Goyder - Pygmy Bluetongue Lizard Survey

March 2021

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Prepared by EBS Ecology for Neoen Australia Pty Ltd

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Cover photograph: Adult Pygmy Bluetongue Lizard found at Goyder during the March 2021 survey.

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GLOSSARY AND ABBREVIATION OF TERMS

%	percent
cm	centimetre(s)
CEMP	Construction Environmental Management Plan
DEW	Department for Environment and Water
DEWNR	Department for Environment, Water and Natural Resources (Australian Government)
DotE	Department of the Environment
EBS	Environmental and Biodiversity Services Pty Ltd – *trading as* EBS Ecology
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ha	hectare(s)
m	metre(s)
MWh	Megawatt hours
MET mast	Meteorological Mast
NPW Act	*National Parks and Wildlife Act 1972*
NVC	Native Vegetation Council
n.d.	no date
OEMP	Operational Environmental Management Plan
PBTL	Pygmy Bluetongue Lizard (*Tiliqua adelaidensis*)
the Project	Goyder South Hybrid Renewable Energy Project (also referred to as Goyder South)
Project Area	The area within the perimeter boundary of the proposed Goyder South Hybrid Renewable Energy Project
sp.	species
VA	Vegetation Association(s)
WTG	Wind Turbine Generator(s)

EXECUTIVE SUMMARY

The Goyder South Hybrid Renewable Energy Project (Goyder South - the Project) is a windfarm of up to 163 turbines with a capacity of 1200MW. The Project also includes a solar farm of up to 3000 hectares with up to 600MW capacity, and a storage facility with a capacity of up to 900MW/1800MWh (the Project Area). Associated infrastructure includes substations, access tracks, underground connection cabling and transmission lines, maintenance and operations compounds, meteorological masts and temporary construction compounds.

In 2019 a survey was undertaken across the Project Area to determine areas of ecological significance including Threatened Ecological Communities, threatened flora and threatened fauna (EBS Ecology 2020). Pygmy Bluetongue Lizards (PBTLs) (*Tiliqua adelaidensis*) are listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*, and unique to the Mid-north region of South Australia, where up to 30 populations have now been discovered. Across the Project Area, the initial survey identified 62 PBTLs and mapped 870.437 ha of *potential* habitat and 194.181 ha of *likely* habitat.

Based on the outcome of these surveys, Neoen committed to avoiding known and potential PBTL habitat (and other sensitive features) during the construction design phase, as much as possible. Following provision of the largely finalised infrastructure design footprint (subject to a final round of micro-siting of turbines), EBS Ecology (EBS) was engaged to undertake targeted PBTL surveys where the proposed infrastructure layout intercepted PBTL habitat already mapped as *potential* and *likely*.

The targeted survey identified nine locations where the proposed infrastructure layout impacted mapped PBTL habitat, including three areas where habitat was mapped as *likely*, and 6 locations where habitat was mapped as *potential*. A total of 13 individual PBTLs were located across three sites. Based on the proposed layout, the following recommendations have been made to further mitigate the potential impacts of the Project on PBTL populations:

- Where infrastructure footprints impact known PBTL populations, micro-siting should be explored to further avoid or reduce impacts to PBTL.
- It is recommended that the Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) consider actions to mitigate direct and indirect impacts to PBTLs.
- Undertake further PBTL surveys if the proposed infrastructure layout is modified to fall within areas likely or possibly containing PBTLs.

Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

1.1 Pygmy Bluetongue Lizard

The Pygmy Bluetongue Lizard (PBTL) (*Tiliqua adelaidensis*) is a small, stout skink which lives in disused spider burrows in sparsely vegetated native and degraded grasslands, where it spends most of its life inside and nearby the burrow hunting for small insect prey, retreating to the burrow when disturbed.

Because of their shy nature and small size, PBTLs are difficult to detect, and between their discovery in 1863 and 1959 only 20 specimens were collected. Between 1959 and 1992 no sightings were recorded, and it was presumed that this species had gone extinct until a specimen was identified inside the stomach of a road-kill brown snake, leading to surveys in the surrounding area across the Mid North. The PBTL is now known from around 30 sites, from north of Port Wakefield to south of Peterborough and west of Clare (Bull and Hutchinson 2018). The species is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

PBTLs cannot live in areas where ground has been disturbed by recent (within 20 years) ploughing, and their abundance within lightly grazed grassland is largely dependent on availability of suitable spider burrows (Bull and Hutchinson 2018).

