Member of the Surbana Jurong Group

Technical Memorandum
Addendum to GSM OMS V5 July 21

Technical Memo No.	30042800N-TM-GSM-V1-14122021	**Date of Issue**	14 December 2021
Subject/Title	Golden Sun Moth Offset Management Strategy (v5, dated July 2021) – Adaptive Biomass Control		
Project Name	Stockyard Hill Wind Farm	**Project Number**	30042800N
Discipline	Ecology		
Revision Details	30042800N-TM-GSM-DRAFT-13102021 (Draft Version) 30042800N-TM-GSM-V1-14122021 (Final Version)		
Author	Andrew Taylor		
Reviewed by	Dan Weller		
Approved by	Andrew Taylor		
Prepared for	Stockyard Hill Wind Farm Pty Ltd	**Attention to**	Elizabeth Zorondo
Attachments	Appendix A: EPBC Act Conditions (EPBC 2016/7746) Appendix B: Offset site Figures		
Document Application	It is understood that this technical memorandum must be read in conjunction with the Golden Sun Moth Offset Management Strategy (GSM OMS) (v5, dated July 2021) to provide full context for adaptive management measures pertaining to biomass control. Where there are any inconsistencies between this technical memorandum and the OMS (v5), this technical memorandum (v1) will have primacy over the OMS (v5, dated July 2021). Reference documents: • 30042800N-TM-GSM-V1-14122021 (Final Version) • 8073_EHP_GSM-OMS_SHWF_FINAL_17072021 (v5, dated July 21) (Final Version)		

1. Overview

1.1 Background

SMEC Australia Pty Ltd (SMEC) have prepared this addendum to the GSM OMS v5 dated July 21, as a technical memorandum to provide ecological advice to support an adaptive management approach to biomass control within a 9 ha Golden Sun Moth (***Synemon plana***) offset site for the Stockyard Hill Wind Farm (the Project), Victoria.

The Project was approved under the ***Environmental Protection and Biodiversity Conservation Act 1999*** (EPBC Act) by the Department of Agriculture, Water and the Environment (DAWE) on 19 August 2018, subject to conditions (Approval Decision EPBC 2016/7746) (Appendix 1). The approved Project consists of 149 wind turbines located approximately 35 km west of Ballarat, Victoria.

As part of the Project, DAWE approved a 10-year Offset Management Strategy (OMS) for Golden Sun Moth, prepared by Ecology and Heritage Partners Pty Ltd (EHP) (EHP 2017). The EPBC conditions outlined within the OMS and project approvals identified how impacts to Golden Sun Moth were to be managed via a third party offset site located on private property. SMEC Australia Pty Ltd (SMEC) have undertaken annual monitoring at the offset site in accordance with the OMS since November 2019 for Goldwind Australia Pty Ltd (GWA), on behalf of Stockyard Hill Wind Farm Pty Ltd (SHWFPL).

1.2 Management objectives (see Section 1.1 of GSM OMS v5)

Management objectives in accordance with the approved OMS include the following (EHP 2017):

- Protect and secure the environmental values of the site, ensuring that indigenous species survive;
- Maintain and enhance the biodiversity of the site by maintaining natural ecosystem processes;
- Maintain, and if possible, expand Golden Sun Moth populations and associated habitats;
- Control and, if possible, eliminate populations of pest plants and animals; and
- Achieve a high level of ecologically sound on-ground management, monitoring and reporting.

1.2 Adaptive approach (see Section 6.2 of GSM OMS v5)

Consistent with Condition 12 of the EPBC Act approval, this technical memorandum serves as an addendum to the GSM OMS v5, dated July 2021 currently with the Minister for approval. The following sections detail a potential new impact source associated with adaptive biomass control and outline a significant impact assessment for Golden Sun Moth and its associated habitats as result of this revised management approach.

2. Site Details

2.1 Offset site

The 9 ha offset site is located within private property (Crown Allotments 23A, 23B, 24A and 24B Parish of Eurambeen) and is situated within a broader 263 ha area of land within the northern extent of the Project area. The offset site is located approximately 180 km west of Melbourne and 60 km west of Ballarat (Figure 1).

The offset site has historically been used for rotational grazing by sheep and comprises remnant vegetation – patches of Grassy Woodland (EVC 175). The vegetation within the offset site also consists of scattered native trees and areas of open understorey supporting native tussock grasses, including wallaby grasses (***Rytidosperma*** spp.), Kangaroo Grass (***Themeda triandra***) and spear grasses (***Austrostipa*** spp.).

2.2 Previous monitoring

2.2.1 Golden Sun Moth

Population monitoring at the offset site has been undertaken annually since 2018 during the species core flight period between October and January (EHP 2019, SMEC 2020, SMEC 2021).

2.2.1.1 Year 1

Two separate surveys were undertaken by EHP on 19 November 2018 and 2 January 2019. Surveys on 19 November recorded high population numbers (400+), indicating the site continues to support a significant population (EHP 2019).

2.2.1.2 Year 2

A total of approximately 88 male Golden Sun Moth were recorded during four separate monitoring events (SMEC 2020, Figure 2). In addition, up to 159 Golden Sun Moth were detected in a single survey event by the landowner. While population numbers are lower than Year 1 monitoring, overall population counts across Victoria in 2019/20 were typically low and was therefore not considered to be associated with management practices within the offset site (SMEC 2020).

2.2.1.3 Year 3

A total of approximately 477 male Golden Sun Moth were recorded during four separate monitoring events (SMEC 2021, Figure 3). Golden Sun Moth were typically observed in areas of higher quality grassland during Surveys 1 and 2 (30 November and 3 December 2020). The species was detected in areas with a higher percentage of native grass cover (≥40-50%) and open ground (≥25%) across the eastern portion of the offset site (SMEC 2021).

The highest species emergence was detected on Survey 3 (11 December 2020), with 386 male Golden Sun Moth recorded (SMEC 2021). The species was observed across the entire offset site during Survey 3 and areas adjoining the offset site where high quality grassland habitat for the species is present. It was assumed the Golden Sun Moth core emergence period had finished by Survey 4 (14 January 2021), as no individuals were detected. No female Golden Sun Moth were observed during monitoring events across the site (SMEC 2021).

