E16. Eastern False Pipistrelle - (*Falsistrellus tasmaniensis*)

The Eastern False Pipistrelle is listed as Vulnerable under the *Threatened Species Conservation Act 1995*. This species was recorded via Anabat detection in Riparian Woodland during current surveys.

This species is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania (Department of Environment and Climate Change 2005a). Its distribution extends over the Great Dividing Range, with a preference for wet altitude forests (Law 2008). The Eastern False Pipistrelle roosts in tree hollows, although it can sometimes be found in caves (Jenolan area) and buildings (Churchill 1998).

E16.1 Significance assessment – Environmental Planning and Assessment Act 1979

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

This species is a forest dwelling bat of south-eastern Australia, with a preference for wet altitude forest (Law, Herr and Phillips 2008). It roosts in tree hollows and occasionally caves and buildings.

Although foraging, and potentially breeding, habitat may be affected by the Proposal, the area is not considered to be significant for the lifecycle of this species in relation to habitat available in the locality. With reported movements of 12 kilometres recorded for this species from roost to foraging area (Law, Herr and Phillips 2008), it is likely that this species does not rely solely on resources occurring within the subject site. Furthermore, clearing protocols would be put in place to minimise the impacts of clearing of hollow-bearing trees.

Therefore, it is not likely that the lifecycle of the Eastern False Pipistrelle would be affected by the Proposal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal would remove approximately 11 hectares of habitat for this species (refer Figure E16), including roosting and foraging resources. The area of this habitat is not, however, considered to be significant in relation to the amount of similar habitat that would remain unaffected in the locality. Furthermore, this species is highly mobile and similar foraging and roosting habitat is available in the local area. This species has reported movements of 12 kilometres from roost to foraging area in Victoria (Law, Herr and Phillips 2008). So, while the Proposal may temporarily affect the dynamics and habitat use of the local population, it is not likely to result in a long-term reduction in habitat availability for a local population.

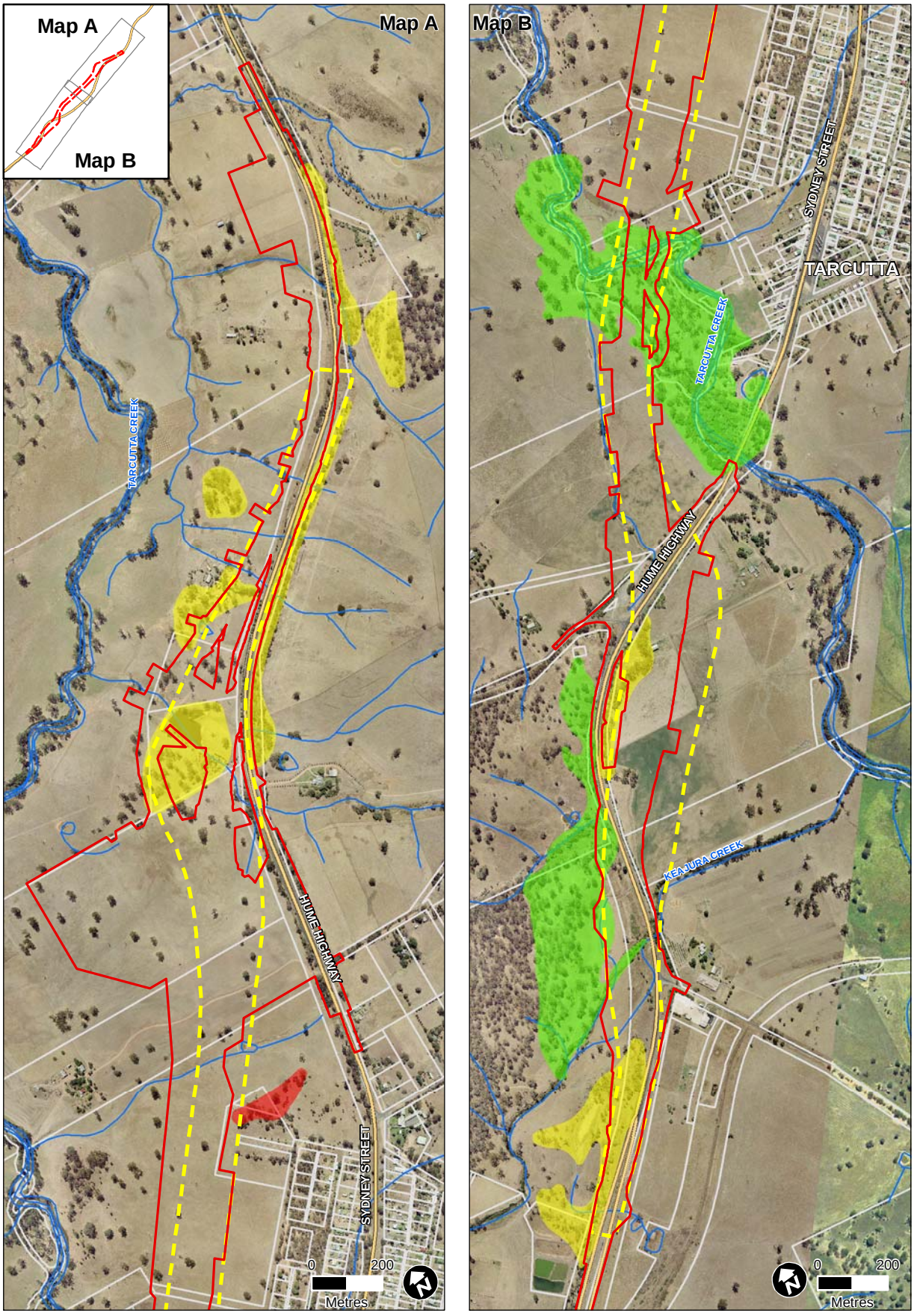

Figure E16 Distribution of potential habitat of the Eastern False Pipistrelle - *Falsistrellus tasmaniensis*

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

This species is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania with its distribution extending over the Great Dividing Range. The study area is, therefore, not at the limit of this species known distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency), flooding or other disturbance regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation, dead wood and hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

The Proposal would involve the removal of approximately 11 hectares of habitat for this species. The majority of this impact would occur as a linear strip within this habitat. Given the mobility of this species, the removal of the vegetation is not likely to further fragment or isolate habitat for this species.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.

The mobile nature of the species allows the Eastern False Pipistrelle to occupy foraging and roosting resources outside of the area proposed for vegetation removal. The species is not reliant on critical habitat features, such as maternity caves, like other species of microchiropteran bat. Therefore, relatively small areas of foraging and roosting habitats would not be considered critical to the survival of the species.

It is not likely that the Proposal would adversely affect habitat critical to the survival of the species.

Conclusion

Based on the above assessment, the Eastern False Pipistrelle is not likely to be significantly affected by the Proposal.

E17. Greater Long-eared Bat - *Nyctophilus timoriensis* (south-eastern form)

The Greater Long-eared Bat is listed as Vulnerable under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act*. Although not recorded, suitable habitat exists within the study area.

Greater Long-eared Bats inhabit a variety of vegetation types, including mallee and box eucalypt dominated communities, but they are distinctly more common in box/ironbark/cypress-pine vegetation, which occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. They roost in tree hollows, crevices and under loose bark. It is a slow flying, agile bat using the understorey to hunt non-flying prey — especially caterpillars and beetles — and will even hunt on the ground. Mating takes place in autumn, with one or two young born in late spring to early summer (Churchill 1998).

Threats to this species include:

- Loss of remnant semi-arid woodland and mallee habitat.
- Loss of hollow-bearing trees.
- Application of pesticides in or adjacent to foraging areas (Department of Environment and Conservation 2005b).

This species was not recorded during current field surveys.

E17.1 Significance assessment – Environment Protection and Biodiversity Conservation Act 1999

The following assessment has been undertaken following the *Principal Significant Impact Guidelines 1.1* (Department of the Environment and Heritage 2006a).

Under these guidelines, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity; and/or
- at or near the limit of the species range.

The Greater Long-eared Bat population in the study area, if present, is not considered to be important.