Threats to PBTLs include soil disturbance (ploughing or heavy trampling), population fragmentation and isolation, predation, over-grazing, habitat destruction and the use of herbicides and insecticides (reducing spider populations for burrow and prey availability) (DEH n.d.).

1.2 Site description

The Project Area for Goyder South begins 5.5 kilometres (km) south of the centre of Burra extending 27 km south toward Robertstown. It spans the Worlds End Valley with turbines located on the western and eastern ridge lines extending between Burra and Robertstown. Land within the Project Area is generally privately owned and comprises predominantly agricultural (grazing and cropping) land.

Twenty (20) broad vegetation associations (VAs) were mapped over the Project Area during the Flora and Fauna Assessment (EBS Ecology 2020). Native vegetation covered 26,559.2 hectares (ha) of the overall Project Area.

The most well-represented VAs, spread across the Project Area, were

- VA 8 - *Austrostipa spp*. (Spear Grass) Mixed Grassland;
- VA 5 - *Eucalyptus oleosa ssp. oleosa* (Red Mallee) Mixed Open Mallee; and
- VA 1 - *Maireana aphylla* (Cotton-bush) / *Atriplex stipitata* (Bitter Saltbush) Mixed Low Open Chenopod Shrubland.

Of these, VA 8 provides the most suitable habitat for PBTLs within the Project Area.

1.3 Project background

The Goyder South Hybrid Renewable Energy Facility (Goyder South) combines wind, solar and energy storage in one integrated project. The facility will be capable of delivering a steady, reliable, dispatchable output of power throughout the day and night.

The Goyder South Hybrid Renewable Energy Facility is comprised of:

- A wind farm of up to 163 turbines with a capacity of up to 1200MW, a maximum hub height of 160 metres (m), a maximum blade length of 80 m and an overall maximum height (tip height) of 240 m;
- A solar farm (across two sites) of up to 3000 ha of solar panels with a capacity of up to 600MW;
- An energy storage facility (lithium-ion battery) with a capacity of up to 900MW/1,800MWh (2 hours);
- Associated infrastructure for connection to the electricity grid including three substations, access tracks, underground connection cabling and transmission lines;
- Permanent operations and maintenance compounds;
- Temporary construction compounds for both wind and solar components, including concrete batching plants; and
- Several meteorological masts (in addition to those already on the site) to record wind speed and other meteorological data, both pre- and post- construction.

Due to the location of the Project Area coinciding with known distribution of PBTLs, surveys were undertaken in autumn and spring 2019 to check for the presence of PBTLs within the Project Area. *Potential* and *likely* PBTL habitat was mapped across the Project Area based on observations of PBTLs and the presence of suitable habitat characteristics. Results from this survey are presented in the Goyder South Hybrid Renewable Energy Facility: Flora and Fauna Assessment Report (EBS 2020).

Neoen has committed to avoiding known and potential PTBL habitat (and other sensitive features) as far as possible during the construction design phase, however EBS understands that some overlap with mapped PBTL habitat was unavoidable.

The 2021 survey aimed to determine if PBTLs occupy areas within the impact area of the final proposed design footprint, including access tracks, cabling, Meteorological (MET) Masts, transmission lines, substations and Wind Turbine Generators (WTGs). Detailed mapping of PBTLs within the infrastructure zone can guide micro-siting of construction features to further avoid impact in areas where PBTLs are identified.

2 METHODS

2.1 Field survey

A targeted field survey was undertaken from 9 to 11 March 2021 by four EBS ecologists. The weather and survey conditions were satisfactory for detecting PTBL's, with relatively low grass cover allowing good visibility between tussocks, and partly cloudy weather which caused minimal obstruction. The results from survey locations can therefore be reported with a moderate to high degree of confidence.

Based on mapping of suitable habitat previously undertaken in 2019 (EBS 2020), EBS undertook targeted surveys covering the proposed footprint where it intercepted with habitat mapped as *likely* or *potential habitat.* In total, nine sites were identified as *potential* impact areas, and surveyed accordingly (Figure 1).

Where access tracks and / or cabling intercepted habitat, a PBTL search area followed the alignment, considering 15 m for the width of the track, an additional 5 m where underground cabling was indicated, plus a buffer of approximately 10 m either side, for a total search transect width of approximately 40 m (plus). Similarly, where WTG laydown areas were identified, the entire footprint area was searched by systematically walking multiple transects through the area.

