

Appendix D – Assessments of significance

EP&A Act assessments of significance

As per section 7 of the DGRs (page 18), the assessments of significance are provided based on including relevant information from section 5.1 to 7 of the SIS. This includes incorporation of relevant mitigation measures (see section 7) and compensatory strategies (see section 7.1.7).

Microchiropteran bats

- Southern Myotis (*Myotis macropus*) – Vulnerable.
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) – Vulnerable.

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 woodland in the study area is known to provide habitat for the Southern Myotis and Yellow-bellied Sheathtail-bat, which were captured and detected by call, respectively, during current surveys (WSP 2013). Known habitat for Southern Myotis is also located along the Murrumbidgee River corridor.

The woodland in the study area provides potential foraging habitat for both microbat species.

Trees in the study area also provide potential roosting and breeding habitat for the Yellow-bellied Sheathtail-bat, in hollows or under loose bark. The Southern Myotis is more likely to roost in caves and man-made structures in close proximity to water, however, may also use tree hollows.

The woodland in the study area provides movement habitat for both of these species.

The proposed removal of woodland would reduce the amount of foraging, roosting and breeding habitat for threatened bats in the study area. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent of woodland in the locality.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect the life cycle of the Yellow-bellied Sheathtail-bat, which could potentially use tree hollows in the study area. One hollow bearing tree in close proximity to the dam at which the Southern Myotis was caught would be removed and may impact on this species if it is roosting in the tree (WSP 2013). There are large areas of potential breeding habitat in the locality, including at least an additional 240 hollow-bearing trees in the study area, and the removal of these trees would be unlikely to represent a significant loss of potential breeding habitat.

The proposal would remove 788 trees from the subject site, of which 30 trees have a dbh greater than 40 centimetres. These trees provide foraging, roosting, breeding and movement habitat for threatened bats, however their removal would be unlikely to significantly affect the life cycle of any of these species due to the relatively small amount of habitat to be affected compared to the amount of habitat present in the locality and due to the mobility and relatively large ranges of the threatened bats.

The Yellow-bellied Sheathtail-bat (which was identified by a probable call) is considered to be an uncommon vagrant to the region and is a highly mobile species capable of travelling long distances (WSP 2013). The proposal is therefore unlikely to significantly impact the species due to the presence of alternative habitat located in the locality and the species ability to traverse long distances to these alternative areas of habitat.

In addition, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on the life cycle of microbats in the study area. These include:

- Removal of mature trees, including hollow-bearing trees, will be minimised wherever possible.
- The installation of nest boxes in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres. Seventy per cent of nest boxes required for the proposal would be installed prior to the commencement of clearing activities.
- Microbat nest boxes will be constructed of UV resistant recycled plastic to increase longevity and decrease maintenance requirements. These would comprise approximately 10 per cent of all nest boxes required for the project.

In addition, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a *Nature Conservation Trust Act 2001* covenant. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The vegetation types identified at the offset site include:

- Grassy White Box – Blakely's Red Gum – Yellow Box woodland of the NSW South Western Slopes Bioregion.
- Mugga Ironbark – Inland Grey Box – Pine tall woodland of the NSW South Western Slopes Bioregion.
- White Box – White Cypress – Inland Grey Box woodland on the western slopes of NSW.

The offset site contains a similar vegetation type to what is being removed at the subject site, with the majority of canopy vegetation classifying as Box-Gum Woodland. The site provides suitable potential habitat for both threatened bat species, according to the BBAM. Therefore, the habitat for the threatened bat species to be removed would be partially compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

The amount of habitat for threatened bat species proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality. High quality habitat for these species is present in other parts of the study area and outside the study area, in addition to the offset site to be conserved in perpetuity. As well, tree hollows do not form primary roosting habitat for the Southern Myotis, which prefers to roost in caves and man-made structures. Given the mobility of most bat species, the amount of available habitat in the locality, and the implementation of mitigation measures to reduce potential impacts on the species, it is unlikely that the proposal would have an adverse effect on the life cycle of a threatened bat species such that a viable local population of the species is likely to 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

Not applicable.

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.

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

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

The proposed removal of trees would reduce the amount of potential foraging, roosting and movement habitat for threatened bats in the study area. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent of woodland in the locality.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect breeding habitat for the Yellow-bellied Sheathtail-bat. The Southern Myotis may also be impacted by the loss of hollow-bearing trees, if the species is roosting in a tree likely to be removed in close proximity to the dam at which an individual was caught (WSP 2013). Only one tree is likely to be removed within 100 metres of this dam (WSP 2013). There are large areas of potential breeding habitat in the locality, including at least an additional 240 hollow-bearing trees in the study area, and the removal of these trees would be unlikely to represent a substantial loss of potential breeding habitat.

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

Fragmentation of the vegetation in the locality has previously occurred through the development of surrounding areas for agriculture, residential expansion, the Kapooka Military Area and through the construction of other linear infrastructure (such as roads, railway lines and power lines). Although these developments have created barriers to movement for some fauna species, they have not prevented the Southern Myotis and Yellow-bellied Sheathtail-bat from using the study area.

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga. These corridors link to remnant vegetation patches south of the study area (eg Mount Flakney, Gregadoo Hills and Livingstone National Park). The woodland in the study area is likely to facilitate the movement of threatened bats. Being particularly mobile species, these bats have fewer constraints for movement than many other terrestrial species and connectivity 'stepping stones' provide suitable habitat between foraging, resting and roosting sites in fragmented landscapes (WSP 2013). A combination of vegetation, dams and channels is likely to connect the Southern Myotis to habitat along the Murrumbidgee River corridor (WSP 2013). The Southern Myotis prefers to forage over water and roost in riparian habitat, with the Murrumbidgee River corridor previously considered preferred habitat for the species in the locality, prior to its capture in the study area during surveys.

Lighting and noise impacts have been shown to alter the use of habitat by microbats. Bats have been found to respond to vehicle noise from as far as 40 metres away and turn away from noise when a level of about 88 decibels is reached (WSP 2013).

Lighting impacts have been shown to be species specific, with responses ranging from avoiding artificially lit areas to foraging at lights (WSP 2013). Mitigation measures will be implemented as part of the proposal to reduce the impacts of lighting on threatened bat species utilising the study area. These include:

- Road lighting that directs light down to the road and minimises light pollution of the night sky will be used to minimise disorientation of nocturnal species moving through the area. This will include use of LED lights and/or low pressure lights with longer wave lengths (orange or red colour spectrum) to minimise impacts to microbats.

Due to the mobility of the threatened bats assessed, their relatively large home ranges, and the likelihood of the Yellow-bellied Sheath-tail-bat only being a vagrant to the region (WSP 2013), the proposal is unlikely to create any significant barriers to movement for these species.

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

The habitat to be removed provides high quality woodland habitat for threatened bats. These species are all likely to use the woodland in the study area for foraging and movement, although, the Yellow-bellied Sheath-tail-bat is only considered to be a vagrant to the region. As well, hollow-bearing trees in the study area could potentially be used for roosting and breeding by the Yellow-bellied Sheath-tail-bat. The Southern Myotis is more likely to roost in caves and man-made structures in close proximity to water, however, may also use tree hollows.

The amount of habitat for threatened microbat species proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality (there are 6500 hectares of habitat available in the locality). High quality habitat for these species is present in other parts of the study area and outside the study area. As well, tree hollows do not form primary roosting habitat for the Southern Myotis, which prefers to roost in caves and man-made structures. Given the mobility of both bat species, it is unlikely that the relatively small area of habitat to be removed would be important to the long-term survival of any of these species in the locality.

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

The proposal would not affect any habitat listed on the critical habitat register.

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

A recovery plan has not been prepared for any of the threatened bat species. However, the OEH Threatened Species website identifies a number of actions important for the recovery of these species:

- Retain remnant woodland.
- Retain hollow-bearing trees and provide for hollow tree recruitment.
- Protect roosting sites from damage or disturbance.
- Retain native vegetation that is floristically and structurally diverse.

The proposal would remove known habitat for the Southern Myotis and Yellow-bellied Sheath-tail-bat. The loss of habitat would include 30 trees with dbh greater than 40 centimetres, including 13 hollow-bearing trees. The proposal would also remove around 700 regenerating trees.

