Review of the impacts of Narrabri lateral pipeline on Eastern Pygmy-possum *Cercartetus nanus*, Corben's Long-eared Bat *Nyctophilus corbeni* and the Pilliga Mouse *Pseudomys pilligaensis*

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SUMMARY

Habitat loss and fragmentation associated with the NLP combined with cumulative impacts of recent fires, the NGP and climate change will have a significant residual impact on Eastern Pygmy-possum *Cercartetus nanus*, Corben's Long-eared Bat *Nyctophilus corbeni* and the Pilliga Mouse *Pseudomys pilligaensis* despite proposed mitigation measures and offsets. The restrictive habitat needs and importance of the Pilliga for these species and the cumulative impacts these species have already experienced, including from the Duck Creek fire, together raise the significance of the impact of further habitat loss and fragmentation proposed for this development. For the Pilliga Mouse, its restricted geographical range means this could reach a level where it may be considered serious and irreversible.

The Biodiversity Development Assessment Report (BDAR, Ecoresolve 2025) is inadequate with respect to assessment of impacts on the Eastern Pygmy-possum *Cercartetus nanus*, Corben's Long-eared Bat *Nyctophilus corbeni* and the Pilliga Mouse *Pseudomys pilligaensis*. The BDAR is contradictory and fails to include the key ecological traits of these three species into its discussion and recommendations for mitigation. These impacts on populations of key threatened species as well as on a number of other threatened vertebrates with core populations in the Pilliga, especially the Pilliga Mouse, may be severe and irreversible. This is because they are unlikely to be alleviated by proposed mitigation measures or compensated for using offsets.

The Pilliga forest is the most important continuous, relatively unfragmented stand of temperate, semi-arid forest and woodland in south-eastern Australia. This 0.5 million hectare remnant provides a major refuge for these ecosystems, particularly for threatened vertebrate species in a landscape largely cleared for agriculture (NICE and CUCCLG 2012, Milledge 2017, Lunney *et al.* 2017, Milledge 2020). It forms part of a recognised National Biodiversity hotspot (Australian Government Biodiversity Hotspots website, accessed December 2025) and is a globally acknowledged Key Biodiversity Area (Birdlife Australia website, accessed December 2025). It supports a number of range-restricted species, species with their strongholds in the area and species at the western extent of their distributions that are exposed to high levels of ongoing threats. These include the threatened Pale-headed Snake *Hoplocephalus bitorquatus*, Barking Owl *Ninox connivens*, Eastern Pygmy-possum *Cercartetus nanus*, Black-striped Wallaby *Macropus dorsalis*, Corben's Long-eared Bat *Nyctophilus corbeni* and Pilliga Mouse *Pseudomys pilligaensis*. The area also provides core habitat for a number of declining, threatened woodland birds (Ford *et al.* 2001, Birds Australia 2005) and constitutes a substantial section of the Eastern Australian Bird Migration System (Nix 1976, Griffoen and Clarke 2002).

Background to the review

Santos is proposing to construct, operate and decommission an underground gas transmission pipeline to deliver gas to the east coast gas market. The proposed 55-km Narrabri Lateral Pipeline (NLP) would connect the Narrabri Gas Project (NGP) to the Queensland Hunter Gas Pipeline (HGP). The **development footprint** – that area that would be directly impacted by the proposal – is estimated to be 212ha including 168.34ha of dry sclerophyll forest and woodland of the Pilliga East and Bibblewindi State Forests. While approximately 80% of the proposed pipeline route is forested, the remaining 20% to the east transects the Liverpool Plains IBRA subregion which is primarily agricultural land, but contains native vegetation remnants that would be impacted.

Most of the **construction corridor** would be 30m wide, but up to 20.9km or 40% of the corridor could extend to 55-60m in width where it is **co-located** with infrastructure associated with the NGP, between the proposed Bibblewindi facility and the Leewood facility. The final width of the **operational corridor** or right-of-way (**ROW**) is expected to reduce to 20m, but would remain 40m wide in areas where it is co-located with NGP infrastructure. The **ROW easement** would be managed to maintain early successional stages of vegetation (grasses and herbs) and to exclude trees and woody shrubs.

The co-location sections proposed are:

- Leewood to Bibblewindi: cumulative clearing of up to 60m wide over a distance of 15m
- East of Bibblewindi: cumulative clearing of up to 55 m wide over 5km.