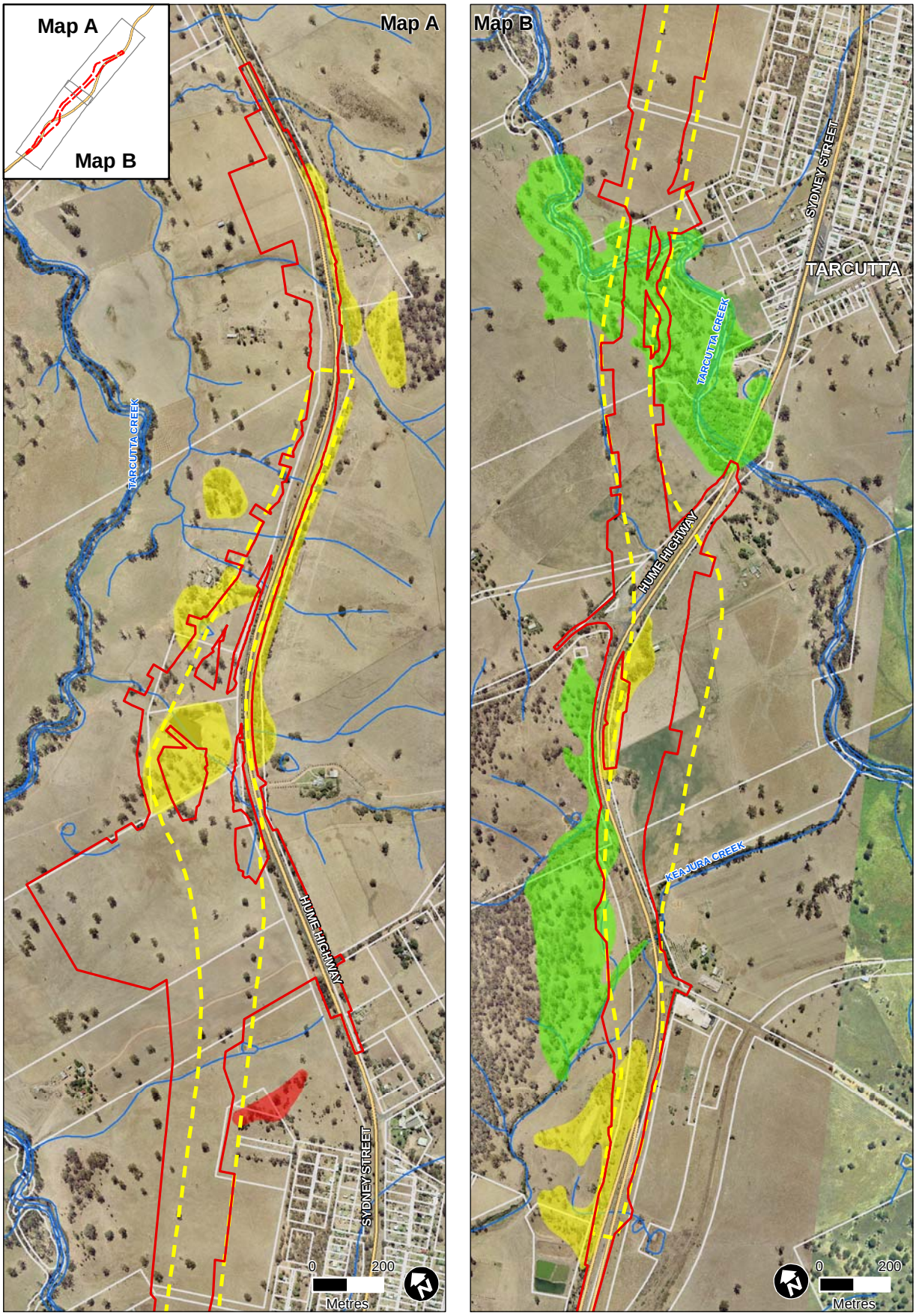

Figure E17 Distribution of potential habitat of the Greater Long-eared Bat - *Nyctophilus timoriensis* (south-eastern form)

Will the action lead to a long-term decrease in the size of an important population of a species?

The population of Greater Long-eared Bat in the study area is not considered to be an important population.

The Proposal would remove approximately 11 hectares of habitat for this species, including roosting and foraging resources. This area is not, however, considered to be significant in terms of similar habitat available in the locality. Furthermore, this species is highly mobile and similar foraging and roosting habitats are available in the local area. Although the Proposal may temporarily affect the dynamics of the local population, it is unlikely to result in a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population of the species?

The population of Greater Long-eared Bat in the study area is not considered an important population.

The Proposal would remove approximately 11 hectares of habitat for this species, including roosting and foraging resources. The area of this habitat is not, however, considered to be significant in relation to the amount of similar habitat that would remain unaffected in the locality.

Will the action fragment an existing important population into two or more populations?

The population of Greater Long-eared Bat in the study area is not considered an important population.

The Proposal would remove approximately 11 hectares of habitat for this species that generally occurs as relatively small remnants in an otherwise modified landscape. Given the mobility of this species, the removal of the vegetation is not likely to further fragment or isolate populations.

Will the action adversely affect habitat critical to the survival of a species?

The mobile nature of the species allows the Greater Long-eared Bat to occupy foraging and roosting resources outside of the area proposed for vegetation removal. The species is not reliant on critical habitat features, such as maternity caves, like other species of microchiropteran bat. Therefore, relatively small areas of foraging and roosting habitats should not be considered critical to the survival of the species.

It is not likely that the Proposal would adversely affect habitat critical to the survival of the species.

Will the action disrupt the breeding cycle of an important population?

The population of Greater Long-eared Bat in the study area is not considered an important population. Although breeding habitat may be affected, the area is not considered to be significant in relation to habitat available in the locality. Furthermore, clearing protocols would be put in place to minimise the impacts of clearing of hollow-bearing trees.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area contains moderate foraging and roosting resources for bats. The amount of habitat proposed for removal (approximately 11 hectares) (12.5 per cent of vegetation in the study area) is relatively small in relation to habitat remaining in the locality.

The removal of habitat is not likely to significantly decrease the availability of habitat or result in the decline of habitat condition for this species. The high mobility of this species would allow offsite foraging resources to be used and the Proposal would not result in isolation of habitat.

It is not likely that the Proposal would isolate or decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is not likely that invasive species that are harmful to the Greater Long-eared Bat would become established.

Will the action introduce disease that may cause the species to decline?

No. There are no known diseases that are likely to increase in the area as a result of the Proposal.

Will the action interfere with the recovery of the species?

The *Action Plan for Australian Bats* (Duncan *et al.* 1999) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific roosting requirements. However, based on the potential ecological impacts of the Proposal on the species, as discussed above, it is not likely that the Proposal would interfere with the recovery of this species.

E17.2 Significance assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Greater Long-eared Bats inhabit a variety of vegetation types, including mallee and box eucalypt dominated communities, but they are distinctly more common in box/ironbark/cypress-pine vegetation, where they roost in tree hollows, crevices and under loose bark.

Although breeding habitat may be affected, the area is not considered to be significant for the lifecycle of this species in relation to habitat available in the locality. Clearing protocols would be put in place to minimise the impacts of clearing of hollow-bearing trees.

Therefore, it is not likely that the lifecycle of the Greater Long-eared Bat would be affected by the Proposal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal would remove approximately 11 hectares of habitat for this species (Figure E18), including roosting and foraging resources. The area of this habitat is not, however, considered to be significant in relation to the amount of similar habitat that would remain unaffected in the locality Furthermore, this species is highly mobile and similar foraging and roosting habitat are available in the local area. Although the Proposal may temporarily affect the dynamics and habitat use of the local population, it is not likely to result in a long-term reduction in habitat availability for a local population.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Greater Long-eared Bats inhabit a variety of vegetation types throughout NSW, including mallee and box eucalypt dominated communities. They are distinctly more common in box/ironbark/cypress-pine vegetation, which occur in a north-south belt along the western slopes and plains of NSW and southern Queensland (Department of Environment and Conservation 2006b). The study area is, therefore, not at the limit of this species' known distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency), flooding or other disturbance regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and such impacts on biodiversity are already present. The Proposal would introduce several disturbance regimes including, loss of native vegetation, dead wood and hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

The Proposal would involve the removal of approximately 11 hectares of potential habitat for this species. The majority of this impact would occur as a linear strip within potential, albeit disturbed, habitat. Given the mobility of this species, the removal of the vegetation is not likely to further fragment or isolate habitat for this species.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.

The mobile nature of the species allows the Greater Long-eared Bat to occupy foraging and roosting resources outside of the area proposed for vegetation removal. The species is not reliant on critical habitat features, such as maternity caves, like other species of microchiropteran bat. Therefore, relatively small areas of foraging and roosting habitats would not be considered critical to the survival of the species.

It is unlikely that the Proposal would adversely affect habitat critical to the survival of the species.

Conclusion

Based on the above assessment, the Greater Long-eared Bat is not likely to be significantly affected by the Proposal.

E18. Koala (*Phascolarctos cinereus*)

The Koala occurs along the east coast of Australia and extends into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range (Department of Environment and Climate Change 2008a). The range of the Koala covers all such suitable areas of NSW. The diet is generally restricted Eucalypt leaves (Department of Environment and Climate Change 2008a). On occasion, non-Eucalypt foliage is eaten. The foliage of *Eucalyptus camaldulensis* (River Red Gum), *E. melliodora* (Yellow Box), *E. albens* (White Box), *E. blakelyi* (Blakely's Red Gum) and *E. microcarpa* (Western Grey Box) are some of the preferred and secondary food tree species for Koalas occurring on the Western Slopes and Plains (Department of Environment and Climate Change, 2008 #2061). Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted or nutrient deprived.

This species was not recorded during current field surveys.

E18.1 Significance assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Approximately 11 hectares of potential habitat for Koalas would be removed by the Proposal. Although potential habitat occurs within the study area, the area is not considered to be significant for the lifecycle of this species in relation to habitat available in the locality. The majority of Box-Gum Woodland likely to be affected occurs as small remnant stands and paddock trees. Approximately three hectares of moderate condition Riparian Woodland occurring to the west of the township of Tarcutta (survey site S2) is likely to be affected and fragmented by the Proposal.

Vegetation within the subject site could potentially be used for foraging, and would generally exist as part of a larger home range. Depending on habitat quality, Koalas have a home range that ranges from less than two hectares to more than several hundred hectares (Department of Environment and Climate Change 2008c). As such, this species is not likely to be dependent on foraging or breeding resources available in the subject site.

Although Riparian Woodland located at survey site S2 would be fragmented by the Proposal, appropriate mitigation measure, as outlined in Section 7 and Appendix F, would ameliorate certain impacts of the Proposal. The proposed bridge over Tarcutta Creek would effectively provide a passageway for this species to move through the natural corridor. As such, the removal of approximately three hectares of predominantly moderate condition habitat is not likely to significantly affect the life cycle of this species.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal would remove approximately 11 hectares of vegetation occurring as small remnant stands and paddock trees, which provide habitat for Koalas. Moderate condition Riparian Woodland occurring to the west of the township of Tarcutta (survey site S2) is likely to be fragmented by the Proposal, with approximately three hectares of this habitat affected.

As Koalas have a home range varying from less than two hectares to more than several hundred hectares (Department of Environment and Climate Change 2008a), it is not likely that the removal of 11 hectares of moderate condition habitat would significantly reduce the availability of habitat for this species in the wider landscape. Appropriate mitigation measures have been suggested in Section 7 and Appendix F to ameliorate impacts associated with the Proposal, particularly with respect to impacts concerning Riparian Woodland at survey site S2. For example, the proposed bridge over Tarcutta Creek will effectively provide a passageway for this species to move through the natural corridor.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Koala has a fragmented but widespread distribution throughout eastern Australia (Department of Environment and Climate Change 2008a). It is generally associated with sclerophyll forest and woodland on foothills and plains on both sides of the Great Dividing Range from north-east Queensland to the Mt Lofty Ranges in South Australia. As such, this species is not at the limit of its known distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency), flooding or other disturbance regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and such impacts on biodiversity are already present. The Proposal would introduce several disturbance regimes including, loss of native vegetation.

How is the proposal likely to affect habitat connectivity?