Due to the proposed removal of woodland and trees of various size classes, the proposal is not consistent with the recovery actions identified on the OEH (2011) Threatened Species website. The proposed removal of habitat is however unlikely to significantly affect any of the threatened bat species, as described above.

In addition, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on threatened bats in the study area, as described above.

As well, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a covenant under the *Nature Conservation Trust Act 2001*. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The site provides suitable potential habitat for all three threatened bat species, according to the BBAM. Therefore, the habitat for the threatened bat species to be removed would be compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

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 proposed action will result in the operation of three listed key threatening processes relevant to the subject species:

- Clearing of native vegetation – the proposal would remove 14.2 hectares of woodland habitat from the subject site; however this is unlikely to represent a significant loss of habitat for any of the bat species in the locality (0.2 per cent of woodland in the locality). Vegetation to be removed would be compensated for by a biodiversity offset site that has been identified. An offset plan has been prepared to manage the site and conserve in in perpetuity, as described in (f).
- Loss of hollow-bearing trees – the proposal would remove 13 hollow-bearing trees from the subject site. However, there are large areas of potential breeding habitat in the locality (including at least 240 hollow bearing trees in the study area), as described above, and the removal of these trees would be unlikely to represent a significant loss of potential breeding habitat. In addition, nest boxes will be installed in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres, and any hollows removed during pre-clearing and not being relocated as coarse woody debris will be used in the design of nest boxes. In addition, hollow-bearing trees were observed throughout the proposed offset site.
- Removal of dead trees – the proposal would remove six dead trees with dbh less than 40 centimetres from the subject site. This has the potential to impact on threatened bat species if hollows or decorticated bark are being used for roosting habitat. Mitigation measures would be implemented to compensate for the loss of hollow-bearing trees, as described above.

Conclusion

The proposal would be unlikely to have a significant effect any threatened microbat species for the following reasons:

- *The relatively small proportion of potential habitat for these species in the locality being removed (0.2 per cent)*
- *The high mobility and large home ranges of the threatened bats assessed*
- *The presence of high quality habitat for these species in other parts of the study area and locality*
- *The implementation of mitigation measures to reduce potential impacts on the species, particularly in regards to roosting habitat in hollow-bearing trees*
- *The conservation of a biodiversity offset site in perpetuity that provides suitable potential habitat for the threatened bat species assessed.*

Mammals

- Squirrel Glider population in the Wagga Wagga Local Government Area (*Petaurus norfolcensis*) – Endangered Population

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

Not applicable.

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

The Squirrel Glider was recorded numerous times during the current survey period via trapping and has been recorded previously in the study area during a number of separate surveys (GHD 2012, CSU 2002, CSU 2003 and CSU 2005c). Within the study area, Squirrel Gliders form a viable colony. Previous surveys have captured both juveniles and sexually mature, breeding individuals (CSU 2005c). However, the actual group structures of this colony are not exactly known. Current surveys also captured both juveniles and sexually mature, breeding individuals with a male to female ratio of 0.65 to one (ARCUE 2013). The population of Squirrel Gliders within the locality is likely to utilise habitat in the locality as one continuous, connected patch, with the population functionally operating as a single population. Gliders are likely to be moving among all the different locations that were targeted for trapping in the ARCUE (2013) survey period, including dispersing individuals and adults investigating adjacent social groups.

It is likely that the species in the region forms a metapopulation (ARCUE 2013). This means that many small sub-populations exist, with movement between the sub-populations. If one sub-population declines or goes extinct (perhaps due to disease, fire, loss of hollows, predation), then individuals from adjacent sub-populations can disperse into this declining sub-population to increase its size. Over time, sub-populations may go through periods of decline, extinction and recolonisation, but at the overall metapopulation level, the species as a whole is viable. Consequently, it is likely that most populations in the study area and locality rely on each other for their survival and movement in all directions should be maintained for the ongoing persistence of the species (ARCUE 2013).

Woodland within the study area provides breeding and foraging habitat for this species in the form of hollow-bearing trees, shrubs and other woodland vegetation. The trees in the study area provide nectar and pollen during periods of flowering. The woodland in the study area also provides important movement habitat for the species. A number of important elements have been identified to provide quality habitat for the species, including a mixed age-class canopy with large and hollow-bearing trees and an understorey with *Acacia* species (ARCUE 2013), which is provided for in the study area. It is estimated that most woodland in the study area would support Squirrel Gliders, provided it contains about five or more hollow-bearing trees per hectare (ARCUE 2013).

The proposal would remove 14.2 hectares of woodland habitat for Squirrel Gliders (6.8 per cent of the woodland in the study area and 0.2 per cent of the woodland in the locality). This represents a reasonable proportion of woodland in the study area for the species. This is

primarily because of the limited mobility and small home range of the species and not all of the vegetation in the study area being available to Squirrel Gliders due to a lack of connectivity. Assuming home ranges of members of each group is approximately five hectares (van der Ree and Bennett 2003), this is likely to result in the loss of three to four social groups of gliders (with social groups consisting of between two and five to six individuals) (ARCUE 2013).

Squirrel Gliders use multiple hollows, and change every few days, with some individuals using 10 to 15 hollows over the period of a few months (van der Ree unpub data). Thirteen hollow-bearing trees would be removed from the subject site, which contain 30 hollows that are greater than five centimetres in diameter and likely to be suitable den hollows for this species. There are 465 hollows greater than five centimetres in diameter in the study area and the loss of 30 of these represents about six per cent of suitable hollows for this species in the study area. The removal of these trees therefore has the potential to affect the life cycle of the Squirrel Glider. However, the use of crossing structures and nest boxes combined with the metapopulations ability to disperse throughout the area would minimise impacts on this species.

Mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on Squirrel Gliders in the study area. These include:

- Removal of mature trees, including hollow-bearing trees, will be minimised wherever possible while still meeting operational objectives for road safety, design and sediment basin operation
- The installation of nest boxes in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres. Seventy per cent of nest boxes required for the proposal will be installed prior to the commencement of clearing activities
- Tall trees on the edge of the proposal site will be retained where safety requirements permit, to maintain natural connectivity for Squirrel Gliders (eg at Silvalite Reserve and on the northern approaches to the bridge).
- Rope bridges will be constructed at two locations – north of the proposed bridge from Silvalite Reserve to freehold land to the west; and within the Planning Agreement Areas south of the proposed bridge. Specific advice from OEH and a Squirrel Glider specialist should be sought to advise on the exact location and design of crossing structures and which tall trees should be retained
- Trees and shrubs will be planted at the southern glider crossing location (in consultation with Wagga Wagga City Council) between the sections of cut and fill to facilitate future movement of Squirrel Gliders and other fauna from east to west and north to south

As well, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a covenant under the *Nature Conservation Trust Act 2001*. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The vegetation zones identified at the offset site include:

- Grassy White Box – Blakely's Red Gum – Yellow Box woodland of the NSW South Western Slopes Bioregion
- Mugga Ironbark – Inland Grey Box – Pine tall woodland of the NSW South Western Slopes Bioregion
- White Box – White Cypress – Inland Grey Box woodland on the western slopes of NSW

The offset site contains a similar vegetation type to what is being removed at the subject site, with the majority of canopy vegetation classifying as Box-Gum Woodland. The site provides suitable potential habitat for Squirrel Gliders, according to the BBAM and is in close proximity to

known habitat of the species along the Murrumbidgee River corridor. Therefore, the habitat for Squirrel Gliders to be removed would be partially compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

The proposal would remove breeding and foraging habitat, affect the potential movement of this species by the creation of large gaps in woodland cover and increase the risk of collision of gliders with vehicles (ARCUE 2013). However, the placement of rope bridges with adjacent tree plantings leading to these structures (ARCUE 2013) to facilitate movement and the placement of hollow limbs and artificial nesting structures would mean the proposal would be unlikely to adversely affect the life cycle of the Squirrel Glider such that the viable population of the species is likely to be placed at risk of extinction. In addition, an offset site will be conserved in perpetuity that contains suitable potential habitat for the species and is in close proximity to known habitat of the species along the Murrumbidgee River Corridor.

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

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

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

The proposed removal of trees would reduce the amount of potential foraging, breeding and movement habitat for Squirrel Gliders in the study area. The proposal would remove 14.2 hectares of woodland habitat for Squirrel Gliders (6.8 per cent of the woodland in the study area and 0.2 per cent of the woodland in the locality).