Based on other shared monitoring data across Victoria (ECA 2021), this offset site continues to provide high abundances of the species compared with other reference locations and offset sites for which data is available. Monitoring results indicate that a high number of Golden Sun Moth are still persisting across the offset site and is continuing to provide high quality habitat for the species (SMEC 2021).

2.2.2 Native Vegetation

Native vegetation monitoring in accordance with the OMS has been undertaken by EHP (Year 1) and SMEC (Years 2 and 3) between 2018 and 2021. Vegetation monitoring undertaken by SMEC identified management Zones 1-5, distinguished by percentage cover of native and introduced tussock-forming grass species and bare open ground. This information has been used to inform management in areas that may require more focussed biomass and weed controls to meet objectives outlined in the OMS.

2.2.2.1 Year 1

Vegetation monitoring undertaken by EHP in 2019 identified that western sections of the offset site supported a smaller number of Golden Sun Moth in comparison to other areas of the site (EHP 2019). Potential factors at the time of the assessment may have been related to a higher percentage cover of introduced grasses such as Rye grass (***Lolium perenne***), and some environmental weeds species such as Cape Weed (***Arctotheca calendula***) (EHP 2019).

2.2.2.2 Year 2

Vegetation monitoring indicated the offset site had a high level of biomass and it was recommended by SMEC that this be reduced by rotational stock grazing in Zones 1 and 2 (Figure 4).

It was recommended that weed treatment focus on high threat weeds across the study site including Spear Thistle (***Cirsium vulgare***), Cape Weed (***Arctotheca calendula***), Yorkshire Fog (***Holcus lanatus***), Brown-top Bent (***Agrostic capillaris***), Cat's Ear (***Hypochaeris radicata***) and Sweet Vernal Grass (***Anthoxanthum odoratum***) to maintain or reduce levels within the offset site in subsequent years (SMEC 2020).

Zone 3 supported the highest quality Golden Sun Moth habitat, and lower intensity stock grazing was considered sufficient to maintain current biomass and recruitment levels (Figure 4). As Zone 4 is immediately adjoining higher quality Golden Sun Moth habitat in Zone 3, it was recommended any high threat weeds be treated to minimise their potential spread into adjacent areas of higher quality remnant vegetation (SMEC 2020).

2.2.2.3 Year 3

One additional zone (Zone 5) was included in Year 3 vegetation monitoring due to a higher proportion of introduced pasture grasses recorded in the south-west corner of the offset sites (Figure 5). Overall, monitoring identified the site to maintain a high level of biomass with renewed recommendations by SMEC for more intensive stock grazing in Zones 1, 2 and 5 (SMEC 2021). Zone 3 maintained the highest quality habitat for Golden Sun Moth although the adjoining Zone 4 would again require active management of high threat weeds to minimise potential spread across the offset site (Figure 5). High threat weeds observed included Spear Thistle, Cape Weed, Yorkshire Fog, Bent-top Grass and Cat's Ear (SMEC 2021).

2.3 Biomass Control (see Section 6.5.3 of GSM OMS v5)

2.3.1 Threats of grazing

Golden Sun Moth have a specific habitat relationship and reliance on suitable host plants (wallaby grasses) in native grasslands. As a result, the modification of ecological processes through changes to land use in locations known to support Golden Sun Moth and its associated habitat is a known threat to the species (DSE 2004).

Land use practices such as grazing is known to reduce the suitability of remnant grasslands for Golden Sun Moth (SPRAT 2021). For example, reduced grazing may increase biomass levels if not managed, allowing tall perennial grasses to dominate and limit overall species diversity (SPRAT 2021). Reduced grazing effort can also create less space (bare open ground) which enables introduced to increase in cover over time (SPRAT 2021). This may ultimately shade native species or suitable host plants (wallaby grasses) where taller grass species (native or exotic) have the ability to limit species growth (Van Praagh 2004).

Conversely, increased levels of grazing may encourage weed invasion and degradation of native grassland regeneration (Barlow 1998). Therefore, it is important to manage grazing levels by applying suitable stocking rates and timing management to allow natural recruitment of native species at an appropriate time of year.

2.3.2 Biomass objectives

The following section outlines the actions and performance measures identified within the OMS for biomass control (EHP 2018).

Actions

Biomass control will proceed in accordance with the following:

- Ensure adequate grazing to reduce biomass to acceptable cover levels (i.e. 70%);
- Grazing within the offset site containing areas of Plains Grassland will cease from approximately late September through to late January; and
- An appropriate land manager/contractor will co-ordinate weed control works with the grazing regime.

Performance Measures

The following key performance target has been provided to measure the success of the biomass control:

- Vegetation cover is maintained at greater than 70% throughout the offset site, and the space (i.e. open ground) available for native flora species recruitment is between 20% and 40%;
- Golden Sun Moth populations are not reduced;
- A herb-rich diversity native open ground cover is maintained and enhanced;
- No evidence of an increase in soil pugging; and
- The maintenance of open structured Plains Grassland community suitable for the ecological requirements of Golden Sun Moth.

2.3.3 Previous grazing

2.3.3.1 Year 1

A general discussion of stock grazing was not provided in the Year 1 monitoring report (EHP 2019).

It was noted that further biomass and weed control measures could be used to improve the habitat quality for Golden Sun Moth in areas where the species was detected less during monitoring (i.e. western sections of the site) (EHP 2019).

Information provided within the landowner work diary indicated sheep grazing was implemented between March to September 2018 and soil conditions were not subject to pugging during winter (Gerrpart Holdings Pty Ltd 2019).

2.3.3.2 Year 2

Grazing with sheep was permitted between March to September 2019; however, due to a wet winter and spring, stock were removed and a high growth rate of biomass was observed in late spring (Gerrpart Holdings Pty Ltd 2019). Higher biomass levels were identified in Zones 1, 2 and 4 within the offset site during 2019, and greater weed control and stock grazing was recommended in these areas during suitable conditions (to avoid soil pugging in low lying areas when inundated) (SMEC 2020). Zone 3 provided the highest quality habitat for Golden Sun Moth. Table 2 below provides a summary of cover (%) for native and introduced tussock species and open ground within the offset during Year 2 monitoring.

Table 1. Year 2 biomass levels within the offset site.