All suitable holes were marked temporarily with survey tags and then checked for PBTL occupancy once surveyors were confident all holes had been located and marked. Holes were checked using an optic fibre Burrowscope' with a light and camera on the end. Several attributes were collected for each burrow including:

- GPS location coordinates
- Burrow contents (i.e. burrow too small, debris, PBTL, wolf spider, trapdoor spider, weevil, beetle, centipede, ants, cockroach, scorpion, other)
- Burrow depth (depth categories: 1 = <10 centimetres (cm), 2 = 10-20cm, 3 = 20-30cm, 4 = >30cm)

If PBTL's were identified in a burrow, additional information was collected including:

- Number of individuals
- Estimated maturity (adult, sub-adult, juvenile)
- Photograph (see Figure 2).

If a PBTL was located at a site, an additional buffer of approximately 50 m each side was surveyed to determine the local extent of the population and assist in guiding micro-siting to avoid impacts to known PBTL habitat if possible.

Survey tags were removed at the completion of each survey.

Table 1. Site survey details with estimated intercept length / area surveyed.

#	Site name	Infrastructure feature	Approximate intercept length (m) / area (ha)	Method
1	1	Access track	155 m	Transect
2	2	Access track	185 m	Transect
3	3	Access track	135m	Transect
4	4	Access track, cabling and WTG	~1.84 ha	Area search
5	5	Access track, cabling	318 m	Transect
6	6	Access track, cabling	1062 m	Transect
7	6A	Access track	276 m	Transect
8	7	Access track, WTG	~2 ha	Area search
9	8	Access track, cabling Access track	75 m 113 m	Transect Transect

2.2 Limitations

The survey covered areas mapped as likely and potential PBTL habitat which intersected with the impact design footprint at the time of survey and does not account for any changes made thereafter. Additionally, whilst every effort was made to locate all holes within a given area, detection can be difficult due to obstruction by grass and their small size (~5 - 25 millimeter entrance), and it is possible that some holes may have been missed. Detectability, coupled with low PBTL densities, means that non-detection on this survey does not guarantee that no PBTL's reside in these locations.

A handheld GPS was used to record the location of all checked holes (empty and those containing PBTL). The accuracy of the GPS is +/- 5 m and so it is not necessarily possible to definitively re-survey the same hole multiple times, particularly when there is a high density of holes in an area.

The age of PBTL (adult, sub-adult, juvenile) was estimated for all lizards observed in holes. The age categories should be used as a guide only as this is extremely difficult to distinguish, particularly when the view of the lizard is restricted.

Only areas previously mapped as *likely* or *potential* PBTL habitat were surveyed on this occasion.

Figure 1. Goyder South site layout showing the mapped PBTL habitat and 2021 PBTL survey sites and previous survey effort.

3 RESULTS

3.1 Overall survey results

Nine locations were surveyed for presence of PBTL's based on where mapped *potential* and *likely* habitat intercepted with proposed construction footprints. Across the nine sites, a total of 972 holes were assessed. Over 40 percent (%) of the surveyed holes contained only debris, while wolf spiders (*Lycosa* sp.) accounted for 23.7% of occupants (Figure 2), and weevils accounted for 14.8%. Only 1.1 % of holes contained PBTL (Table 2).

PBTL were present at 3 sites (Site1, Site 2 and Site 5) and absent at 6 sites (Site 1, 4, 6, 6A, 7, and 8). Site photographs (where available) are presented in the Appendices.

The three sites which intercepted *likely* PBTL habitat had the most holes surveyed, but this cannot necessarily be interpreted as higher burrow density due to the variability in the size of areas surveyed.

Table 2. Summary of burrow contents of the 2021 targeted PBTL survey at Goyder South.