The biodiversity survey was conducted over a wider **investigation area** comprising a 60-100m wide corridor in the Pilliga East and Bibblewindi State forests and a 300m wide corridor on lands outside the forested areas.

Between December 2023 and January 2024, the Duck Creek wildfires burned about 130,000ha in Bibblewindi and Pilliga East State Forests, much of it severely. The BDAR's analysis of fire impacts states that this represents about 25% of the Pilliga forests. It also estimates that 56% of the investigation area and 32.45kms of the 55-km pipeline corridor within the Pilliga and Pilliga Outwash IBRA subregions were impacted by fire. Only 57.6ha or almost one-third of the 212ha of the development footprint was left unburnt.

This report is based on a review of the Biodiversity Development Assessment Report prepared by Ecoresolve (2025), and appendices to that Report, particularly *Appendix I EPBC Act MNES Assessment Report* and *Appendix K Pale-headed Snake Expert Report.* The findings of the Duck Creek bushfires assessment found in Section 3 of Appendix I were also considered. The MNES assessment is referred to throughout this report because it assesses the impact of the pipeline against a series of Commonwealth criteria that reveal its severity, including a specific requirement regarding the elevated value of remaining habitat in the wake of the Duck Creek fires. Additional information relating to cumulative impacts of the Narrabri Gas Project (NGP) was obtained from Appendix J1 of the Ecological Impact Assessment for the NGP prepared by EcoLogical (2016).

Habitat loss and fragmentation associated with the NLP combined with cumulative impacts of recent fires, the NGP and climate change will have a significant permanent residual impact on Pilliga Mouse, Eastern Pygmy-possum and Corben's Long-eared Bat despite mitigation measures and offsets.

Pilliga Mouse

The Pilliga Mouse is almost totally confined to the Pilliga Forest. No important populations of Pilliga Mouse have been formally identified or defined, but it is noted in Appendix I of the BDAR that all populations are considered important due to the species' "restricted distribution and their likely role in maintaining genetic diversity necessary for the long-term survival of the species."

The NLP would result in the loss of approximately 151ha of habitat for the Pilliga Mouse. The Significant Impact Assessment (Appendix I) concludes:

- that the project has the potential to reduce the population's "local" area of occupancy, but is not specific about the scope of this statement. It also concludes that the project increases the likelihood of population fragmentation and will adversely affect habitat critical to the survival of the species through direct loss and long-term modification.
- that this could disrupt the breeding cycle by reducing juvenile survival and have "longer-term effects on population stability."
- that the impacts of the project could lead to "local" population decline "if connectivity remains compromised over the medium to long-term (such as where the operational corridor is adjacent to other linear infrastructure) and impacts persist over successive breeding seasons."

The Leewood to Bibblewindi co-location corridor with 60m wide clearing will occur to the west of Bohena Creek where the two Pilliga Mouse sightings occurred during BDAR surveys.

Pre- and post-fire surveys used spotlighting to detect individuals but this is not an appropriate survey method for this species. Pre-survey effort for the Pilliga Mouse involving three days of Elliot trapping and two nights of spotlighting in March 2023, does not meet recommended survey times (October-February) or methodology for nationally threatened species (CoA 2011).

To mitigate impacts on habitat connectivity the BDAR proposes the following measures:

- Horizontal directional drilling across Bohena, Tulla Mullen and Little Sandy Creeks,
- Reduction of the construction corridor to 20 m across one crossing of Bibblewindi Creek and two crossings of Little Sandy Creek,
- Progressive rehabilitation of construction corridor and the provision of timber shelter post-construction, and
- Preparation of a Connectivity Strategy.

While these will slightly reduce habitat removal and barrier impacts in riparian vegetation with high biodiversity values, the remaining 20-40m wide operational corridor will create an enduring movement barrier for the Pilliga Mouse.

However, there are no mitigation measures recommended in the BDAR (Section 8.7.4) to avoid construction impacts on key threatened species. Due to the high importance of the Pilliga area for a number of threatened species with restricted distributions, it is imperative that any construction activities be adjusted seasonally to take into account breeding and torpor periods.