Management Zones	Native tussock cover (%)	Pasture grass cover (%)	Open ground (%)	Landowner comment
Zone 1	25%	70%	<5%	Biomass is under control on the east side but despite grazing on the south and west sides, grasses have grown well due to the wet and prolonged season.
Zone 2	30%	60%	10%	
Zone 3	40-50%	25%	25%	
Zone 4	30%	60%	10%	

2.3.3.3 Year 3

Given the wet conditions and warmer temperatures, spring growth of pasture grasses was again high in Zones 1, 2, 4 and 5 (SMEC 2021, Table 2).

Table 2. Year 3 biomass levels within the offset site.

Management Zones	Native tussock cover (%)	Pasture grass cover (%)	Open ground (%)	Landowner comment
Zone 1	30%	65%	5%	Biomass is under control on the east side but despite grazing on the south and west sides, grasses have grown well due to the wet and prolonged season.
Zone 2	30%	60%	10%	
Zone 3	40-50%	25%	25%	
Zone 4	30%	60%	10%	
Zone 5	5%	85%	10%	

2.3.4 Biomass growth

It is apparent that years with high rainfall can limit stock access leading to increased biomass levels in late spring/early summer. This allows introduced pasture grasses to increase in cover and total biomass and reduces bare open ground and space for native species to recruit.

Biomass monitoring has identified high annual growth rates for introduced species across the offset site throughout October to December in 2019/20 and 2020/21. Table 3 presents indicative regional pasture data for Ballarat where it is evident that annual growth rates (kg/ha/day) are highest throughout October to December (EverGraze 2021).

Table 3. Growth rates (kg/ha/day) for various species in South West Upper, Victoria (Ballarat).

	Growth rates (kg/ha/day)											
	J	F	M	A	M	J	J	A	S	O	N	D
Perennial grass, clover pasture, Fert – Stnd year	0	0	15	20	30	20	20	35	50	90	80	70
Bent grass, No fertiliser – Standard year	10	10	5	5	5	5	5	20	40	60	40	30

High growth rates could be countered by allowing adaptive management through the application of grazing when the site is dry and less likely to result in ground disturbance by stock (October to December). In doing this and before native flora species recruitment is undertaken (January to February). Based on recent discussions with the landowner, growth rates for introduced species are again expected to be high during spring and summer 2021/22 in response to high soil temperatures and moisture levels. It is evident that without adaptive management during high growth periods, the ability to reduce the percentage of grass cover and subsequent seeding of introduced species is limiting the ability to achieve the OMS management objectives.

Plates 1 and 2 below provides an example of biomass and ground cover in Zone 2 during Year 3 monitoring after high growth during late spring/early summer. The majority of the offset site had a bare ground component of 10% with introduced species cover at approximately 60% (or greater) during late spring/early summer (SMEC 2021, Table 2).

Plate 3: Open ground (25%) December 2020.

Plate 4: Vegetation height (10-30cm) December 2020.

Plates 3 and 4 below provide an example of higher quality Golden Sun Moth habitat in Zone 3 during Year 3 monitoring in which open ground (25%) and native tussock (40-50%) was greatest (SMEC 2021, Table2). This habitat has also supported the highest population densities of Golden Sun Moth since commencement of monitoring in 2018 (EHP 2019, SMEC 2020, SMEC 2021).

Vegetation monitoring in Zones 1, 2, 4 and 5 provides evidence that growth rates and biomass levels are exceeding targets during this period without additional grazing. It is understood that high growth rates will not occur every year and is dependent on annual climatic conditions at the site. However, without options to implement adaptive management for biomass control between October to December, introduced pasture grasses have the demonstrated ability to increase in cover and dominate overall biomass across the offset site during suitable conditions. While Golden Sun Moth can persist in modified habitats, the ability for native flora species to persist and regenerate is limited by high levels of introduced vegetation species biomass.

Plate 1: Open ground (10%) December 2020.

Plate 2: Vegetation height (20-40cm) December 2020.

2.3.5 Stocking rates

Typically, the offset site is grazed at three (3) week intervals during March to August with approximately three (3) rotations overall. A Dry Sheep Equivalent (DSE) value is used to describe the amount of feed or dry matter (kg DM) required to maintain a wether or nonlactating ewe per day (weighing 45-50 kg). Table 4 indicates the current DSE stocking rates for biomass control in accordance with the OMS between March to August.

Table 4. Current stocking rates within the offset site in accordance with OMS.

Biomass control	Stocking rate	No. of stock	Comment
March to August	3 DSE/Ha	30	Typically, the offset site is grazed at three (3) week intervals during March to August with approximately three (3) rotations overall.
September to February	No grazing	No grazing	A significant limitation to managing biomass during spring if environmental conditions are favourable for pasture growth.

2.4 Adaptive biomass management

2.4.1 Current limitations

Discussion with the landowners has identified limitations in the OMS with regards to stock grazing periods and the control of biomass (particularly in seasonally wet years as observed in the 2019/20 and 2020/21 monitoring period). For example, biomass level management and the control of weeds during Year 3 monitoring could have been more successful if stock grazing could have been extended with additional short periods of grazing between October to December.

2.4.2 Adaptive management

2.4.2.1 Stocking rates

The proposed adaptive management approach would allow additional grazing at greater densities between October to December over a shorter seven (7) day period and a stocking rate of 5 DSE/Ha (Table 3).

Table 3. Proposed stocking rates within the offset site under adaptive biomass management.

Biomass control	Stocking rate	No. of stock	Comment
October to December	5 DSE/Ha	50	Period of grazing would only occur if season suited (i.e. higher growth rates of pasture). Grazing period would be maximum of seven (7) days with stock removed for a minimum or 14 days.

Under a revised biomass control procedure, adaptive management via grazing would be implemented under the guidance of a suitably qualified ecologist between October to December during years of high pasture growth. Sheep would be permitted for a maximum of seven (7) days and removed for a minimum or 14 days in any given month between October to December to reduce biomass levels. Total vegetation cover will not exceed 70% (particularly in seasonally wet years) and open ground must also be maintained between 20 and 40% to allow adequate recruitment space for native flora species.

All sheep are to be removed annually to rest the site in September, and between January to February to allow the critical flowering/reproductive period for native species. In any circumstance sheep must be removed should total vegetation cover fall to or below 70% and open ground between 20 and 40%.

