APPENDIX F ASSESSMENTS OF SIGNIFICANCE

F.1 THREATENED SPECIES CONSERVATION ACT SEVEN-PART TEST

Section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) specifies seven factors to be taken into account in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the *Threatened Species Conservation Act 1995*.

Threatened bird assessments have been undertaken by Ambrose Ecological Services (2016); refer Appendix B.

Lord Howe Placostylus

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 diet of the Lord Howe Placostylus is thought to be the fallen dead leaves of broadleaf trees. In suitable habitat the Lord Howe Placostylus occurs at an average density of one live adult per 4.17 m^2 and one live juvenile per 3.03 m^2, with localised densities of up to two live animals per square metre in appropriate microhabitat patches within these areas. Accumulated shells of dead Lord Howe Placostylus have been recorded at densities of up to 30 shells per square metre (Ponder and Chapman 1999 in NPWS 2001).

Related Placostylus species in New Zealand (*Placostylus hongii* and *P. ambagiosus*) reach maturity at 3-5 years and may live for 20 years or more (Parrish *et al*. 1995). Mating in these species appears to be triggered by climatic conditions (e.g. rainfall) and probably occurs every year except in periods of drought. The Lord Howe Placostylus lays small clutches of eggs in the soil beneath leaf litter, probably during the warmer months. Hatchling and juvenile mortality is high (Ponder and Chapman ibid.). Egg-laying in a captive Lord Howe Placostylus breeding colony on the island was recorded in the month of August (Hutton 2010).

Giant Land Snails may be particularly vulnerable to predation during mating and egg-laying. New Zealand Placostylus hatchlings may spend an unknown period living in trees and shrubs up to 6 metres above the ground (Parrish *et al*. 1995).

The total population of the Lord Howe Placostylus is estimated to be less than 1000 mature individuals (DOE 2016). The species is restricted to two fragmented locations (comprising a total of 26 sites) in the settlement area and around North Bay (Ponder and Chapman ibid.).

Habitat at the proposed access track site appears to be marginal for this species (refer d) below) and the potential for significant life cycle impacts is therefore likely to be low. Fragmentation and barrier impacts are assessed in d) below. Potential life cycle impacts caused by habitat loss or fragmentation would be mitigated and offset by specific measures identified in this Biodiversity Assessment, including pre-works survey, redistribution of leaf litter, restrictions on clearing, track surfacing, post-works management of the access track site and habitat restoration in the proposed offset area (Appendix F).

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

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

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

i. The Lord Howe Placostylus is restricted to two fragmented locations (comprising a total of 26 sites) in the settlement area and around North Bay (Ponder and Chapman ibid.). The concentration of clearing in the settlement area is likely to have had an adverse impact on the species, whose preferred habitat coincides with this area (DECC 2007). Nearly 50% of high quality potential habitat for the species has been cleared since settlement (DOE 2016). The extent of occurrence is less than 15.2km^2 and the current area of occupancy is approximately 7.95km^2 (DOE 2016).

   Based on current knowledge regarding habitat preferences and distribution (refer iii. below), the limited clearing of up to 200m^2 of marginal forest habitat for the widening of the proposed access track is not expected to result in a significant loss of Placostylus habitat in areal terms. A series of precautionary and contingency measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and offset habitat loss impacts.

ii. The Lord Howe Placostylus was formerly widespread over Lord Howe Island but is now apparently restricted to two fragmented locations. Many of the populations of this species may already be effectively isolated from others, except where they exist within the same forest remnant or similar immediately adjacent locations (NPWS 2001).

   Placostylus has been recorded 120 metres to the south and 190 metres to the north of the access track site on calcarenite substrate. Live Placostylus snails were recorded near Transit Hill in June 2000 (E. Brown RBG pers. comm. in NPWS 2001) and are known to be present at Pine Trees to the west of the site (Hutton 2010). The *Howea forsteriana* closed forest on calcarenite to the north-east of the subject site is likely to be unsuitable habitat because of seasonal disturbance from Flesh-footed Shearwater nesting. If Placostylus disperse through suboptimal habitat (disturbed forest on basalt), the strip of vegetation at the access track site may provide opportunities for genetic exchange between populations north and south of the site (although the speciation within *P. bivaricosus* suggests low rates of gene flow between habitat areas).