The Proposal would effectively introduce a new barrier in the landscape for this species. While such barriers/impacts are present in the surrounding landscape the removal of approximately 11 hectares of habitat and the new road itself would introduce new barriers in the landscape. The Proposal would remove approximately eleven hectares of Box-Gum Woodland habitat for this species, which occurs predominantly as small remnant stands of vegetation and paddock trees. A further three hectares (approximately) of Riparian Woodland would be affected; fragmenting remaining Riparian Woodland on either side of the Proposal. Hence, the Proposal would introduce a new barrier in the landscape.

The loss of vegetation, particularly Riparian Woodland, is not likely to result in isolation of habitat for Koalas. The proposed bridge that will span Tarcutta Creek would provide a passage for this species through this natural corridor. Furthermore, appropriate mitigating measures (at strategic locations of the subject site), as outlined in Section 7 and Appendix F, would provide access to adjacent habitat. Therefore, it is not likely that a local population of this species would become fragmented or isolated from other areas of habitat any more than currently occurs within the Proposal study area.

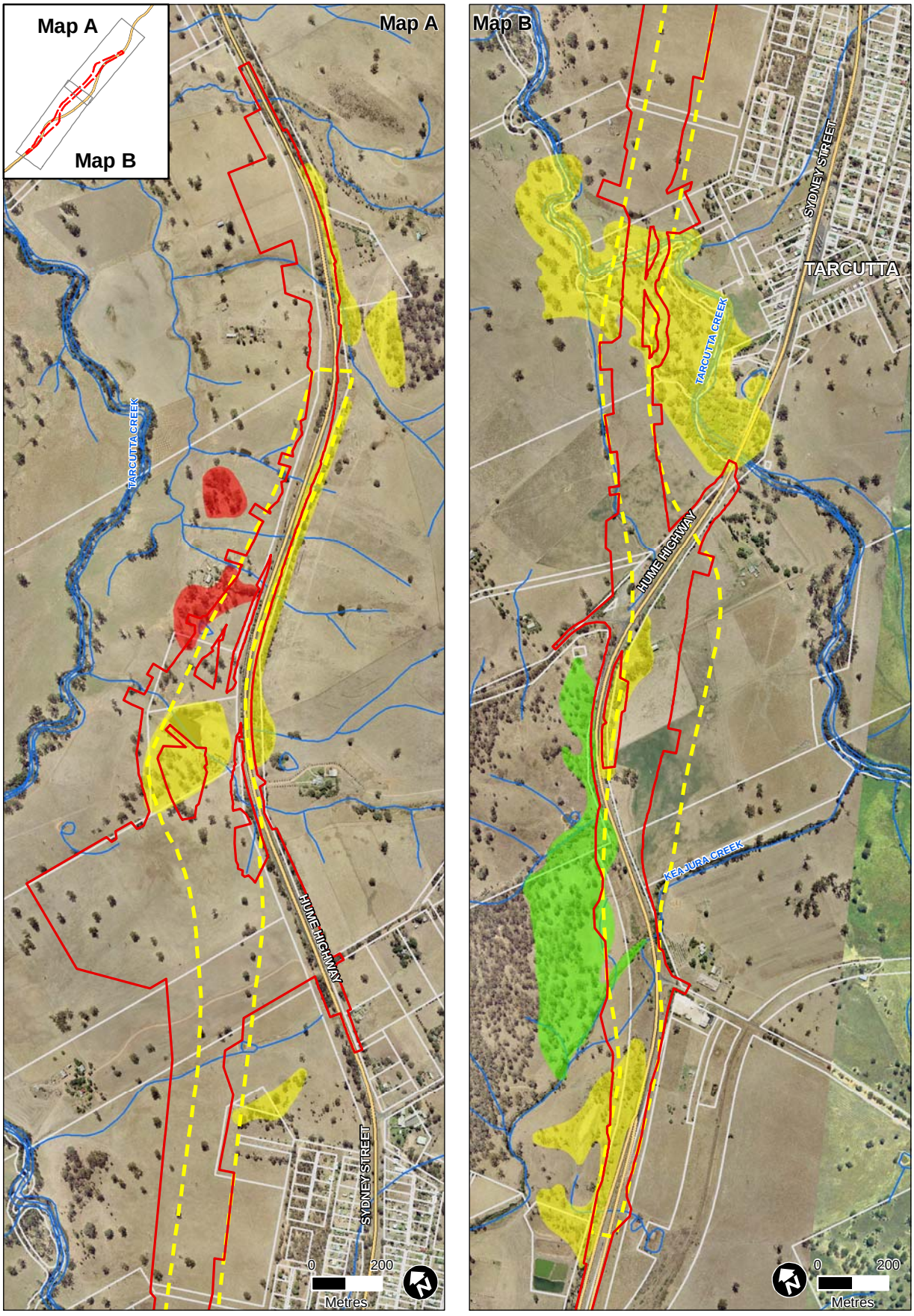

Figure E18 Distribution of potential habitat of the Koala - *Phascolarctos cinereus*

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. Critical habitat cannot be listed for the Koala, as it is listed under Schedule 2 of the *Threatened Species Conservation Act 1995.* The land within the Proposal study area is not considered critical to the survival of a local population of Koala.

Conclusion

Despite the incremental loss of habitat (approximately 11 hectares), the Proposal is not likely to have a significant effect on this species. Key areas of potential habitat have been avoided in the design and connectivity would be maintained in key areas.

E19. Pink-tailed Worm Lizard - (*Aprasia parapulchella*)

The Pink-tailed Worm Lizard is listed as Vulnerable under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.

The Pink-tailed Worm Lizard is worm-like, with a dark-brown head and nape, gradually merging with a pale grey or grey-brown body (Department of Environment and Climate Change 2005b). It is fossorial, living beneath stones in burrows formed initially by ant colonies. The species feeds exclusively on ants, particularly on their eggs and larvae. Suitable habitat for this species occurs in association with open rocky areas on hillsides and the upper slopes of river valleys (Osbourne & Jones 1995). Potential habitat is characterised by open grassland habitats that have a substantial cover of partially embedded rocks (Ecology Partners 2007). Near Tarcutta the species is found beneath large fragments of granodiorite (Osbourne & Jones 1995). Better quality sites do not have trees or tall shrubs present and have cover predominantly of native grasses. Sites with a lower abundance of the species tend to have been subject to pasture improvement or intensive livestock grazing (Osbourne & Jones 1995).

Potential habitat for this species occurs to the west of the current highway in the Southern Travelling Stock Reserve (rocky hillside in proximity to survey site S3c, refer Figure 2-2). No individuals were recorded and no habitat was recorded in the subject site.

E19.1 Significance assessment – Environment Protection and Biodiversity Conservation Act 1999

The following assessment has been undertaken following the *Principal Significant Impact Guidelines 1.1* (Department of the Environment and Heritage 2006a).

Under this Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity; and/or
- at or near the limit of the species range.

Currently this lizard is known from four sites in eastern Australia, near Canberra in the ACT, Tarcutta and Bathurst in NSW and near Bendigo in Victoria. As such, any population, if present, would be considered an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Potential habitat for the Pink-tailed Worm Lizard is located approximately 100 metres to the west of the subject site (refer Figure E20) and is likely to extent further west than that. No habitat is currently within the subject site, and as such, none would be affected by the Proposal.

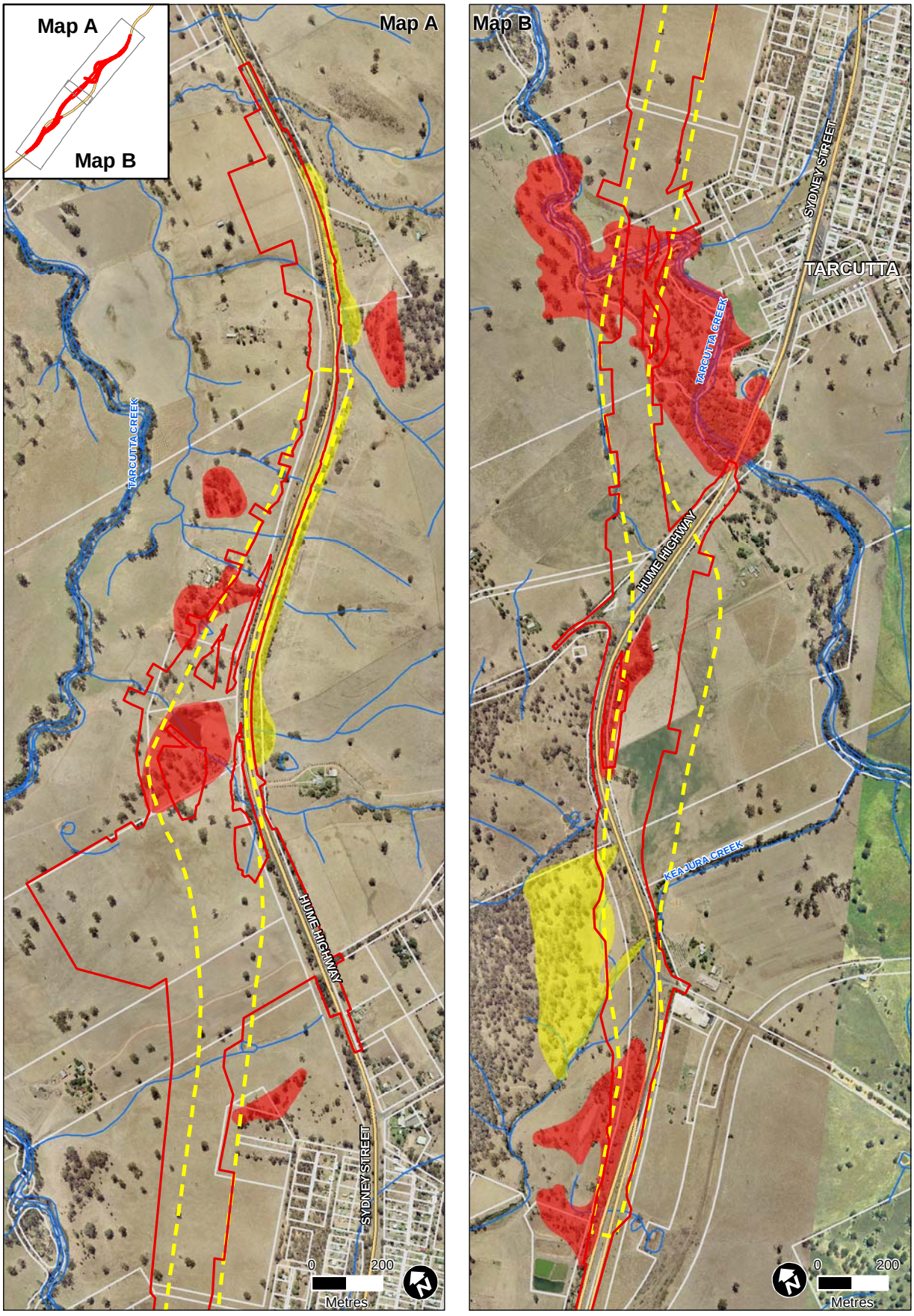

Figure E19 Distribution of potential habitat of the Pink-tailed Worm Lizard - *Aprasia parapulchella*

Will the action reduce the area of occupancy of an important population of the species?

