 6 Cumberland Plain Land Snail shell located in the development site

Given the availability of suitable habitat, it is likely that this species is more widespread within the study area.

No additional threatened fauna species were recorded within the study area.

Table 12 Species credit species (fauna) and status within the study area.

Common name	Scientific name	Habitat present in the development site	Justification	Recorded during targeted surveys	Impacted by development
Cumberland Plain Land Snail	*Meridolum corneovirens*	Yes	2.85 ha of habitat consisting of land containing bark or leaf litter accumulation is present within development site. Targeted surveys confirmed the presence of the species with expired shells and live individuals. Habitat was mapped by traversing the site and recording locations of bark and leaf litter accumulation using a GPS. Polygons were then applied to areas mapped in the field based on the vegetation mapping to ensure all habitat had been captured.	**Yes**	**Yes – See above**
Eastern Pygmy-possum	*Cercartetus nanus*	No	More typically associated with shrubby heath vegetation but can be found in woodland and dry sclerophylla forest. The mowing regime of the study area has removed the majority of shrubs and there were no tree hollows recorded.	No	No
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Yes	The species is known to occur in the Cumberland IBRA sub-region. Trees and shrubs located within the development site, including flowering eucalypts provide foraging habitat for the species. The species not detected in targeted survey. No suitable hollows were located within the development site.	No	No
Gang-gang Cockatoo population, Hornsby and Ku-ring-gai Local Government Areas	*Callocephalon fimbriatum population in the Hornsby and Ku-ring-gai Local Government Areas*	Yes	See above. Not applicable to Wollondilly Shire Council.	No	No
Giant Burrowing Frog	*Heleioporus australiacus*	Yes	Study area contains woodland and forest habitat within 300m of a stream. Due to the damming of the upper extent of these streams however, suitable habitat for this species is either not present or so degraded as to warrant the species unlikely to	No	No

Common name	Scientific name	Habitat present in the development site	Justification	Recorded during targeted surveys	Impacted by development
			occur.		
Green and Golden Bell Frog	*Litoria aurea*	Yes	Suitable habitat is very limited in the dams located throughout the study area with several dams completely lacking any fringing or emergent vegetation. There are no records of the species on the Atlas of NSW Wildlife in relation to the study area. Diurnal inspections of waterbodies completed during the breeding season did not detect the species.	No	No
Koala	*Phascolarctos cinereus*	Yes	The development site contained one feed species listed as preferred species in accordance with SEPP 44. The Grey Gum is considered to constitute >15% of the overstorey tree species. In addition there is a growing body of evidence that identifies the importance of shelter (non-food) trees to koalas. On this basis, targeted surveys for the Koala were included as a part of field assessments, including tree assessment and searching around the base of feed trees for scats. Using the methodology outlined in Section 6 of Commonwealth of Australia (2014) the study area does not contain habitat critical to the survival of the koala (see Appendix 3 for scoring).	No	No
Little Eagle	*Hieraaetus morphnoides*	Yes	The species is known to occur in the Cumberland IBRA sub-region and occupies open eucalypt forest, woodland or open woodland. Given its large home range, it is therefore considered likely to fly-over or forage in the proposed development site on occasion. No nests or suitable tall living trees within a remnant patches were recorded during target surveys.	No	No
Red-crowned Toadlet	*Pseudophryne australis*	Yes	Suitable habitat for this species is either not present or so degraded as to warrant the species unlikely to occur. Two ephemeral drainage lines run through the development site; however, both have been regraded to allow for dams and are heavily infested with groundcover weeds. Surveys did not detect the species within the development site.	No	No

Common name	Scientific name	Habitat present in the development site	Justification	Recorded during targeted surveys	Impacted by development
Regent Honeyeater	*Anthochaera phrygia*	Yes	Potential foraging resources (such as flowering eucalypts) occur within the development site. There is potential for the species to opportunistically forage on these resources; however the urban nature of the study area and expansive range of the species mean the species would be considered vagrant and it is highly unlikely to be impacted by the proposed development.	No	No
Square-tailed Kite	*Lophoictinia isura*	Yes	Potential foraging habitat occurs in the woodland areas of the development site however no individuals were recorded during targeted surveys. Similarly, no platform nests sites were recorded during surveys.	No	No
Squirrel Glider	*Petaurus norfolcensis*	No	This species is known to occur in Blackbutt-Bloodwood enriched sandstone forests in coastal areas and requires numerous tree hollows for breeding. No such vegetation type or tree hollows were recorded within the development site.	No	No

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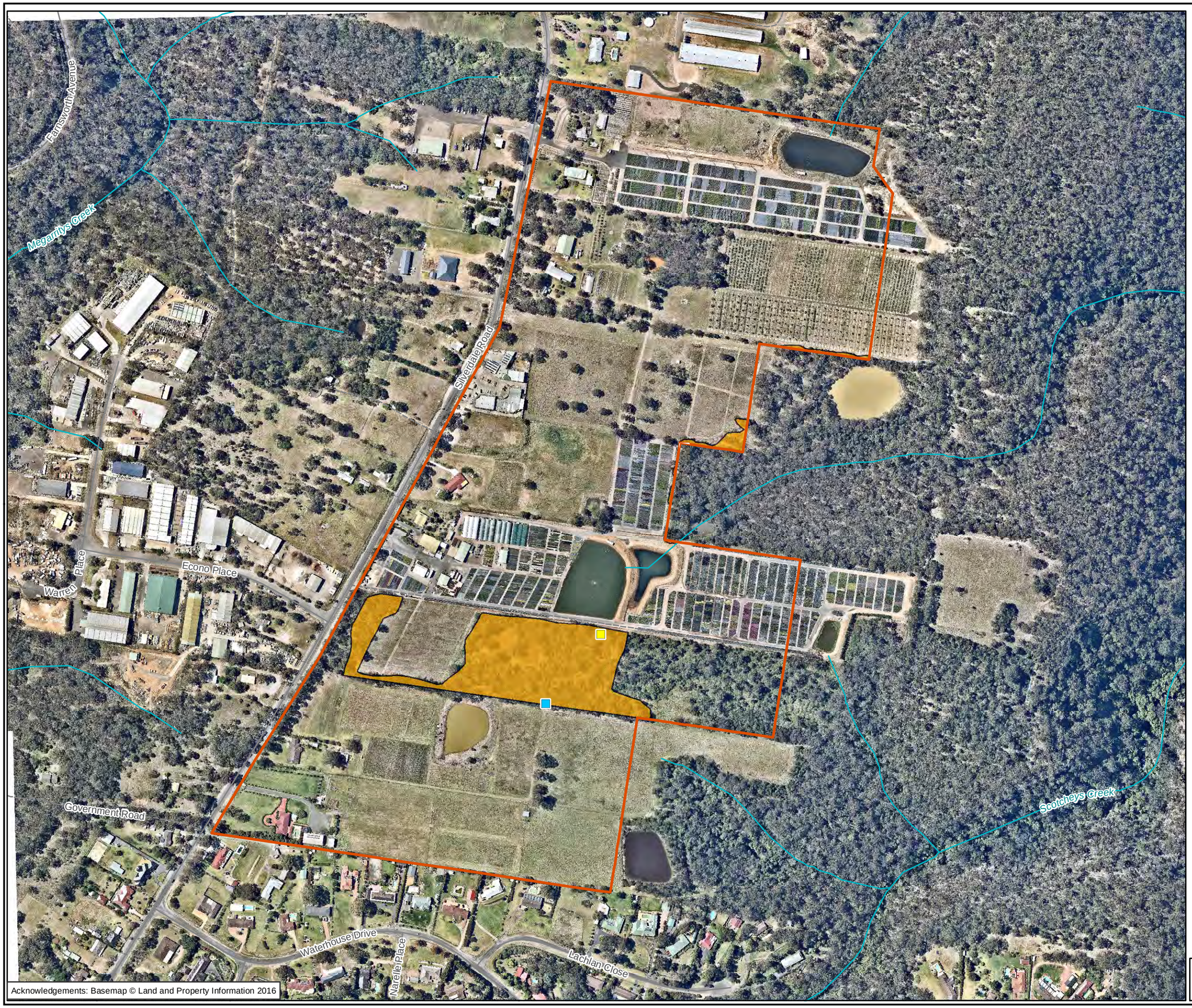

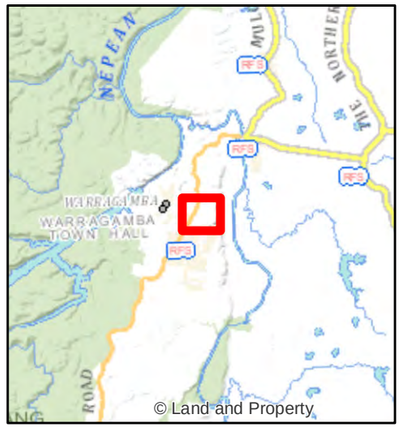

Legend

- Development site

Cumberland Plain Land Snail

Current survey (Biosis 2016)

- Shell
- Shell fragment
- Cumberland Plain Land Snail habitat

Acknowledgements: Basemap © Land and Property Information 2016

Figure 9: Cumberland Plain Land Snail habitat and records within the development site

0 40 80 120 160 200

Metres
Scale: 1:4,500 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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Location: P:\22800s\22832\Mapping\Report Figures - Development Site\22832_BBDS_F9_CPLSHabitat_20170226

5.5 Other threatened species

5.5.1 Species listed under the EPBC Act

In order to provide a context for the study area, information about flora and fauna from within five kilometres (the 'locality') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- DEE Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - the database for the Atlas of NSW Wildlife, OEH (TSC Act).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2013 (BA).

In summary, 21 flora species and 21 fauna species have been recorded or are predicted to occur in the locality. Following the review of geographic features and targeted surveys forming part of the BioBanking assessment, none of these species are considered likely to occur within the building envelopes in the E3 zoned land, and development is unlikely to constitute a significant impact. The study area does not support important or critical habitat for any threatened species listed under the EPBC Act.

Vegetation mapping of the study area has been used to determine the presence of threatened ecological communities. The building envelopes in the E3 zoned land support one hectare of Shale Sandstone Transition Forest vegetation equivalent to the CEEC listed under the EPBC Act. On its own, this impact would not constitute a significant impact under the EPBC Act. However, under the Act the whole action must be considered, including removal of a total of 10.52 hectares of CEEC. The removal of this vegetation will require a referral to the Commonwealth DEE when development applications are lodged for the development of the site.

5.5.2 Threatened species habitat in the E3 zone proposed access roads and building envelopes

The removal of one hectare of Shale Sandstone Transition Forest CEEC is unlikely to constitute a significant effect on its own given the degraded nature of the area and connectivity with much larger remnants.

An area of 0.64 hectares of habitat for Cumberland Plain Land Snail is located within the area proposed for clearing to allow for access roads and building envelops within the E3 zone (Figure 6).

Following targeted survey, no individuals were located within this area; however the species was confirmed in adjoining habitat (Section 5.4.2).

Stage 2 – Impact assessment (biodiversity values)

6 Impact assessment (biodiversity values)

This section identifies the potential impacts of proposed development on the ecological values of the development site and includes the recommendations adopted by SitePlus and North Silverdale Centre Landowner Group to design the Planning Proposal and subsequent development to minimise impacts on biodiversity.

This impact assessment is based on clearing of native vegetation and fauna habitat. It includes an assessment of all potential impacts arising from the project, including those that may have arisen during the initial Planning Proposal stages.

6.1 Avoidance and minimisation

6.1.1 Process of impact avoidance and minimisation

Measures to avoid and minimise impacts have been considered as part of the Planning Proposal process to rezone the study area. The following outlines the steps taken in the preparation of the Planning Proposal.

Step 1: Initial Planning Proposal for Lots 199 & 200 DP 1092447

In October 2011, Wollondilly Shire Council received a Planning Proposal from Restifa & Partners for the rezoning of the land surrounding the Silverdale shops (Lots 199 & 200 DP 1092447) to B2 Local Centre. The applicant was notified in a letter dated 20 October 2011 that the planning proposal would need to be revised to meet the requirements of Council's Growth Management Strategy (GMS; Wollondilly Shire Council 2011c), which identified *"that growth of the Silverdale Commercial Centre needs to be linked to residential development of lands adjoining the site."*

Step 2: Revised Planning Proposal to address GMS and include additional lots

The Planning Proposal was revised in 2012 by SitePlus and resubmitted to Wollondilly Shire Council in March 2012, including additional lots to the north and south of those originally identified (SitePlus 2012).

As part of this revised Planning Proposal, Kevin Mills & Associates (2011) provided preliminary ecological advice indicating that development should be sited in the western half of the study area due to the lack of significant ecological features. The assessment also identified that the eastern portion of the site was likely to contain species of ecological significance, and therefore the Planning Proposal should consider the promotion and conservation of this area (Kevin Mills & Associates 2011).

As a result, to achieve a balance between meeting the development needs and services provided to the current and future residents of Silverdale and conservation of sensitive ecological values, the Planning Proposal (SitePlus 2012) sited the developable zones (B2, IN2, R3 and R2 zones) in the western portion of the lots. The eastern portion, containing remnant vegetation, was proposed to be rezoned to E2 Environmental Conservation.

On 1 May 2013, the then NSW Department of Planning and Infrastructure (DP&I) issued a Gateway Determination for the proposal, which was amended at the request of Wollondilly Shire Council on 25 June 2013. In support of the Planning Proposal, Wollondilly Shire Council recommended the DP&I consider the preparation of a number of studies as part of a Gateway Assessment, including the preparation of a flora and fauna assessment. The requirement for the preparation of a flora and fauna assessment for the Planning Proposal was also specified in the DP&I Planning Team Report and endorsed in the Gateway Determination (DP&I 2013).