Thirteen hollow-bearing trees would be removed from the subject site, which contain 30 hollows that are greater than five centimetres in diameter and likely to be suitable den hollows for this species. There are 465 hollows greater than five centimetres in diameter in the study area and the loss of 30 of these represents about six per cent of suitable hollows for this species in the study area.

The proposal would remove 788 trees from the subject site, of which 30 trees have a dbh greater than 40 centimetres. With the exception of paddock trees to be removed, most would be used by the Squirrel Glider for foraging and movement. The proposal would remove shrubs which are used by Squirrel Gliders for foraging.

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

Fragmentation of the vegetation in the locality has previously occurred through the development of surrounding areas for agriculture, residential expansion, the Kapooka Military Area and through the construction of other linear infrastructure (such as roads, railway lines and power lines). Although these developments have created barriers to movement for some fauna species, they have not prevented Squirrel Gliders from using the study area. Results from the

current survey period demonstrate that individuals of this population are regularly crossing linear infrastructure including the existing highway and the Sydney to Melbourne Rail Line (see Figure 17).

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga. These corridors link to remnant vegetation patches south of the study area (eg Mount Flakney, Gregadoo Hills and Livingstone National Park). The woodland in the study area is likely to facilitate the movement of Squirrel Gliders.

The proposal would fragment known habitat for the Squirrel Glider. Squirrel Gliders are known to occur on both the eastern and western sides of the highway at the northern limits of the subject site. This area has the smallest gap in woodland connectivity from west to east across the highway in the study area (about 30 metres). In the short-term, the proposal would widen the gap by a further 40 metres, creating a gap in the vegetation of about 70 metres. This 70 metre width would be reduced by about 25 metres when the new alignment is an operation as the existing road would be ripped and restored (bitumen removed and replanting with locally native species).

The Squirrel Glider has an average gliding width of 20 to 40 metres, and a maximum gliding width of about 70 to 80 metres (van der Ree *et al* 2003). Squirrel Gliders are efficient and capable of regularly traversing tree-less gaps of 30 to 40 metres, and less frequently up to 70 to 80 metres (ARCUE 2013).

The proposed realignment of the Olympic Highway would restrict the movement of Squirrel Gliders. However, wildlife crossing structures to facilitate the movement of Squirrel Gliders across the Olympic Highway will be implemented to limit the impact of the highway on Squirrel Glider movement. ARCUE (2013) recorded a number of individuals crossing linear infrastructure in the study area including the existing Olympic Highway and the Sydney to Melbourne Rail Line which demonstrates the ability of the population occurring in the study area to disperse across linear infrastructure.

Squirrel Gliders are capable of occupying narrow strips of mature woodland along roads and waterways (van der Ree and Bennett 2003). Squirrel Gliders are also willing to use regrowth woodland as movement pathways, provided there are sufficient hollow-bearing trees nearby to use for denning. Likely important pathways for movement for Squirrel Gliders in the area include northwards through Silvalite Reserve, south along the railway line and Olympic Highway and west through the Kapooka Military Area. Options for movement in an easterly direction are more limited, but are essential if any populations that remain within the suburban areas of Wagga Wagga are to persist (ARCUE 2013).

The temporary loss of movement across the alignment is unlikely to be a major issue for the local population because individuals on both sides of the highway are probably large enough to survive with the temporary disruption to movement. However, effective reconnection of habitat in the medium term (within 12 – 18 months) is essential (ARCUE 2013).

The proposal would also increase the distance between potential den sites for this species in the study area and result in a reduction in potential den sites through the removal of hollow-bearing trees.

The proposal has the potential to limit the local population from breeding and dispersing, thereby preventing the exchange of genetic material across the local population.

The proposal would mitigate impacts on increased fragmentation using strategic placement of rope bridges in at least two east-west locations. The location of each crossing point would be developed in conjunction with OEH and a Squirrel Glider specialist. Given that the proposal

would temporarily (before the old road is decommissioned and removed) increase the gap in vegetation to 70 metres in the northern limits of the subject site and Squirrel Gliders are known to glide up to 80 metres (van der Ree *et al* 2003), the proposal would not result in fragmentation such that the species is unable to traverse from east to west.

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

The proposal would remove 9.6 hectares of woodland from the E2 zone. The E2 zone has been designated as such for environmental conservation. Removal of an area specifically set aside for conservation purposes has the potential to affect the Squirrel Glider within the study area due to a decrease in the availability of known habitat.

The habitat to be removed provides known woodland habitat for the Squirrel Glider and supports a self-sustaining breeding population (ARCUE 2013). The species uses the woodland in the study area for breeding, foraging and movement. The woodland in the study area is important to the species' ability to move through the study area, including its ability to traverse the Olympic Highway and Sydney to Melbourne Rail Line in sections where there is canopy cover.

The proposal would increase the gap in vegetation to 70 metres in the northern limits of the subject site where Squirrel Gliders are known to occur on both sides of the existing Olympic Highway; however, Squirrel Gliders are known to be able to glide up to 80 metres (van der Ree *et al* 2003). In addition, the proposed 70 metre wide gap would be temporary and would be reduced by about 25 metres when the existing highway is decommissioned and rehabilitated with locally native species. Therefore the proposal would not result in a permanent barrier to east to west movements of the Squirrel Glider. In addition, the proposal would mitigate impacts on habitat connectivity through the provision of crossing structures across the road between existing patches of woodland.

Hollow-bearing trees in the study area provide breeding habitat for the Squirrel Glider. For this reason the habitat to be removed is likely to be important for the species. Mitigation measures would be implemented to reduce the impact of the removal of hollow-bearing trees on the species, as described above. Nest boxes will be installed in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres.

The woodland vegetation in the study area is important to the survival of the Squirrel Glider in the locality, particularly due to the fragmented nature of the woodland in the locality. Any further increases in fragmentation are likely to put further pressure on this species, which already exists in a fragmented landscape. However, the implementation of mitigation measures and the conservation of an offset site with suitable potential habitat for Squirrel Gliders will assist in mitigating impacts on the species.

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

The proposal would not affect any habitat listed on the critical habitat register.

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

A preliminary draft recovery plan has been prepared for the Squirrel Glider population in the Wagga Wagga LGA (NPWS 2004). The plan outlines 22 recovery actions under five objectives for the population. Action 3.7 is relevant to the proposal:

“To ensure that management of roadsides in or near Squirrel Glider sites protects or enhances existing habitat.”

This action identifies Roads and Maritime and Wagga Wagga City Council as responsible parties for this action. The proposal is not consistent with this recovery action due to the proposed removal of Squirrel Glider habitat along the existing Olympic Highway, particularly in the vicinity of Silvalite Reserve. This has the potential to fragment habitat, creating barriers to movement and compromising the viability of the local population.

Mitigation measures will be incorporated into the proposal in order to reduce the potential impacts of vegetation removal and fragmentation, which create barriers to movement for Squirrel Gliders, as described above.

As well, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a covenant under the *Nature Conservation Trust Act 2001*. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The site provides suitable potential habitat for Squirrel Gliders, according to the BBAM and is in close proximity to known habitat of the species along the Murrumbidgee River corridor. Therefore, the habitat for Squirrel Gliders to be removed would be compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

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 proposed action constitutes three listed key threatening processes relevant to the Squirrel Glider:

- Clearing of native vegetation – the proposal would remove 14.2 hectares of woodland habitat from the subject site (6.8 per cent in the study area and 0.2 per cent in the locality). Vegetation to be removed would be compensated for by a biodiversity offset site that has been identified. An offset plan has been prepared to manage the site and conserve in in perpetuity, as described in (f).
- Loss of hollow-bearing trees – the proposal would remove 13 hollow-bearing trees from the subject site (8.1 per cent from the study area and maximum 2.9 per cent in the locality). Nest boxes will be installed in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres, and any hollows removed during pre-clearing and not being relocated as coarse woody debris will be used in the design of nest boxes.
- Removal of dead trees – the proposal would remove six dead trees with dbh less than 40 centimetres from the subject site. This has the potential to impact Squirrel Gliders if hollows are contained within the trees. Mitigation measures would be implemented to compensate for the loss of hollow-bearing trees, as described above.