No habitat for this species would be affected by the Proposal. Potential habitat is located uphill and approximately 100 metres to the west of the Proposal (see Figure E20).

Will the action fragment an existing important population into two or more populations?

The Proposal is located to the east of current potential habitat for this species. It is not likely that connectivity would exist between potential habitat occurring in proximity to survey site S3C (no other potential habitat observed in the Proposal area), and any potential habitat occurring outside the study area. As such the Proposal would not fragment an existing population.

Will the action adversely affect habitat critical to the survival of a species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species. The site is unlikely to be critical to the survival of the species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

Therefore, isolated habitats, including rocky hills would be considered important and would meet criteria considered critical to the survival of this species.

While the Proposal would remove approximately 11 hectares of native vegetation, potential habitat occurring in the study area would not be affected by the Proposal.

Will the action disrupt the breeding cycle of an important population?

Potential habitat occurs on an acclivity in proximity to survey site S3C (refer Figure 2-2 and Figure E20), with no habitat being recorded in the subject site. Therefore, it is not likely that the Proposal would affect the breeding cycle of this species.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

No habitat was recorded in the subject site. Potential habitat was recorded on an acclivity in the study area, approximately 100 metres from the Proposal centreline. Therefore, no potential habitat would be affect by the Proposal.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is not likely that invasive species that are harmful to the Pink-tailed Worm Lizard would become established.

Will the action introduce disease that may cause the species to decline?

No. There are no known diseases that are likely to increase in the area as a result of the Proposal.

Will the action interfere with the recovery of the species?

No recovery plan has been prepared for this species under the *Threatened Species Conservation Act 1995* or the *Environment Protection Biodiversity Act 1999*, however, a recovery plan for this species has been produced by (Osbourne & Jones 1995) in the ACT.

The Department of Environment and Conservation has, however, identified seven recovery strategies (17 priority actions) to help recover this species (Department of Environment and Climate Change 2005b). The Proposal is not likely to affect these recovery strategies.

E19.2 Significance assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Pink-tailed Worm Lizards generally occupy open areas with predominantly native grass understorey and rock outcrops.

Although potential breeding habitat occurs within the study area, the area is not considered to be significant for the lifecycle of this species in relation to habitat available in the locality. Therefore, it is not likely that the lifecycle of the Pink-tailed Worm Lizard would be affected by the Proposal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

No habitat was recorded in the subject site. Potential habitat was recorded on an acclivity in the study area, approximately 100 metres from the Proposal centreline. Therefore, no potential habitat would be affected by the Proposal.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Pink-tailed Worm Lizards generally occupy open areas with predominantly native grass understorey and rock outcrops. Currently this lizard is known from four sites in eastern Australia, near Canberra in the ACT, Tarcutta and Bathurst in NSW and near Bendigo in Victoria. While the study area is not at the limit of this species' known distribution, this species may occur as disjunct populations; with individuals occurring in Tarcutta not

connected to other populations, and therefore, may be genetically distinct. Hence, this species may in fact be at the limit of this potentially disjunct population.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency), flooding or other disturbance regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and such impacts on biodiversity are already present.

The Proposal would introduce several disturbance regimes including, loss of native vegetation.

How is the proposal likely to affect habitat connectivity?

The Proposal is located to the east of current potential habitat for this species. It is not likely that connectivity would exist between potential habitat occurring near survey site S3C (no other potential habitat was observed in the Proposal study area) and any potential habitat occurring to the east of the study area.

The proposed bypass would effectively introduce a new barrier into the landscape for this species. While such barriers are present in the surrounding landscape the removal of approximately 11 hectares of native vegetation and the new road itself would introduce new barriers in the landscape.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species. The site is unlikely to be critical to the survival of the species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

Therefore, isolated habitats, including rocky hills would be considered important and would meet criteria considered critical to the survival of this species.

While the Proposal would remove approximately 11 hectares of native vegetation, potential habitat for this species generally occurs outside the subject site. Therefore, it is not likely that the Proposal would adversely affect habitat critical to the survival of the species.

Conclusion

The Proposal is not likely to have a significant effect on this species. Key areas of potential habitat have been avoided in the design.

E20. Striped Legless Lizard - (*Delma impar*)

The Striped Legless Lizard is listed as Vulnerable under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.

This species is found mainly in natural temperate grasslands, but has also been captured in grasslands that have a high exotic component. Habitat occurs where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa* spp., poa tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* spp. (Department of Environment and Climate Change 2005c). It is also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland.

The Striped Legless Lizard occurs in the Southern Tablelands and the South-western Slopes. Populations are known from the Goulbourn, Yass, Queanbeyan, Cooma and Tumut areas (Department of Environment and Climate Change 2005c). This species also occurs in the ACT, Victoria and south-eastern South Australia.

The key to this species' survival in rural areas may be the availability of shelter during disturbance events (such as heavy grazing), from which they may be able to recolonise disturbed sites after the cessation of the disturbance (Smith & Robertson 1999).

This species was not recorded during current surveys. Potential habitat for this species occurs to the west of the current Hume Highway on a rocky acclivity near survey site S3C (refer Figure 2-2). The rocky acclivity provided a range of partially imbedded rocks, from cobbles to boulders and included partially imbedded rock slabs. Potential habitat was also present in Derived Native Grassland habitat recorded near Tarcutta Cemetery (survey site S4).

E20.1 Significance assessment – Environment Protection and Biodiversity Conservation Act 1999

The following assessment has been undertaken following the *Principal Significant Impact Guidelines 1.1* (Department of the Environment and Heritage 2006a).

Under this Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Currently this lizard is known from the Southern Tablelands and South-western Slopes as well as the ACT, Victoria and south-eastern South Australia. Potential habitat occurring within the Proposal study area is not considered key habitat for this species, and therefore, is not an important population if present. This species was not recorded during recent field surveys.

Will the action lead to a long-term decrease in the size of an important population of a species?

Potential habitat for the Striped Legless Lizard is located approximately 100 metres to the west of the subject site and is likely to extend further west than that. Potential habitat also occurs in Derived Native Grassland located near Tarcutta Cemetery (survey site S4) with approximately two hectares of this habitat affected by the Proposal.

Roadside reserves could also be used by this species as a refuge and population sources in areas of disturbance (Smith & Robertson 1999). Although some roadside areas may be affected by the Proposal, the road reserve may in the long term act as a refuge in the grazed landscape.

The removal of approximately two hectares of potential habitat would not lead to a long-term decrease in a potential population's size.

Will the action reduce the area of occupancy of an important population of the species?

Approximately two hectares (10 per cent occurring in the study area) of Derived Native Grassland would be affected by the Proposal. Further potential habitat is located approximately 100 metres to the west of the subject site on a rocky acclivity (refer Figure E21) and would not be affected by the Proposal. The Proposal would not significantly reduce the area of occupancy.

Will the action fragment an existing important population into two or more populations?

The Proposal wouldl essentially traverse an altered landscape, removing approximately two hectares of potential habitat in the form of Derived Native Grassland. It is not likely that the Proposal would fragment an existing population.

The proposed bypass would effectively introduce a new barrier in the landscape for this species. While such barriers are present in the surrounding landscape, the removal of approximately two hectares of native grassland would introduce a new barrier in the landscape.

Will the action adversely affect habitat critical to the survival of a species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. No critical habitat is listed for this species under the *Environment Protection and Biodiversity Conservation Act 1999*.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of Environment and Climate Change 2005c).

The Proposal would remove approximately two hectares of potential habitat for this species, including foraging resources. With similar habitat communities occurring across south-eastern NSW, this would not meet these criteria.

Therefore, habitat in the study area is not considered critical to the survival of the species.

Will the action disrupt the breeding cycle of an important population?

Potential habitats occur on an acclivity near survey site S3C and in native grasslands occurring north of Tarcutta Cemetery (north of survey site S4) (refer Figure 2-2 and Figure E21). Approximately two hectares of Derived Native Grassland habitat would be affected by the Proposal, however, with similar habitats occurring within the study area and locality, as well as roadside reserves potentially acting as refuges and population sources in areas of disturbance, the Proposal is not likely to disrupt the species' breeding cycle.

Furthermore, clearing protocols would be put in place to minimise the impacts of the removal of fallen timber, rocks and ground debris.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area contains moderate habitat for the Striped Legless Lizard. The amount of habitat proposed for removal (approximately two hectares, 10 per cent of Derived Native Grassland occurring in the study area) is relatively small in relation to potential habitat remaining in the study area (rocky acclivity near survey site S3C) and locality.

The removal of habitat is not likely to significantly decrease the availability of habitat or result in the decline of habitat condition for this species. The Proposal is not likely to isolate habitat any more than that currently occurring onsite.

It is not likely that the Proposal would isolate or decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

No invasive species that may be harmful to the Striped Legless Lizard (e.g. European Fox and Cat) would become established as a result of the Proposal.

Will the action introduce disease that may cause the species to decline?

No. There are no known diseases that are likely to increase in the area as a result of the Proposal.

Will the action interfere with the recovery of the species?

The National Recovery Plan for the Striped Legless Lizard (Smith & Robertson 1999) addresses the need for further ecological research on the species and conservation and protection of a series of reserves such that viable populations are maintained across the known distribution. However, based on the potential ecological impacts of the Proposal on the species, as discussed above, it is not likely that the Proposal would interfere with the recovery of this species.