Step 3: Second revision of Planning Proposal to address Gateway Determination

SitePlus subsequently updated the Planning Proposal to address many of the concerns raised in the Gateway Determination and Wollondilly Shire Council, including amendments or further consideration of the following; final land zoning, lot size, height of buildings, natural resources maps and available specialist studies.

The second edition of the proposed rezoning layout included the following zones:

- R2 Low Density Residential.
- R3 Medium Density Residential.
- B2 Local Centre.
- B4 Mixed Use.
- E4 Environmental Living.

The strip of land proposed to be E2 Environmental Conservation zone was originally a narrow corridor running along the eastern boundary of the study area. This was changed to E4 Environmental Living to allow for larger lots that encompass both residential dwellings and an increased area for conservation.

Biosis prepared a flora and fauna assessment for the works (Biosis 2014) which included a number of recommendations for consideration during the detailed design process. Using current vegetation mapping data, it has been calculated that the zone layout proposed in this revision would have resulted in the potential removal of 13.21 hectares of Shale Sandstone Transition Forest CEEC and 0.03 hectares of Western Sandstone Gully Forest located in B2, B4, R3 and R2 zones. This plan also proposed the protection of 8.03 hectares of Shale Sandstone Transition Forest CEEC and 6.26 hectares of Western Sandstone Gully Forest in an area proposed as E4 zoning.

The Biosis (2014) report made a number of additional recommendations including:

- Retain native vegetation and natural stream structure within any future development, where feasible to do so.
- Habitat corridors along the eastern boundaries should be retained to provide for fauna connectivity throughout the landscape. These corridors should be as wide as possible, with a minimum width of retained vegetation of 50 metres.
- Offset losses, using BioBanking or other appropriate method, for all vegetation identified as Class 4 and Class 5 under the Wollondilly Development Control Plan 2011 that will be removed.
- Undertake soil translocation of areas of Shale Sandstone Transition Forest that will be removed into areas of the E4 zone that do not currently support native vegetation.
- Future development of the study area should be undertaken in an ecologically sustainable manner, including 'designing out' unnecessary impacts to identified features, such as the control of urban run-off.
- Exclude and or manage stock to ensure the retention of key habitat resources for the Cumberland Plain Land Snail, including native ground covers, leaf litter and woody debris accumulations within the mapped Shale Sandstone Transition Forest.
- Undertaken targeted surveys for Cumberland Plain Land Snail for any proposed development where the removal of Shale Sandstone Transition Forest cannot be avoided.
- Where the removal of mapped potential habitat and native vegetation corridors is unavoidable, targeted Koala surveys should be undertaken using the Spot Assessment Technique.

Step 4: Final Planning Proposal that considers biodiversity offsets

Following consultation with Biosis, Wollondilly Shire Council, the DPE and OEH between 2013 and 2016, the proponent and SitePlus have redesigned the development to further avoid areas of Shale Sandstone Transition Forest CEEC.

The final Planning Proposal has further resulted in additional measures to avoid and minimise impacts to biodiversity including the increased area dedicated to environmental conservation and further widening of the eastern boundary corridor. The Planning Proposal also proposes E3 - Environmental Management zoning rather than E4 Environmental Living and has identified building envelops adjoining R2 and R3 zones for the development of residential buildings and associated infrastructure such as access roads. E3 zoning is Wollondilly Shire Council's preferred zone for this area, and allows for increased protection of environmental values. Development applications, including the assessment of biodiversity impacts using the information provided herein as a foundation, will need to be lodged to Wollondilly Shire Council prior to the development of these building envelopes.

Vegetation within the proposed development site is highly modified and has been maintained through land management practices including vegetation clearing, ongoing slashing, dumping of soil and horticultural debris and the thinning of understorey. The surrounding establishment of a horticultural business through the centre of the study area fragments stands of vegetation in the north and south. Much of the vegetation within the development site now consists of a mix of remnant trees with an exotic understorey dominated with Lantana and is surrounded by residential dwellings, horticultural practices and a small shopping complex with a service station.

The resulting changes now allow for the retention of 9.67 hectares of Shale Sandstone Transition Forest CEEC and 5.99 hectares of Western Sandstone Gully Forest in the area proposed for E3 zoning.

With the retention of vegetation across the majority of the proposed E3 zoned area through the establishment of a BioBank site, the total CEEC to be removed will be reduced to 10.29 hectares within the development site, with 7.95 hectares meeting red flag criteria. An additional one hectare of Shale Sandstone Transition Forest CEEC is also likely to be impacted to allow for the development of residential buildings in the separate assessment area located within the E3 zone. The removal of this vegetation has been considered herein (Section 8 and Appendix 4 and 5).

Table 13 shows the increase in land identified to be zoned environmental in the progression of this Planning Proposal

Table 13 Summary of environmental zoned land prosposed in each phase of the Planning Proposal

Planning proposal phase	Proposed zoning	Total area of land within environmental zone*
Initial Planning Proposal	E2 Zone	11.5 ha
Revised Planning Proposal	E4 Zone	17 ha
Current Proposal	E3 Zone	21.99 ha

* Data provided by SitePlus

Step 5: Current assessment recommendations

Following the successful rezoning of the study area, development application(s) will be required to subdivide the land and clear vegetation for any future development. The final project footprint (impact area) for the relevant lots will be prepared as part of each development application. It is the intention of the proponents to submit separate BioBanking statement applications for the development of each lot once the Planning

Proposal has been approved. As such, the current BioBanking assessment will require a review and potential update to ensure impacts to biodiversity reflect more detailed designs. It is expected impacts to biodiversity will be lower than or equal to those reflected in this report.

Additional measures to mitigate any residual impacts arising from future development will need to consider the following recommendations:

During construction

- Installation of appropriate exclusion fencing to the boundary of the retained vegetation and any construction areas where there is some potential for accidental encroachment. This would include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'.
- Identification of any 'No Go Zones' in site inductions and a Construction Environmental Management Plan.
- Restriction of construction impacts within the development site, and ensuring no encroachment into retained vegetation results from the development. All material stockpiles, vehicle parking and machinery storage should be located within the areas proposed for clearing, and not in areas of native vegetation that are to be retained.
- Wetting down of areas to reduce dust generation during construction.
- Development of an Ecological Management Plan, for inclusion in a Construction Environmental Management Plan. This Ecological Management Plan should outline measures for staged vegetation clearing to manage fauna species during tree removal, including having a spotter / catcher present. Staged removal involves clearing of understorey vegetation and non-hollow-bearing trees in Stage 1, with removal of hollow-bearing trees in Stage 2. There should be a minimum of 24 to 48 hours between Stage 1 and Stage 2.
- Control of sediment and erosion through the implementation prior to works commencing within the study area (e.g. silt fences, sediment traps), to protect terrestrial and aquatic habitats downstream. These should conform to relevant guidelines, should be maintained throughout the construction period and should be carefully removed following the completion of works.
- Stabilisation of bare ground through the mulching and re-use of native vegetation cleared for the development.
- Implementation of appropriate hygiene protocols including cleaning down work boots, machinery and equipment prior to entering the site, and before being transferred to another site, to minimise the risk of transferring soil-borne pathogens and fungi.
- Relocation of hollows (all sizes) and large branches (>30cm) removed from trees to be placed in areas of retained vegetation for reuse as either hollows attached to trees or logs to be placed on the ground as habitat for ground-dwelling fauna.

Ongoing

- Implementation of stormwater controls within a drainage reserve to minimise impacts to downstream aquatic environments from stormwater run-off.
- Restriction of vegetation clearing within E3 zone for development pads and APZs in consultation with a bushfire consultant.
- Improvement of retained vegetation within a BioBank site, including:

  - Weed removal.
  - Rehabilitation of disturbed areas including the horticultural business to natural vegetation.
  - Increasing large woody debris ground cover.
  - Allowing the overstorey species to regenerate.
  - Avoiding the removing shrubs (plants at an approximate height to 30 cm to 2 metres in height).
- Permanent establishment of fencing surrounding all retained vegetation within the proposed BioBank site to prevent vehicles and discourage residents from disturbing vegetation.
- Informing residents of the proposed large lots located within the E3 zone of ecological values within areas of retained vegetation.

6.1.2 Residual impacts

Throughout the preparation of this biodiversity assessment, SitePlus and Biosis have worked together to design a project that, where possible, avoids and minimises impacts to significant biodiversity features whilst allowing for the development needs of the area. Following this process, the residual impacts to biodiversity are summarised in Table 14 below.

Table 14 Summary of residual biodiversity impacts

Biodiversity feature	Area of impact in the development site	Area of impact in the separate assessment area
Total native vegetation	10.29 ha	1.00 ha
1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	10.29 ha	1.00 ha
Cumberland Plain Land Snail	2.85 ha	0.64 ha
Juniper-leaved Grevillea	5 individuals	None

Additional indirect impacts to adjoining bushland may include:

- Temporary increased noise levels from construction equipment, leading to disturbance of fauna, especially during breeding seasons.
- Permanent increased noise levels from residential development (resulting from more vehicle movements and household noise), leading to disturbance of fauna, especially during breeding seasons.
- Increased levels of light between dusk and dawn, leading to disturbance of nocturnal fauna including forging and breeding behaviour and disturbance to diurnal fauna including sheltering behaviour.

The following vegetated areas will be retained and managed in accordance with the subsequent implementation of the recommendations outlined in Section 6.1.1:

- The retention and restoration of 15.66 hectares of native vegetation within the proposed BioBank site, including 9.67 hectares of 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (equating to the TSC Act listed CEEC Shale Sandstone Transition Forest) and 5.99 hectares of HN564 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney.

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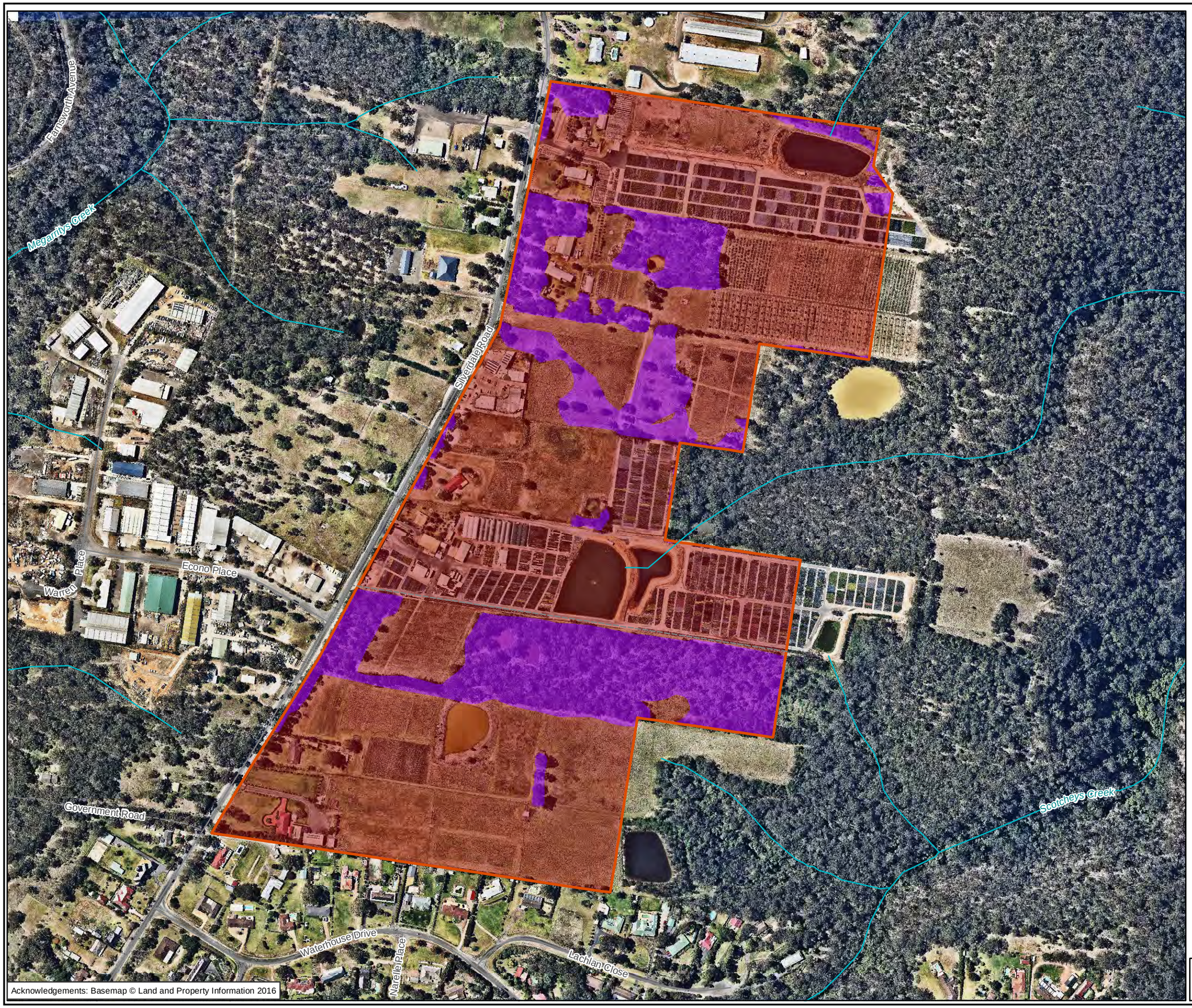
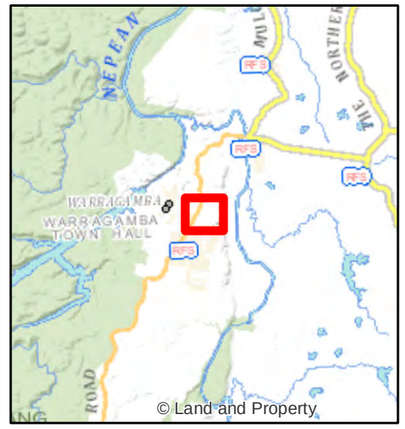
- The retention and restoration of 7.91 hectares of habitat for the Cumberland Plain Land Snail within the proposed BioBank site.
- Retention and improvement of connectivity values provided by the vegetative link between Bents Basin and the Warragamba Special Area through the proposed BioBank site along the eastern boundary of the study area.