Conclusion

The proposal would be unlikely to have a significant effect on the endangered population of Squirrel Glider in the Wagga Wagga LGA provided the proposed mitigation measures are implemented. These include reuse of hollow-bearing trees at strategic locations, nest boxes, strategic placement of rope bridges and strategic revegetation. Further consultation would be

undertaken with the OEH and Squirrel Glider specialists to ensure the proposed mitigation measures (such as glider crossing zones) are appropriately placed, managed and implemented in a timely fashion so as not to fragment this population during construction or operation.

Ecological communities

- White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)

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

Not applicable.

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

Not applicable.

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

The project would remove 12.8 hectares of Box-Gum Woodland. There is about 168.3 hectares of Box-Gum Woodland in the study area and about 1845 hectares in the locality. The local occurrence of the community extends to the north and east outside the study area in areas zoned E2 and that form part of the Planning Agreement Areas. The removal of 12.8 hectares in the subject site represents about 7.6 per cent of Box-Gum Woodland in the study area and 0.7 per cent in the locality.

Of the 12.8 hectares of Box-Gum Woodland to be removed, 9.6 hectares occurs within the E2 zone, of which 8.4 hectares is within the Planning Agreement Areas. The E2 zone has been zoned for environmental conservation and the Planning Agreement Areas have been designated for biodiversity offsetting as part of the biocertification of the Wagga Wagga LEP. The Planning Agreement Areas have an area of 148 hectares. The removal of 8.4 hectares of woodland from these areas therefore represents 5.6 per cent of this area.

The proposal would remove groundcover vegetation, shrubs and litter which removes foraging habitat for a range of fauna species that assist in the dispersal of seed and the general health of this community (eg gleaning lerp).

The proposal would remove woody debris from the subject site, which also provides habitat for a range of fauna species. The benchmark for total length of fallen logs in Western Slopes Grassy Woodland in the Murrumbidgee CMA is five metres per 0.1 hectares. All quadrats surveyed within the subject site had a value less than this benchmark. The proposal would reduce this benchmark further within the study area.

The extent of the community in the study area and locality would be reduced; its local occurrence in the study area and contiguous areas to the east and north is likely to be placed at

risk of extinction due to the reduction in its local occurrence through areas of high quality habitat.

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 proposal has the potential to modify the composition of the ecological community by creating conditions conducive to the spread of weed species. This could occur through earthworks and general disturbance from machinery and vehicles, and foot traffic. These conditions could lead to the spread of invasive species such as St. Johns Wort which occurs in the subject site. However, weed control measures such as chemical and manual removal of noxious weed species would be implemented during construction and operation.

The proposal could also lead to an increase in the spread of weeds in the Box-Gum Woodland through edge effects associated with disturbance. The existing presence of weeds in the study area is likely to have occurred through disturbance created by the development of the Olympic Highway and other land uses in the study area. It is likely therefore that further development would increase the potential for weeds to invade the remaining area of high quality Box-Gum Woodland in the Planning Agreement Areas. This could lead to a decline in the quality of Box-Gum Woodland in the study area.

The local occurrence of the community includes its occurrence in the study area (about 168 hectares) and adjoining areas of land zoned E2 which form a contiguous part of the local occurrence of the community. The composition of the local occurrence of the community may be indirectly affected by the proposal by a decline in condition through edge effects and weed spread and therefore the local occurrence of the community may 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

The project would remove 12.8 hectares of Box-Gum Woodland. There is about 168.3 hectares of Box-Gum Woodland in the study area and about 1845 hectares in the locality. The removal of 12.8 hectares in the subject site represents about 7.6 per cent of Box-Gum Woodland in the study area and 0.7 per cent in the locality.

The proposal would remove groundcover vegetation, woody debris, shrubs and litter which provides foraging habitat for a range of fauna species as well as structural components of Box-Gum Woodland. The canopy trees of the community are important for fauna foraging, refuge and potentially nesting and roosting. Canopy trees of the community form part of known habitat that is used by a range of threatened species including recently fledged Superb Parrots and a resident population of Squirrel Gliders.

The removal of these structural layers of Box Gum Woodland, particularly mature trees will remove the seed bank of Box-Gum Woodland in the subject site. The seed bank of Box-Gum Woodland in the study area and locality would not be removed or modified.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect hollow-dependent fauna in the ecological community, in particular the endangered population of Squirrel Gliders that occur in the study area.

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

Fragmentation of the vegetation in the locality has previously occurred through the development of surrounding areas for agriculture, residential expansion, the Kapooka Military Area and through the construction of other linear infrastructure (such as roads, railway lines and power lines).

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga. These corridors link to remnant vegetation patches south of the study area (e.g. Mount Flakney, Gregadoo Hills and Livingstone National Park). The woodland in the study area is likely to facilitate the movement of a range of fauna species to the north and south which assist in the persistence of the community.

The proposal has the potential to fragment woodland habitat throughout the study area. The width of the proposed road formation and clear zone requirements (up to 180 metres), including locations of fill (up to 14 metres in height) and cut (up to 18 metres in depth) have the potential to create barriers to movement for fauna species which may be important for seed dispersal or pollination.

Box-Gum Woodland in the study area forms an important part of the habitat available for both threatened and non-threatened fauna. Box-Gum Woodland will be further fragmented by the proposal and has the potential to affect the movement of the endangered population of Squirrel Gliders and other woodland birds in the study area. The proposal will minimise the effects of habitat fragmentation and connectivity through a strategic revegetation plan and placement of Squirrel Glider crossing structures to facilitate species movement through the subject site and study area.

The construction of the realigned Olympic Highway through the E2 zone would fragment the Planning Agreement Areas in the west from the remaining Planning Agreement Areas in the east. The resulting fragment of the Planning Agreement Area that would be bound by the existing Olympic Highway, the realigned Olympic Highway, and the Sydney to Melbourne Rail Line and Camp Access Road is about 7.7 hectares (eight hectares in the E2 zone).

These areas form part of the local occurrence of the community and will be fragmented and isolated from remaining areas of the local occurrence of this community to the east and north of the proposal.

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

There are few remnants of Box-Gum Woodland in good condition in the locality. Remnants of the ecological community in the locality are largely restricted to isolated patches of canopy trees with a highly degraded understorey. An exception to this is the area protected under the Planning Agreement Areas for the biocertified Wagga Wagga LEP. In addition, many of the remaining Box-Gum Woodland remnant vegetation patches in the locality (eg Kapooka Military Area, Pomingalarna Reserve, Red Hill Reserve and Willans Hill) are zoned either E2 or RE1 (Public Recreation) but do not have formal conservation agreements in place to protect these sites specifically for their biodiversity values.

The Planning Agreement Areas were established by Wagga Wagga City Council to offset other impacts on Box-Gum Woodland within the biocertified area of the Wagga Wagga LEP 2010 at a ratio of 10:1. The woodland vegetation in the study area including the Planning Agreement Areas and E2 zone is very important to the survival of Box-Gum Woodland, particularly due to the fragmented nature of the woodland in the locality, increasing developmental pressure and

the high quality of the Box-Gum Woodland to be removed (ie substantial canopy cover with diverse native understory).

Although there is an additional 1845 hectares of the Box-Gum Woodland in the locality, much of the remaining patches do not have the high diversity in the groundlayer as parts of the subject site and hence have less ability to recover.

The habitat to be removed is therefore considered to be important to the long-term survival of the ecological community in the locality.

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

The proposal would not affect any habitat listed on the critical habitat register.

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

There is no state recovery plan for Box-Gum Woodland. There is a national recovery plan for the ecological community. Strategy two of the recovery plan aims to 'increase protection of Box-Gum Grassy Woodland'. The proposal is not consistent with this strategy and also has direct impacts on an area of Box-Gum Grassy Woodland that has been previously protected for conservation purposes in the Planning Agreement Areas (8.4 hectares). However, a proposed offset site has been identified that has 287.4 hectares of Box-Gum Woodland on the property of which 117.9 hectares would be used to offset the residual impacts of this project.

In addition, the OEH (2011) Threatened Species website identifies a number of actions that need to occur to recover the community, which are relevant to the proposal:

- Protect all sites from further clearing and disturbance

The proposal would conflict with some of the recommended recovery actions due to the requirement for vegetation removal within the Box-Gum Woodland ecological community. The proposal includes the conservation of a proposed offset site in perpetuity which includes 117.9 hectares of Box-Gum Woodland (287.4 hectares of Box-Gum Woodland available at the offset site).