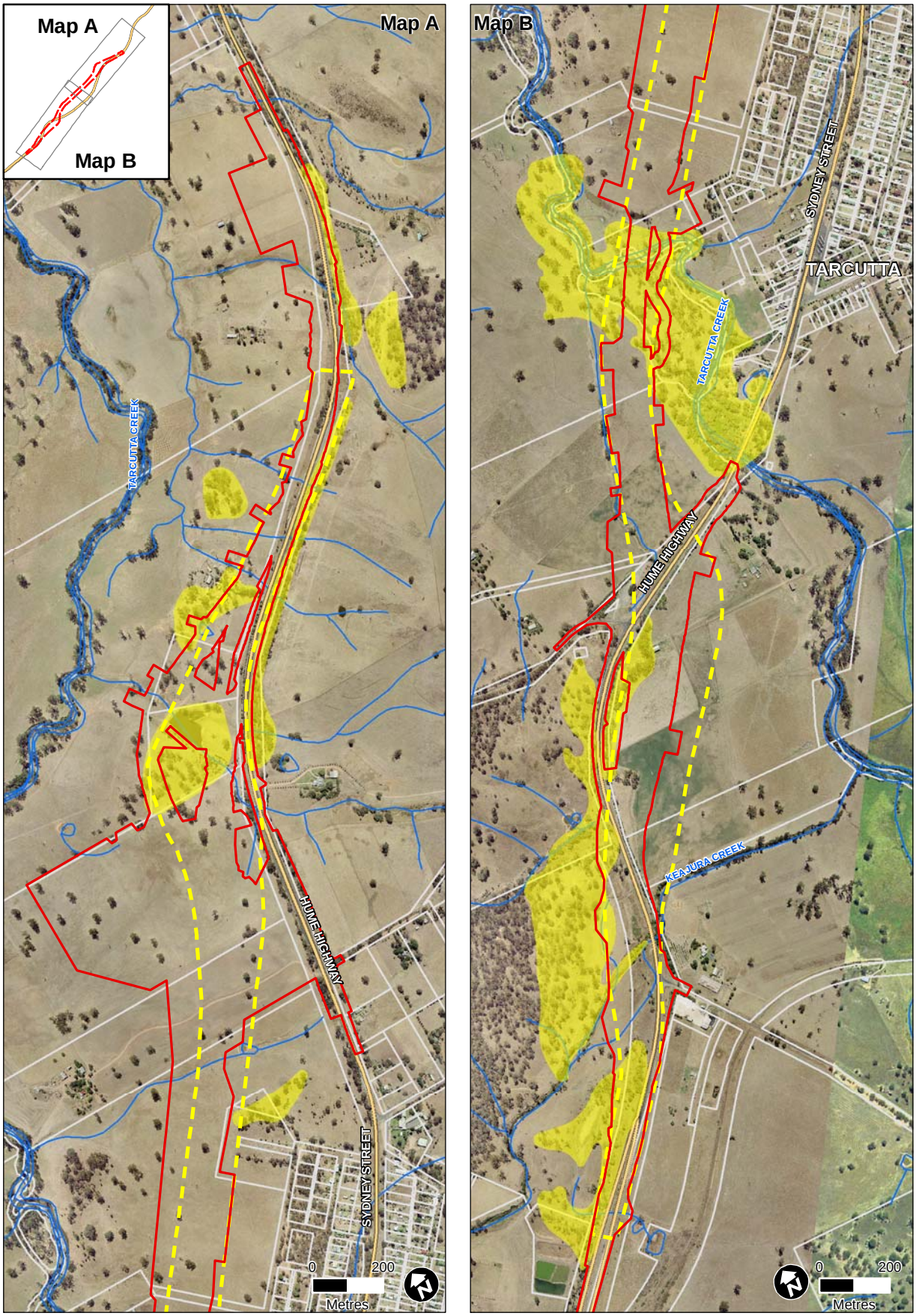

Figure E20 Distribution of potential habitat of the Striped Legless Lizard

E20.2 Significance assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Striped Legless Lizards are generally restricted to native grasslands and woodlands with a native grass understorey where they shelter under logs, rocks and ground debris.

Although potential habitat may be affected (two hectares), the area is not considered to be significant for the lifecycle of this species in relation to habitat available in the locality. Clearing protocols would be put in place to minimise the impacts of clearing fallen timber, rocks and ground debris.

Therefore, it is not likely that the lifecycle of the Striped Legless Lizard would be affected by the Proposal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal would remove approximately two hectares of potential habitat for this species (refer Figure E21), including shelter and foraging resources. The area of this habitat is not, however, considered to be significant in relation to the amount of similar habitat that would remain unaffected in the locality. Furthermore, similar foraging habitat is available in the study area and locality. The Proposal is not likely to result in a long-term reduction in habitat availability for a local population.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Striped Legless Lizards are generally restricted to native grasslands and woodlands with a native grass understorey where they shelter under logs, rocks and ground debris. Currently this lizard is known from the Southern Tablelands and South-western Slopes. This species also occurs in the ACT, Victoria and south-eastern South Australia. This study area is, therefore, not at the limit of this species' known distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency), flooding or other disturbance regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and such impacts on biodiversity are already present. The Proposal would introduce several disturbance regimes including, loss of native vegetation and dead wood.

How is the proposal likely to affect habitat connectivity?

The Proposal would involve the removal of approximately two hectares of potential habitat for this species. The majority of this impact would occur as a linear strip occurring on the periphery of potential native grassland habitat. The removal of the vegetation is likely to fragment potential habitat occurring north of Tarcutta Cemetery (north of survey site S4).

The proposed bypass would effectively introduce a new barrier in the landscape for this species. While such barriers are present in the surrounding landscape the removal of approximately two hectares of native vegetation and the new road itself would introduce a new barrier into the landscape.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.

With potential habitat for this species generally occurring outside the subject site, it is not likely that the Project would adversely affect habitat critical to the survival of the species.

Conclusion

Approximately two hectares of potential habitat for this species would be affected by the Proposal. The Proposal would remove 10 per cent of Derived Native Grassland habitat occurring in the study area, while the rocky acclivity occurring near survey site S3C will remain unaffected. Furthermore, in the long term roadside reserves in the study area may act as refuges in the grazed landscape. Therefore, the Proposal is not likely to have a significant effect on this species.

E21. Southern Pygmy Perch - *Nannoperca australis*

The Southern Pygmy Perch is a small sized fish, generally less than 85 millimetres in length. It prefers slow-flowing waters and still, vegetated habitats in small streams, lakes, billabongs and wetlands (NSW Fisheries Scientific Committee 2001).

Threats to this species include:

- Habitat degradation including loss of aquatic and riparian vegetation.
- Alienation of floodplain habitats by flood mitigation works, such as floodgates and levees.
- Modification of natural river flows and temperatures as a result of river regulation leading to drying and fragmentation of habitat and spawning failures.
- Predation by, and competition with, introduced fish species such as redfin perch and *Gambusia* (NSW Fisheries Scientific Committee 2001).

The Southern Pygmy Perch was recorded in Tarcutta Creek in the study area. The habitats within the study area are, however, generally degraded and contain the predatory Mosquito Fish.

E21.1 Significance assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Breeding of the Southern Pygmy Perch occurs between September and January in response to rising water temperatures. Females produce anywhere from a few hundred to several thousand small, transparent eggs, which are scattered over vegetation or rocks on the bottom of waterways (NSW Fisheries Scientific Committee 2001).

Within the study area a number of waterway crossings are planned, including a bridge at Tarcutta Creek and temporary crossings during construction. Given that suitable habitat exists up and downstream within Tarcutta Creek at the proposed crossing location and that all crossings would be design in accordance with NSW Fisheries guidelines (Fairfull & Witheridge 2003) it is unlikely that the Proposal would affect the lifecycle of the Southern Pygmy Perch.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

A small area of Southern Pygmy Perch habitat would be removed as a result of constructing the proposed waterway crossing at Tarcutta Creek. However suitable habitat would remain up and downstream within Tarcutta Creek. It is considered that the removal of this amount of habitat is unlikely to significantly impact on this species provided fish passage is maintained in accordance with the NSW Fisheries guidelines (Fairfull &

Witheridge 2003) and erosion and sedimentation controls are implemented in accordance with best practice (Department of Environment and Climate Change 2008b).

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The natural distribution of the Southern Pygmy Perch includes Riverina billabongs and streams throughout inland southern NSW. The study area is located in close proximity to the eastern edge of the natural distribution of this species.

How is the proposal likely to affect current disturbance regimes?

The habitats within the study area are generally degraded and contain the predatory Mosquito Fish. Although waterway crossings of Tarcutta Creek exist at the current highway, the construction of the new structures for the bypass is likely to extend already existing disturbance to adjacent parts of the creeks. However, the waterways within the study area are affected currently by riparian vegetation clearance, erosion and sedimentation, alteration to flows and bank instability due to stock access and vegetation removal. Given that suitable habitat exists up and downstream of the watercourses, no long-term impacts from the proposed waterway crossings are expected on the Southern Pygmy Perch within the area, if the crossings comply with NSW Fisheries guidelines (Fairfull & Witheridge 2003) and erosion and sedimentation controls are implemented in accordance with best practice (Department of Environment and Climate Change 2008b).

How is the proposal likely to affect habitat connectivity?

The waterways within the study area would not become disconnected as a result of the Proposal. However, the installation of bridges and culverts would have the potential to create barriers to fish passage. Provided the waterways crossings are undertaken in accordance with the NSW Fisheries Guidelines (Fairfull & Witheridge 2003) it is unlikely that the Proposal would result in any barriers to fish passage or habitat connectivity.

How is the proposal likely to affect critical habitat?

The Department of Primary Industries maintains a register of critical habitat. Water bodies within the study area are not listed as a critical habitat and are not considered critical to the survival of the ecological community.

Conclusion

A bridge crossing is proposed for Tarcutta Creek where this species was recorded. Mitigation measures will be incorporated into the final design for the road so that drainage crossing structures comply with fish friendly waterway crossings. As such the impacts on Southern Pygmy Perch are unlikely to be significant.