Legend

- Development site
- Areas not requiring assessment

Vegetation communities (Biosis 2016)

- 1395 – Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556)

Acknowledgements: Basemap © Land and Property Information 2016

Figure 10: Impacts summary for North Silverdale project, NSW

0 40 80 120 160 200

Metres
Scale: 1:4,500 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 22832
Date: 26 April 2017
Checked by: KJR. Drawn by: ANP. Last edited by: apritchard
Location:P:\22800s\22832\Mapping\Report Figures - Development Site\22832_BBDS_F10_Impacts_20170226

6.2 Impact summary

6.2.1 Impact to Red Flag areas

This section identifies red flag areas in accordance with Section 9.2 of the NSW BioBanking Assessment Methodology (OEH 0214). Red flag areas are mapped in Figure 11.

Landscape features

The study area does not support any 4th, 5th or 6th order streams, estuarine areas, important wetlands, or state or regional biodiversity links.

Native vegetation

A total of 10.29 hectares of the TSC Act listed Critically Endangered Ecological Community (CEEC), *Shale Sandstone Transition Forest in the Sydney Basin Bioregion*, has been mapped within the development site. Shale Sandstone Transition Forest is equivalent to the PCT 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest which is listed as being 80% cleared and listed as a CEEC under the TSC Act.

Of the 10.29 hectares, 2.34 hectares does not constitute as a red flag area due to the condition and low scores as summarised below:

- 0.77 hectares is in low condition with site value score of less than 34 (site value score 13.04).
- 0.92 hectares is a derived native grassland in moderate/good condition with site value score of less than 34 (site value score 21.01).
- 0.65 hectares is a derived native shrubland in moderate/good condition with site value score of less than 34 (site value score 24.64).

The remaining 7.95 hectares proposed to be removed forms part of the following red flag variation (please refer to Section 6.2.2).

Threatened species and populations

The Cumberland Plain Land Snail was detected within the study area during targeted surveys. Within the development site, a total of 2.85 hectares of habitat is considered to occur in areas containing leaf litter accumulations, woody debris and grass tussocks. The species is listed as endangered under the TSC Act. The Cumberland Plain Land Snail is known to occur within the Cumberland IBRA subregion and is considered to be a threatened species that can withstand further loss.

A total of five (5) individuals of Juniper-leaved Grevillea *Grevillea juniperina* subsp. *juniperina* were also detected within the development site. The OEH Threatened Species Online Database states that up to five individuals can be removed with a negligible loss in the Hawkesbury-Nepean Catchment.

Therefore the development site does not support threatened species or populations that cannot withstand further loss, a threatened species not previously recorded in the IBRA subregion or critical habitat listed under Section 55 of the TSC Act. Neither of these threatened species meet the red flag criteria outlined in the BBAM.

6.2.2 Red flag variation

In accordance with the BBAM, to seek a red flag variation an application must be made to the Chief Executive of OEH, with an assessment against relevant determinations set out in Section 9.2.4.1 and Section 9.2.6 (OEH 2014). The Chief Executive of OEH must determine that the viability of biodiversity values in the red flag area is low or not viable depending on the following:

(a) The condition of the vegetation

(b) The size of the area of biodiversity values and its isolation

(c) Current or proposed tenure and zoning under any relevant planning instrument

(d) Current and proposed surrounding land use, and

(e) Whether mechanisms and funds are available to manage low viability sites such that their viability is improved over time.

The above points have been considered in Table 15, which provides an assessment of the red flag area against the relevant criteria accordance with the BBAM. This information has been reviewed by OEH and incorporates comments provided by Ray Giddins (Regional Biodiversity Conservation Officer, Regional Operations Division - Greater Sydney) dated 13 March 2017. Sections 9.2.5 and 9.2.7 are not considered below as the red flag areas do not form part of a landscape feature or a threatened species or population.

Table 15 Summary assessment against relevant criteria to seek a red flag variation

Relevant determinations	Assessment
Paragraph 9.2.4: Options to avoid and minimise impacts on a red flag area must be considered	
Paragraph 9.2.4.1: The Chief Executive of OEH must determine that he or she is satisfied that all reasonable measures have been considered to:	**(a) avoid and minimise the adverse impacts of development on the red flag area(s) consistent with the guidelines set out in Subsection 8.3.2** Measures to avoid and minimise impacts have been considered as part of the Planning Proposal process to rezone the study area. SitePlus prepared a Planning Proposal for the study area on behalf of the owner of Lot 199 and 200 DP1092447, who were the proponents of a rezoning application in 2012 (SitePlus 2012). Kevin Mills & Associates provided preliminary ecological advice to inform the Planning Proposal indicating that development should be sited in the western half of the study area due to the lack of significant ecological features. The assessment also identified that the eastern portion of the site was likely to contain species of ecological significance, and therefore the Planning Proposal should consider the promotion and conservation of this area (Kevin Mills & Associates 2011). As a result, to achieve a balance between meeting the development needs and services provided to the current and future residents of Silverdale and conservation of sensitive ecological values, SitePlus 2012 proposed a mixed rezoning of the site which included all lots discussed within the current proposal. The proposed zoning included the rezoning of the study area to including zones allowing for business, industry and residential areas (B2, IN2, R3 and R2 zones) in the western portion of the lots. The eastern portion, containing remnant vegetation, was proposed to be rezoned to E2 Environmental Conservation. In 2013, the Department of Planning and Environment (DPE) issued a Gateway Determination for the proposal. The Gateway Proposal required that additional consideration to the proposed E4 zoning and the assessment of significant ecological values through a formal flora and fauna assessment. The proponent and SitePlus subsequently redesigned the Planning Proposal to further avoid areas of Shale Sandstone Transition Forest CEEC. The zoning plan was altered to increase the originally very narrow E2 Environmental Conservation zone to a wider E4 Environmental Living zone which allowed for larger lots encompassing both residential dwellings and an increased area for conservation.

Relevant determinations	Assessment
	Biosis prepared a flora and fauna assessment for the revised Planning Proposal (Biosis 2014). Using vegetation mapping data currently available, it has been calculated that the proposed rezoning would have resulted in the potential removal of 13.21 hectares of Shale Sandstone Transition Forest CEEC and 0.03 hectares of Western Sandstone Gully Forest located in B2, B4, R3 and R2 zones. This original plan also proposed the protection of 8.03 hectares of Shale Sandstone Transition Forest CEEC and 6.26 hectares of Western Sandstone Gully Forest in an area proposed for E4 zoning. The Biosis report included a number of recommendations for consideration during the concept design process including the requirement for offsetting areas of vegetation classed 4 and 5 under the *Wollondilly Development Control Plan 2011*. Following consultation with Biosis, Wollondilly Shire Council, the DPE and OEH between 2013 and 2016, the proponent and SitePlus have redesigned the development to further avoid areas of Shale Sandstone Transition Forest CEEC. The final Planning Proposal has further resulted in additional measures to avoid and minimise impacts to biodiversity including the increased area dedicated to environmental conservation and further widening of the eastern boundary corridor. It also proposes E3 - Environmental Management zoning rather than E4 - Environmental Living and has identified likely building envelops adjoining R2 and R3 zones for the development of residential buildings and associated infrastructure. E3 zoning is Wollondilly Shire Council's preferred zoned for this area and allows for increased protection of environmental values. The resulting changes now allow for the retention of 9.67 hectares of Shale Sandstone Transition Forest CEEC and 5.99 hectares of Western Sandstone Gully Forest in the area proposed for E3 zoning. With the retention of vegetation within the majority of the E3 area through the establishment of a BioBank site, the total CEEC to be removed will be reduced to 10.29 ha, with 7.95 ha meeting red flag criteria. An additional one hectare of Shale Sandstone Transition Forest CEEC is also likely to be impacted to allow for the development of residential buildings in the separate assessment area located within the E3 zone. While the total extent of vegetation removal may change in relation to each development application, the removal of this vegetation under the current plan has been considered herein (Section 8 and Appendix 4 and 5). **(b) improve the viability of the biodiversity values of the red flag area. This includes consideration of whether appropriate conservation management arrangements can be established over the red flag area given its current ownership, status under a regional plan, zoning and the likely costs of future management.** The study area is currently zoned RU2 Rural Landscape and B1 Neighbourhood Centre within the *Wollondilly Local Environment Plan 2011*. Wollondilly Shire Council has also incorporated the site within the Wollondilly Growth Management Strategy (Wollondilly Shire Council 2011c) as an area identified for future residential growth and future commercial expansion. The owners of the site therefore wish to consider the proposal for low and medium density residential development and the expansion of the existing retail centre in concert with the identified needs of the current and future residents of Silverdale (SitePlus 2012). Currently, there is residential development to the south, forming part of the existing Silverdale township. The site is subject to further development pressure to support the proposed Western Sydney Airport and associated Sydney Aerotropolis. SitePlus, on behalf of the proponent, has liaised with Wollondilly Shire Council, DPE and OEH to prepare a

Relevant determinations	Assessment
	Planning Proposal that builds on the existing business district that encompasses the Silverdale Shops and provides surrounding R2 and R3 residential development in accordance with the Wollondilly Growth Management Strategy. The DPE issued a Gateway Determination for the proposal in 2013, indicating support for the red flag area to be rezoned. The current zoning of the study area (RU2 and B1) does not provide the long-term protection of significant vegetation, particular that occurring along the eastern boundary. The land is currently under the ownership of a number of landholders who can apply for the removal of this vegetation using a piecemeal approach where cumulative impacts are inadequately considered. The Planning Proposal seeks to provide an E3 zone that conserves the corridor of native vegetation extending along the eastern boundary of the study area and provides connectivity from Bents Basin and the Nepean River in the south through to the Blue Mountains National Park in the north. Vegetation to be retained as part of a proposed BioBank site within this area consists of 9.67 hectares of Shale Sandstone Transition Forest CEEC and 5.99 hectares of Western Sandstone Gully Forest, which will be maintained and managed in perpetuity. The red flag area of the development site consists of areas of moderate/good-poor condition vegetation and areas of moderate/good-medium condition vegetation which are largely made up of highly modified remnants subject to direct impacts from surrounding land practices including ongoing mowing and slashing, dumping of soil, vegetation clearing and firewood collection. This has resulted in simplified patches of vegetation with significantly increased weed levels. The latter is particularly evident in areas mapped in moderate/good-poor condition vegetation with the understorey dominated by Lantana. While these areas are contiguous with vegetation to be retained (particularly in Lot 11 DP 39123), the significant weed infestation and simplified structure of this vegetation zone limit the improvement of viability without substantial management efforts and costs. Areas of moderate/good-medium condition occur as linear and fragmented stands, making long term management challenging. The linear nature of moderate/good-medium condition vegetation means they are subject to significant edge effects, and their isolation means there are limited opportunities for natural regeneration. Given the current condition of vegetation and ongoing disturbances, it is unlikely that management of this vegetation would result in an improvement in the viability of this vegetation without significant management of the site and associated costs.
Paragraph 9.2.6: Additional assessment criteria for PCTs and ecological communities	
Paragraph 9.2.6.1: Where the red flag area contains native vegetation referred to in Paragraph 9.2.2.3 and the proposed development will have an adverse impact on that native vegetation, the Chief Executive of OEH must be satisfied that: **(a) the viability of that red flag area is low or**	**Paragraph 9.2.6.3: In making an assessment that the viability of biodiversity values in a red flag area is low or not viable, the Chief Executive of OEH must be satisfied that at least one of the following factors applies:** *Paragraph 9.2.6.3 (a): The current or future land uses of land surrounding the red flag area (other than the land use proposed in the BioBanking statement application) reduce its viability or make it unviable. Relatively small areas of native vegetation surrounded or largely surrounded by intense land uses, such as urban development, can be unviable or have low viability because of disturbances from urbanisation, including edge effects.* <u>Current land use</u> The development site is located along Silverdale Road at the northern extent of the Silverdale township. The Silverdale shopping complex, including a service station, is already located within the proposed business precinct of the development site. This has resulted in