   The existing 5-9 metre wide track corridor passes through a narrow strip of Greybark-Blackbutt Closed Forest over a distance of approximately 50 metres. Sealed and unsealed roads and tracks have been found to impede dispersal in other land snail species (Baur and Baur 1990). The Placostylus Recovery Plan recommends that, because little is know about dispersal ability, any development which will result in the fragmentation of evergreen closed forest habitat areas should be considered as likely to isolate Placostylus populations (NPWS 2001). The existing track corridor may already represent a dispersal barrier for Placostylus, if the species is present at the site.

   The track corridor would be widened to provide a uniform 9 metre wide corridor to enable construction access for the project. In view of the low probability of the Placostylus being present at the site, and the presence of the existing track corridor, the proposed works are considered unlikely to significantly exacerbate existing fragmentation impacts for the Placostylus in the study area. Precautionary measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and knowledge gaps regarding the dispersal ability of the species.

iii. The preferred habitat of the Lord Howe Placostylus is described as the *Drypetes deplanchei–Cryptocarya triplinervis* association and *Howea forsteriana* association on calcarenite (Hunter 2002, DECC 2007), in damp shaded locations with a closed canopy (DECC 2007). The vegetation at all recent sites is either *Howea forsteriana* closed forest or *Drypetes deplanchei-Cryptocarya triplinervis* closed forest or a combination of the two (Curtis 1998; Pickard 1983; Ponder and Chapman ibid.). NPWS

(2001) and Hunter (2002) note that Placostylus distribution is confined largely, but not totally, to calcarenite or sandy substrates. Ponder and Chapman (ibid.) found the species sheltering under leaf litter in forest often, but not exclusively, in the vicinity of Banyan trees and mostly on calcarenite-derived soils and sandy soils.

The Recovery Plan for the species recommends that any area supporting evergreen closed forest on calcarenite-derived soils or sandy soils should be considered as potential habitat, no matter how degraded, especially if a leaf litter layer is present (NPWS 2001).

The Lord Howe Placostylus appears to avoid open areas (Brazier 1889 in NPWS 2001). Placostylus species do not seal the shell aperture with mucous and are therefore prone to desiccation (Sherley 1994 in NPWS 2001). Ponder and Chapman (ibid.) noted freshly dead shells in areas where the forest canopy had been damaged by drought or storms (NPWS 2001).

Ponder and Chapman (ibid.) also suggested that disturbance of the leaf litter layer by nesting seabirds may adversely affect the species and noted many dead shells but few fresh specimens and no live specimens in active nesting areas. There are no Placostylus records from Flesh-footed Shearwater nesting area to the north-east of the subject site. Ponder and Chapman (ibid) further suggested that the Placostylus is impacted by trampling by domestic cattle.

Prime habitat elements for this species are likely to be a lowland position, overstorey tree canopy cover providing shade and high humidity, a shrub - small tree midstorey (refer a) above), a well-developed litter layer, and possibly sandy or calcarenite substrate. Negative features include exposed sites, possibly basalt substrates, nesting seabirds, grazing cattle and the presence of predators such as the Ship Rat, Blackbird, Song Thrush and domestic chickens.

The vegetation affected by the proposal at the access track site is *Drypetes deplanchei-Cryptocarya triplinervis* closed forest on basalt, with a disturbed understorey and low broken canopy and a patchy litter layer. The forest appears to be regrowth with no large trees. Based on current knowledge, the access track site appears to provide unlikely habitat for the Placostylus, and the proposed clearing of up to 200m^2 of forest is not expected to result in a significant loss of habitat. Precautionary measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and to offset habitat impacts.

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

Not applicable.

f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.

The approved recovery plan for the Lord Howe Placostylus (NPWS 2001) outlines the distribution, habitat and ecology of the snail, key threats and recovery actions. The overall objective of the plan is to protect and recover the species in the wild in the long term. Specific objectives include to identify habitat and populations, to identify and ameliorate current threats, to support and coordinate relevant and to encourage community awareness and involvement.