Burrow Contents	1	2	3	4	5	6	6A	7	8	Total	%
Pygmy Bluetongue Lizard		**7**	**1**		**3**					**11**	**1.1**
Ants	5	14	3	6	3		1	4	1	**37**	**3.8**
Beetle		1						1		**2**	**0.2**
Centipede	3	11	2	1	1	1		2	2	**23**	**2.4**
Centipede and Wolf spider				1						**1**	**0.1**
Cockroach		1								**1**	**0.1**
Cricket	1	2				2	1	1		**7**	**0.7**
Debris	66	106	27	20	98	30	14	31	14	**406**	**41.8**
Red-back Spider		1		1			1			**3**	**0.3**
Scorpion	1				4					**5**	**0.5**
Slater						1				**1**	**0.1**
Trapdoor Spider		1				1				**2**	**0.2**
Weevil/s	36	10	15	4	33	16	10	12	9	**144**	**14.8**
Weevil/s and ants	2									**2**	**0.2**
Weevil/s and Wolf Spider							1			**1**	**0.1**
Wolf spider	30	38	19	21	31	24	19	38	10	**230**	**23.7**
Too small	44	19	5	1	11	11		3	1	**95**	**9.8**
Total holes surveyed	**188**	**211**	**72**	**55**	**184**	**86**	**47**	**92**	**37**	**972**	**1.1**

3.2 PBTL survey results

PBTL were detected in 11 burrows at three sites (Site 2, 3 and 5), with a total of 13 individuals recorded, consisting of 10 adults and 3 juveniles. Two burrows were found to have two PBTL individuals in the one hole (Figure 2).

Burrow depth was estimated to the location in the hole where the PBTL was first encountered, and so some holes may have been deeper than recorded. The median burrow depth of holes that had PBTL in them was depth category 2 (10-20cm), with one very deep burrow at Site 5 (>40cm).

A summary of PBTL findings is presented in Table 3 and Figure 3.

Table 3. Summary of PBTL findings at each site.

Site	Hole ID	Contents	Burrow Depth	Total
2	1018	1 adult, 1 juvenile	2	**2**
	1022	1 adult	2	**1**
	1120	1 adult	2	**1**
	1167	1 adult	1	**1**
	1168	2 juveniles	2	**2**
	168	1 adult	3	**1**
	191	1 adult	3	**1**
3	1355	1 adult	1	**1**
5	1222	1 adult	2	**1**
	1224	1 adult	4	**1**
	1260	1 adult	3	**1**
			TOTALS	**13**

Figure 2. Adult and juvenile PBTL in burrow at Site 2 (left) and Wolf spider (*Lycosa* sp.) in burrow (right).

Figure 3. Overview of PBTL observations from 2021 (small blue-green circle) and 2019 (large blue circle) within the Goyder South Project Area.

3.2.1 Site 2

Site 2 was mapped as *likely* PBTL habitat, with previous records from the 2019 survey (Figure 4). The site was surveyed across two days, with the impact footprint surveyed on 9 March 2021 finding 5 individuals (4 adults, 1 juvenile), and an additional 50 m buffer search on 10 March 2021 finding four individuals (2 adults and 2 juveniles).

PBTL records were concentrated in the western section of the infrastructure:habitat interface. While an additional four individual PBTLs were discovered during the 50 m buffer search, these were also concentrated near the proposed impact footprint, and did not uncover additional PBTLs to the north or south. Given the +/- 5m accuracy of the GPS, and the propensity for PBTL's to move between holes it is possible that at least two individuals may have been counted twice on the second survey occasion.

During the 2019 survey, four PBTLs were found in the habitat mapped as *likely* to the north of the proposed infrastructure (at Site 2; Figure 4). This area was not re-assessed during the 2021 survey.

3.2.2 Site 3

Site 3 was mapped as *potential* PBTL habitat. Though habitat was not considered optimal, and burrows were infrequent lower on the slope, one individual adult PBTL was recorded, but this individual is likely to be outside of the proposed construction footprint (Figure 5). Burrow density was generally low at the site.

3.2.3 Site 5

Site 5 was mapped on the western part of the slope as *potential* habitat, and in the eastern part as *likely,* having previous 2019 PBTL (Figure 6). During the 2021 survey two PBTLs were found in the *potential* habitat area on the lower slopes, and one PBTL was found higher on the slope in the *likely* habitat to the east of the access track / cabling, but this individual is likely to be outside of the proposed construction footprint (Figure 6).

Figure 4. Map of site 2 with 2021 and 2019 PBTL records, and survey effort.

Figure 5. Map of Site 3 with location of the 2021 PBTL record.

Figure 6. Map of Site 5 with location of 2021 and 2019 PBTL records.