2.4.2.2 Risks without grazing

The following factors are considered relevant to inactive biomass control at the offset site:

- Increased biomass and cover (%) of introduced pasture grasses limiting open ground for native species to recolonise and/or recruit successfully;
- Increased spread of introduced pasture grasses if seed heads are not grazed during spring and subsequently allowed to flower and colonise available open ground;
- Decreased suitability of Golden Sun Moth habitat in response to increased biomass levels and shading at ground level; and
- Reduced ability to implement rehabilitation objectives for the OMS in response to additional management effort required (i.e. increased weed management in subsequent years).

2.4.2.3 Impacts to species

An adaptive grazing regime is considered an appropriate method for managing excessive biomass given that Golden Sun Moth and remnant vegetation has persisted historically prior to rotational grazing under the OMS. Golden Sun Moth may persist during active sheep grazing (without resting the site) at similar or greater densities and has been observed during previous monitoring seasons in south-eastern Victoria (Pers. Obs. A, Taylor, 2018). Therefore, the long-term persistence of the Golden Sun Moth population in this location in response to similar historical stocking rates, indicates short-term grazing under an adaptive management approach is unlikely to lead to any additional impacts to the species.

2.4.3 Adaptive improvements

To further minimise any potential risk to the species, it is proposed that temporary fencing to manage Zones 1, 2 and 5 is implemented to minimise stock access to higher quality areas of Golden Sun Moth habitat that do not require adaptive management. A reduction of introduced pasture grasses through active weed management and grazing will also assist with increasing grass structural complexity through creating open space for native species to regenerate naturally.

3. Summary

Based on the previous three years of Golden Sun Moth monitoring at the offset site, it is apparent that an important population of Golden Sun Moth are persisting, supported by the presence of high quality habitat. Currently, there have been limitations identified in the management of biomass during years of high pasture growth and a recommendation for adaptive stock grazing is proposed. The following adaptations are recommended to improve biomass management at the offset site:

1. Continue biomass control in accordance with the OMS between **March to August** at a stocking rate of 3 DSE/Ha (approximately 30 sheep);
2. Removing all stock during **September**;
3. Implementing adaptive biomass control between **October to December** at a stocking rate of 5 DSE/Ha (approximately 50 sheep) (as required);
4. Sheep are to be retained on site for a maximum of seven (7) days and removed for a minimum or 14 days in any given month between October to December to reduce biomass levels;

5. Sheep must be removed prior to seven (7) days should total vegetation cover fall to or below 70% and open ground between 20 and 40%;
6. All sheep are to be removed annually from the site between **January to February** to allow the critical flowering/reproductive period for native species; and
7. Implementation of temporary fencing is recommended around Zones 1, 2 and 5 to minimise stock access to higher quality habitat(s) known to support the species.

The historical land use of the offset site indicates management of the site has been consistent (or greater) with proposed adaptive management proposed for the OMS. Overall, it should be acknowledged that the response of natural environments and management of biomass needs to allow for more flexible grazing periods to respond to changing conditions in any given year (in accordance with **Section 6.2 – Adaptive Management Approach** in the OMS, EHP 2017).

To further mitigate any potential risk during the species active periods, temporary stock exclusion fencing will also be implemented to focus grazing in areas of the site requiring biomass management. Allowing flexibility around the timing of stock grazing at the discretion of the landowner and regulators (in consultation with an ecologist) is therefore recommended to better maintain performance and completion criteria within the OMS.

4. References

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Van Praagh, B.D. 2004. New sightings of the Golden Sun Moth ***Synemon plana*** (Lepidoptera: Castniidae) at Craigbieburn and Cooper St Grasslands, Melbourne Victoria 2003/2004. Report prepared for the Department of Sustainability and Environment. Victoria.

Appendix A **EPBC Act Conditions**

Approval

Stockyard Hill Wind Farm – Wind Energy Facility and associated infrastructure, south-west Victoria (EPBC 2016/7746)

This decision is made under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999*.

Proposed action

person to whom the approval is granted	Stockyard Hill Wind Farm Pty Ltd
proponent's ABN	71 118 119 501
proposed action	To develop and operate the Stockyard Hill Wind Farm and associated infrastructure in south-west Victoria, approximately 150 km west, northwest of Melbourne and approximately 35 km west of Ballarat [see EPBC 2016/7746].

Approval decision

Controlling Provision	Decision
Listed threatened species and communities (sections 18 & 18A)	Approved

conditions of approval

This approval is subject to the conditions specified below.

expiry date of approval

This approval has effect until 31 July 2050.

Decision-maker

name and position	James Barker Assistant Secretary Assessments and Governance Branch
signature	
date of decision	18 August 2017

Conditions attached to the approval

1. The **approval holder** must not **clear** more than:

    a. 42.16 ha of habitat for **striped legless lizard**; and

    b. 1.57 ha of habitat for **golden sun moth**,

    Without the prior written approval of the **Minister**.

2. To compensate for the loss of 42.16 ha of **striped legless lizard** habitat, the **approval holder** must:

    a. secure the **striped legless lizard offset** with a **covenant** before **commencement of construction**; and

    b. implement the **Striped Legless Lizard Offset Management Strategy** for the secured **striped legless lizard offset**.

3. To compensate for the loss of 1.57 ha of **golden sun moth** habitat, the **approval holder** must:

    a. secure the **golden sun moth offset** with a **covenant** prior to **commencement of construction**. The **golden sun moth offset** must contain at least 9 ha of known **golden sun moth** habitat (**Figure 2**); and

    b. implement the **Golden Sun Moth Offset Management Strategy** for the secured **golden sun moth offset**.

Administrative

4. Within 14 days after the **commencement of construction**, the **approval holder** must advise the **Department** in writing of the actual date of **commencement of construction**.

5. The **approval holder** must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the **strategy** required by this approval, and make them available upon request to the **Department**. Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **Department's** website. The results of audits may also be publicised through the general media.

6. Within three months of every 12 month anniversary of the **commencement of construction**, the **approval holder** must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any **strategies** as specified in the conditions. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the **Department** at the same time as the compliance report is published. Reports must remain published for the life of the approval. The **approval holder** must continue to publish reports until such time as advised in writing by the **Minister**.