Importance of habitat

The BDAR (Appendix I) concludes that the project removes habitat that is critical to the survival of the Pilliga Mouse and which has been mapped as important in previous studies (Paull et al 2014; Ecological Australia 2016). It also acknowledges the dynamic nature of the Pilliga Mouse habitat and population, noting that "previously marginal areas may now hold greater ecological value or support higher levels of occupancy."

For this reason, and given the disrupted survey effort as a result of the Duck Creek fires, a "serious and irreversible" impact assessment is needed for this species.

Fragmentation impacts

The Pilliga Mouse avoids open spaces and the co-located corridor between Leewood and Bibblewindi will create a barrier to movement for small terrestrial mammals such as the Pilliga Mouse at least for the 25-year duration of the gasfield and pipeline and likely longer.

The assessment of fragmentation impacts on the Pilliga Mouse is contradictory. The MNES assessment concludes that the loss of connectivity will "temporarily fragment" habitat and create a barrier to movement during "early post-construction years" (i.e. irruptions) but also indicates that that the impacts of the project could lead to population decline "if connectivity remains compromised over the medium to long-term (such as where the operational corridor is adjacent to other linear infrastructure) and impacts persist over successive breeding seasons." This will be the case in the Leewood to Bibblewindi co-location corridor.

The assessment also stated that the response of Pilliga Mouse to the Duck Creek fires is "generally unknown" (BDAR Section 8.3.1.1) but the MNES assessment acknowledges the species' "'boom and bust life history strategy that is closely linked to fire dynamics" (Appendix I Section 6.12.2).

The MNES assessment predicts that connectivity impacts are likely to lessen over time as vegetation both outside and within the ROW are allowed to regenerate post-construction. However, the ROW will be regenerated with shallow-rooted, non-woody ground and understorey and would be maintained free of woody shrub cover and tree canopy for the life of the project. This does not match the description for any of the preferred habitats for the Pilliga Mouse as described in the literature or in the BDAR itself. Individuals are unlikely to cross the easement despite the addition of timber shelter, as the species requires continuous cover for protection from predators.

NICE and CUCCLG (22012) considered that the Pilliga Mouse had already been impacted by gas development infrastructure in 2011-12 through fragmentation of its population or metapopulation, destruction of critical habitat, disruption of breeding cycles and increased establishment of exotic pest species. It was observed that the population or metapopulation

underwent a “contraction to a series of discrete refuges” in response to road widening and pipeline corridor construction and that refuge habitat was fragmented and isolated due to clearing. The same populations were impacted by the Duck Creek fires in 2023 and will be cumulatively impacted by the NLP.

A Connectivity Strategy has not been prepared so it is still unknown if any of the mitigation measures to be proposed will be feasible or effective. Based on the literature, it is unlikely that the Pilliga Mouse will avoid open areas with no shrubby cover. It is essential that the strategy be finalised and reviewed by the decision-maker prior to any decision being made or there is a high risk that the population will become further fragmented.

Fragmentation, fire and predation

Although the BDAR acknowledges that there are likely to be cumulative impacts from the Duck Creek fires, habitat removal and fragmentation, it has not considered the impact of increased predation associated with fragmentation and fire. In fact, the BDAR downplays the significance of predation by stating that foxes are already plentiful in the area and that the restoration of vegetative cover would reduce the risk of predation over time. However, it does not consider that post-fire predation could result in extinction of local populations restricted to refuge habitats before they have a chance to recolonise burned areas.

Paull (2020) confirmed that foxes are very common in the Pilliga Forest and noted that landscape scale baiting undertaken by the Forestry Corporation and the National Parks and Wildlife Service has made little difference to fox numbers. He stressed that fragmentation increases fox predation and quoted research that has shown that foxes spend 30% of their night-time activity hunting near linear landscape features. Importantly he stressed that increased predation cannot be mitigated in any meaningful way and that it placed small mammals at risk of extinction. Conservation advice lists predation by foxes, feral cats and pigs as a threat to the Pilliga Mouse.

Doherty *et al.* (2023) reviewed 12 Australian studies that have examined fox and cat predatory behaviour following fire in southeastern Australia. The results indicated that foxes are more likely to increase activity 12-30 months post-fire. As the impact of the Duck Creek fires and increased predation on Pilliga Mouse are unknown, the cumulative impacts of habitat fragmentation cannot be accurately predicted but are likely to be significant.