Recovery actions cover survey and research, protection of extant populations and habitat (including rat baiting, habitat mapping and application of assessment guidelines), Commonwealth listing, community information and publicity, *ex situ* conservation measures (captive breeding and habitat regeneration on Blackburn Island), and the formation of a Lord Howe Island recovery team with representatives from the Board and Lord Howe Island community, OEH and the Australian Museum.

Habitat mapping under the plan is to incorporate the occurrence of calcarenite-derived and sandy soils, occurrence of *Howea forsteriana* evergreen closed forest and *Drypetes-Cryptocarya* evergreen closed forest, and recent and historical Placostylus records.

Appendix 2 of the plan provides Environmental Impact Assessment Guidelines to ensure that potential impacts to the Placostylus and its habitat are considered in development assessment processes.

The plan notes that the causes of the decline of the Lord Howe Placostylus are likely to include habitat clearing and modification, predation and habitat disturbance by exotic fauna species, and possibly herbicide and pesticide use. The Ship Rat is considered to be a major predator and a significant threat.

Other threats include predation by Song Thrush, Blackbird and domestic chickens, cattle trampling, habitat disturbance from nesting seabirds and weeds such as Ground Asparagus and Guava.

The proposed works would not interfere with the objectives or actions contained in the recovery plan. Mitigation and offsetting measures associated with the proposal are consistent with recovery actions in the plan.

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

Key Threatening Processes are listed in NSW under the TSC Act and at the Commonwealth level under the EPBC Act. KTPs of direct relevance to the current proposal include:

- Clearing of native vegetation (NSW and Commonwealth)
- Invasion of native plant communities by exotic perennial grasses (NSW)
- Loss of hollow-bearing trees (NSW)
- Removal of dead wood and dead trees (NSW).

KTPs which represent particular environmental risks to be managed during the construction phase of the project include:

- Infection of native plants by *Phytophthora cinnamomi* (NSW and Commonwealth)
- Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae (NSW)
- Importation of red imported fire ants (*Solenopsis invicta*) (NSW and Commonwealth)
- Invasion of the yellow crazy ant (*Anoplolepis gracilipes*) (NSW)
- Predation by the ship rat (*Rattus rattus*) on Lord Howe Island (NSW and Commonwealth)
- Invasion, establishment and spread of *Lantana camara* (NSW)
- Invasion of native plant communities by *Chrysanthemoides monilifera* (Bitou Bush and Boneseed) (NSW).

The assessment and mitigation of these threats have been incorporated into the impact assessment in this report. The safeguards for the proposal contain specific control measures for rat predation and environmental weeds, which are two significant threatening processes currently operating at the site. In the context of impacts to identified biodiversity values and proposed avoidance and mitigation measures, the proposal is not considered likely to significantly exacerbate the operation of, or increase the impact of, a key threatening process.

Conclusion

The limited forest clearing associated with the wind turbine proposal is unlikely to significantly affect the Lord Howe Placostylus or its habitat. A series of mitigation measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and to offset habitat impacts (refer section 6.2.4).

F.2 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT ASSESSMENT OF SIGNIFICANCE

The Commonwealth Significant Impact Guidelines 1.1 provide assessment criteria for the assessment of significance of impacts to MNES. The criteria are used to determine whether a proposal is likely to have a significant impact and requires referral to the Commonwealth Government for approval under the EPBC Act.

For the purposes of this assessment, an 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range (Commonwealth of Australia 2013).

Threatened bird assessments have been undertaken by Ambrose Ecological Services (2016); refer Appendix B.

Lord Howe Placostylus

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

The preferred habitat of the Lord Howe Placostylus is described as the D*rypetes deplanchei–Cryptocarya triplinervis* association and *Howea forsteriana* association on calcarenite (Hunter 2002, DECC 2007), in damp shaded locations with a closed canopy (DECC 2007). The vegetation at all recent sites is either *Howea forsteriana* closed forest or *Drypetes deplanchei-Cryptocarya triplinervis* closed forest or a combination of the two (Curtis 1998; Pickard 1983; Ponder and Chapman 1999 in NPWS 2001). NPWS (2001) and Hunter (2002) note that Placostylus distribution is confined largely, but not totally, to calcarenite or sandy substrates. Ponder and Chapman (ibid.) found the species sheltering under leaf litter in forest often, but not exclusively, in the vicinity of Banyan trees and mostly on calcarenite-derived soils and sandy soils.