E22. Appendix E References

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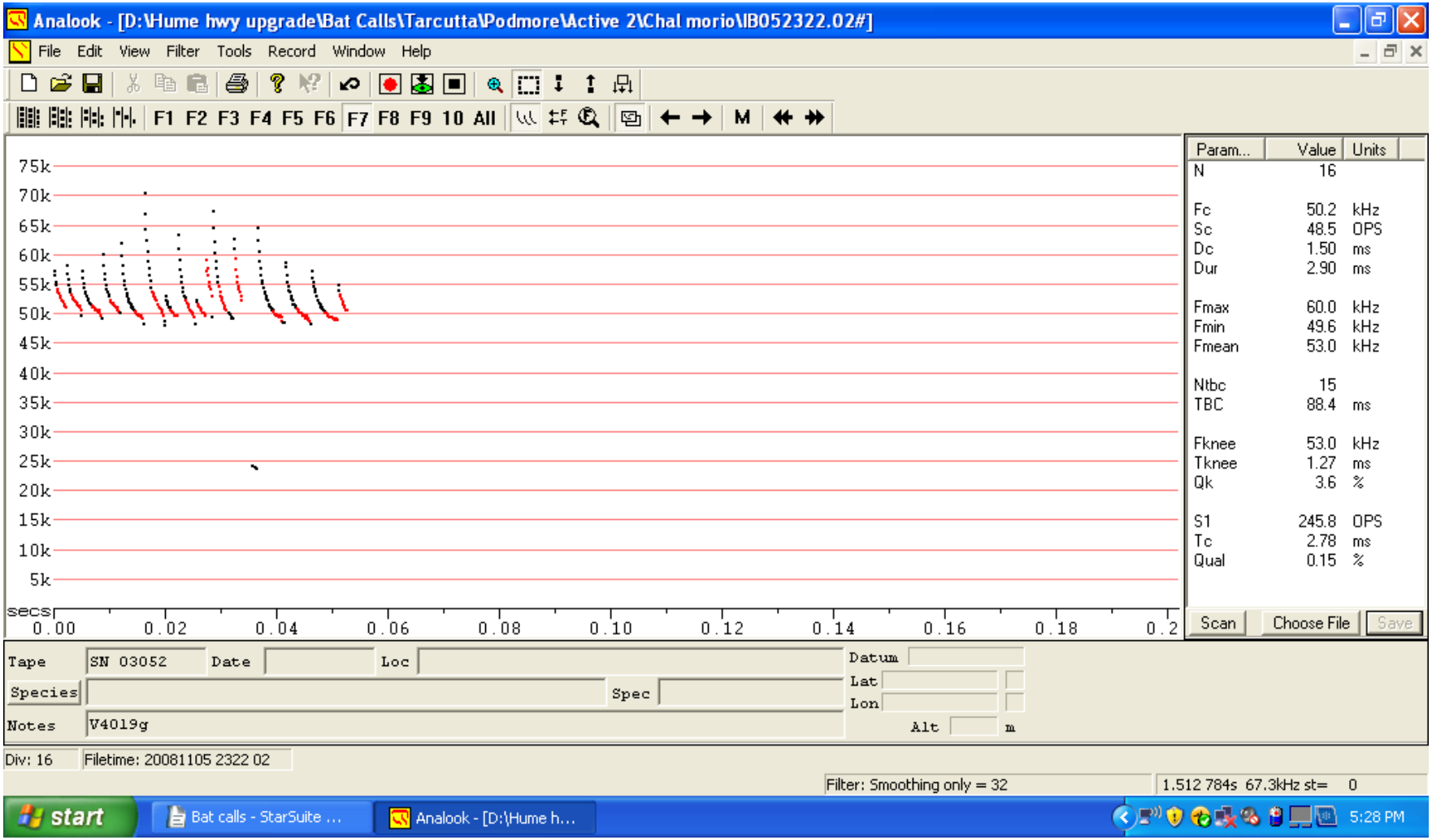
Appendix F