Relevant determinations	Assessment
not viable in accordance with Paragraph 9.2.6.3 **(b) the contribution to regional biodiversity values of that red flag area is low in accordance with Paragraph 9.2.6.4.**	ongoing impacts to and clearing of vegetation to accommodate ongoing land use. The development site itself contains several existing residential dwellings, horticultural businesses and areas of non-native vegetation with significant disturbance from heavy weed loads. As outlined above, this has resulted in vegetation in the study area experiencing high levels of disturbance and subject to edge effects from adjoining land uses. The red flag area of the development site has been modified by long-term disturbance practices associated with the past and recent use by local residents. Due to the tree age and structure of vegetation, it is apparent that vegetation assigned to be in moderate/good-poor condition has been the subject of past clearing practices. Tree age appears to be approximately 30 years in age and the vegetation structure is now limited to a simplified form. These areas were likely left to regenerate due to the high sandstone influence of the soil, making horticultural practices unviable. Although regeneration is evident in some areas, clearing of vegetation has reduced the long-term viability of these areas which is now evident through the invasion of Lantana in the understorey. The red flag areas assigned to be in moderate/good-medium condition occur as isolated and linear clusters located along the Silverdale Road and amongst horticultural business in the northern portion of the development site. These areas are subject to edge effects both from the road reserve and through the dumping of rubbish and garden clippings by residents. The effect of these impacts is likely to exacerbate over time due to the multiple land uses by multiple landholders to the point where all red flag areas are reduced to having low viability. <u>Future land use</u> Land use that is permissible within the study area under the current zoning is likely to further degrade the vegetation within the red flag area through the continued dumping and spread of weeds from the road verge and residents, the collection of firewood and the encroachment of clearing practices into areas of remnant vegetation. As each lot is individually owned, each landholder can also apply to further clear vegetation within the red flag area using a piecemeal approach. While the removal of vegetation on an individual lot basis may not result in a significant impact, over all lots within the study area the removal of vegetation will result in a significant impact to Shale Sandstone Transition Forest CEEC if not assessed using a holistic approach such as a BioBanking assessment. *Paragraph 9.2.6.3 (b): The size and connectedness of native vegetation in the red flag area to other native vegetation is insufficient to maintain its viability. Relatively small areas of isolated native vegetation can be unviable or have low viability. In considering the size and connectedness, the assessor may consider whether there is less than 30% native vegetation cover within a 0.55 km and 1.75 km radius of the red flag area, or the area to perimeter ratio of the patch size that contains the red flag area.* The development site is located in between two local native vegetation corridors extending north-south. The outer assessment circle has a 47% native vegetation cover which will be reduced to 46% following the removal of the red flag area, and an inner assessment circle that currently contains 41% native vegetation cover which will be reduced to 33% following the removal of the red flag area. The corridor to the west consists of vegetation extending from the Warragamba Special Area, along Megarritys Creek which eventually joins with the Warragamba River approximately 2.5 kilometres north. Connectivity from this corridor to the study area is limited in extent due to existing development associated with the industrial area associated

Relevant determinations	Assessment
	with Econo Place and Warren Place. Silverdale Road also fragments connectivity between the study area and the Megarritys Creek. The Silverdale shopping complex, including a service station, is already located within the proposed business precinct of the development site. This along with the existing residential dwellings, horticultural businesses and areas of non-native vegetation which further limits connectivity between the study area and the Megarritys Creek. The corridor to the east extends along the eastern boundary of the study area and provides connectivity from Bents Basin and the Nepean River in the south through to the Blue Mountains National Park in the north. While vegetation within the eastern portion of the study area is considered to form part of this corridor, this area is proposed to be retained and managed as a BioBank site. Red flag areas in moderate/good-poor condition are simplified versions of Shale Sandstone Transition Forest CEEC with large Lantana infestations. While these areas are contiguous with bushland to be retained in the eastern corridor, they are considered to have low viability that is likely to further decrease without significant management. Moderate/good-medium condition vegetation located within the red flag area represents isolated patches and linear remnants of vegetation surrounded by the existing residential and business infrastructure within the site. As a result of the large area to perimeter ratio of red flag areas, the impact of edge effects including weed invasion, dumping of soil and simplification of community structure are apparent and are likely to further result in the degradation of these area over time to the point where viability is substantially limited. *Paragraph 9.2.6.3 (c): The condition of native vegetation in the red flag area is substantially degraded resulting in loss of, or reduced, viability. Native vegetation in degraded condition can be unviable or have low viability. Degraded condition means vegetation in the vegetation zone where at least half of the site attributes are less than 50% of benchmark as listed in Table 2 of the BBAM without the vegetation being in low condition, or having a site value score of ≤34.* The two vegetation zones forming part of the red flag variation, consisting of 7.95 hectares of Shale Sandstone Transition Forest CEEC, are in poor to medium condition but do not meet the definition of degraded in OEH (2014). Areas containing moderate/good-poor condition vegetation (5.33 hectares with a score of 50.72) support high weed loads and a simplified structure. This is exhibited by the two site attributes greater than 150% of the benchmark and the 67% exotic plant cover score (Table 24 of Appendix 2). Similarly, areas containing moderate/good-medium condition vegetation (2.62 hectares with a score of 61.11) are isolated and fragmented in nature and are subject to edge effects such as weed invasion, dumping of soil and collection of firewood, resulting from the adjoining road verge and horticultural business. Again, this is exhibited by the two site attributes greater than 150% of the benchmark (Table 24 of Appendix 2). While site attributes greater than 150% of the benchmark are not included in the definition of degraded in OEH (2014), all values outside of the benchmark receive a score of 1 or 0. This has resulted in the reduced overall site value scores across the development site. **Paragraph 9.2.6.4: In making an assessment as to whether the contribution of the red flag area to regional biodiversity values is low for the purposes of Paragraph 9.2.6.1, the Chief Executive of OEH must consider the following factors for each PCT that is in that red flag area:** *Paragraph 9.2.6.4 (a): relative abundance – whether the PCT, or the EEC or CEEC in the red flag area is relatively abundant in the region.*

Relevant determinations	Assessment
	As published on 6 July 2016, the OEH online profile for Shale Sandstone Transition Forest CEEC stated that there is 9,950 hectares remaining intact, with this entire remnant occurring within the Sydney Basin IBRA region, as Shale Sandstone Transition Forest is restricted to the margins of the Cumberland Plain. At the regional level the values in current extent for vegetation communities vary greatly with estimates ranging from 33,300 ha remaining (and 40% cleared) for non-threatened PCTs such as *HN564 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain* to 1,100 ha (and 95% cleared) for threatened PCTs such as *HN513 Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain* (Cooks River Castlereagh Ironbark Forest EEC). Shale Sandstone Transition Forest, being a threatened ecological community, sits at the higher end of the total extent remaining and percent cleared for PCTs in the region at 80% cleared. When compared to the extent of other threatened ecological communities occurring in the region using VIS Classification 2.1 (accessed March 2017), the estimated extent remaining for Shale Sandstone Transition Forest CEEC is relatively high, as demonstrated below: • 6,800 ha estimated remaining of *HN528 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain* (forming part of Cumberland Plain Woodland CEEC) which is 95% cleared in the Hawkesbury-Nepean Catchment. • 4,400 ha estimated remaining of *HN529 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain* (also forming part of Cumberland Plain Woodland CEEC) which is 90% cleared in the Hawkesbury-Nepean Catchment. • 1,700 ha estimated remaining of *HN512 Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain* (Shale/Gravel Transition Forest EEC) which is 75% cleared in the Hawkesbury-Nepean Catchment. • 1,100 ha estimated remaining of *HN513 Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain* (Cooks River Castlereagh Ironbark Forest) which is 95% cleared in the Hawkesbury-Nepean Catchment. When compared to other vegetation types in the region, Shale Sandstone Transition Forest would be relatively common and considered to be relatively abundant. *Paragraph 9.2.6.4 (b): percent remaining is high – that the percent remaining of the PCT, or the EEC or CEEC, in the red flag area is relatively high for the region* 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (Shale Sandstone Transition Forest) is currently 80% cleared in the Hawkesbury-Nepean Catchment, and is therefore not considered to be a highly cleared vegetation type in accordance with Section 9.2.3.2 of OEH (2014). It is considered that 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest is also 80% cleared within the Cumberland IBRA subregion. Following development, the percent remaining will be reduced by 0.08% (calculated from the removal of 7.95 ha of the estimated 9,950 ha remaining). Therefore the percent remaining will remain relatively unchanged. *Paragraph 9.2.6.4 (c): percent native vegetation (by area) remaining is high – that the percent remaining of all native vegetation cover in the region is relatively high* 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest is currently

Relevant determinations	Assessment
	80% cleared in the Hawkesbury-Nepean region. The native vegetation extent documented in the Hawkesbury-Nepean Catchment is 70% according to the State of the catchments report for native vegetation within the Hawkesbury-Nepean region (NSW Government 2010). According to Section 9.2.3.2 of OEH (2014), 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest is not considered to be a highly cleared vegetation type and there is a relatively high percent of vegetation remaining in the Hawkesbury-Nepean Catchment. Similarly, the Mitchell Landscape is estimated to be 41% cleared, with native vegetation cover estimated to be 56%. There is a 47% native vegetation cover in the 1000 ha outer assessment circles which will be reduced to 46% cent following the proposal. Thus, following development, the percent native vegetation within the outer assessment circle will remain relatively unchanged. *Paragraph 9.2.6.4 (d): condition of the PCT – whether the PCT or the EEC/CEEC that comprises the red flag area is generally in moderate to good condition in the region.* Shale Sandstone Transition Forest CEEC of the study area is in similar condition to that occurring in the region (scoring 50.72 and 61.11 out of 100). These areas however are currently under threat from ongoing slashing, limited recovery from past land clearing practices, weed invasion (namely Lantana), dumping of soil and debris from horticultural practices and edge effects from surrounding land uses. These impacts are beginning to show in the site scores with site attributes sitting outside of the benchmark reducing the condition of the vegetation over time.

The main rational for seeking a red flag variation is the current and future land use of the study area and the highly modified condition of the vegetation. The section of the study area supporting the red flag area is currently zoned RU2, and is proposed to be rezoned to R2, R3, B2 and B4. Retention of vegetation conforming to the red flag criteria (namely those areas mapped in moderate/good-poor and moderate/good-medium condition) within a residential matrix is not viable without significant management and associated costs. Finally, 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556) is currently 80% cleared, and is therefore not a highly cleared vegetation type, as outlined in Section 9.2.3.2 of OEH (2014).

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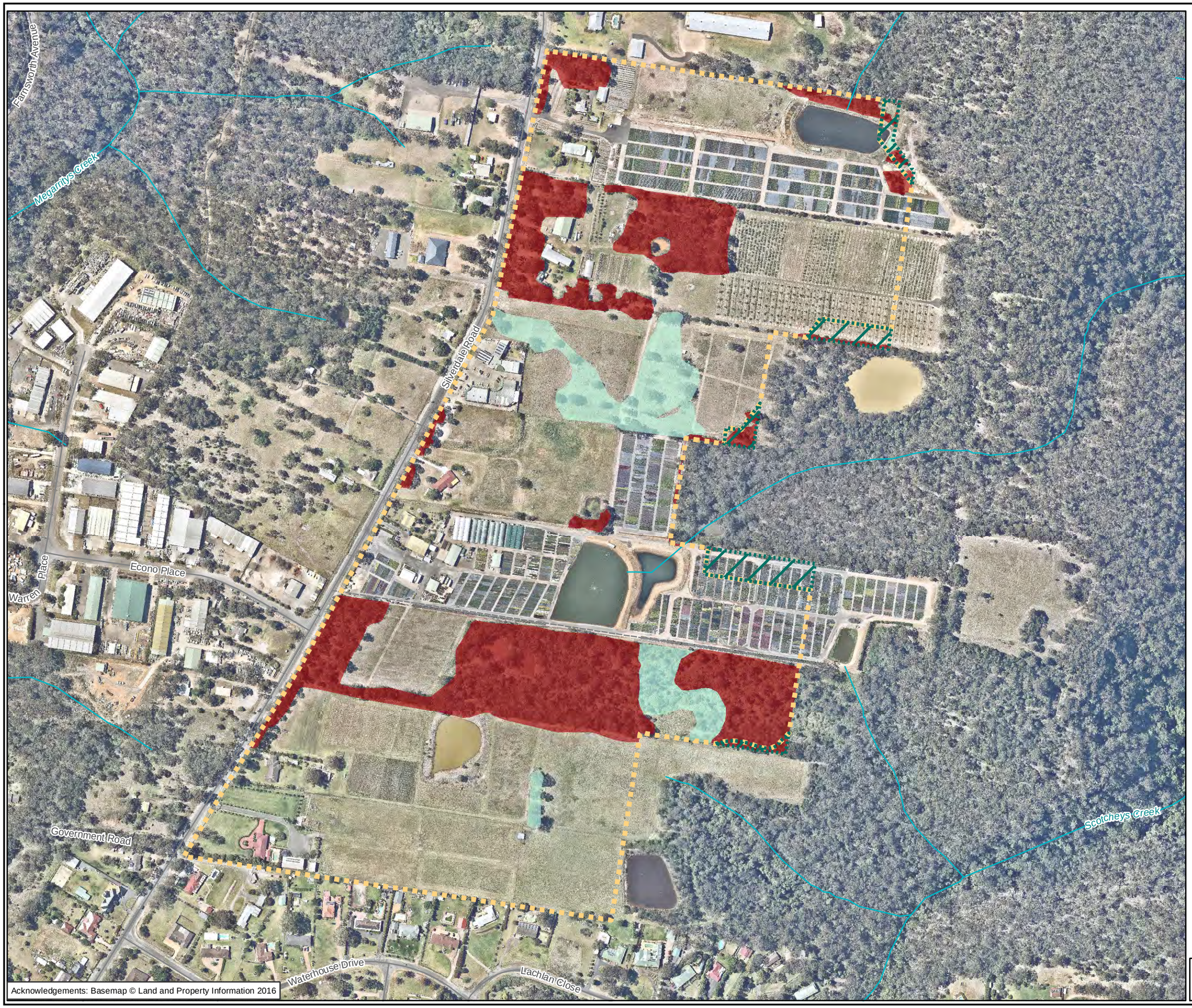