The Recovery Plan for the species recommends that any area supporting evergreen closed forest on calcarenite-derived soils or sandy soils should be considered as potential habitat, no matter how degraded, especially if a leaf litter layer is present (NPWS 2001).

Ponder and Chapman ((ibid.) also suggested that disturbance of the leaf litter layer by nesting seabirds may adversely affect the species and noted many dead shells but few fresh specimens and no live specimens in active nesting areas. There are no Placostylus records from Flesh-footed Shearwater nesting area to the north-east of the subject site. Ponder and Chapman (ibid) further suggested that the Placostylus is impacted by trampling by domestic cattle.

Prime habitat elements for this species are likely to be a lowland position, overstorey tree canopy cover providing shade and high humidity, a shrub - small tree midstorey (refer a) above), a well-developed litter layer, and possibly sandy or calcarenite substrate. Negative features include exposed sites, possibly basalt substrates, nesting seabirds, grazing cattle and the presence of predators such as the Ship Rat, Blackbird, Song Thrush and domestic chickens.

The vegetation affected by the proposal at the access track site is *Drypetes deplanchei-Cryptocarya triplinervis* closed forest on basalt, with a disturbed understorey and low broken canopy and a patchy litter layer. The forest appears to be regrowth with no large trees. Based on current knowledge, the access track site appears to provide unlikely habitat for the Placostylus, and is unlikely to support an important population. The proposed clearing of up to 200m^2 of forest is not expected to result in a long-term decrease in the size of a Placostyuls population. Precautionary measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and offset population and habitat impacts.

b) Will the action reduce the area of occupancy of the an important population?

The Lord Howe Placostylus occurs at two locations on Lord Howe Island; the settlement area and North Bay. The extent of occurrence is less than 15.2km^2 and the current area of occupancy is approximately 7.95km^2 (DOE 2016).

Based on current knowledge, the access track site appears to provide unlikely habitat for the Placostylus (refer a) above) and is unlikely to support an important population. The proposed clearing of up to 200m^2 of forest is not expected to result in a reduction in the area of occupancy of the Placostylus. Precautionary and contingency measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and offset habitat impacts.

c) Will the action fragment and existing population into two or more populations?

The Lord Howe Placostylus was formerly widespread over Lord Howe Island but is now apparently restricted to the northern, lower end of the Island, with the majority of records in the settlement area. Many of the populations of this species may already be effectively isolated from others, except where they exist within the same forest remnant or similar immediately adjacent locations (NPWS 2001).

Placostylus has been recorded 120 metres to the south and 190 metres to the north of the access track site on calcarenite substrate. Live Placostylus snails were recorded near Transit Hill in June 2000 (E. Brown RBG pers. comm. in NPWS 2001) and are known to be present at Pine Trees to the west of the site (Hutton 2010). The *Howea forsteriana* closed forest on calcarenite to the north-east of the subject site is likely to be unsuitable habitat because of seasonal disturbance from Flesh-footed Shearwater nesting. If Placostylus disperse through suboptimal habitat (disturbed forest on basalt), the strip of vegetation at the access track site may provide opportunities for genetic exchange between populations north and south of the site (although the speciation within *Placostylus bivaricosus* suggests low rates of gene flow between habitat areas).

The existing 5-9 metre wide track corridor passes through a narrow strip of Greybark-Blackbutt Closed Forest over a distance of approximately 50 metres. Sealed and unsealed roads and tracks have been found to impede dispersal in other land snail species (Baur and Baur 1990). The Placostylus Recovery Plan recommends that, because little is know about dispersal ability, any development which will result in the fragmentation of evergreen closed forest habitat areas should be considered as likely to isolate Placostylus populations (NPWS 2001). The existing track corridor may already represent a dispersal barrier for Placostylus, if the species is present at the site.

The track corridor would be widened to provide a uniform 9 metre wide corridor to enable construction access for the project. In view of the low probability of the Placostylus being present at the site, and the presence of the existing track corridor, the proposed works are considered unlikely to significantly exacerbate existing fragmentation impacts for the Placostylus in the study area. Precautionary measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and knowledge gaps regarding the dispersal ability of the species.