- Ensure remnants remain connected or linked to each other

The proposal would conflict with this recovery action by contributing to the existing fragmentation of the woodland in the study area as described above. This would cause the fragmentation of Box-Gum Woodland from east to west. The proposal will minimise the effects of fragmentation by implementation of strategic revegetation that aims to maintain and increase connectivity in the study area.

- Leave fallen timber on the ground

The proposal would conflict with this recovery action by removing woody debris from the subject site as described above. However, felled trees would be salvaged from the subject site and placed in the study area to benchmark levels for the Box-Gum Woodland vegetation type in the Murrumbidgee CMA.

- Undertake weed control (taking care to spray or dig out only target species)

The proposal would conflict with this recovery action by creating conditions that could promote the spread of introduced weed species through a high quality patch of Box-Gum Woodland, as

described above. However, weed control measures such as chemical and manual removal of noxious weed species will be implemented during construction and operation.

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 proposed action constitutes three listed key threatening processes relevant to the Box-Gum Woodland ecological community:

- Clearing of native vegetation – the proposal would remove 12.8 hectares of Box-Gum Woodland. However a proposed offset site that contains 117.9 hectares of Box-Gum Woodland in the LGA would be conserved in perpetuity.
- Loss of hollow-bearing trees – the proposal would remove 13 hollow-bearing trees from the subject site. The removal of these trees has the potential to affect hollow-dependent fauna in the ecological community. The offset site contains hollow-bearing trees and hollow dependant threatened fauna species have been observed at the offset site (eg Superb Parrot and Little Lorikeet). In addition, a nest box strategy would be developed in implemented to mitigate the short term loss of hollows in the subject site.
- Removal of dead wood and dead trees – the proposal would remove woody debris and six dead trees with dbh less than 40 centimetres from the subject site. Woody debris would be relocated into the study area wherever possible to within benchmark levels for that vegetation type. The offset site contains dead wood and dead trees throughout and these would be retained as part of the management and conservation of the offset site.

Conclusion

The proposal is likely to have a significant effect on the local occurrence of endangered Box-Gum Woodland. The local occurrence of the community includes the contiguous patch of Box-Gum Woodland that encompasses its occurrence in the study area and extending north and east into the E2 zone and Planning Agreement Areas. The local occurrence of the community would be significantly impacted by:

- *Fragmentation and isolation of the local occurrence of Box-Gum Woodland.*
- *Direct removal of 8.4 hectares of Box-Gum Woodland in the Planning Agreement Areas*
- *Reduction in extent of the local occurrence of the ecological community.*
- *Modification of the composition of the local occurrence of the ecological community.*

Parrots and lorikeets

- Little Lorikeet (*Glossopsitta pusilla*) – Vulnerable.
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable.
- Swift Parrot (*Lathamus discolor*) – Endangered.
- Turquoise Parrot (*Neophema pulchella*) – Vulnerable.

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 woodland in the study area is known to provide habitat for three threatened woodland parrot species, the Little Lorikeet, Superb Parrot and Swift Parrot.

The Superb Parrot was observed in the study area in large numbers. Fledglings were present in the study area, and had likely been brought to the site by parents from breeding habitat closer to the Murrumbidgee River. No breeding behaviour by adult Superb Parrots was observed in the study area. Previous surveys have also identified the Superb Parrot in the study area and locality with breeding behaviour observed in River Red Gum Woodland in the locality only (not the study area) (CSU 2006).

The Swift Parrot was observed foraging on Golden Wattle (*Acacia pycnantha*) in the study area near the decommissioned fuel depot and has been previously observed in Silvalite Reserve and the Kapooka Military Area during previous surveys. The Little Lorikeet was observed in both the subject site and study area foraging on flowering White Box, east of the existing Olympic Highway, and has previously been recorded within Silvalite Reserve.

No Turquoise Parrots were observed in the targeted surveys in there are no previous records in the study area for this species. However, the study does have suitable potential habitat for this species in the form of eucalypt woodland on the edges of cleared areas with abundant food sources on the ground.

The trees provide nectar and pollen during periods of flowering for the Little Lorikeet, Superb Parrot and Swift Parrot. The White Box trees in the study area provide a foraging resource for the Swift Parrot during winter when the species migrates to the mainland from Tasmania.

The grassy understorey and shrubs in the woodland provide foraging resources for the Little Lorikeet and Superb Parrot. In addition, the Superb Parrot is known to forage in low condition vegetation and introduced grassland and was observed feeding in cleared agricultural land during current surveys.

Hollow-bearing trees could potentially be used by the Little Lorikeet and Turquoise Parrot for nesting, although this has not been observed during any of the surveys in the study area. They are unlikely to be used by the Superb Parrot, which is only known to use River Red Gum trees for breeding in the locality (and no breeding behaviour has observed in the study area). No breeding of the Swift Parrot occurs in the study area as it only breeds in Tasmania.

The woodland in the study area provides movement habitat for all these species. The proposed removal of woodland would reduce the amount of roosting and foraging habitat, for woodland parrots and lorikeets in the study area, and potential nesting habitat for the Little Lorikeet and Turquoise Parrot. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent of woodland in the locality.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect the life cycle of the Little Lorikeet, which could potentially use tree hollows in the study area. However, there are large areas of potential breeding habitat in the study area and locality, including at least an additional 465 hollows in the study area that are suitable for use by the Little Lorikeet and Turquoise Parrot, and the removal of these trees would be unlikely to represent a significant loss of potential breeding habitat.

The proposal would remove 788 trees from the subject site, of which 30 trees have a dbh greater than 40 centimetres. These trees provide roosting, movement and foraging habitat for threatened parrots, however their removal would be unlikely to significantly affect the life cycle of any of these species due to the relatively small amount of habitat to be affected compared to the amount of habitat present in the locality and due to the mobility and relatively large ranges of these species.

The proposal would remove groundcover vegetation and shrubs where roads are constructed and where vehicle and machinery accesses are located. This would remove foraging habitat for the Little Lorikeet and Superb Parrot.

In addition, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on the life cycle of threatened parrots and lorikeets in the study area. These include:

- Removal of mature trees, including hollow-bearing trees, will be minimised wherever possible.
- The installation of nest boxes in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres. Seventy per cent of nest boxes required for the proposal would be installed prior to the commencement of clearing activities.
- The limits of the proposal will be defined by survey before clearing and grubbing. Removal of remnant native vegetation in Silvalite Reserve, the Planning Agreement Areas and roadside reserves will be minimised wherever possible and will include use of exclusion fencing where appropriate.
- Shrubs will be planted under the bridge and on batter slopes to assist in revegetation and to aid fauna passage and woodland bird movement.

In addition, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a *Nature Conservation Trust Act 2001* covenant. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The vegetation types identified at the offset site include:

- Grassy White Box – Blakely's Red Gum – Yellow Box woodland of the NSW South Western Slopes Bioregion.
- Mugga Ironbark – Inland Grey Box – Pine tall woodland of the NSW South Western Slopes Bioregion.
- White Box – White Cypress – Inland Grey Box woodland on the western slopes of NSW.

The offset site contains a similar vegetation type to what is being removed at the subject site, with the majority of canopy vegetation classifying as Box-Gum Woodland. The site provides suitable potential habitat for all three threatened parrot and lorikeet species, according to the BBAM, with the Little Lorikeet and Superb Parrot both recorded at the site. Therefore, the habitat for the threatened parrot and lorikeet species to be removed would be partially compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

The amount of habitat for threatened parrot and lorikeet species proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality. High quality habitat for these species is present in other parts of the study area and outside the study area, in addition to the offset site to be conserved in perpetuity. As well, the Superb Parrot and Swift Parrot would not use the study area for breeding. Given the mobility of these species, the amount of habitat available in the locality, and the implementation of mitigation measure to reduce potential impacts on the species, it is unlikely that the proposal would have an adverse effect on the life cycle of a threatened parrot or lorikeet species such that a viable local population of the species is likely to 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

Not applicable.

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.