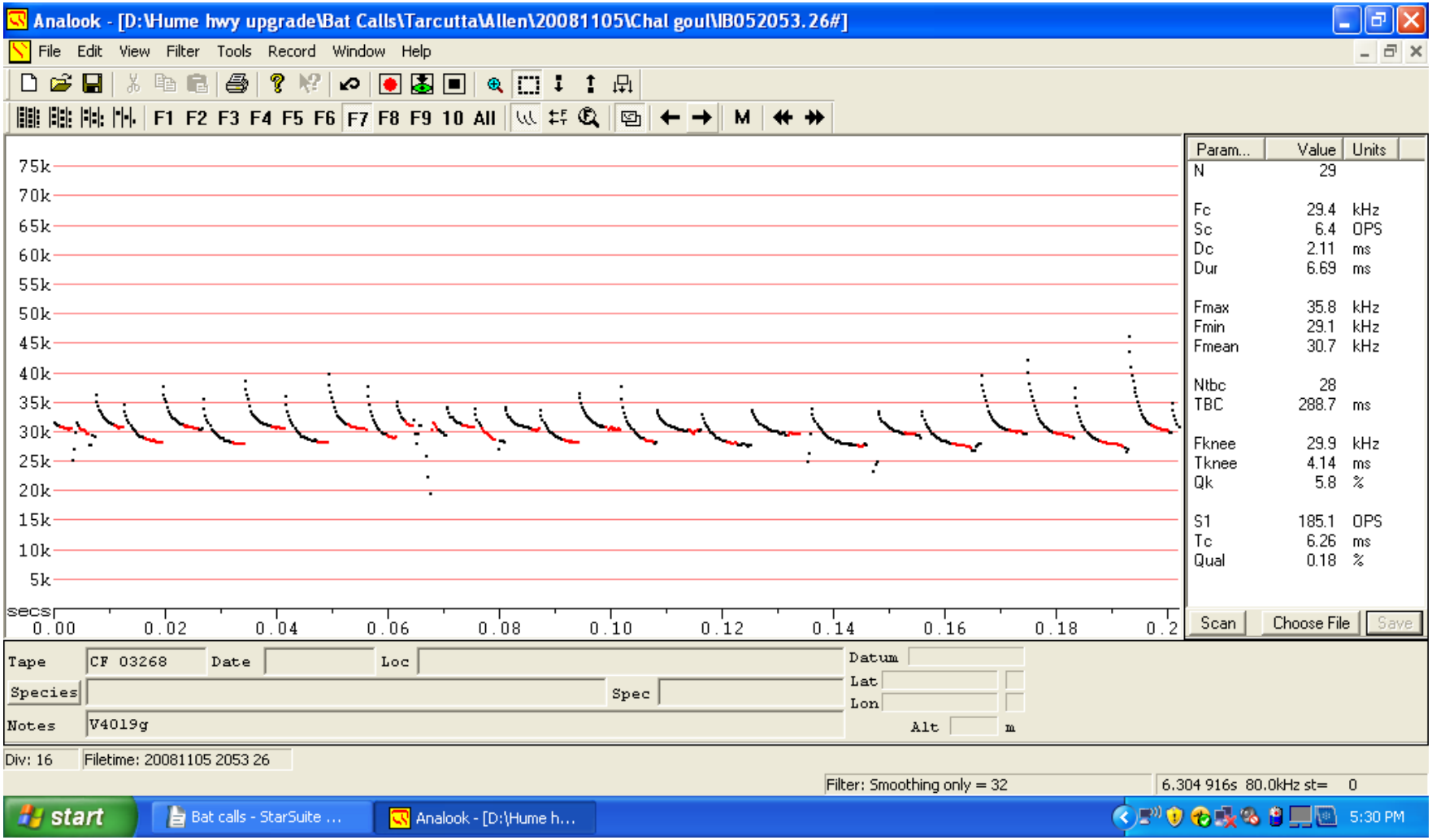
Bat call analysis and sonograms

Table F1: Summary of bat calls recorded at Tarcutta

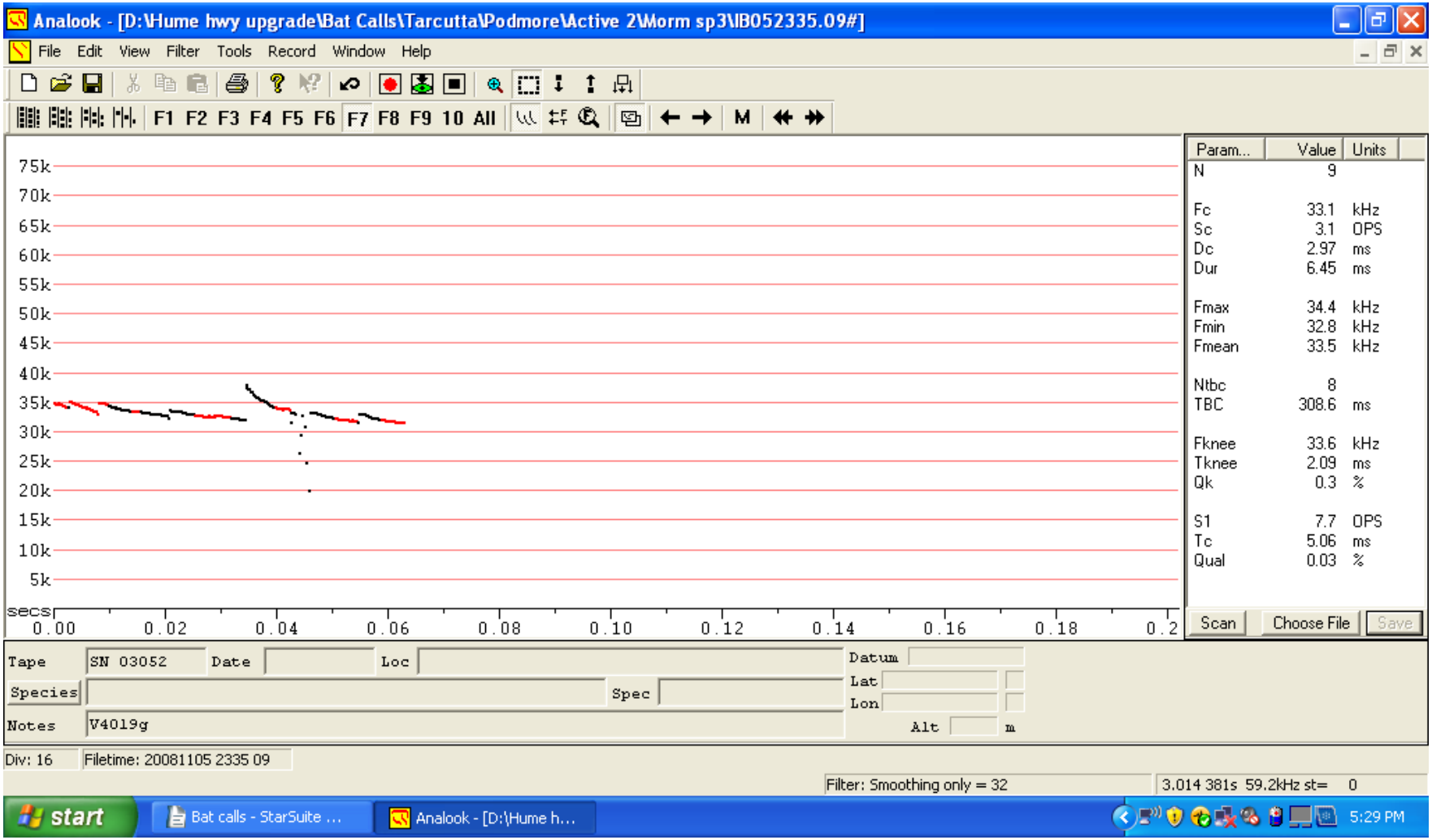
	Tarcutta										
Species	**Survey Site S3 4/11/08**	**Survey Site S3 5/11/08**	**Survey Site S3 6/11/08**	**Survey Site S3 (Active) 6/11/08**	**Survey Site S1 (Active) 4/11/08**	**Survey Site S2 Dam 5/11/08**	**Survey Site S2 Drain 5/11/08**	**Survey Site S2 Creek 6/11/08**	**Survey Site S2 (Active) 4/11/08**	**Survey Site S2 (Active) 5/11/09**	**Total**
Number of files recorded	**70**	**249**	**109**	**45**	**68**	**292**	**1**	**88**	**5**	**53**	**428**
Calls identified to species level	**13**	**115**	**56**	**30**	**22**	**118**	**0**	**15**	**0**	**17**	**184**
Percentage of calls positively identified	**18.57%**	**46.18%**	**51.38%**	**66.67%**	**32.35%**	**40.38%**	**0.00%**	**17.04%**	**0.00%**	**32.08%**	**42.99%**
Gould's Wattled Bat *Chalinolobus gouldi*		42	18	6	11	40				1	**118**
Eastern Falsitrellus *Falsistrellus tasmaniensis*						1					**1**
Chocolate Wattled Bat *Chalinolobus morio*	13	55	19	4		46		7		4	**148**
Large Forest Bat *Vespadelus darlingtoni*		4	2	13	11	21		2		7	**60**
Little Forest Bat *Vespadelus vulturnus*											**0**
Southern Freetail Bat *Mormopterus Sp4*		13	15	5		8				1	**42**
Eastern Freetail Bat Mormopterus Sp3		1				1		6		4	**12**
White-striped Freetail Bat *Tadarida australis*			2	2		1					**5**
Calls not identified to species	**45**	**54**	**36**	**9**	**24**	**136**	**0**	**0**	**4**	**27**	**135**
Percentage	**64.29%**	**21.69%**	**33.03%**	**20.00%**	**35.29%**	**46.61%**	**0.00%**	**0.05%**	**80.00%**	**50.94%**	**31.54%**
Mormopterus spp *Mormopterus sp4 / Mormopterus sp3*		27	15	1	14	2			4	7	**70**
Goulds Wattled Bat / Inland Broadnosed Bat *Chalinolobus gouldi / Scortorepens greyi*		3									**3**
Broadnosed species *Scotorepens balstoni / S. orion*		1			1	1					**3**
Large Forest Bat / Eastern Bent-wing Bat Vespedalus dralingtoni / Miniopterus schreibersii oceanensis			8	2		121					**131**
Goulds Watted Bat / Mormopterus spp *Chalinolobus gouldi / Mormopterus sp 4 & 3*		7				11				14	**32**
Long-eared Bat sp *Nyctophilus* spp	11	2		4	2					1	**20**
Little Forest Bat / Chocolate Wattled Bat *Vespadelus vulturnus / Chalinolobus morio*		1			7	1					**9**
Large / Southern / Little Forest Bat *Vespadelus darlingtoni / V. regulus / V. vulturnus*	34	13	13	2		0		0		5	**67**
Unidentified (poor quality or call length)	**12**	**80**	**17**	**6**	**22**	**38**	**1**	**73**	**1**	**9**	**109.00**
Percentage of calls	**17.14%**	**32.13%**	**15.60%**	**13.33%**	**32.35%**	**13.01%**	**100.00%**	**82.92%**	**20.00%**	**16.98%**	**25.47%**