Edge effects

The BDAR downplays the impact of edge effects, stating that “"Because the Pilliga forests are a contiguous tract of drier forest ecosystems with relatively lower biomass, they are expected to be less sensitive to edge effects." (BDAR Section 10.1.3)

However, the assessment ignores the contribution of edge effects to increased predation on the Pilliga Mouse. The cumulative indirect impacts of fragmentation, edge effects and predation associated with the NGP and NLP projects have not been assessed and are likely to be significant for the Pilliga Mouse.

Strevens *et al.* (2008) summarised Australian research on edge effects associated with powerline easements that found exotic predators within 50-200m of easements, recorded

lower species richness and total abundance of birds at 25-125m from edges and measured abiotic impacts extending to 20-25m from edges.

Cumulative impacts

The cumulative impacts of projects in the region are listed in the BDAR but not assessed. The Narrabri Gas Project would directly and indirectly impact 374.6ha[1] of Pilliga Mouse habitat and the Narrabri Lateral Pipeline will directly impact a further 151ha. This would result in the loss and fragmentation of over 500ha of habitat for the Pilliga Mouse that will isolate local populations through the creation of a network of movement barriers that will also increase access to predators. In late 2023 and early 2024, the Duck Creek fires burned through 130,000ha, much of it severely, within and around the area this project is proposed.

The BDAR (Appendix I Section 3) estimates that the Duck Creek fires burned about 121,987ha of potential habitat for the Pilliga Mouse. This represents about 36% of available habitat in the Pilliga forest and a reduction of 65.46% of potential habitat in the development footprint. Remaining areas of unburned habitat are substantially more important to the survival of the Pilliga Mouse following this fire.

The BDAR has not undertaken a survey of burnt and unburnt areas within the wider Pilliga East and Bibblewindi SF to assess the habitat values of unburnt areas. These areas would be substantially more important for the population if the areas of burnt and unburnt critical habitat and/or important habitat was known. Due to the lack of post-fire surveys, it is unknown how the Pilliga Mouse population is responding post-fire. Therefore, a precautionary approach is warranted and it must be assumed that removal of unburnt habitat as part of the NLP will have a significant cumulative impact on the individuals occupying unburnt patches.

Eastern Pygmy-possum

NICE and CUCCLG (2012) noted that the eastern Pilliga forests support an important population of Eastern Pygmy-possum. It was also noted that this species is at the western limit of its distribution there and, as it appears to be isolated from other populations on the western slopes, it may be genetically distinct. Within its range, the species has a patchy distribution and low abundance.

The NLP would result in the loss of approximately 125.5ha of habitat for the Eastern Pygmy-possum. As this species is not listed nationally, it was not subject to the more rigorous Significant Impact Assessment and therefore the impact assessment is considered to be inadequate as it is not assessed against Commonwealth criteria, does not consider the cumulative impacts of fire or reference any historical or recent research studies.

Camera traps and Elliot traps were deployed prior to the fires but the equipment was destroyed and no data could be retrieved. This species was subject to targeted surveys post-fire by spotlighting outside the recommended survey times. Although the BDAR noted

[1] In Table A9 in Appendix J1 of the ecological assessment for the NGP https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6456%2120190228T035858.354%20GMT

that one individual was observed post-fire during spotlighting in the Liverpool Plains IBRA subregion, it assumed that suitable habitat is found throughout the forested parts of the development footprint as these contain continuous foraging and breeding habitat, structurally complex vegetation and key resources and are connected to adjacent habitat.

The Eastern Pygmy-possum occupies a range of habitat types but woodlands and heaths are preferred. Individuals feed on nectar and pollen from banksias, bottlebrushes and eucalypts and nest in hollows. Suitable foraging and breeding habitat within the development footprint includes heathy woodland and open woodland with a dense shrub layer (BDAR Section 8.3.1.1).

Fragmentation and edge effects

Table 38 in the BDAR concluded that the connectivity impacts for this species would be "major" in the short-term with "overall reduced viability" of populations within the locality during construction. However, residual impacts would lessen to low to moderate over time as vegetation both outside and within the ROW is allowed to regenerate. However, as the ROW would not be rehabilitated with shrubby vegetation preferred by this species, it would not contain foraging or breeding resources or continuous cover. It is therefore likely to be avoided as it would be highly exposed to predators. Although the BDAR assumes that pygmy-possums are physically able to travel more than 50m on the ground, it does not take into account small mammal behavioural responses to predators. Bladon *et al.* (2002) found that individuals would cross 10-20m of open ground to reach heavily used nest boxes, but were only rarely seen walking on the ground and were more likely to be found on trunks and branches 1-5m above the ground, indicating more frequent movement through the canopy.