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

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

The proposed removal of trees would reduce the amount of roosting, movement and foraging habitat for woodland parrots and lorikeets in the study area, and potential nesting habitat for the Little Lorikeet and Turquoise Parrot. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent in the locality.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect breeding habitat for the Little Lorikeet. However, there are large areas of potential breeding habitat in the locality, including at least an additional 465 hollows in the study area that are suitable for use by the Little Lorikeet and Turquoise Parrot, and the removal of these trees would be unlikely to represent a substantial loss of potential breeding habitat.

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

Fragmentation of the vegetation in the locality has previously occurred through the development of surrounding areas for agriculture, residential expansion, the Kapooka Military Area and through the construction of other linear infrastructure (such as roads, railway lines and power lines). Although these developments have created barriers to movement for some fauna species, they have not prevented Little Lorikeets, Superb Parrots and Swift Parrots from using the study area.

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga. These corridors link to remnant vegetation patches south of the study area (eg Mount Flakney, Gregadoo Hills and Livingstone National Park). The woodland in the study area is likely to facilitate the movement of woodland parrots and lorikeets.

The removal of vegetation would increase fragmentation in the study area, further increasing the gaps in vegetation that parrots and lorikeets use for dispersal, nesting, roosting and foraging but not to the extent that it would cause isolation because of the species high mobility. In addition, this will be mitigated through the use of strategic revegetation.

Due to the mobility of the threatened parrots and lorikeets assessed, and their relatively large home ranges, the proposal is unlikely to create any substantial barriers to movement for these species.

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

The proposal would remove 9.6 hectares of woodland from the E2 zone, of which 8.4 hectares is within the Planning Agreement Areas. The E2 zone has been designated as such for environmental conservation, with the Planning Agreement Areas, owned by council, for biodiversity offsetting for the Wagga Wagga LEP. Removal of an area specifically set aside for conservation purposes has the potential to affect the threatened parrot and lorikeet species within the study area due to a decrease in the availability of high quality habitat.

The habitat to be removed provides high quality woodland habitat for threatened parrot and lorikeet species. These species are likely to use the woodland in the study area for foraging and movement. As well, hollow-bearing trees in the study area could potentially be used for nesting and breeding by the Little Lorikeet and Turquoise Parrot.

The amount of habitat for threatened parrot and lorikeet species proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality (there are 6500 hectares of habitat available in the locality). High quality habitat for these species is present in other parts of the study area and outside the study area. As well, hollow-bearing trees in the study area would not be used by the Superb Parrot and Swift Parrot. Given the mobility of these species, it is unlikely that the relatively small area of habitat to be removed would be important to any of these species in the locality.

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

The proposal would not affect any habitat listed on the critical habitat register.

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

There is no state recovery plan for any of the threatened parrot and lorikeet species. A national recovery plan has been prepared for the Superb Parrot and Swift Parrot.

There is one objective of the Superb Parrot national recovery plan that is relevant to the proposal; develop and implement threat abatement strategies (objective 3). The proposal would exacerbate the listed major threats to the species, including loss and degradation of habitat and road-kills.

There are two main recovery actions for the Swift Parrot in the national recovery plan that are relevant to the proposal; manage and protect Swift Parrot habitat at the landscape scale (action 2) and monitor and manage the impact of collisions, competition and disease (action 3).

The management of the offset site will assist in protecting potential Swift Parrot habitat at the landscape scale (action 2) through conservation in perpetuity and active management strategies to preserve and increase habitat for threatened species. However, the proposal may result in increased collisions at the proposal site (action 3).

For the Little Lorikeet the OEH (2013) Threatened Species website lists a number of actions that need to occur to assist the species recovery. These include the retention of large old trees,

especially those that are hollow-bearing and protection of large flowering *Eucalyptus* trees. Another action identified is to ensure recruitment of trees into the mature age class so that there is not a lag period of decades between the death of old trees and hollow formation in younger trees. The proposal is not consistent with these actions due to the removal of woodland, including hollow-bearing trees.

For the Turquoise Parrot the OEH (2013) Threatened Species website lists a number of relevant actions that need to occur to assist the species recovery. These include the control of feral cats and foxes, control weeds at priority sites and encourage management of livestock grazing so as to improve foraging habitat.

The proposal would remove known habitat for the Little Lorikeet, Superb Parrot and Swift Parrot and potential habitat for the Turquoise Parrot. The loss of habitat would include 30 trees with dbh greater than 40 centimetres, including 13 hollow-bearing trees. The proposal would also remove around 700 regenerating trees.

However, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on threatened parrots and lorikeets in the study area, as described above.

As well, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a covenant under the *Nature Conservation Trust Act 2001*. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The site provides suitable potential habitat for all three threatened parrot and lorikeet species, according to the BBAM. Therefore, the habitat to be removed would be compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

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 proposed action constitutes three listed key threatening processes relevant to the proposal:

- Clearing of native vegetation – the proposal would remove 14.2 hectares of woodland habitat from the subject site; however this is unlikely to represent a significant loss of habitat for any of the parrot or lorikeet species in the locality (0.2 per cent of woodland in the locality). Vegetation to be removed would be compensated for by a biodiversity offset site that has been identified. An offset plan has been prepared to manage the site and conserve in in perpetuity, as described in (a).
- Loss of hollow-bearing trees – the proposal would remove 13 hollow-bearing trees from the subject site. This has the potential to affect the Little Lorikeet and Turquoise Parrot. However, there are large areas of potential breeding habitat in the locality (including at least an additional 465 hollows in the study area that are suitable for use by the Little Lorikeet), as described above, and the removal of these trees would be unlikely to represent a significant loss of potential breeding habitat. In addition, nest boxes will be installed in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres, and any hollows removed during pre-clearing and not being relocated as coarse woody debris will be used in the design of nest boxes. In addition, hollow-bearing trees were observed throughout the proposed offset site.
- Removal of dead trees – the proposal would remove six dead trees with dbh less than 40 centimetres from the subject site. This has the potential to impact on the Little Lorikeet if hollows are being used for nesting habitat. Mitigation measures would be implemented to compensate for the loss of hollow-bearing trees, as described above.

Conclusion

The proposal would be unlikely to have a significant effect on any threatened parrot or lorikeet species for the following reasons:

- The relatively small proportion of potential habitat for these species in the locality being removed (0.2 per cent)
- The high mobility and large home ranges of the threatened parrot and lorikeet species assessed
- The presence of high quality habitat for these species in other parts of the study area and locality
- The implementation of mitigations measures to reduce potential impacts on the species, particularly in regards to nesting habitat in hollow-bearing trees and strategic revegetation
- The conservation of a biodiversity offset site in perpetuity that provides suitable potential habitat for the threatened parrot and lorikeet species assessed.

Woodland birds

- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*) – Vulnerable.
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) – Vulnerable.
- Diamond Firetail (*Stagonopleura guttata*) – Vulnerable.
- Flame Robin (*Petroica phoenicea*) – Vulnerable.
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) – Vulnerable.
- Hooded Robin (south eastern form) (*Melanodryas cucullata cucullata*) – Vulnerable.
- Scarlet Robin (*Petroica boodang*) – Vulnerable.
- Speckled Warbler (*Pyrrholaemus saggitatus*) – Vulnerable.
- Varied Sittella (*Daphoenositta chrysoptera*) – Vulnerable.

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 woodland in the study area is known to provide habitat for the Brown Treecreeper, Diamond Firetail, Flame Robin, Grey-crowned Babbler, Scarlet Robin and Speckled Warbler. The Grey-crowned Babbler, Brown Treecreeper and Scarlet Robin are all known from the areas immediately adjacent to the subject site while the Diamond Firetail, Flame Robin and Speckled Warbler are known from the north western edge of the study area in plantings of the agricultural research station.

The Brown Treecreeper has been observed in Silvalite Reserve during previous studies. The Grey-crowned Babbler was observed in the study area during this study and previous studies.

Based on resources present and records in the locality, the woodland in the study area may also provide habitat for the Hooded Robin, Black-chinned Honeyeater and Varied Sittella.

The trees provide nectar and pollen during periods of flowering, as well as invertebrates for the Black-chinned Honeyeater, Brown Treecreeper, Gilberts Whistler and Grey-crowned Babbler.

The grassy understorey and shrubs of the woodland provide foraging resources for the Brown Treecreeper, Diamond Firetail, Flame Robin, Grey-crowned Babbler, Hooded Robin, Speckled Warbler and Scarlet Robin.