7. The **approval holder** may choose to revise a **strategy** approved by the **Minister** under conditions 2 and 3 without submitting it for approval under section 143A of the **EPBC Act**, if the taking of the action in accordance with the revised **strategy** would not be likely to have a **new or increased impact**. If the **approval holder** makes this choice they must:

i. notify the **Department** in writing that the approved **strategy** has been revised and provide the **Department** with an electronic copy of the revised **strategy**;

ii. implement the revised **strategy** from the date that the **strategy** is submitted to the **Department**; and

iii. for the life of this approval, maintain a record of the reasons the approval holder considers that taking the action in accordance with the revised **strategy** would not be likely to have a **new or increased impact**.

8. The **approval holder** may revoke their choice under condition 7 at any time by notice to the **Department**. If the person taking the action revokes the choice to implement a revised **strategy**, without approval under section 143A of the Act, the **strategy** approved by the **Minister** must be implemented.

9. Condition 7 does not apply if the revisions to the approved **strategy** include changes to environmental offsets provided under the **strategy** in relation to a matter protected by a controlling provision for the action, unless otherwise agreed in writing by the **Minister**. This does not otherwise limit the circumstances in which the taking of the action in accordance with a revised **strategy** would, or would not, be likely to have **new or increased impacts**.

10. If the **Minister** gives a notice to the **approval holder** that the **Minister** is satisfied that the taking of the action in accordance with the revised **strategy** would be likely to have a **new or increased impact**, then:

    i. Condition 7 does not apply, or ceases to apply, in relation to the revised **strategy**; and

    ii. The person taking the action must implement the **strategy** approved by the **Minister**.

    To avoid any doubt, this condition does not affect any operation of conditions 7 and 8 in the period before the day the notice is given.

11. At the time of giving the notice the **Minister** may also notify that for a specified period of time that condition 7 does not apply for the **strategies** required under the approval.

12. Conditions 7 and 8 are not intended to limit the operation of section 143A of the EPBC Act which allows the person taking the action to submit a revised **strategy** to the **Minister** for approval.

13. If, at any time after 5 years from the date of this approval, the **approval holder** has not **commenced** the action, then the person taking the action must not **commence** the action without the written agreement of the **Minister**.

14. Unless otherwise agreed to in writing by the **Minister**, the **approval holder** must publish all **strategies** referred to in these conditions of approval on their website.

15. Unless otherwise agreed to in writing by the **Minister**, the **approval holder** must provide a copy of any **strategy** referred to in these conditions of approval to members of the public upon request, within a reasonable time of the request.

Definitions

Approval holder: means the person to whom the approval is granted, or to when the approval is transferred under section 145B of the **EPBC Act**.

Commencement of construction: the date that preparatory construction works are first undertaken, including but not limited to clearing of vegetation (the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of native vegetation), the erection of any onsite temporary structures and the use of heavy duty equipment for the purpose of breaking the ground for fencing, infrastructure or earthworks associated with construction of the wind farm and associated infrastructure within the areas of identified habitat for the golden sun moth and striped legless lizard as shown on **Figure 3**. For the purposes of this approval, the carrying out of preliminary investigative works, including geotechnical investigations, for the purposes of gathering data or making other assessments necessary to confirm the final location of proposed infrastructure, is not considered to be commencement of construction.

Covenant: a long term conservation agreement on the land title/s, such as a section 69 agreement under the Victorian *Conservation, Forests and Lands Act 1987* or a Trust for Nature (Victoria) covenant.

Clear: the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of native or non-native vegetation.

Department: The Australian Government Department or any other agency administering the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) from time to time.

EPBC Act: the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

Golden sun moth: *Synemon plana* listed under the Environment Protection and Biodiversity Conservation Act 1999.

Golden Sun Moth Offset Management Strategy: the approved document which outlines the management actions for the **offset** area for **golden sun moth** (*Golden Sun Moth Synemon plana Offset Management Strategy for the Stockyard Hill Wind Farm April 2017*).

Golden sun moth offset: means the area shown in yellow on the map at **Figure 2**, or other area approved by the Minister.

Known striped legless lizard habitat: relevant habitat as identified by a **suitably qualified expert** experienced in undertaking **targeted surveys** in accordance with the Department's survey guidelines.

Minister: The Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and includes a delegate of the Minister.

New or increased impact: A new or increased impact on any matter protected by the controlling provisions for the action, when compared to the **strategy** that has been approved by the Minister.

Offset Policy: *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy, October 2012.*

Offset Management Strategy: the **Golden Sun Moth Offset Management Strategy** or **Striped Legless Lizard Offset Management Strategy**.

Striped Legless Lizard Offset Management Strategy: the approved document which outlines the management actions for the **offset** area for **striped legless lizard** (*Striped Legless Lizard Delma impar Offset Management Strategy for the Stockyard Hill Wind Farm April 2017*).

Striped legless lizard offset means either of the following, as further described in the preliminary documentation:

- the on-site offset (the Option 1 and Option 2 offset constituting at least 43 ha of **known striped legless lizard habitat** shown in blue hatching on the map at **Figure 1**) or other area approved by the Minister; or
- the off-site offset (the Option 3 offset at Cressy constituting 30 ha of **known striped legless lizard habitat**. A map of the off-site offset must be submitted to the **Department** if this offset is implemented).

Strategy: see **Offset Management Strategy**.

Striped legless lizard: *Delma impar* listed under the *Environment Protection and Biodiversity Conservation Act 1999.*

Suitably qualified expert: a person with qualifications in environmental science, biology or ecology and demonstrated experience in the management of native vegetation and the preparation of offset strategies under the **EPBC Act**, or a person otherwise agreed to in writing by the **Department**.

Targeted surveys: surveys undertaken in accordance with **Departmental** guidelines.