Bladon *et al.* (2002) also observed a small population of Eastern Pygmy-possums on private property in northern NSW for almost three years before the site was extensively cleared. Clearing had a substantial detrimental effect on recruitment of young and appeared to be greater for females than males. Usage of nest boxes near the edge of disturbance fell from 83% before clearing to 5% in the 12 months following clearing, indicating that edge effects associated with fragmentation are significant for this species. Given that it has a patchy distribution, fragmentation associated with the NGP and NLP is likely to isolate populations, exposing them to a high risk of localised extinction through stochastic natural events.

A Connectivity Strategy has not been prepared, so it is still unknown if any of the mitigation measures to be proposed will be feasible or effective. Although pygmy-possums may be physically capable of crossing 50m, they are likely to avoid open ground with no cover. It is essential that the strategy be finalised and reviewed by the decision-maker prior to any decision being made, or there is a high risk that the population will become fragmented.

Cumulative impacts

The BDAR (Appendix I Section 3) did not estimate the area of Eastern Pygmy-possum habitat impacted by the Duck Creek wildfires but this is likely to be similar to that calculated for the Pilliga Mouse. Consequently, the proposed NLP would remove an additional 125.5ha of habitat for this species.

The cumulative loss and fragmentation of 1053ha of Eastern Pygmy-possum habitat as a result of the approved NGP[2] and proposed NLP will increase isolation of populations while increasing edge effects and predator pressure. This small terrestrial marsupial has already been significantly impacted by habitat loss and increased predator pressure from the Duck Creek wildfires.

The BDAR has not undertaken a survey of burnt and unburnt areas within the wider Pilliga East and Bibblewindi SF to assess the habitat values of unburnt areas. These areas would be substantially more important for the population if the areas of burnt and unburnt critical habitat and/or important habitat was known. Due to the lack of post-fire surveys, it is unknown how the Eastern Pygmy-possum population is responding post-fire. Therefore, a precautionary approach is warranted and it must be assumed that removal of unburnt habitat as part of the NLP will have a significant cumulative impact on the individuals occupying unburnt patches.

Corben's Long-eared Bat

Pilliga East SF forms part of one of only three areas considered to be a stronghold for Corben's Long-eared Bat (Law et al. 2023) due to its extensive box/ironbark/cypress pine forests and availability of suitable tree hollows. The BDAR (Appendix I) states that important populations are found within the Pilliga, Pilliga Outwash and Liverpool Plains IBRA subregions. It cites references identifying the Pilliga as a stronghold supporting a significant portion of the species' range in NSW.

The NLP would result in the loss of approximately 167ha of habitat for Corben's Long-eared Bat. The Significant Impact Assessment (Appendix I) concludes:

- that there is a credible risk that the project has the potential to "affect the integrity, breeding capacity and long-term persistence of the local important population."
- that it would reduce the local area of occupancy of an important population within the Pilliga region.
- that it would adversely affect habitat critical to the survival of the species including "reductions in habitat extent, quality, connectivity and resource availability."
- that in the absence of a formal recovery plan, the further loss, degradation and fragmentation of critical habitat, "represents a risk to the species long-term recovery and persistence in the region."

The assessment concluded that, based on current evidence, there is a "real chance or possibility that the project could lead to long-term population decline, reduced area of occupancy, disruption of breeding and interference with recovery." The MNES assessment has therefore determined that there will be an unacceptable impact on this stronghold population as the cumulative impacts of the NLP and Duck Creek fires have already and will in future, seriously impair the viability of the species and damage critical habitat, including foraging and breeding resources.

[2] The NGP would impact 927.8ha of Eastern Pygmy-possum habitat (Table A9 in Appendix J1 of ecological assessment for the NGP)
https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6456%2120190228T035858.354%20GMT

The presence of Corben's Long-eared Bat was not confirmed during pre-fire surveys but the species was assumed to occur. Surveys conducted as part of the BDAR used Anabat detection which is not recommended by threatened species guidelines as calls cannot be reliably identified to species level (CoA 2010). Guidelines recommend 20 trap-nights using mist nets or harp traps over a minimum of 5 nights. NICE and CUCCLG (2012) captured several Corben's Long-eared Bats within the study area and Spark (2024) trapped two individuals on private property located within one kilometre of the proposed pipeline corridor in the Liverpool Plains IBRA subregion.