The trees and understorey in the study area, particularly in Silvalite Reserve and parts of the Planning Agreement Areas are providing potential feeding and roosting resources for all of these species

Hollow-bearing trees could potentially be used by the Brown Treecreeper for nesting, although breeding behaviour this has not been observed during any of the surveys in the study area.

The proposed removal of woodland would reduce the amount of nesting, roosting, movement and foraging habitat for woodland birds in the study area. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent of woodland in the locality.

The woodland in the study area provides movement habitat for all these species. The proposed removal of woodland would reduce the amount of roosting and foraging habitat, for woodland birds in the study area.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect the life cycle of the Brown Treecreeper, which could potentially use tree hollows in the study area. However, there are large areas of potential breeding habitat in the study area and locality, including at least an additional 465 hollows in the study area that are suitable for use by this species, and the removal of these trees would be unlikely to represent a significant loss of potential breeding habitat.

The proposal would remove 788 trees from the subject site, of which 30 trees have a dbh greater than 40 centimetres. These trees provide potential breeding, roosting, movement and foraging habitat for the non-hollow dependant species, however their removal would be unlikely to significantly affect the life cycle of any of these species due to the relatively small amount of habitat to be affected compared to the amount of habitat present in the study area and locality.

In addition, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on the life cycle of threatened woodland birds in the study area. These include:

- Removal of mature trees, including hollow-bearing trees, will be minimised wherever possible.
- The installation of nest boxes in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres. Seventy per cent of nest boxes required for the proposal would be installed prior to the commencement of clearing activities.
- The limits of the proposal will be defined by survey before clearing and grubbing. Removal of remnant native vegetation in Silvalite Reserve, the Planning Agreement Areas and roadside reserves will be minimised wherever possible and will include use of exclusion fencing where appropriate.
- Shrubs will be planted under the bridge and on batter slopes to assist in revegetation and to aid fauna passage and woodland bird movement.

In addition, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a *Nature Conservation Trust Act 2001* covenant. The offset site is 298.3 hectares in size

and contains predominantly native vegetation. The vegetation types identified at the offset site include:

- Grassy White Box – Blakely's Red Gum – Yellow Box woodland of the NSW South Western Slopes Bioregion.
- Mugga Ironbark – Inland Grey Box – Pine tall woodland of the NSW South Western Slopes Bioregion.
- White Box – White Cypress – Inland Grey Box woodland on the western slopes of NSW.

The offset site contains a similar vegetation type to what is being removed at the subject site, with the majority of canopy vegetation classifying as Box-Gum Woodland. The site provides suitable potential habitat for all woodland bird species, according to the BBAM, with the Brown Treecreeper, Diamond Firetail, Scarlet Robin and Flame Robin all recorded at the offset site.

Therefore, habitat for the woodland birds would be partially compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

The amount of habitat for woodland bird species proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality. High quality habitat for these species is present in other parts of the study area and outside the study area, in addition to the offset site to be conserved in perpetuity. Given the amount of habitat available in the study area and locality, and the implementation of mitigation measure to reduce potential impacts on the species, it is unlikely that the proposal would have an adverse effect on the life cycle of the threatened woodland bird species such that a viable local population of the species is likely to 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

Not applicable.

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.

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

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

The proposed removal of trees would reduce the amount of nesting, roosting, movement and foraging habitat for woodland birds in the study area. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent in the locality.

Thirteen hollow-bearing trees would be removed from the subject site. The removal of these trees has the potential to affect breeding habitat for the Brown Treecreeper. However, there are

large areas of potential breeding habitat in the locality, including at least an additional 465 hollows in the study area that are suitable for use by the Brown Treecreeper, and the removal of these trees would be unlikely to represent a substantial loss of potential breeding habitat.

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

Fragmentation of the vegetation in the locality has previously occurred through the development of surrounding areas for agriculture, residential expansion, the Kapooka Military Area and through the construction of other linear infrastructure (such as roads, railway lines and power lines). Although these developments have created barriers to movement for some fauna species, they have not prevented some of the woodland birds recorded from using the study area.

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga. These corridors link to remnant vegetation patches south of the study area (eg Mount Flakney, Gregadoo Hills and Livingstone National Park). The woodland in the study area is likely to facilitate the movement of woodland birds.

The removal of vegetation would increase fragmentation in the study area, further increasing the gaps in vegetation that parrots and lorikeets use for dispersal, nesting, roosting and foraging but not to the extent that it would cause isolation. In addition, this will be mitigated through the use of strategic revegetation.

Grey-crowned Babblers are laborious in flight and establish territorial family groups and are generally unable to cross large open areas. Brown Treecreepers, while more mobile are fairly sedentary. It is unlikely though that the fragmentation caused by the proposal would prevent these species from moving through the study area. Studies by SKM (2011) have identified Brown Treecreepers crossing a four lane dual carriageway highway using newly planted vegetation in the median strip as a stepping stone.

However, due to the mobility of the other threatened birds assessed, and their moderate home ranges, the proposal is unlikely to create any significant barriers to movement for these species.

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

The proposal would remove 9.6 hectares of woodland from the E2 zone, of which 8.4 hectares is within the Planning Agreement Areas. The E2 zone has been designated as such for environmental conservation, with the Planning Agreement Areas, owned by council, for biodiversity offsetting for the Wagga Wagga LEP. Removal of an area specifically set aside for conservation purposes has the potential to affect the threatened parrot and lorikeet species within the study area due to a decrease in the availability of high quality habitat.

The habitat to be removed provides high quality woodland habitat for woodland bird species. These species are likely to use the woodland in the study area for foraging and movement. As well, hollow-bearing trees in the study area could potentially be used for nesting and breeding by the Brown Treecreeper.

The amount of habitat for woodland bird species proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality (ranging anywhere from ~2000 hectares to ~5000 hectares for various species). High quality habitat for these species is present in other parts of the study area and locality (eg Planning Agreement Areas, Silvalite Reserve and Pomingalarna Reserve). Given the mobility of species and availability of habitat

that would not be impacted in the study area, it is unlikely that the relatively small area of habitat to be removed would be important to any of these species in the locality.

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

The proposal would not affect any habitat listed on the critical habitat register.

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

There is no state recovery plan for any of the threatened woodland bird species. However, in the profiles for these species on the OEH (2011) Threatened Species website, a number of actions are identified that need to occur to recover these species. For all the woodland bird species, an important action is the prevention of habitat loss, including loss of woodland habitat, hollow-bearing trees and woody debris. Prevention of weed invasion is also identified as an important action for some species.

The proposal would remove known habitat for the Brown Treecreeper and Grey-crowned Babbler, and potential habitat for the other woodland bird species. The loss of habitat would include 30 trees with dbh greater than 40 centimetres, including 13 hollow-bearing trees. The proposal would also remove around 700 regenerating trees.

Due to the proposed removal of woodland and trees of various size classes, the proposal is not consistent with the recovery actions identified on the OEH (2011) Threatened Species website.

In addition, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on threatened woodland birds in the study area.

As well, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a covenant under the *Nature Conservation Trust Act 2001*. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The site provides suitable potential habitat for all woodland bird species, according to the BBAM. Therefore, the habitat to be removed would be compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

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 proposed action constitutes three listed key threatening processes relevant to the proposal:

- Clearing of native vegetation – the proposal would remove 14.2 hectares of woodland habitat from the subject site; however this is unlikely to represent a significant loss of habitat for any woodland birds in the locality (0.2 per cent of woodland in the locality). Vegetation to be removed would be compensated for by a biodiversity offset site that has been identified. An offset plan has been prepared to manage the site and conserve in in perpetuity, as described in (a).
- Loss of hollow-bearing trees – the proposal would remove 13 hollow-bearing trees from the subject site. This has the potential to affect the Brown Treecreeper. However, there are large areas of potential breeding habitat in the locality (including at least an additional 465 hollows in the study area that are suitable for use by the Brown Treecreeper), as described above, and the removal of these trees would be unlikely to represent a

significant loss of potential breeding habitat. In addition, nest boxes will be installed in the subject site and study area at a minimum 1:1 ratio for the loss of hollows greater than five centimetres, and any hollows removed during pre-clearing and not being relocated as coarse woody debris will be used in the design of nest boxes. In addition, hollow-bearing trees were observed throughout the proposed offset site.