4 RECOMMENDATIONS

Following baseline mapping of sensitive environmental features in 2019 (see EBS 2020 for details), Neoen have attempted to avoid impacts to PBTL habitat, proposing infrastructure designs that minimise overlay, however several areas of overlap between PBTL habitat and infrastructure footprint remains. For the most part, the larger footprint areas of WTG laydown areas in PBTL *likely* habitat have been avoided, leaving primarily access tracks (~15 m wide footprint) and cables (~6 m wide) unable to avoid potential PBTL habitat.

The following recommendations have been made to further mitigate the potential impacts of the Project on PBTL populations:

- Where infrastructure footprints impact known PBTL populations, micro-siting should be explored to further avoid or reduce impacts to PBTL.
- It is recommended that the CEMP and OEMP consider actions to mitigate direct and indirect impacts to PBTLs.
- Undertake further PBTL surveys if the proposed infrastructure layout is modified to fall within areas likely or possibly containing PBTLs.

A PBTL Recovery Team was formed in 1993 to monitor the effectiveness of the preliminary research phase, and to eventually oversee the implementation of the *National Recovery Plan for the Pygmy Bluetongue Lizard (Tiliqua adelaidensis)* (DAWE 2021). Queries regarding guidelines or actions recommended around PBTL in South Australia, typically go through the PBTL Recovery Team, at some stage of a Project.

5 REFERENCES

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6 APPENDICES

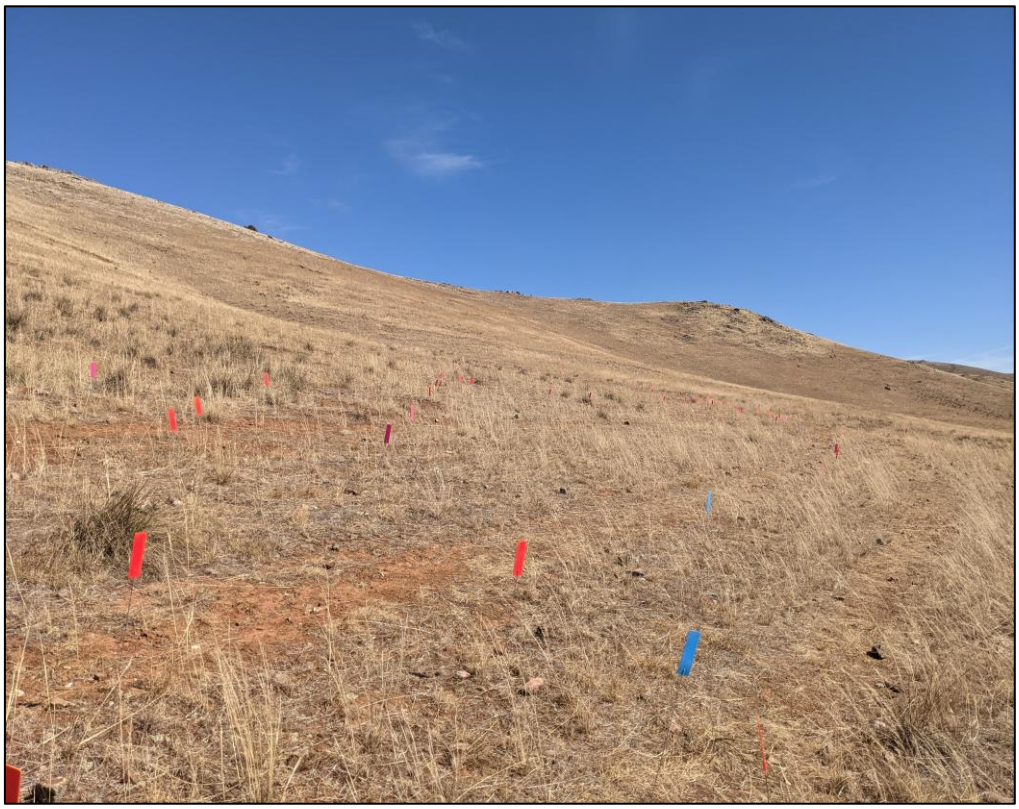

Figure 7. Photograph of Site 1, where no PBTL were found.

Figure 8. Photograph of Site 3, where PBTL were found.

Figure 9. Photograph of Site 4, heavily degraded, border of cropping zone, unsuitable for PBTL.

Figure 10. Photograph of Site 6 and 6A, where no PBTL were found.

Figure 11. Photograph of Site 7, where no PBTL were found.

Figure 12. Photograph of Site 8, where no PBTL were found.

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