Importance of habitat

This species prefers large, intact forest remnants with a well-developed canopy and dense cluttered understorey. (Law *et al.* 2023, NSW DCCEEW Corben's Long-eared Bat on-line profile, accessed December 2025) and avoids cleared areas when foraging. The BDAR states that the subject site contains a significant number of hollow-bearing trees, a dead buloke tree (dead or senescent Bulokes *Allocasuarina leuhmannii*a are favoured for roosting (Law *et al.* 2023) and other important attributes of the species' favoured habitat.

The BDAR (Appendix I) considers that the habitat within the investigation area meets the Significant Impact Guidelines, particularly in the context of "its location in a regional stronghold for the species, and the Duck Creek bushfires, which have reduced the extent and quality of habitat in the region, reducing hollow availability, canopy connectivity and regenerating foraging resources."

Mitigation measures proposed to minimise connectivity impacts are the same as for the Pilliga Mouse. However, minor reductions in habitat clearing and fragmentation are highly unlikely to mitigate impacts for a species that is dependent on tree hollows and continuous canopy cover, both of which have already been lost due to recent fire. These will be permanently removed from the ROW and will not be regenerate in construction areas outside the ROW for decades, if ever.

Fragmentation and edge effects

The MNES assessment noted that the wider co-located corridors would "reduce functional habitat connectivity and increase the potential for fragmentation" for this species. It concluded that fragmentation associated with the project has the potential to "alter nightly movements, reduce breeding opportunities and inhibit recolonisation." Because the species generally avoid open cleared areas for foraging, the MNES assessment stated that the corridor has the "potential to lead to behavioural changes, such as avoidance of newly created edges."

Hollow availability

According to the MNES assessment, the proposed pipeline will remove 184 hollow-bearing trees, including 150 with hollow entrances measuring 1-15cm in diameter considered to be suitable for Corben's Long-eared Bat. Hollow-bearing trees within two metres of the disturbance area may be retained where engineering constraints allow (BDAR Section 8.7.4). The BDAR admits that it may take many decades to replace lost tree hollows.

However, the BDAR admits that the assumed total tree removal may be an underestimate as it is possible that the visibility of hollows was reduced by the fires and the use of 20m linear transects designed for survey of threatened plants (BDAR Section 8.1.4) which is not a satisfactory method for measuring hollow density. Modelling undertaken as part of the Pale-headed Snake expert report estimated that the area supports 686-1994 live hollow-bearing trees within the development footprint (BDAR, Appendix K). At 16 hollow-bearing trees per hectare, the report considered this density to be moderately high for the region. As more than two-thirds of the development footprint has been burnt, these remaining hollows are essential in supporting the local population.

No surveys were undertaken for burnt areas in the Pilliga East and Bibblewindi State Forests to assess the extent of loss of important resources for Corben's Long-eared Bat. While most of the foraging habitat would have been destroyed, any remaining dead trees could provide suitable breeding habitat if located near unburnt areas. However, as this species prefers to small hollows in smaller trees as maternity sites and for roosting (Law *et al*. 2023), these would have probably been completely lost in all severely burned areas. As the total extent of foraging and breeding resources is unknown for Corben's Long-eared Bat, a precautionary approach is required.

Cumulative impacts

The BDAR (Section 3, Appendix I) estimates that the Duck Creek wildfires burned about 121,596ha of potential habitat for Corben's Long-eared Bat, reducing hollow availability, canopy connectivity and foraging habitat within the eastern Pilliga forests. The BDAR also states that this species is sensitive to fire, including low intensity burns, and that the Duck Creek fires reduced the extent and quality of habitat for Corben's Long-eared Bat in the region. The MNES assessment concluded that the unburnt areas within the Pilliga forests "are likely to have gained importance for the survival of Corben's Long-eared Bat in the post-fire period." The Narrabri Gas project[3] was approved to directly and indirectly impact 1060.4ha of Corben's Long-eared Bat habitat, including removal and fragmentation of foraging habitat and loss of hollow-bearing trees for roosting and maternity sites. The cumulative impact of this project with the NLP and the Duck Creek fires is likely to have a significant impact on Corben's Long-eared Bat despite mitigation measures or offsets. The impact of habitat removal and fragmentation of unburnt areas along the NLP corridor is therefore likely to be even more critical for the species.