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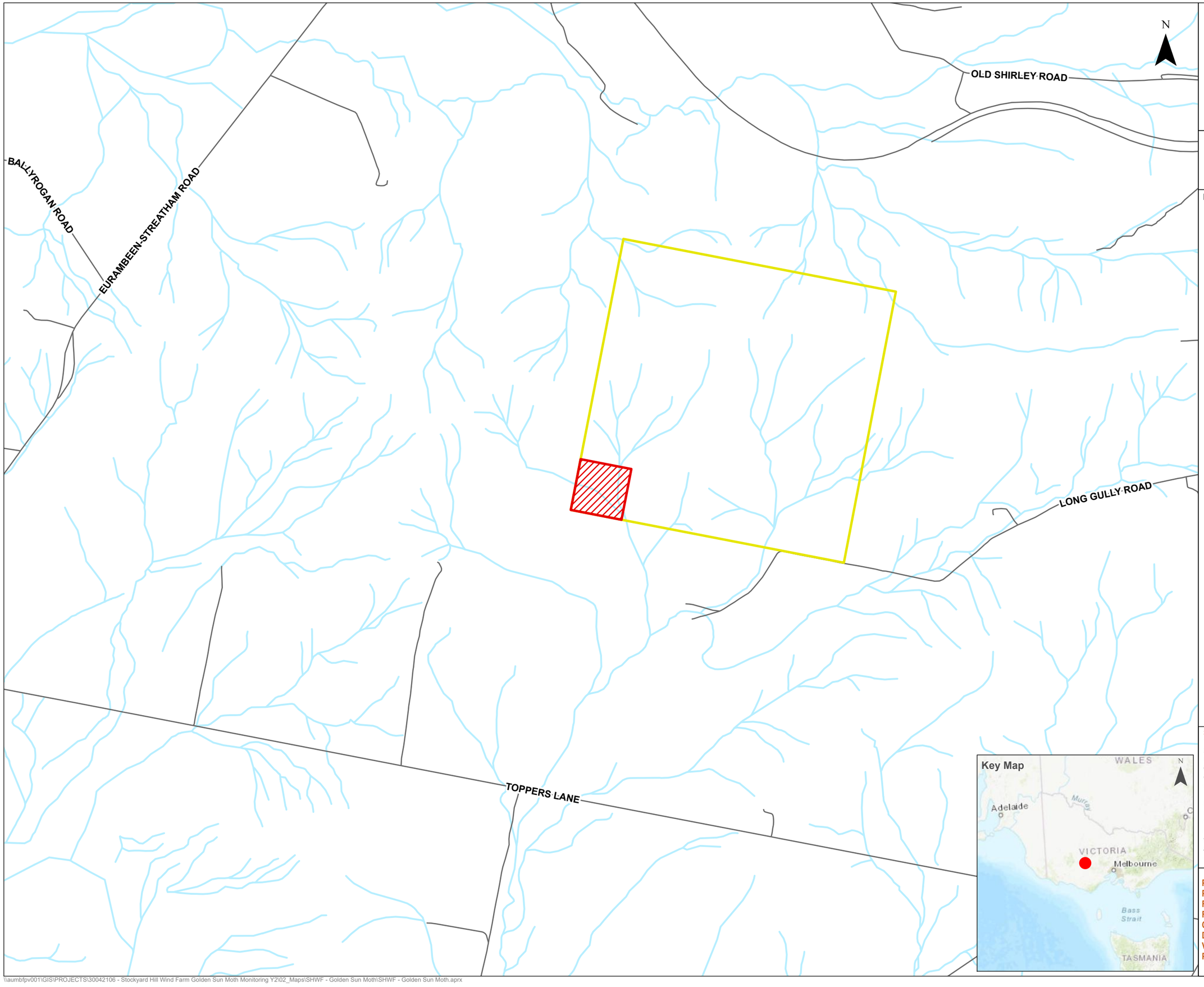
Appendix B **Figures**



SMEC

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SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149

0 250 500 750 1000
Meters

1:20,000

Legend

- Property Boundary
- 9 ha Offset Site
- Watercourse
- Road

PROJECT: Stockyard Hill Wind Farm - Golden Sun Moth
PROJECT NO: 30042106
FIGURE NO: 1
FIGURE TITLE: Golden Sun Moth Offset
CREATED BY: ar15136
DATE: 30/01/2020
VERSION: DRAFT 1
PAGE SIZE: A3

\\aumbfpv001\GIS\PROJECTS\30042106 - Stockyard Hill Wind Farm Golden Sun Moth Monitoring Y2\02_Maps\SHWF - Golden Sun Moth\SHWF - Golden Sun Moth.aprx

SMEC

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ABN 47 065 475 149

0 20 40 60 80
Meters

1:1,600

Legend

- Golden Sun Moth Offset

Golden Sun Moth Observations

- November 21 2019
- December 10 2019
- December 18 2019

Survey Transects

- November 21 2019 (3 males)
- December 10 2019 (31 males)
- December 18 2019 (54 males)
- January 9 2020 (0 indvs.)

SOURCES:

1. Example Data © DELWP 2019
2. Basemap, World Imagery: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECT:	Stockyard Hill Wind Farm - Golden Sun Moth
PROJECT NO:	30042106
FIGURE NO:	2
FIGURE TITLE:	Golden Sun Moth Monitoring (Year 2)
CREATED BY:	ar15136
DATE:	30/01/2020
VERSION:	DRAFT 1
PAGE SIZE:	A3

\\aumbfpv001\GIS\PROJECTS\30042106 - Stockyard Hill Wind Farm Golden Sun Moth Monitoring Y2\02_Maps\SHWF - Golden Sun Moth\SHWF - Golden Sun Moth.aprx

Legend

Golden Sun Moth Offset Site

Golden Sun Moth Observations

- November 30 2020
- December 3 2020
- December 11 2020

Survey Transects

- November 30 2020 (35 males)
- December 3 2020 (56 males)
- December 11 2020 (386 males)
- January 14 2021 (0 indvs.)

0 20 40 60 80 m

PAGE SIZE	A3
FIGURE TITLE	Golden Sun Moth Monitoring (Year 3)
PROJECT TITLE	Stockyard Hill Wind Farm - Golden Sun Moth
PROJECT NO.	30043049N
FIGURE NO.	3
DATE	12-02-2021
CREATED BY	NC14936
SOURCES	ESRI

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ABN 47 065 475 149

Filepath: \\filer.nasuni.local\SMECANZ\Projects\300430\30043049N - Stockyard Hill Wind Farm Golden Sun Moth Monitoring (Year 3)\050 Technical\GIS\SHWF_GSM_Monitoring_Year2&3.qgz

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0 20 40 60 80
Meters

1:2,000

Legend

- Golden Sun Moth Offset

Vegetation Zone

- Zone 1
- Zone 2
- Zone 3
- Zone 4

SOURCES:

1. Example Data © DELWP 2019
2. Basemap, World Imagery: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the informa;on contained on this is free from error or omission. Any reliance placed on such informa;on shall be at the sole risk of the user. Please verify the accuracy of all informa;on prior to using it. This map is not a design document.