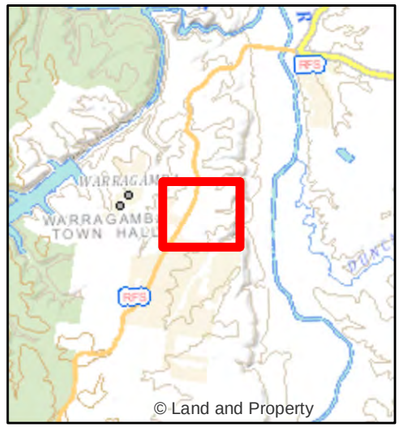

Legend

- Development area
- Development area, APZ
- Red flag area
- Does not meet red flag criteria

Figure 11: Red flag areas located within the development site

0 40 80 120 160 200

Metres
Scale: 1:4,200 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

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Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

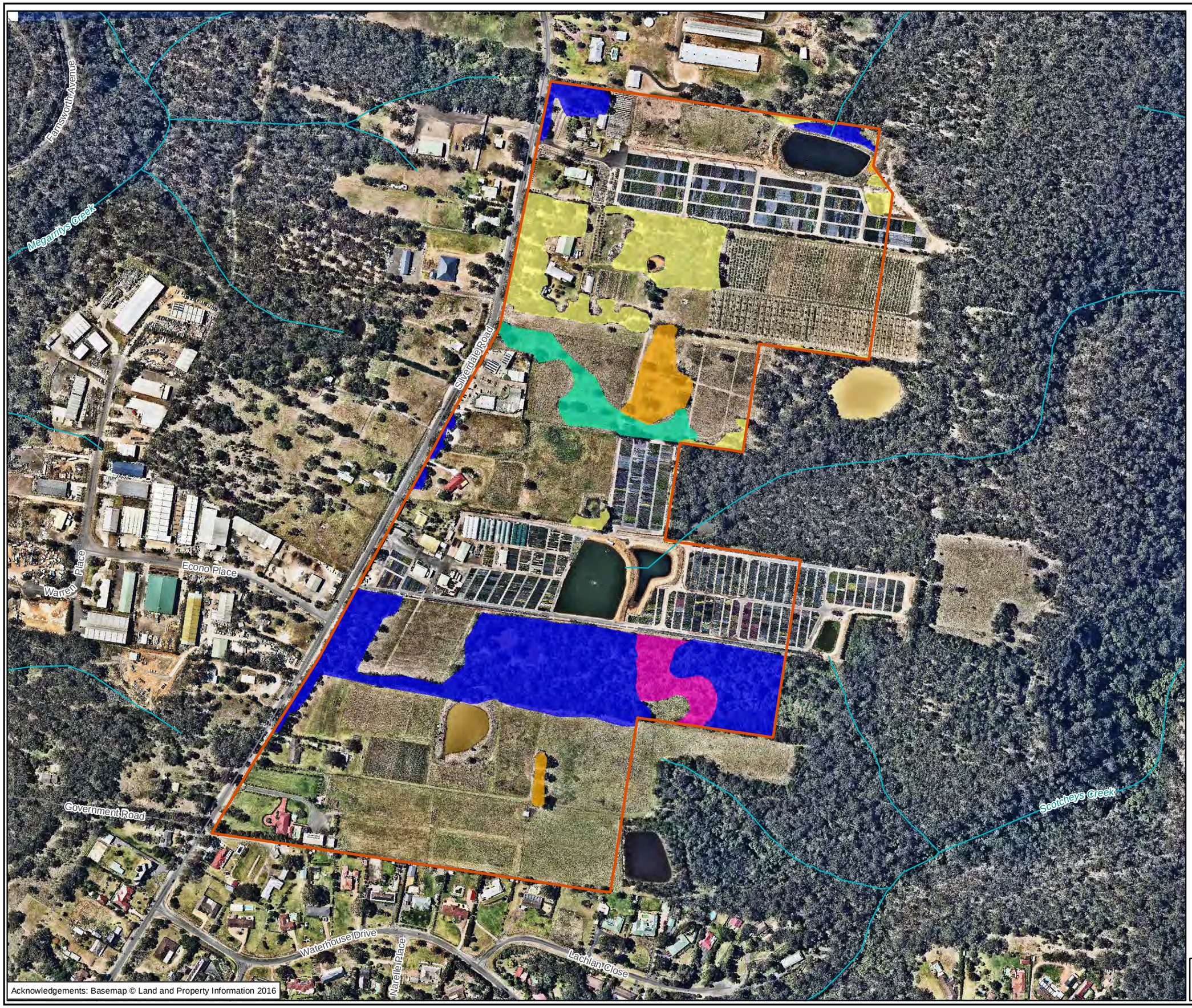
Matter: 22832
Date: 26 April 2017,
Checked by: KJR, Drawn by: ANP, Last edited by: apritchard
Location:P:\22800s\22832\Mapping\Report Figures - Development Site\22832_BBDS_F11_RedFlag_20170226

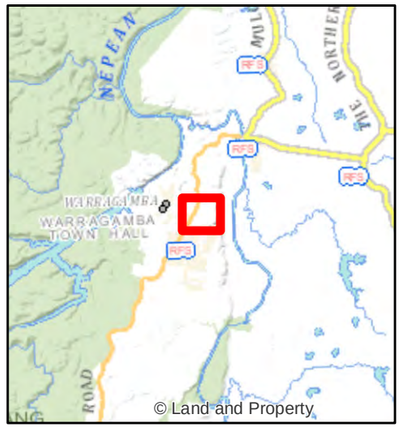
6.2.3 Impacts to Plant Community Types

This section provides an assessment of PCTs requiring offsets in accordance with Section 9.3 of the BBAM. Five management zones (identical to the vegetation zones) have been delineated (Table 16), based on the PCT, condition and future land use. All vegetation within the development site and associated management zones (Table 16 and Figure 12) will be cleared, with all site attribute scores set to 0 to represent total loss.

Table 16 Summary of management zones located within the proposed development site

Management Zone	Vegetation zone	Area (ha)	Plant Community Type	Condition	Ancillary code
MZ1	**1**	0.77	1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Low	Poor
MZ2	**2**	0.92	1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Moderate/ Good	Derived grassland
MZ3	**3**	0.65	1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Moderate/ Good	Other
MZ4	**4**	5.33	1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Moderate/ Good	Poor
MZ5	**5**	2.62	1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Moderate/ Good	Medium
Total					**10.29**





Legend

Development site

Management zone

- MZ1
- MZ2
- MZ3
- MZ4
- MZ5

Acknowledgements: Basemap © Land and Property Information 2016

Figure 12: Location of management zones within the development site

0 40 80 120 160 200

Metres
Scale: 1:4,500 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

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Date: 27 April 2017
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Location:P:\22800s\22832\Mapping\Report Figures - Development Site\22832_BBDS_F12_ManagementZones_20170226

6.2.4 Impacts to threatened species

This section provides an assessment of threatened species requiring offsets in accordance with Section 9.3 of the BBAM.

Based on the outcomes of Section 5.4, offsets are required for loss of 2.85 hectares of known habitat for Cumberland Plain Land Snail. The quantum of credits is outlined in Section 7.

6.2.5 Areas not requiring assessment

This section provides an assessment of those areas that do not require an offset in accordance with Section 9.4 of the BBAM. These areas include the following and do not require further assessment:

- Bare ground
- Sealed roads
- Waterbodies
- Weeds and exotics
- Planted vegetation

Areas not mapped as a PCT are mapped in Figure 10 and are not assessed as native vegetation, and do not provide habitat for threatened species.

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7 Biodiversity credits

This section provides a summary of biodiversity credits required to impact on the biodiversity values within the development site, following consideration of measures to avoid, minimise and mitigate impacts.

Table 17 provides a summary of ecosystem credits resulting from the proposed development. The full credit profile is provided in Appendix 6.

Table 17 Summary of ecosystem credits for all management zones

Vegetation Zone	PCT code	Plant community type name	Red flag	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits required for threatened species	Threatened species TS with highest credit required	Threatened species offset multiplier	Ecosystem credits required
1	HN556	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	No	0.77	16.80	13.04	3.0	11	Masked Owl	3.0	11
2	HN556	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	No	0.92	16.80	21.01	3.0	18	Sooty Owl	3.0	18
3	HN556	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	No	0.65	16.80	24.64	3.0	15	Sooty Owl	3.0	15
4	HN556	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Yes	5.33	16.80	50.72	3.0	226	Sooty Owl	3.0	226
5	HN556	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey	Yes	2.62	16.80	61.11	3.0	131	Sooty Owl	3.0	131

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Vegetation Zone	PCT code	Plant community type name	Red flag	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits required for threatened species	Threatened species TS with highest credit required	Threatened species offset multiplier	Ecosystem credits required
		Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion									

Table 18 Summary of species credits for all management zones

Scientific name	Common name	Red flag	TS offset multiplier	Species credits required
***Meridolum* corneovirens**	Cumberland Plain Land Snail	No	1.3	37
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	No	2.0	100

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The current credit report for the Planning Proposal provides prospective buyers with the surety that biodiversity values have been considered. It will be used as a point of reference or foundation to build on for the development applications to clear the land following the successful rezoning of the land.

In the event that impacts remain unchanged as part of future developments, each lot owner will be required to acquire the credits listed in Table 19. The table also shows the likely credits generated at the proposed BioBank site. The owners may act separately or in concert in submitting the BioBanking agreement application.

Table 19 Breakdown of credits required per lot.

Location and vegetation type	Credits required	Credits generated at proposed BioBank site
Lot 10 DP38123		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	1	3
Cumberland Plain Land Snail	0	1
Lot 11 DP38123		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	197	8
HN564 Red Bloodwood - Grey Gum woodland	0	2
Juniper-leaved Grevillea	60	0
Cumberland Plain Land Snail	35	2
Lot 121 DP747833		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	20	23
HN564 Red Bloodwood - Grey Gum woodland	0	9
Cumberland Plain Land Snail	0	13
Lot 122 DP747833		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	1	7
HN564 Red Bloodwood - Grey Gum woodland	0	20
Cumberland Plain Land Snail	0	2
Lot 199 DP1092447		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	2	0
Lot 2 DP519533		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	37	15

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Location and vegetation type	Credits required	Credits generated at proposed BioBank site
HN564 Red Bloodwood - Grey Gum woodland	0	12
Cumberland Plain Land Snail	2	8
Lot 200 DP1092447		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	7	38
HN564 Red Bloodwood - Grey Gum woodland	0	1
Juniper-leaved Grevillea	40	0
Cumberland Plain Land Snail	0	22
Lot 6 DP1086326		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	30	5
HN564 Red Bloodwood - Grey Gum woodland	0	9
Lot 7 DP38123		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	106	0
HN564 Red Bloodwood - Grey Gum woodland	0	6
Lot A DP161634		
HN556 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest	1	0

Figure 13 shows the native vegetation and Cumberland Plain Land Snail habitat mapping from which the Table 19 credits were generated from within the proposed E3 zone conservation area. This calculation excludes the separate assessment area and is based on a partial credit generation for areas within APZ. It is the intention of the landowners to lodge separate BioBanking agreement applications for each lot in order to proceed with the generation of credits separately. This will done in consultation with OEH.

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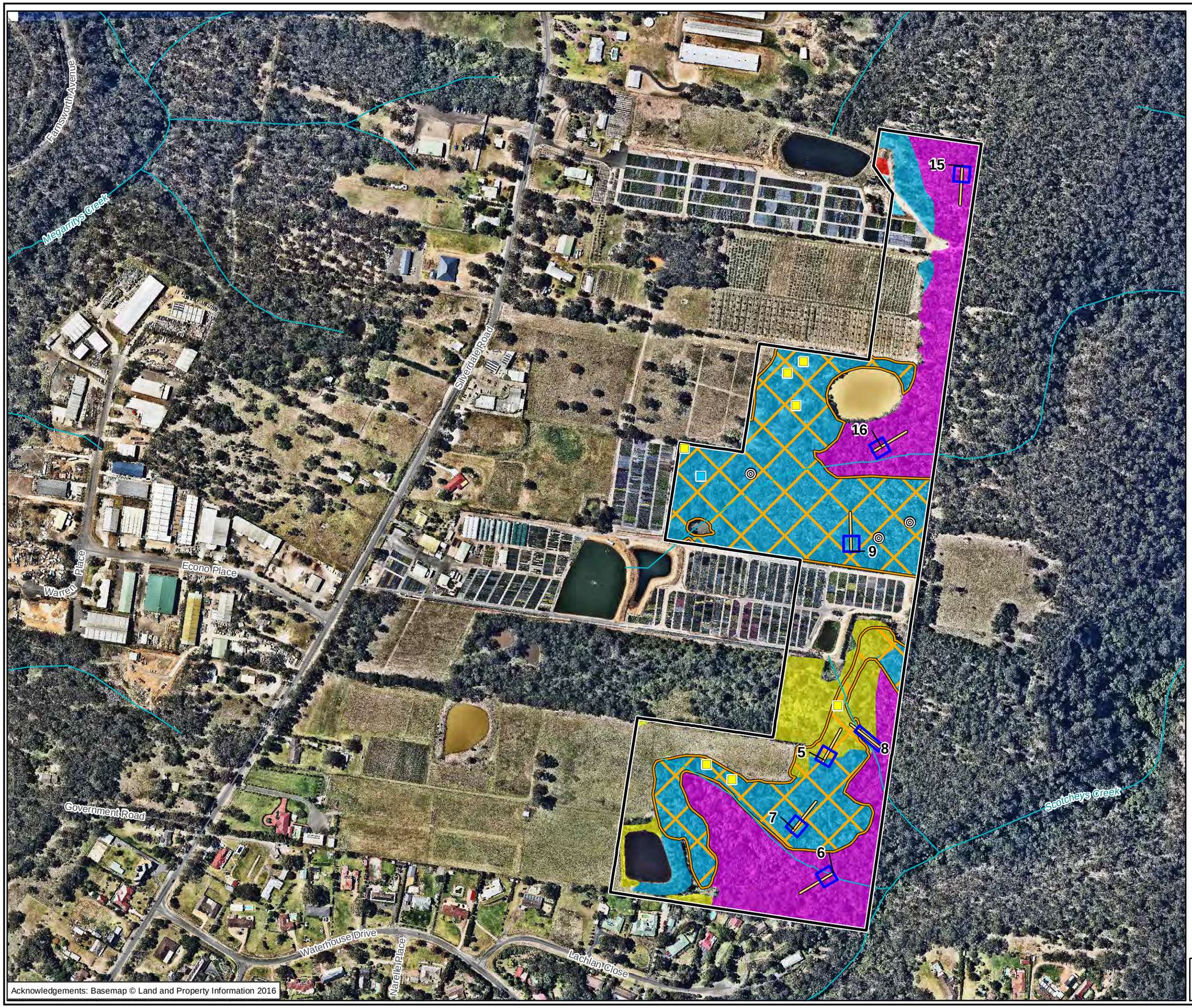