Climate change

The Pilliga is already subject to frequent fires. The frequency and intensity of bushfires and drought conditions are expected to increase under warmer, drier conditions predicted with climate change. The fugitive emissions and burning of gas associated with the NGP and NLP will in turn exacerbate weather and temperature extremes. The cumulative impact of climate change with habitat loss and fragmentation, fire and predation on important populations and critical habitat has not been considered in any of the BDAR documents, but is likely to be significant.

[3] Table A9 in Appendix J1 of the ecological assessment for the NGP. https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6456%2120190228T035858.354%20GMT

REFERENCES

Birds Australia 2005. The State of Australia's Birds 2005. Woodlands and Birds. Suppl. to Wingspan 15, No. 4, December 2005. Birds Australia, Hawthorn East, Vic.

Bladon, R.V., Dickman, C.R. and Hume I.D. 2002. Effects of habitat fragmentation on the demography, movements and social organisation of the eastern pygmy-possum (*Cercartetus nanus*) in northern NSW. *Wildlife Research* 29:105-116.

CoA, 2008. Approved conservation advice *Pseudomys pilligaensis* (Pilliga Mouse). https://www.environment.gov.au/biodiversity/threatened/species/pubs/99-conservation-advice.pdf

CoA, 2010. Survey guidelines for Australia's threatened bats. Commonwealth of Australia, Canberra.

CoA, 2011. Survey guidelines for Australia's threatened mammals. Commonwealth of Australia, Canberra.
DPE (2008)

Doherty, T.S., Watchorn, D.J., Miritis, V., Pestell, J.L. and Geary W.L. 2023. Cats, foxes and fire: quantitative review reveals that invasive predator activity is most likely to increase shortly after fire. Fire Ecology 19 (22)

Ecoresolve, 2025. Technical Report 1 – Biodiversity Development Assessment Report. Report prepared as part of the Narrabri Lateral Pipeline EIS for Santos/Hunter Gas Pipeline.

EcoLogical Australia. 2016. Ecological Impact Assessment Narrabri Gas Project Appendix J1. Report prepared for Santos.

Ford, H.A., Barrett, G.W., Saunders, D.A. and Recher, H.F. 2001. Why have birds in the woodlands of Southern Australia declined? *Biol. Cons.* 97: 71-88.

Griffioen, P.A. and Clarke, M.F. 2002. Large-scale bird-movement patterns evident in eastern Australian atlas data. *Emu* 2002: 99-125.

Law, B.S., Turbill, C., Lumsden, L.F. and Ford, G,I. 2023. Corben's Long-eared Bat *Nyctophilus corbeni*. Chapter in *Strahan's Mammals of Australia*. Fourth edition. Ed. A.M. Baker and I.C. Gynther. Reed New Holland, Sydney, NSW.

Lunney, D., Predavec, M., Sonawane, I., Kavanagh, K., Barrott-Brown, G., Phillips, S., Callaghan, J., Mitchell, D., Parnaby, H., Paull, D., Shannon, I., Ellis, M., Price, O. and Milledge, D. (*submitted 2017*). The remaining koalas (*Phascolarctos cinereus*) of the Pilliga forests, northwest NSW: refugial persistence or a population on the road to extinction? *Pacific Conservation Biology*.

Milledge, D. 2017. Report on the adequacy of the Environmental Impact Statement for the Narrabri Gas Project in assessing and mitigating impacts on the vertebrate fauna of the Project Area. Unpubl. Report to EDO NSW. Landmark Ecological Services, Suffolk Park, NSW.

Milledge, D. 2020. Report on likely impacts on the threatened vertebrate fauna of the Pilliga forests and woodlands from the proposed Narrabri Gas Project. Unpubl. report to Environmental Defenders Office and North West Alliance. Landmark Ecological Services, Suffolk Park, NSW.

NICE and CUCCLG 2012. ed. D.R. Milledge. National significance: The ecological values of Pilliga East Forest and the threats posed by coal seam gas mining 2011-2012. Report to Northern Inland Council for the Environment and the Coonabarabran and Upper Castlereagh Catchment and Landcare Group. Northern Inland Council for the Environment and The Wilderness Society, Coonabarabran and Sydney, NSW.