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

As indicated under a) above, the disturbed forest at the proposed access track site is considered unlikely to provide habitat for the Placostylus. Precautionary measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and and offset any habitat impacts.

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

Related Placostylus species in New Zealand (*Placostylus hongii* and *P. ambagiosus*) reach maturity at 3-5 years and may live for 20 years or more (Parrish *et al*. 1995). Mating in these species appears to be triggered by climatic conditions (e.g. rainfall) and probably occurs every year except in periods of drought. The Lord Howe Placostylus lays small clutches of eggs in the soil beneath leaf litter, probably during the warmer months. Hatchling and juvenile mortality is high (Ponder and Chapman ibid.). Egg-laying in a captive Lord Howe Placostylus breeding colony on the island was recorded in July and August (Hutton 2010).

Giant Land Snails may be particularly vulnerable to predation during mating and egg-laying. New Zealand Placostylus hatchlings may spend an unknown period living in trees and shrubs up to 6 metres above the ground (Parrish *et al*. 1995).

As indicated under a) above, the disturbed forest at the proposed access track site is considered unlikely to provide habitat for an important Placostylus poplation and the potential for breeding impacts is therefore

likely to be low. The precautionary mitigation measures included in the Biodiversity Assessment provide for the protection and restoration of habitat elements important for Placostylus breeding.

f) 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?

As indicated under a) above, the disturbed forest at the proposed access track site is considered unlikely to provide habitat for the Placostylus. The loss of up to 200 m^2 of this forest is unlikely to result in or exacerbate the decline of the species. Precautionary measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and and offset any habitat impacts.

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

The proposed works are unlikely to result in the introduction or spread of invasive plant or animal species at the site. Measures to exclude and control pest species included in the Biodiversity Assessment include stringent biosecurity in relation to materials imported to the island and weed control before and after the works.

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

The proposed works are unlikely to result in the introduction or spread of pathogens at the site. Stringent biosecurity and site hygiene measures are included in the Biodiversity Assessment.

i) Will the action interfere with substantially with the recovery of the species?

The NSW recovery plan for the Lord Howe Placostylus (NPWS 2001) outlines the distribution, habitat and ecology of the snail, key threats and recovery actions. The overall objective of the plan is to protect and recover the species in the wild in the long term. Specific objectives include to identify habitat and populations, to identify and ameliorate current threats, to support and coordinate relevant and to encourage community awareness and involvement.

Recovery actions cover survey and research, protection of extant populations and habitat (including rat baiting, habitat mapping and application of assessment guidelines), Commonwealth listing, community information and publicity, *ex situ* conservation measures (captive breeding and habitat regeneration on Blackburn Island), and the formation of a Lord Howe Island recovery team with representatives from the Board and Lord Howe Island community, OEH and the Australian Museum.

Habitat mapping under the plan is to incorporate the occurrence of calcarenite-derived and sandy soils, occurrence of *Howea forsteriana* evergreen closed forest and *Drypetes-Cryptocarya* evergreen closed forest, and recent and historical Placostylus records.

Appendix 2 of the plan provides Environmental Impact Assessment Guidelines to ensure that potential impacts to the Placostylus and its habitat are considered in development assessment processes.

The plan notes that the causes of the decline of the Lord Howe Placostylus are likely to include habitat clearing and modification, predation and habitat disturbance by exotic fauna species, and possibly herbicide and pesticide use. The Ship Rat is considered to be a major predator and a significant threat. Other threats include predation by Song Thrush, Blackbird and domestic chickens, cattle trampling, habitat disturbance from nesting seabirds and weeds such as Ground Asparagus and Guava.

The proposed works would not interfere with the objectives or actions contained in the recovery plan. Mitigation and offsetting measures associated with the proposal are consistent with recovery actions in the plan. The safeguards for the proposal contain specific control measures for rat predation and environmental weeds, which are two significant threatening processes currently operating at the site.

Key Threatening Processes relevant to the proposal are discussed in section 6.4.

Conclusion

The limited forest clearing associated with the wind turbine proposal is unlikely to significantly affect the Lord Howe Placostylus or its habitat. A series of mitigation measures are included in the Biodiversity Assessment to account for the possible presence of the species at the site and to offset habitat impacts (refer section 6.2.4 and Appendix G).