Legend

E3 zone

Quadrat

Transect

Vegetation communities (Biosis 2016)

1081 – Red Bloodwood - Grey Gum woodland (HN564)

Moderate/good, Medium

1395 – Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556)

Low, Poor

Moderate/good, Derived shrubland

Moderate/good, Medium

Moderate/good, Poor

Cumberland Plain Land Snail

Current survey (Biosis 2016)

Shell

Shell fragment

Cumberland Plain Land Snail habitat

Previous survey (Mills 2011)

Cumberland Plain Land Snail

Figure 13: Biosis mapped native vegetation within the proposed E3 zone

0 40 80 120 160 200

Metres

Scale: 1:4,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 22832
Date: 26 April 2017
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Location:P:\22800s\22832\Mapping\Report Figures - Development Site\22832_BBDS_F13_BiosisVeg_E3_20170226

8 Assessment of biodiversity legislation

8.1 Environment Protection and Biodiversity Conservation Act 1999

An assessment of the impacts of the proposed development on Matters of NES, against heads of consideration outlined in Matters of National Environmental Significance - Significant Impact Guidelines 1.1 EPBC Act (Commonwealth of Australia 2013), was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. Matters of NES relevant to the project are summarised in Table 20.

Table 20 Assessment of the project against the EPBC Act.

Matter of NES	Project specifics	Potential for significant impact
Threatened species (flora and fauna)	Twenty-one (21) flora species and 21 fauna species have been recorded or are predicted to occur in the locality. Following targeted surveys, none of these species are considered a medium or high likelihood of occurrence within the study area.	Significant impact unlikely to result from the proposed development.
Threatened ecological communities	The EPBC Act listed CEEC Shale Sandstone Transition Forest is mapped within the study area. The proposed development will result in the permanent removal of 9.52 ha of this CEEC.	On the basis of potential for significant impacts on Shale Sandstone Transition Forest CEEC, the EPBC Act is likely to be triggered and referral of the proposed action to the Australian Government Minister for the Environment is recommended with the future development applications relating to the study area.
Migratory species	Fourteen migratory species have been recorded or are predicted to occur in the locality. The study area does not provide important habitat for an ecologically significant proportion of any of these species.	Significant impact unlikely to result from the proposed development.
Wetlands of international importance (Ramsar sites)	There are 12 Ramsar sites in NSW, the closest one being the Towra Point Nature Reserve on the Kurnell Peninsula in Sydney. The study area does not flow directly into a Ramsar site and the development is not likely to result in a significant impact.	Significant impact unlikely to result from the proposed development.

Shale Sandstone Transition Forest within the study area was assessed against the condition thresholds listed in the Approved Conservation Advice (including listing advice) for *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* (Commonwealth of Australia 2014). The patch size within the study area is considered to be greater than 0.5 hectares, with this vegetation being part of a larger patch of native vegetation over 1000 hectares in size. Shale Sandstone Transition Forest within the study area is assessed as being in moderate and high condition (see Table 5). The removal of this vegetation would result in a significant impact

on this CEEC. Referral to the Commonwealth Minister for the Environment is recommended when development applications are prepared for the development site and separate assessment areas.

8.2 Environmental Planning and Assessment Act 1979

8.2.1 Wollondilly Development Control Plan

The portion of the study area located within Lots 121 and 122 of DP 747833 is included within the *Natural Resources – Water Map* and is therefore considered to be 'sensitive land' under the WLEP 2011. The *Wollondilly Development Control Plan 2016* requires that a survey be undertaken to measure a 10 metre buffer distance from the top of the bank either side of the watercourse and that suitable measures must be undertaken to avoid, minimise or mitigate any adverse impacts to these areas. While the tributary doesn't fall within the proposed development site or the separate assessment, 340 metres of the mapped tributary is located within the proposed BioBank site, including 60 metres in the APZ. When development applications are lodged, due consideration will be required to be given in addressing these matters in the final development proposal.

No areas within the study area are mapped as 'sensitive land' on the *Natural Resources – Biodiversity Map*.

8.3 Threatened Species Conservation Act 1995

The TSC Act provides for the protection and conservation of biodiversity in NSW through the listing of threatened biota; key threatening processes; and critical habitat for threatened biota.

Native vegetation within the proposed access roads and building envelopes of the E3 - Environmental Management zone will require removal of native vegetation and habitat for the Cumberland Plain Land Snail. These areas are not assessed and offset within this BioBanking assessment given the restrictions under Clause 11 of the BioBanking Regulation and TSC Act. Further consideration has been given to threatened species, population and ecological communities that are known to occur within this area to provide surety to prospective buyers that these environmental values have been considered.

Of the 2.69 hectares of the proposed building envelopes and associated clearing of the E3 zone (referred to as the separate assessment area herein), one hectare contains native vegetation consistent with the listing of Shale Sandstone Transition Forest CEEC. Of this one hectare of native vegetation, 0.64 hectares contains habitat for the Cumberland Plain Land Snail. As this area does not form part of the BioBanking assessment, impacts to the threatened biota were assessed through the AoS process under Section 5A of the EP&A Act.

An AoS has been prepared for each of the following threatened biota:

- Shale Sandstone Transition Forest.
- Cumberland Plain Land Snail.

They indicate that a significant impact is not likely to result from the future development of these areas. A SIS for the area of proposed building envelopes and associated clearing within the E3 zone is therefore not required.

8.4 Water Management Act 2000

Under the WM Act an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt (WM Act, section 91E). Following the successful rezoning of the study area, any development application will need to consider the works and activities that are permissible on waterfront

land and in riparian corridors in accordance with the riparian corridor matrix provided in the *Guidelines for riparian corridors on waterfront land* (NSW Office of Water 2012).

In summary, the following works are permissible within first order streams and associated 10 metre in riparian corridors occurring within areas of proposed development (proposed construction footprint, APZs and the separate assessment area):

- Riparian corridor (RC) off-setting for non RC uses such as Asset Protection Zones within the outer 50% of the VRZ.
- Cycleways and paths.
- Bio-retention basins (including those online).
- Stormwater outlet structures and essential services.
- Stream realignment.
- Road crossings (including over road, culverts and bridges).

Provided works are consistent with the above, a Controlled Activity Approval from the NSW Department of Primary Industries would not be required for future development.

8.5 Native Vegetation Act 2003

Following the successful rezoning of the study area, the construction of each dwelling within the proposed building envelopes and associated vegetation clearing located in the E3 - Environmental Management zone (referred to as the separate assessment area herein) will require development consent from Wollondilly Shire Council. Clause 49 of the *Native Vegetation Regulation 2013* states that:

(1) The clearing of native vegetation in carrying out the following development is a routine agricultural management activity if development consent is required under the EPA Act for the clearing and the clearing is carried out in accordance with that consent:

> *(a) development for the purpose of a dual occupancy, a dwelling house, a secondary dwelling, a semi-detached dwelling or a rural worker's dwelling (within the meaning of the Standard Instrument (Local Environmental Plans) Order 2006),*
>
> *(b) development that is ordinarily incidental or ancillary to such development.*

Therefore, provided development consent is sought from Wollondilly Shire Council, approval for clearing of vegetation in these areas from Local Land Services (LLS) will not be required.

The loss of vegetation from this area has not been included in the current offset calculations, as clearing of native vegetation requiring approval under the NV Act is not development for which BioBanking is available.

To provide surety to prospective buyers, consideration has been given to threatened species, populations and ecological communities that may be impacted by the removal of this vegetation in Appendix 4 and 5.

8.6 Noxious Weeds Act 1993

The NW Act was enacted to provide for the identification, classification and control of noxious weeds. Plants declared as noxious weeds are currently listed under Weed Control Order No. 28 Declaring Certain Plants to be Noxious Weeds published in the New South Wales Government Gazette No. 97 (Department of Premier and Cabinet 2011).

Declared noxious weeds identified in the study area, their control class and legal requirements for each are outlined in Table 21. Treatment for the noxious weeds listed above is recommended within NSW DPI (2011).

Table 21 Noxious weeds recorded within the study area.

Scientific name	Common name	Control class	Legal requirement
Asparagus aethiopicus	Asparagus Fern	4	The plant must not be sold, propagated or knowingly distributed
Asparagus asparagoides	Bridal Creeper	4	The plant must not be sold, propagated or knowingly distributed
Gleditsia triacanthos	Honey Locust	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Senecio madagascariensis	Fireweed	4	The plant must not be sold, propagated or knowingly distributed
***Rubus fruiticosus* sp aggregate**	Blackberry	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed

9 Conclusion

This assessment has been completed in accordance with the BBAM on behalf of SitePlus and their client, North Silverdale Centre Landowner Group.

The Planning Proposal will allow for the rezoning of 68.09 hectares of privately owned land located along Silverdale Road, North Silverdale. The future development of this area, via a development application to Wollondilly Shire Council, will result in a loss of native vegetation and fauna habitat, with 10.29 hectares of vegetation to be permanently removed. This includes the permanent clearing of 10.29 hectares of 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest which equates to the CEEC Shale Sandstone Transition Forest listed under the TSC Act and 9.52 hectares of the CEEC listed under the EPBC Act.

The development site also supports a total of 2.85 hectares of habitat for the Cumberland Plan Land Snail and five individuals of Juniper-leaved Grevillea, of which all will be removed. The development site also provides habitat for a number of ecosystem credit species.

An additional one hectare of 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest and 0.64 hectares of Cumberland Plain Land Snail habitat will be removed within the proposed E3 - Environmental Management zone to allow for the building envelopes and associated development of residencies in this area. In accordance with Section 127ZJ of the TSC Act and Clause 11 of the BioBanking Regulation, this area has been assessed as a separate matter under Section 5A of the EP&A Act. An AoS and SIC (Appendix 4 and 5) have concluded that the removal of vegetation and threatened species habitat within the separate assessment area will not result in a significant impact.

Measures to avoid and minimise impacts to vegetation were considered during the Planning Proposal for the rezoning of the study area, with additional impact minimisation and mitigation measures considered over a four stage processes undertaken by SitePlus and the proponents to arrive at the current layout of the Planning Proposal.

1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556) is a red flag area. A red flag variation application is outlined in Section 6.2.2.

The impacts to native vegetation and species habitat will require retirement of the following credits:

- Removal of 10.29 hectares of Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion = 401 ecosystem credits.
- The removal of 2.85 hectares of habitat for the Cumberland Plain Land Snail = 37 species credits.
- The removal of five individuals of Juniper-leaved Grevillea = 100 species credits.

Credits will be purchased and retired under the NSW BioBanking scheme. Given that the majority of the E3 - Environmental Management zone will be retained for conservation purposes, the preparation of a BioBanking Agreement of this land will result in the generation of a number of the above credits required. Biosis therefore recommends that the landowners development BioBanking Agreements for this area in consultation with OEH.

Given this BAR has been prepared to inform a Planning Proposal, it will require a revision and updating prior to landowners lodging their separate development applications to Wollondilly Shire Council. Additional approval will be required under the EPBC Act, including referral of the project to the Commonwealth Minister for the Environment and Energy when the development applications are lodged with Council.

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Appendices

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Appendix 1 Survey methods

Appendix 1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1990, Harden 1991, Harden 1992, Harden 1993, Harden 2002). All doubtful species names were verified with the on-line Australian Plant Name Index (Australian National Botanic Gardens 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Appendix 2.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the Commonwealth Department of Environment (DoE) (DEWHA 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the fauna list in Appendix 3.

Appendix 1.2 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by the Office of Environment and Heritage under the National Parks and Wildlife Act 1974 (SL100758, expiry date 31 March 2018). Fauna survey was conducted under approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2018).

Appendix 1.3 Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The current flora and fauna assessment was conducted in spring, which is an optimal time for survey. Table 22 provides the recommended survey periods for species credit species targeted during surveys of the development site. The green cells represent when surveys were undertaken which is the optimal time for all species targeted. Surveys for the remaining species were considered to be unnecessary as no habitat was available to survey.

Database searches, and associated conclusions on the likelihood of species to occur within the study area, are reliant upon external data sources and information managed by third parties.

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Table 22 Species credit species required survey timing (sourced from the online BioBanking calculator).