Nix, H.A. 1976. Environmental control of breeding, post-breeding dispersal and migration of birds in the Australian Region. Pp. 272-305 in *Proceedings of the 16th International Ornithological Congress* ed. by H.J. Frith and J.H. Calaby. Australian Academy of Science, Canberra.

Paull, D.C. 2009. Habitat and post-fire selection of the Pilliga Mouse *Pseudomys pilligaensis* in Pilliga East State Forest. *Pacific Conservation Biology* 15: 254–267.

Paull, D.C. 2020. Expert report for the Narrabri Gas Project (SSD_6367) Outstanding biodiversity impact and offset issues. Report prepared for the IPC hearing. https://www.ipcn.nsw.gov.au/sites/default/files/pac/projects/2020/03/narrabri-gas-project/correspondence/edo/paull-narrabri-gas-project-ipc-advice-final.pdf

Paull, D.C., Milledge, D., Spark, P., Townley, S. and Taylor, K. 2014. Identification of important habitat for the Pillliga Mouse *Pseudomys pilligaensis*. *Aust. Zool.* 37:15-22.

Pavey, C.R., McDonald, S.M., Midgley, D.J., Tran-Dinh, N., Mariani, C., Vanderduys, E.P., Murray, B., Johnson, S. and Levick, S.R. 2025. Remote sensing and threatened species surveys to better understand risks of forest fragmentation from the Narrabri Gas Project. CSIRO, Canberra, ACT.

Spark, P. 2024. Results from fauna survey of three properties adjoining the Narrabri Gas Lateral Pipeline, 10-14 March 2024. Unpubl. Report. P.D.Spark, Tamworth, NSW..

Strevens, T.C., Puotinen, M.L. and Whelan R.J. 2008. Powerline easements: ecological impacts and contribution to habitat fragmentation from linear features. *Pacific Conservation Biology* 14: 159-168.

Dr Renata Bali – Lock the Gate Research Coordinator

Renata is an ecologist with more 40 years' experience in environmental impact assessment, environmental planning, and critical and scientific review for a wide diversity of projects in NSW, Victoria and Queensland. She has undertaken environmental assessments on major infrastructure projects, including Pacific Highway Upgrades, the Sydney Second Airport and large residential estates. Renata has provided expert evidence in the NSW Land & Environment Court and at Commissions of Inquiry and has particular expertise in the areas of linear development, fragmentation and edge effects. She undertook a comprehensive review of Australian and international studies on edge effects associated with roads for the former RTA (now TfNSW) which was used to calculate areas of compensatory habitat required to offset edge impacts.

David Milledge – Landmark Ecological Services

David Milledge is a wildlife ecologist with extensive field experience in eastern Australia. He has worked for government authorities and as a private consultant, specialising in forest and woodland ecosystems and concentrating on endangered vertebrate species, including the Pilliga Mouse, Eastern Pygmy-possum and Corben's Long-eared Bat. He has considerable experience investigating flora and fauna values of areas subject to a variety of land uses, particularly in relation to the preparation and review of EISs, SISs and Plans of Management. With colleagues in 2011-2, he undertook a detailed study of the impacts of the former Eastern Star gas development on Pilliga Mouse and other threatened vertebrates. In 2014, David co-authored a paper that described and mapped important habitat for Pilliga Mouse. More recently he reviewed the adequacy of the Narrabri Gas Project EIS in assessing and mitigating the impacts of the project on threatened Pilliga fauna species.

Phil Spark – North West Ecological Services

Phil Spark is a farmer and ecologist experienced in surveying forests and woodlands in northwest NSW. He undertook surveys on the north coast, tablelands and north-west slopes as part of the NSW regional biodiversity assessment. Phil was a founding member of the Northern Inland Council for the Environment (NICE) and has a particular interest in protecting Leard State Forest and the Pilliga from inappropriate development. He provided expert evidence at the Independent Planning Commission hearings for the Narrabri Gas Project and co-authored a paper with David Milledge and other experts on Pilliga Mouse important habitat. In March 2024, he undertook threatened fauna species surveys on several privately-owned blocks located adjacent to the proposed NLP within the Liverpool Plains IBRA subregion.