- Removal of dead trees – the proposal would remove six dead trees with dbh less than 40 centimetres from the subject site. The removal of woody debris habitat from the subject site would be mitigated through the placement of felled woody debris during construction in the study area. The loss of woody debris habitat would be unlikely to significantly affect any woodland bird species for the reasons detailed above.

Conclusion

The proposal would be unlikely to have a significant effect on any threatened woodland bird species for the following reasons:

- *The relatively small proportion of potential habitat for these species in the locality being removed (0.2 per cent).*
- *The presence of high quality habitat for these species in other parts of the study area and locality.*
- *The implementation of mitigations measures to reduce potential impacts on the species, particularly in regards to nesting habitat in hollow-bearing trees and strategic revegetation.*
- *The conservation of a biodiversity offset site in perpetuity that provides suitable potential habitat for the woodland bird species assessed.*

Predatory woodland birds

- Little Eagle (*Hieraaetus morphnoides*) – Vulnerable

b) 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

Little Eagle prefer open eucalypt forest, woodland or open woodland and nest in living eucalypt trees. The woodland in the study area provides known foraging habitat for the Little Eagle. This species was observed soaring over cleared paddocks in the study area during the current surveys. Despite targeted surveys of potential nesting habitat, nesting by Little Eagles was recorded in the study area.

The proposed removal of woodland would reduce the amount of potential roosting, movement and foraging habitat for Little Eagles in the study area. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent of woodland in the locality.

The Little Eagle has a large home range and is unlikely to rely solely on woodland in the subject site or study area for breeding and foraging. No breeding was observed in the study area despite targeted nest surveys. Patches of remnant woodland within the locality provide alternative habitat to that to be removed in the subject site. These patches are located north (Pomingalarna Reserve, Murrumbidgee River riparian corridor and Red Hill Reserve), east

(Lloyd E2 conservation areas) and west (Kapooka Military Area), of the study area. Due to the mobility and relatively large home range of this species, it is unlikely that the proposal would remove a significant amount of habitat for these species

The proposal would remove 788 trees from the subject site that may provide roosting, movement and foraging habitat for this species, however their removal would be unlikely to affect the life cycle of the Little Eagle due to the relatively small amount of habitat to be affected compared to the amount of habitat present in the locality (at least 5910 hectares).

As the proposal would remove habitat resources for potential prey species (eg brushtail possum), the proposal would also reduce the amount of foraging habitat for the Little Eagle. This species is highly mobile with a large home range however, and would be unlikely to be affected by the removal of a relatively small area of potential foraging habitat for prey species.

In addition, mitigation measures will be incorporated into the proposal in order to reduce the potential impacts on the life cycle Little Eagle in the study area. These include:

- The limits of the proposal will be defined by survey before clearing and grubbing. Removal of remnant native vegetation in Silvalite Reserve, the Planning Agreement Areas and roadside reserves will be minimised wherever possible and will include use of exclusion fencing where appropriate.

In addition, a biodiversity offset site has been identified about 40 kilometres east of the subject site and an offset plan has been prepared to manage the site and conserve it in perpetuity under a *Nature Conservation Trust Act 2001* covenant. The offset site is 298.3 hectares in size and contains predominantly native vegetation. The vegetation types identified at the offset site include:

- Grassy White Box – Blakely's Red Gum – Yellow Box woodland of the NSW South Western Slopes Bioregion.
- Mugga Ironbark – Inland Grey Box – Pine tall woodland of the NSW South Western Slopes Bioregion.
- White Box – White Cypress – Inland Grey Box woodland on the western slopes of NSW.

The offset site contains a similar vegetation type to what is being removed at the subject site, with the majority of canopy vegetation classifying as Box-Gum Woodland. The site provides suitable potential habitat for the Little Eagle.

Therefore, habitat for the woodland birds would be partially compensated for by the provision of similar habitat at the offset site, which is to be conserved in perpetuity.

Given the amount of habitat available in the study area and locality, and the implementation of mitigation measure to reduce potential impacts on the species, it is unlikely that the proposal would have an adverse effect on the life cycle of the Little Eagle such that a viable local population of the species is likely to 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

Not applicable.

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.

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

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

The proposed removal of trees would reduce the amount of roosting, movement and foraging habitat for Little Eagle in the study area. The proposal would remove 14.2 hectares of woodland, or 6.8 per cent of the woodland in the study area and 0.2 per cent in the locality.

The proposal would remove 788 trees from the subject site that may provide roosting, movement and foraging habitat for this species, however their removal would be unlikely to affect the life cycle of the Little Eagle due to the relatively small amount of habitat to be affected compared to the amount of habitat present in the locality (greater than 5910 hectares).

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

Fragmentation of the vegetation in the locality has previously occurred through the development of surrounding areas for agriculture, residential expansion, the Kapooka Military Area and through the construction of other linear infrastructure (such as roads, railway lines and power lines). Although these developments have created barriers to movement for some fauna species, they have not prevented the Little Eagle from using the study area.

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga. These corridors link to remnant vegetation patches south of the study area (eg Mount Flakney, Gregadoo Hills and Livingstone National Park). The woodland in the study area is likely to facilitate the movement of this species.

The removal of vegetation would increase fragmentation in the study area, however, this species mobility is unlikely to be affected by this increased fragmentation. In addition, strategic revegetation would be completed as part of the proposal mitigation measures.

Due to the mobility of this species and its large home range, the proposal is unlikely to create any significant barriers to movement for this species.

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

The proposal would remove 9.6 hectares of woodland from the E2 zone, of which 8.4 hectares is within the Planning Agreement Areas. The E2 zone has been designated as such for environmental conservation, with the Planning Agreement Areas, owned by council, for biodiversity offsetting for the Wagga Wagga LEP. Removal of an area specifically set aside for conservation purposes has the potential to affect the species due to a decrease in the availability of high quality habitat. However, this species is also likely to forage over low condition agricultural habitats.

This species is likely to use the woodland in the study area for foraging and movement. The amount of habitat for Little Eagle proposed to be removed is a relatively small proportion of the potential habitat for these species in the locality (at least 5910 hectares). Similar quality habitat for these species is present in other parts of the study area and locality (eg Planning Agreement Areas, Silvalite Reserve and Pomingalarna Reserve and other low condition vegetation in roadsides and agricultural areas). Given the mobility of this species and availability of habitat that would not be impacted in the study area, it is unlikely that the relatively small area of habitat to be removed would be important to any of these species in the locality.

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

The proposal would not affect any habitat listed on the critical habitat register.

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

The Little Eagle does not have a recovery plans established. However, in the profiles for this species on the OEH (2011) Threatened Species website, a number of actions are identified that need to occur to recover these species. For the Little Eagle an important action is the prevention of habitat loss, including loss of woodland habitat.

Due to the proposed removal of woodland and trees of various size classes, the proposal is not consistent with the recovery actions identified on the OEH (2011) Threatened Species website.

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 proposed action constitutes three listed key threatening processes relevant to the proposal:

- Clearing of native vegetation – the proposal would remove 14.2 hectares of woodland habitat from the subject site; however this is unlikely to represent a significant loss of habitat for the Little Eagle in the locality (0.2 per cent of woodland in the locality). Vegetation to be removed would be compensated for by a biodiversity offset site that has been identified. An offset plan has been prepared to manage the site and conserve in in perpetuity.
- Removal of dead trees – the proposal would remove six dead trees with dbh less than 40 centimetres from the subject site. The removal of woody debris habitat from the subject site would be mitigated through the placement of felled woody debris during construction in the study area. The loss of woody debris habitat would be unlikely to significantly affect the Little Eagle for the reasons detailed above.

Conclusion

The proposal would be unlikely to have a significant effect the Little Eagle for the following reasons:

- *The relatively small proportion of potential habitat for these species in the locality being removed (0.2 per cent).*
- *The presence of high quality habitat and low condition habitat that the species is known to utilise in other parts of the study area and locality.*

- *The implementation of mitigations measures to reduce potential impacts on the species, particularly in regards to strategic revegetation.*
- *The conservation of a biodiversity offset site in perpetuity that provides suitable potential habitat for the Little Eagle.*