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bargo Geebung	*Persoonia bargoensis*	Yes	Yes	Yes	Yes	Yes							**Yes**
Brown Pomaderris	*Pomaderris brunnea*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Bynoe's Wattle	*Acacia bynoeana*	Yes	Yes	Yes						Yes	Yes	**Yes**	**Yes**
Cumberland Plain Land Snail	*Meridolum corneovirens*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Deane's Paperbark	*Melaleuca deanei*	Yes	Yes										**Yes**
Dillwynia tenuifolia	*Dillwynia tenuifolia*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
***Dillwynia tenuifolia* (a shrub) population, Kemps Creek**	*Dillwynia tenuifolia - endangered population Kemps Creek*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Downy Wattle	*Acacia pubescens*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Eastern Pygmy-possum	*Cercartetus nanus*												
Epacris purpurascens* subsp. *purpurascens	*Epacris purpurascens* subsp. *purpurascens*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Gang-gang Cockatoo population, Hornsby and Ku-ring-gai Local Government Areas	*Callocephalon fimbriatum population in the Hornsby and Ku-ring-gai Local Government Areas*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Giant Burrowing Frog	*Heleioporus australiacus*	Yes	Yes	Yes	Yes	Yes				Yes	Yes	**Yes**	**Yes**
Green and Golden Bell Frog	*Litoria aurea*	Yes	Yes	Yes					Yes	Yes	Yes	**Yes**	**Yes**
Grevillea parviflora* subsp. *supplicans	*Grevillea parviflora subsp. supplicans*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Gyrostemon	*Gyrostemon*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
thesioides	*thesioides*												
Hairy Geebung	*Persoonia hirsuta*	Yes	Yes	Yes	Yes	Yes							**Yes**
Koala	*Phascolarctos cinereus*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Leucopogon fletcheri* subsp. *fletcheri	*Leucopogon fletcheri* subsp. *fletcheri*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
***Marsdenia viridiflora* subsp. *viridiflora* in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas**	*Marsdenia viridiflora* subsp. *viridiflora - endangered population*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Matted Bush-pea	*Pultenaea pedunculata*									Yes	Yes	**Yes**	
Nodding Geebung	*Persoonia nutans*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Pimelea curviflora* subsp. *curviflora	*Pimelea curviflora* subsp. *curviflora*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Red-crowned Toadlet	*Pseudophryne australis*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Regent Honeyeater	*Anthochaera phrygia*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Small-flower Grevillea	*Grevillea parviflora subsp. parviflora*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Squirrel Glider	*Petaurus norfolcensis*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**	**Yes**
Sydney Plains Greenhood	*Pterostylis saxicola*									Yes	Yes	**Yes**	
Tetratheca glandulosa	*Tetratheca glandulosa*							Yes	Yes	Yes	Yes	**Yes**	

Appendix 2 Native vegetation data (BioBanking)

Appendix 2.1 Plot and transect summary

Table 23 Flora species recorded from the study area and BioBanking plot.

Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Acacia binervia	x								
Acacia decurrens	x		x					x	
Acacia implexa				x			x		
Acacia parramattensis	x	x		x	x	x	x		
Acacia trinervata	x								
Allocasuarina littoralis		x					x		
Allocasuarina torulosa								x	
Andropogon virginicus						x		x	
Araujia sericifera	x	x		x					
Aristida vagans	x	x	x		x		x	x	
Asparagus aethiopicus		x							
Austrostipa pubescens								x	
Austrostipa rudis								x	
Axonopus fissifolius					x	x		x	
Bidens pilosa		x		x	x		x	x	x
Briza minor						x			
Briza subaristata	x			x	x	x			x

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Bromus molliformis						x			
Brunoniella australis		x	x				x		x
Bursaria spinosa	x	x			x		x		x
Caesia parviflora					x				
Calotis cuneifolia	x		x					x	
Calotis dentex							x		
Carex inversa						x			x
Centaurium erythraea						x			
Centaurium tenuiflorum					x				x
Centella asiatica				x	x		x		x
Cheilanthes sieberi					x		x	x	x
Cheilanthes sieberi* subsp. *sieberi	x	x							
Cirsium vulgare						x			
Conyza bonariensis	x				x	x	x	x	x
Cymbopogon refractus						x			
Cynodon dactylon						x			
Daviesia ulicifolia	x				x			x	
Desmodium gunnii							x		

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Desmodium rhytidophyllum	x								x
Dianella caerulea	x								
Dichelachne micrantha	x		x		x		x		
***Dichelachne* sp**						x			
Dichondra repens	x	x	x	x		x	x		x
Digitaria ramularis								x	
Dodonaea triquetra	x								
Echinopogon caespitosus							x	x	x
Echinopogon ovatus	x		x						
Ehrharta erecta	x	x							
Einadia trigonos				x					
Entolasia marginata	x	x	x				x		
Entolasia stricta					x			x	
Eragrostis brownii					x				
Eragrostis curvula	x				x	x		x	
Eragrostis leptostachya			x		x				
Eucalyptus crebra	x	x	x		x		x		x
Eucalyptus eugenioides	x								

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Eucalyptus fibrosa* subsp. *fibrosa	x								
Eucalyptus globoidea							x		x
Eucalyptus punctata		x	x	x			x		
Euchiton sphaericus									x
Gahnia aspera	x	x	x		x		x	x	x
***Gamochaeta* sp**					x				x
Geranium homeanum				x					
Glycine clandestina	x			x	x		x		
Glycine microphylla		x	x				x		
Glycine tabacina	x							x	x
Gomphocarpus fruticosus				x		x			
Gonocarpus tetragynus					x				
Goodenia hederacea	x						x		x
Grevillea mucronulata								x	
Hardenbergia violacea	x						x		
Hibbertia aspera							x		
Hibbertia pedunculata							x		
Hypericum gramineum					x		x		x

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Hypochaeris radicata				x	x	x	x	x	x
Juncus cognatus						x			
Juncus usitatus						x			
Kunzea ambigua							x		
Lachnagrostis filiformis									x
Lantana camara	x	x	x	x		x		x	x
Laxmannia gracilis					x		x		x
Lepidosperma laterale							x	x	
Leptospermum polygalifolium					x				
Lissanthe strigosa* subsp. *strigosa	x								
Lomandra filiformis subsp. coriacea								x	x
Lomandra glauca	x				x		x		x
Lomandra longifolia								x	
Lomandra multiflora	x				x		x	x	
Lotus angustissimus						x			
Malus sp						x			

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Melia azedarach								x	
Mentha diemenica	x								
Microlaena stipoides	x	x	x	x		x	x	x	x
Notelaea longifolia	x							x	
Olea europaea subsp. cuspidata		x							
Opercularia diphylla							x		
Oplismenus aemulus		x		x			x	x	
Oxalis perennans				x					
Ozothamnus diosmifolius	x	x	x						
Panicum simile			x				x		
Paspalidium aversum	x								
Paspalum dilatatum				x		x			
Passiflora herbertiana* subsp. *herbertiana	x	x	x						
Pennisetum clandestinum				x		x			
Plantago lanceolata	x			x	x	x			x
Poa labillardierei							x		
Podolobium scandens							x		x

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Polymeria calycina							x		
Pomax umbellata							x		
Poranthera microphylla							x		x
Pratia purpurascens	x	x		x	x		x		
Pteridium esculentum						x			
Rumex brownii				x					
Rytidosperma tenuius	x				x				x
Schoenus apogon					x	x	x		
Senecio madagascariensis	x		x	x	x	x	x	x	x
Sida rhombifolia	x	x		x		x	x		x
Sporobolus creber							x		
Tagetes minuta						x			
Themeda triandra					x	x	x	x	x
Trema aspera								x	
Trifolium repens				x					
***Verbena* sp**				x		x			
Veronica plebeia		x		x					
Vicia sativa				x					

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Scientific name	Moderate/ good, poor (plot 1)	Moderate/ good, poor (plot 2)	Moderate/ good, poor (plot 3)	Moderate/ good, other (plot 4)	Moderate/ good, derived (plot 11)	Low, Poor (plot 12)	Moderate/ good, medium (plot 13)	Moderate/ good, poor (plot 14)	Moderate/ good, medium (plot 17)
Vulpia bromoides				x		x			x
Wahlenbergia gracilis	x								

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Appendix 2.2 Plot and transect summary

Table 24 Plot scores for each vegetation zone within the development site

Benchmark details	Site value score	Site attributes											
		Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Degraded (Yes/No)	Out of benchmark
Benchmark	N/A	>=36	18.5 to 23.5	13.0 to 23.0	15.0 to 21.0	0.0 to 10.0	15.0 to 21.0	See Table 2 of BBAM	>=0	See Table 2 of BBAM	>=0		
25% or lower of benchmark	N/A	<9	<4.625	<3.25	<3.75	N/A	<3.75		N/A		N/A		
Greater than 150% of benchmark	N/A	N/A	>35.25	>34.5	>31.5	>15	>31.5		N/A		N/A		
Average scores													
Low	13.04	10	4	0	26	0	22	94	0	0	0	**Yes**	3 of 11
Moderate/good, Derived grassland	21.01	24	4	0	74	2	24	82	0	0	0	**Yes**	4 of 11
Moderate/good, Other	24.64	14	0	23	92	0	42	90	0	0	15	**Yes**	5 of 11
Moderate/good, Poor	50.72	24	10.75	13.75	84.5	2.5	42	67	0	0.5	21.25	No	3 of 11
Moderate/good, Medium	61.11	34	31	7	85	2	41	10	0	1	10.5	No	2 of 11

Red cells indicate the site attributes that are below 25% of the benchmark, while blue cells represent those site attributes that are greater than 150% of the benchmark

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Appendix 3 Koala habitat assessment

Appendix 3.1 Koala habitat assessment

Table 29 Koala habitat assessment in accordance with Commonwealth of Australia (2014).

Attribute	Score (Commonwealth of Australia 2014)	Coastal	Score and justification
Koala occurrence	0 (low)	No evidence of one or more koalas within the last 2 years. No evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.	0
			No records of the Koala within 2 km of the study area on the Atlas of NSW Wildlife.
			No Koalas or direct evidence of koala habitation were found during targeted surveys.
			Although scratch marks were observed on several Grey Gum, these were not characteristic of Koala scratches (i.e. a mixture of pock marks and linear scratches). Scratch marks were identified as most likely Common Brushtail Possum *Trichosurus vulpecula*. No Koala scats were found at the base of the trees where scratch marks were found.
Vegetation composition	+1 (medium)	Has forest or woodland with only 1 species of known koala food tree present.	1
			Two Koala habitat trees are located within the study area. Grey Gum is recognised in the NSW Koala recovery plan (2008) as secondary feed tree species and occurs within remnant patches of woodland through the central of the study area. The supplementary species Thin-leaved Stringybark *Eucalyptus eugeniodes* is also present within the study area.
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	2
			The study area is bordered to the east by a linear area of native vegetation that extends to a patch >500 ha to the north. The patch extends through to WaterNSW special area for Warragamba Dam and the Blue Mountains National Park. Within the study area, native vegetation has been maintained in discrete remnant patches, although these is some connectivity to adjoining bushland.
Key existing	0 (low)	Evidence of frequent or	0

Attribute	Score (Commonwealth of Australia 2014)	Coastal	Score and justification
threats		regular koala mortality from vehicle strike or dog attack in the study area at present, OR Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	The study area scores a 0 for Koala occurrence, and contains several key threatening processes. Although there is no evidence of koala mortality in or associated with the study area, a number of Red Fox frequent the site (as evidenced by scat). The study area is also used by local residents including pets, the operation of a horticultural business and shopping complex.
Recovery value	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	0 Although the study area is connected to a larger area of habitat which may support Koalas, there is no evidence of Koala usage and no records within or in proximity to the study area. Therefore the study area is unlikely to help achieve the interim recovery objectives as outlined in table 1.
FINAL SCORE			**3**

Appendix 4 Assessments of Significance

The following section provides for Assessments of Significance according to the seven factors outlined in Section 5A of the EP&A Act for the threatened biota that may be impacted by the removal of native vegetation as a result of the proposed clearing to allow for the building envelops and development of access roads located in the E3 zone. These areas have been excluded from the BioBanking assessment in accordance with Section 127ZJ of the TSC Act and Clause 11(b) of the BioBanking Regulation.

The study area referred to within these assessments is defined as the 2.69 hectares area located between the proposed BioBank site and the development site (Figure 2) and contains one hectare of native vegetation.

Shale Sandstone Transition Forest

Shale Sandstone Transition Forest is currently listed as an endangered ecological community under the TSC Act. The one hectare of Shale Sandstone Transition Forest within this area is made up of the following condition classes:

- 0.01 hectares of moderate/good, derived shrubland condition vegetation.
- 0.34 hectares of moderate/good, poor condition vegetation.
- 0.65 hectares moderate/good, medium condition vegetation.

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

Shale Sandstone Transition Forest is a CEEC and therefore this section is not applicable to the assessment.

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

Shale Sandstone Transition Forest is a CEEC and therefore this section is not applicable to the assessment.

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

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

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

The extent of the CEEC is estimated at one hectare in the study area, of which all is in moderate/good condition with varying levels of disturbance. The preparation of building envelops, roads and associated dwelling infrastructure will likely clear the entire one hectare of Shale Sandstone Transition Forest is a CEEC.

A total of 9.67 hectares of Shale Sandstone Transition Forest will be retained as a BioBank site including the APZ for the proposed building envelops. As such, the removal of vegetation with modification of this vegetation confined to a small area, representing just 7.5 per cent of the area being retained. As published on 6 July 2016, the OEH online profile for Shale Sandstone Transition Forest CEEC stated that there is 9,950 hectares remaining intact, with this entire remnant occurring within the Sydney Basin IBRA region. The loss of one hectare will result in a total loss of <0.01% of the community.

There may be indirect, temporary edge effects on the remaining protected vegetation located within the study area (such as weed invasion). Weed control within these areas will be undertaken in accordance with the VMP.