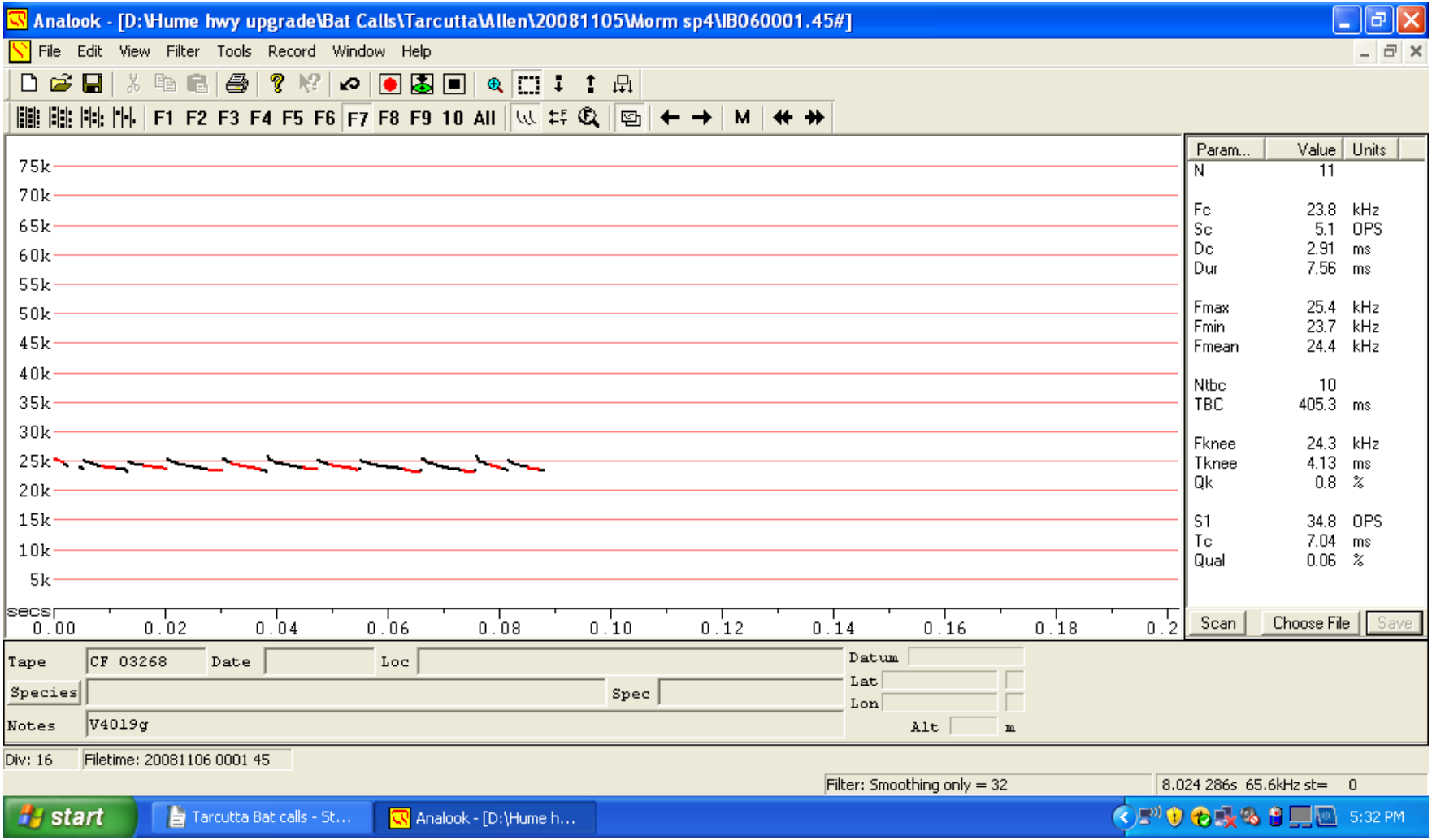
Chocolate Wattled Bat



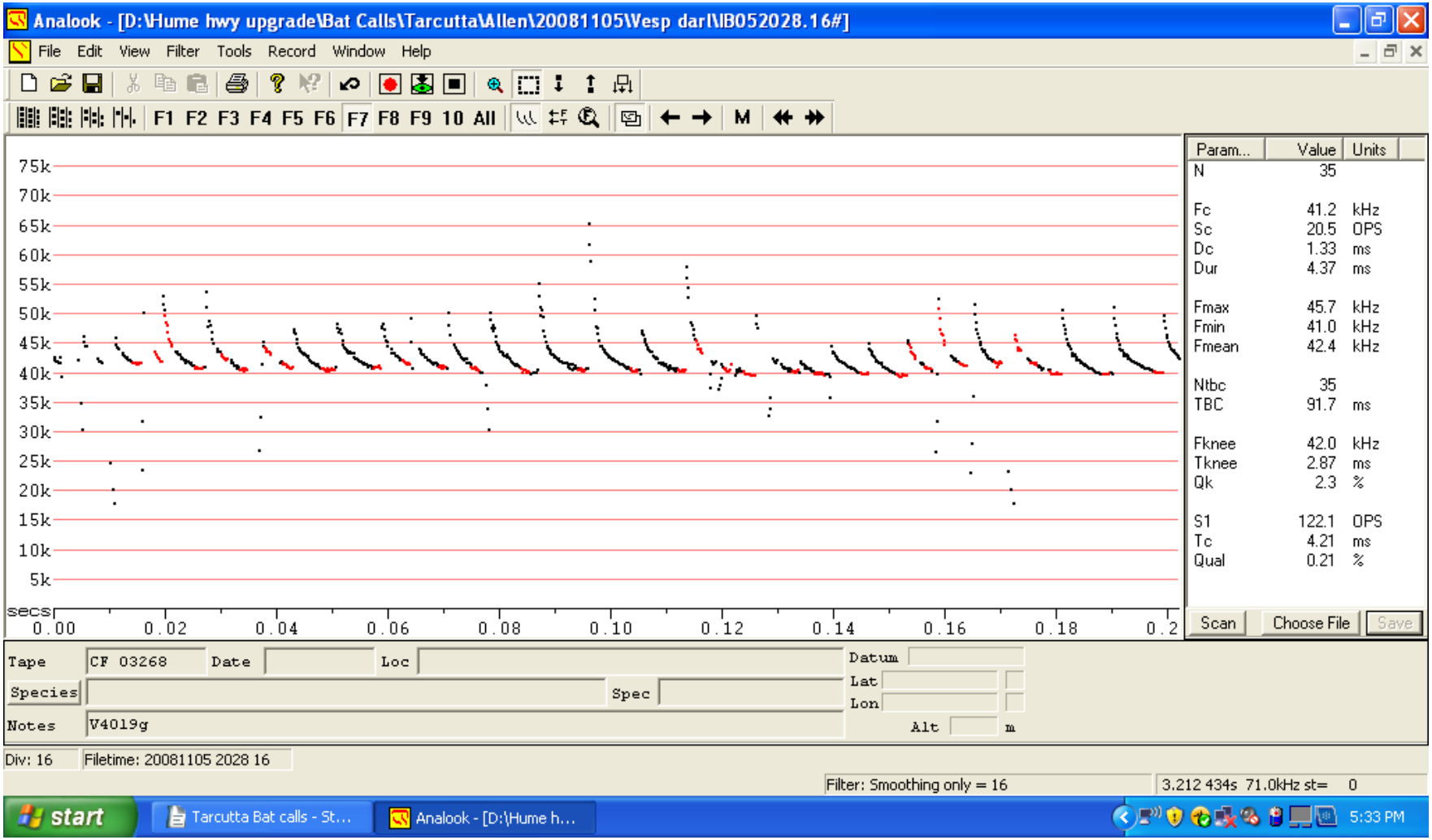
Gould's Wattled Bat



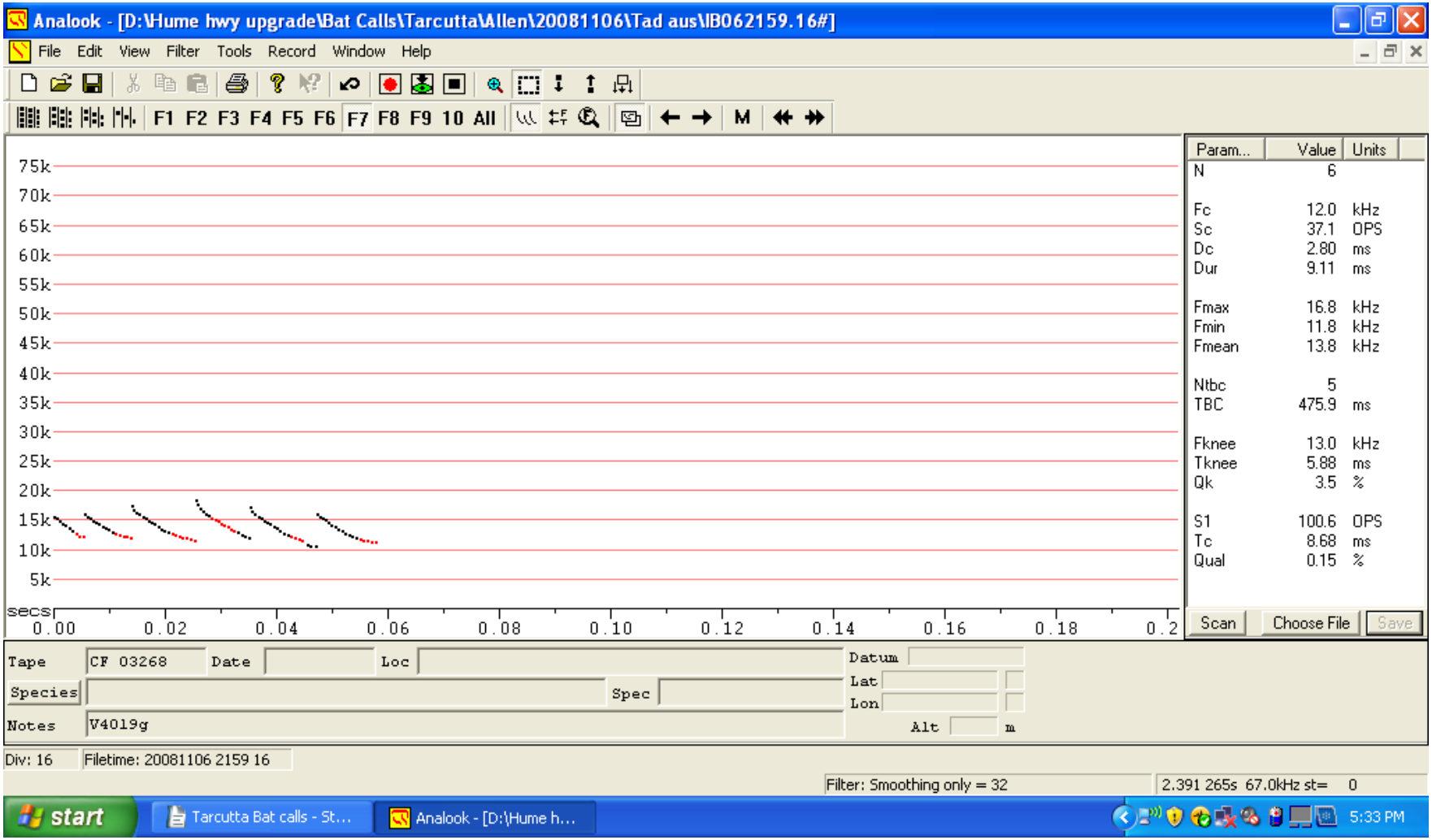
Eastern Freetail Bat



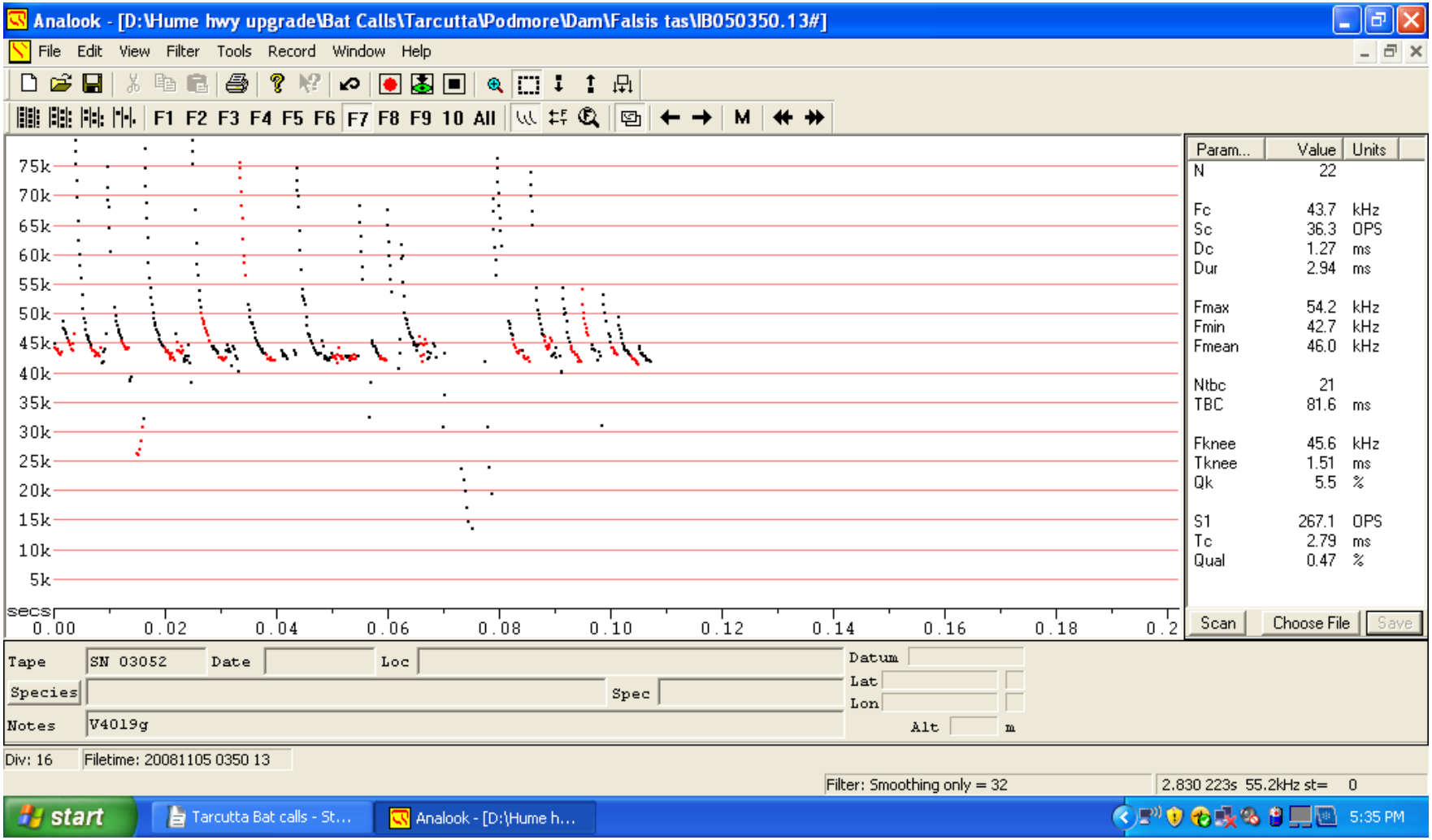
Southern Freetail Bat



Large forest Bat



White-striped Freetail Bat



Eastern Fasistrellus