PROJECT:	Stockyard Hill Wind Farm - Golden Sun Moth
PROJECT NO:	30042106
FIGURE NO:	4
FIGURE TITLE:	Vegetation Management
CREATED BY:	ar15136
DATE:	30/01/2020
VERSION:	DRAFT 1
PAGE SIZE:	A3

\\aumbfpv001\GIS\PROJECTS\30042106 - Stockyard Hill Wind Farm Golden Sun Moth Monitoring Y2\02_Maps\SHWF - Golden Sun Moth\SHWF - Golden Sun Moth.aprx

Legend

Golden Sun Moth Offset Site

Vegetation Zone

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5

0 20 40 60 80 m

PAGE SIZE A3

FIGURE TITLE	Vegetation Management
PROJECT TITLE	Stockyard Hill Wind Farm - Golden Sun Moth
PROJECT NO.	30043049N
FIGURE NO.	5
DATE	15-02-2021
CREATED BY	JH13976
SOURCES	ESRI

SMEC
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SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149

Filepath: \\filer.nasuni.local\SMECANZ\Projects\300430\30043049N - Stockyard Hill Wind Farm Golden Sun Moth Monitoring (Year 3)\050 Technical\GIS\SHWF_GSM_Monitoring_Year2&3.qgz

Final Report

Golden Sun Moth *Synemon plana* Offset Management Strategy for the Stockyard Hill Wind Farm

Prepared for

Stockyard Hill Wind Farm Pty Ltd

July 2021

Ecology and Heritage Partners Pty Ltd

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DOCUMENT CONTROL

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Project manager	Andrew Taylor (Consultant Zoologist)
Report author(s)	Andrew Taylor (Consultant Zoologist) Aaron Organ (Director / Principal Ecologist)
Report reviewer	Aaron Organ (Director / Principal Ecologist)
Mapping	Monique Elsley
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CMA	Glenelg-Hopkins
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Final	Department of Environment and Energy	AT/AO/SHWF	22/02/2017
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- Cara Layton and Peter Marriott (Origin Energy) for project information, on-going discussions and comments on draft reports;
- The Victorian Department of Environment, Land, Water and Planning for access to ecological databases.

CONTENTS

EXECUTIVE SUMMARY

Stockyard Hill Wind Farm Pty Ltd (SHWFPL) obtained approval under the *Environment Protection Biodiversity and Conservation Act 1999* (EPBC Act) (Approval 2009/4719) to build a Wind Energy Facility (WEF) and associated infrastructure at Stockyard Hill, approximately 150 kilometres west of Melbourne. Under this approval, further surveys were required for Golden Sun Moth *Synemon plana* (GSM), which were undertaken by Ecology and Heritage Partners Pty Ltd during the 2011-12 and 2012-13 monitoring seasons. A significant population of GSM were recorded within one property (Crown Allotments 23A, 23B, 24A and 24B Parish of Eurambeen) which is herein referred to as the offset site.

To minimise impacts as part of the overall project an amended footprint was designed and additional site assessments of the WEF footprint and the external overhead powerlines corridor were undertaken on 10 December 2015. The assessments were undertaken to identify any additional patches of remnant native vegetation and/or significant species and communities within the amended WEF footprint. Areas within the permitted WEF footprint that had previously been assessed were also assessed on 10 December 2015, where required.

The amended project has been referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) (formally the Department of the Environment and Energy [DoEE]) for assessment under an updated EPBC Act referral application (EPBC 2016/7746) and it was decided by the DAWE on 14 September 2016 that the proposed action is a controlled action to be further assessed by preliminary documentation. Due to the predicted impacts to GSM, the Commonwealth Minister determined that the project would result in a 'significant impact' on matters of National Environmental Significance (NES). The project is currently being assessed under Preliminary Documentation, where appropriate avoidance, minimisation and offset measures have been identified, and will form part of the project approval under the EPBC Act. This GSM Offset Management Strategy (GSMOMS) forms part of the requirement to address 'Section 4 – *Offsets*' of the preliminary documentation.

This GSM Offset Management Strategy (GSMOMS) provides detailed management actions for the identified GSM population that will lead to a net benefit for the species. Throughout the development of this OMS, SHWFPL has adopted an 'avoid, minimise and offset' approach in relation to the GSM, which has reduced the residual impact to that detailed here.

The residual impact will be offset through the protection of approximately 173 hectares of high-quality GSM habitat which occurs on the site where the GSM has been found in the Action Area. Accordingly, this GSMOMS takes an adaptive management approach to conserving the species.

It will include sections on:

- Monitoring for GSM, Native Vegetation and Invasive Weeds;
- Management of habitat to increase the quality for GSM through weed removal, revegetation, slashing or burning; and
- Reducing the risk of habitat loss by grass fires or poor management decisions.

This GSMOMS will allow for a net benefit to the GSM within the Action Area through long-term protection and management of the existing population for conservation.

1 INTRODUCTION

Stockyard Hill Wind Farm Pty Ltd (SHWFPL propose to build a Wind Energy Facility (WEF) and associated infrastructure.

An EPBC Act referral was submitted for the development in 2009, and the Action was subsequently approved with conditions in early 2011 (EPBC Act Approval 2009/4719). The Action was assessed by the Victorian Government appointed Advisory Committee as an accredited process under the EPBC Act.

Under this approval, further surveys were required for Golden Sun Moth *Synemon plana* (GSM), which were undertaken by Ecology and Heritage Partners Pty Ltd during the 2011-12 and 2012-13 monitoring seasons. A significant population of GSM were recorded within the offset site.

To minimise impacts as part of the overall project an amended footprint was designed and additional site assessments of the WEF footprint and the external overhead powerlines corridor were undertaken on 10 December 2015. The assessments were undertaken to identify any additional patches of remnant native vegetation and/or significant species and communities within the amended WEF footprint. Areas within the permitted WEF footprint that had previously been assessed were also assessed on 10 December 2015, where required.