Direct and indirect impacts are unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

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

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

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

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

Up to one hectare of Shale Sandstone Transition Forest will be permanently lost due to the proposed clearing for building envelops and associated development. Within the locality, this amounts to <0.01% of the community remaining.

The building envelops have been sited at the boundary of the proposed development site and have allowed a small area for clearing. The area of disturbance will therefore allow for the retention of Shale Sandstone Transition Forest downslope as part of a proposed BioBank site. This area forms part of a local corridor extending from Bents Basin to the Warragamba Species Area in the north. It is therefore considered unlikely that the building envelops will increase fragmentation within the study area.

Currently 9,950 hectares of Shale Sandstone Transition Forest remains within the Cumberland Plain. The permanent removal of the small area (less than 0.01 per cent of that in the locality) of 0.78 hectares of this CEEC is unlikely to be important to the long term survival of this CEEC.

It is considered unlikely that the proposal will have a significant impact on the CEEC and 0.78 hectares proposed for removal is not essential to long-term survival of this CEEC in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No area has been designated as 'critical habitat' under Part 3 of the TSC Act for Shale Sandstone Transition Forest.

(*f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

Shale Sandstone Transition Forest was included in the Cumberland Plain recovery plan, developed by DECCW (2010). The following actions relevant to the recovery plan are as follows:

- To build a protected area network, comprising public and private lands, focused on the priority conservation lands
- To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation
- To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program
- To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner

OEH lists activities to assist threatened biota in their recovery within NSW. Those listed for Shale Sandstone Transition Forest relevant to the proposal include:

- Protect habitat by minimising further clearing. This requires recognition of the values of all remnants.
- Protect habitat by controlling run-off entering the site, where it would change water, nutrient or sediment levels or cause erosion.
- Weed control.
- Identify and protect areas in perpetuity through landholder involvement in appropriate conservation schemes.

Although some aspects of the proposal are inconsistent with these priority actions, the permanent removal of 0.78 hectares of CEEC in moderate to good condition is unlikely to interfere with the recovery of the community.

There are no threat abatement plans currently in operation for the CEEC that specifically relate to the current proposal.

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

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act (those KTP marked with * are also listed under the EPBC Act). The following KTPs are relevant to the proposal and Shale Sandstone Transition Forest:

- Clearing of Native Vegetation* (NSW Scientific Committee 2001) - the proposal would involve clearing of native trees that make up a CEEC.
- Competition and Grazing by the Feral European Rabbit* (NSW Scientific Committee 2002) - it is likely that the study area is currently subjected to this KTP due to surrounding land use practices. The proposal is unlikely to increase the operation of this KTP.
- Invasion of Native Plant Communities by Exotic Perennial Grasses (NSW Scientific Committee 2006) – Controls to capture sediment (and water dispersed weed seeds) and restrictions to access that protect the healthy groundcovers from damage are followed; the potential for these KTPs to cause an impact will be greatly reduced.
- Removal of Dead Wood and Dead Trees (NSW Scientific Committee 2003b) - fallen timber provides temporary shelter and predator protection for the woodland birds. Fallen timber within the study area will be relocated to adjacent bushland within the adjacent E3 zone.

Conclusion

Following the consideration of the above seven factors, the proposed works are not likely to cause a significant impact on the Shale Sandstone Transition Forest of the study area or locality as:

- The proposal will not adversely affect the extent or composition of the ecological community to the point where its current ecological function is compromised to cause it to become locally extinct.
- The proposal will not further fragment or isolate the community or affect its long term survival on the subject site or in the locality.
- The area of habitat to be impacted by the proposal is not considered to be important for the long term survival of Shale Sandstone Transition Forest in the locality.

- The proposal does not significantly contribute to any KTP that is either currently in operation on the subject site or will occur on the subject site.

Consequently, a Species Impact Statement is not required for the current proposal.

Cumberland Plain Land Snail *Meridolum corneovirens*

Cumberland Plain Land Snail occurs on the Cumberland Plain west of Sydney, generally associated with Cumberland Plain Woodland. Cumberland Plain Land Snail lives under the litter of bark, leaves and logs, or shelters in loose soil around grass clumps, and feed on fungus. During drought the snail will burrow deeper into the soil to avoid the dry conditions (NPWS 1999).

The Cumberland Plain Land Snail was recorded in adjoining habitat and potential habitat for this species is present within a 0.64 hectare portion of the Shale Sandstone Transition Forest within the study area, particularly at the base of some of the larger trees where there is some soil moisture and litter accumulation.

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

The Cumberland Plain Land Snail occurs within Cumberland Plain and Castlereagh Woodlands of Western Sydney and along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. The snail feeds on fungus associated with decaying leaf litter and bark of eucalypts. Cumberland Plain Land Snail is likely to breed year-round, laying up to 25 eggs when conditions are suitable (i.e. damp). Dispersal of individuals within a single population is limited to about 400 metres suggesting that populations of the species typically occupy a small area (Clarke 2005).

While habitat is present, the species was not recorded within the study area following targeted survey, therefore the proposal is considered unlikely to disrupt the life cycle of the Cumberland Plain Land Snail to the extent that a viable local population would be placed at risk of extinction.

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

There are currently no Endangered Populations listed for the Cumberland Plain Land Snail in NSW.

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

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

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

Not applicable to threatened species.

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

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

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

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

Habitat in the area is already disturbed and fragmented as a result of the current land practices including the horticultural business and the clearing or modification of vegetation for agricultural purposes. These disturbances have resulted in the removal and/or disturbance of groundcover resources for this species throughout the majority of the 2.69 hectare study area. The proposal will result in the removal or modification of 0.64 hectares of habitat for this species, which equates to 0.01 per cent of similar habitat within the locality.

The small-scale disturbance from the proposal will not cause significant fragmentation or isolation of habitat for the Cumberland Plain Land Snail as the proposed access roads and building envelops are situated on proposed boundary of the development site. A total of 7.91 hectares of habitat for the species, with confirmed individuals, will be retained within the E3 zone, likely through the establishment of a BioBank site. This area is considered to be of greater importance for the long-term survival of the species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Cumberland Plain Land Snail (DECC 2008).

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

There is currently no recovery plan or threat abatement plan for Cumberland Plain Land Snail. OEH lists activities to assist species in their recovery within NSW.

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

The following KTPs are relevant to the proposal and the Cumberland Plain Land Snail:

- Clearing of Native Vegetation (NSW Scientific Committee 2001) - the proposal would result in the modification of ground layer vegetation and the removal of some trees which will impact on some areas of potential habitat for the Cumberland Plain Land Snail.
- Removal of Dead Wood and Dead Trees (NSW Scientific Committee 2003b) – dead wood provides habitat for the Cumberland Plain Land Snail. The removal of woody debris will reduce the habitat available for the species within the study area.

Conclusion

The study area provides potential habitat for the Cumberland Plain Land Snail. Despite the species being conspicuous when searched in appropriate habitats, neither the Cumberland Plain Land Snail nor any other members of the genus Meridolum, were recorded during the field inspection within this area. The proposal would remove potential habitat for the species in the form of woody debris. However it is unlikely to result in a significant impact on a local population of the Cumberland Plain Land Snail as:

- 0.64 hectares of habitat to be removed is considered to be limiting for the species. 0.01% of potential habitat would be removed from the locality.
- Fragmentation and/or isolation of habitat would not occur.
- The proposal would not have an adverse effect on critical habitat (directly or indirectly).

Based on the above assessment, an SIS is not considered necessary.

Appendix 5 Significant Impact Criteria assessments

The following section provides an assessment of the Significant Impact Criteria for the threatened biota (in accordance with Commonwealth of Australia (2013)) that may be impacted by the removal of native vegetation as a result of the proposed building envelops and development of access roads located in the E3 zone. These areas have been excluded from the BioBanking assessment in accordance with Section 127ZJ of the TSC Act and Clause 11 of the BioBanking Regulation.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

Shale Sandstone Transition Forest is currently listed as a Critically Endangered ecological community under the EPBC Act.

Approximately one hectare of Shale Sandstone Transition Forest was mapped within the study area, fulfilling both the description and condition classes set out in Commonwealth of Australia (2014) for listing under the EPBC Act.

An action has, will have, or is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will:

Reduce the extent of an ecological community

The extent of the community in the study area is estimated at one hectare. Vegetation clearing required the preparation of building envelops, roads and associated dwelling infrastructure will likely clear the entire one hectare of Shale Sandstone Transition Forest is a CEEC.

Due to the small scale of the removal, the proposal is unlikely to have an adverse effect on the local extent of this community in such a way that a local occurrence of the CEEC would be placed at risk of extinction.

Fragment or increase the fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

The building envelops have been sited at the boundary of the proposed development site and have allowed a small area for clearing. The area of disturbance will therefore allow for the retention of Shale Sandstone Transition Forest downslope as part of a proposed BioBank site. This area forms part of a local corridor extending from Bents Basin to the Warragamba Species Area in the north.

The proposed works will not exacerbate fragmentation of the CEEC in the locality.

Adversely affect habitat critical to the survival of an ecological community

To date, there is currently no critical habitat areas listed for Shale Sandstone Transition Forest within the EPBC Act and the potential habitat in the study area is not an area considered to be necessary for breeding, dispersal or succession; to maintain genetic diversity; or for the reintroduction of populations or recovery of the ecological community.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The proposed works will involve the removal of several small patches of the CEEC bounding the proposed development site and a BioBank site. All drainage from the developable areas will need to consider downstream impacts to areas of retained Shale Sandstone Transition Forest including the modification of hydrology and sedimentation. Provided this is implemented in the future design of dwellings, the clearing for

the proposed building envelops will not significantly alter surface water drainage patterns or result in the modification or destruction of abiotic factors necessary for an ecological community's survival.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionality important species, for example through regular burning or flora or fauna harvesting

The direct removal of one hectare of Shale Sandstone Transition Forest will not alter the species composition of the community occurring within the locality. There is potential for indirect impacts to the composition of retained CEEC groundcover adjacent to the site through processes which may increase the potential for weeds to establish. Indirect impacts would include damage to groundcover through:

- Vehicle traffic, parking or heavy plant access through adjacent areas of CEEC.
- Stockpiling of soil or materials.
- Management of stormwater overland flow to capture weed seed or direct away from retained CEEC.
- Risks of indirect impacts will be managed implementation of exclusion zones to protect remnant CEEC areas.

Provided adequate controls are implemented in the future clearing of vegetation and design of dwellings to prevent the abovementioned indirect impacts, the proposed works are unlikely to lead to a substantial change in species composition of Shale Sandstone Transition Forest that will cause a decline or loss of functionally important species.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to

- *Assisting invasive species, that are harmful to the listed ecological community, to become established, or*
- *Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community*

The proposed works will result in the removal of one hectare of CEEC. The surrounding areas are in moderate condition and pose minimal threat to invasion following completion of works.

Clearing works are to be undertaken to manage weed control, and where applicable, to support revegetation which will provide competition against future weed incursion. Any significant weed invasion is currently contained to areas upslope and form part of the broader development site. Provided appropriate hygiene protocols are implemented during clearing and construction. The proposal is unlikely to facilitate invasive species that are harmful to the listed ecological community, becoming established in areas of retained vegetation.

In the event that fertilizer or herbicide are used during revegetation and weed management, all herbicide is to be applied by appropriately qualified bush regenerators, and take into account appropriate set-backs for herbicide use adjacent to waterways. Provided that the use of fertilizer and herbicide are done appropriately, they are unlikely to cause changes that will kill or inhibit the adjacent or future restored area of CEEC.

Interfere with the recovery of an ecological community

There is currently no recovery plan for Shale Sandstone Transition Forest. However considering the small scale of direct impacts and limited potential for indirect from the proposed works and its limited area of impact, it is unlikely the proposal will interfere with the recovery of the CEEC.

Conclusion

Based on the above assessment, Shale Sandstone Transition Forest is unlikely to be significantly impacted by the proposal, and as such, a Referral under the provisions of the EPBC Act is not recommended for this species.

Appendix 6 Credit profile report

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 26/04/2017 Time: 3:29:45PM Calculator version: v4.0

Development details

Proposal ID:	0103/2014/1052D
Proposal name:	North Silverdale - Development
Proposal address:	Silverdale Road Silverdale NSW 2320
Proponent name:	North Silverdale Landowners Group
Proponent address:	PO Box 5104 Wollongong NSW 2500
Proponent phone:	02 4201 1060
Assessor name:	Nathan Garvey
Assessor address:	8 Tate Street WOLLONGONG NSW 2500
Assessor phone:	4229 5222
Assessor accreditation:	0103

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
  - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion
  - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion
- ☐ Change negligible loss
  - Gang-gang Cockatoo — Callocephalon fimbriatum
- ☐ Expert report...
- ■ Request for additional gain in site value
- ☐ Predicted threatened species not on site
  - Yellow-bellied Glider — Petaurus australis

- Change threatened species response to gain (Tg value)

Ecosystem credits summary

Plant Community type	Area (ha)	Credits required	Red flag
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	2.34	44.36	No
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	7.95	356.23	Yes
Total	10.29	401	

Credit profiles

1. Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN556)

Number of ecosystem credits created 390

IBRA sub-region Cumberland - Hawkesbury/Nepean

Offset options - vegetation types	Offset options - CMA sub-regions
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN556) Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion, (HN513) Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion, (HN604)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN556)

Number of ecosystem credits created 11

IBRA sub-region Cumberland - Hawkesbury/Nepean

Offset options - vegetation types	Offset options - CMA sub-regions
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion, (HN513) Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion, (HN604) Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN556)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Cumberland Plain Land Snail	Meridolum corneovirens	2.85	37
Juniper-leaved Grevillea	Grevillea juniperina subsp. juniperina	5.00	100