The amended project has been referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) (formally the Department of the Environment and Energy [DoEE]) for assessment under an updated EPBC Act referral application (EPBC 2016/7746) and it was decided by the DAWE on 14 September 2016 that the proposed action is a controlled action to be further assessed by preliminary documentation. Due to the predicted impacts to GSM, the Commonwealth Minister determined that the project would result in a 'significant impact' on matters of National Environmental Significance (NES).

The project is currently being assessed under Preliminary Documentation, where appropriate avoidance, minimisation and offset measures have been identified, and will form part of the project approval under the EPBC Act. This GSM Offset Management Strategy (GSMOMS) forms part of the requirement to address 'Section 4 – *Offsets*' of the preliminary documentation.

1.1 Objectives

This GSMOMS sets out the approach to be taken by Stockyard Hill Wind Farm Pty Ltd (SHWFPL) to ensure that the development of the project has a net benefit to GSM within the development area.

It includes how SHWFPL has and will follow the 'avoid, minimise and offset' approach when complying with previous EPBC Act approval requirements and in accordance with 'Section 4 – *Offsets'* of the preliminary documentation which requires this OMS to compensate for the residual significant impacts on this species.

It also provides an evaluation of the suitability of the proposed offset, and a management framework to ensure that the offset site addresses required goals so as to be suitable as an offset site.

The management objective for GSM within the offset site is to prevent any decline in the vegetation condition.

It is essential that management is undertaken to an adequate standard, which manages key threatening processes such as pest plant and animal control, and biomass control. Other requirements such as monitoring and reporting are important management components.

The objectives of the GSMOMS are to:

- Protect and secure the environmental values of the site, ensuring that indigenous species survive;
- Maintain and enhance the biodiversity of the site by maintaining natural ecosystem processes;
- Maintain and if possible expand GSM populations and associated habitats;
- Control and if possible eliminate populations of pest plants and animals; and
- Achieve a high level of ecologically sound on-ground management.

Although conservation is considered the first priority, the overall aims of management from a farming perspective is for the land to be as productive as possible, without compromising ecological values. In practice, this means the offset site will be primarily managed for GSM conservation, by using 'farm' management tools (i.e. strategic grazing by sheep). All actions must be undertaken by personnel experienced in the management of indigenous/grassland ecosystems, who are able to identify significant flora and fauna species, and who are aware of areas of ecological sensitivity.

1.2 Definition of Offset property versus the Offset site

Golden Sun Moth is known to occur across approximately 120 hectares of the entire property which is approximately 263 hectares in size (Figure 1). Of this, a total of 173 hectares is proposed to be secured as an offset property for the species (i.e. a conservation covenant will be placed over the 173 hectares) (Figure 2).

In accordance with the EPBC Act Offset Assessment Guide, given that 173 hectares will exceed the offset requirement (i.e. for removal of 1.57 hectares of GSM habitat), therefore, only nine hectares will be used to compensate for the removal of suitable habitat associated with this project (Figure 2). However, the entire 173 hectares will be managed for the conservation of Golden Sun Moth, and the surplus offsets (i.e. 167 hectares) will be available as offset(s) for future projects (i.e. separate to the SHWF).

Accordingly, this OMS relates to the ongoing management of 173 hectares as an offset property, although under the EPBC Act approval there will only be nine hectares secured as an offset site specific to the loss of 1.57 hectares of GSM habitat within the SHWF.

2 BACKGROUND

Ecology and Heritage Partners Pty Ltd was engaged by SHWFPL to undertake targeted surveys for the nationally significant GSM within the approved Stockyard Hill Wind Farm area during the flight seasons of 2011/12 and 2012/13.

The targeted surveys were required under Condition 1 of EPBC Act Approval 2009/4719 to ascertain the distribution and abundance of GSM and the extent of their habitat within the Action Area. Detailed surveys were required where GSM were found (one property, referred to as offset property) to quantify the potential impacts of the development on the identified population, guide micro-siting of infrastructure and to provide effective information on mitigation measures.

The targeted surveys were undertaken over the 2011/12 and 2012/13 GSM Surveys (Ecology and Heritage Partners Pty Ltd 2014).

Following multiple survey seasons and an understanding of the species distribution, opportunities were identified to use the offset property as an offset site on which the GSM have been found to undertake works associated with the wind farm in conjunction with conservation actions to have an overall *net benefit* to the species population. Accordingly, as part of detailed design stages of the project and in response to previous targeted surveys for the species, a reduction of approximately 1.1 hectares of confirmed GSM habitat (2.67 hectares in the permitted WEF footprint compared with 1.57 hectares for the amended WEF footprint) will be achieved.

In doing so and given the amended WEF footprint is considered a different 'action' under the EPBC Act, the WEF will impact a known population and 1.57 hectares of GSM habitat. This action was assessed by the Commonwealth Government under an updated EPBC Act referral application (EPBC 2016/7746) and it was decided by the DAWE on 14 September 2016 that the proposed action is a 'controlled action' to be further assessed by preliminary documentation.

2.1 Previous Records and Surveys

There were no historic records on the Victorian Biodiversity Atlas (VBA) of GSM from within the boundaries of the SHWF (DELWP 2016), nor were any recorded in preliminary surveys of the wind farm area (Brett Lane & Associates 2008) which was used in the Victorian State Government's assessment of the project in 2009/10. However, these surveys were not considered of sufficient effort to conclusively prove the absence of GSM in a peer review of the data (Biosis Research 2010). In accordance with EPBC Act Approval 2009/4719, surveys for GSM were undertaken over four days within the development footprint of the whole of the wind farm area during the 2011/12 flight season. A total of 203 GSMs (maximum count of 180 individuals in a single survey) were detected on TP272841 (Figure 3). Habitat assessments for GSM were also undertaken during this time, and showed that while TP272841 had high quality habitat, the rest of the wind farm did not contain habitat suitable for GSM (Ecology and Heritage Partners 2013).

More detailed GSM surveys were undertaken of the known population on TP272841 in 2012/13 to further refine the understanding of distribution across the property.

All areas within the offset property were surveyed, except for areas of dense woodland and pine plantation where the understorey was devoid of suitable habitat. A total of 827 individuals were recorded during the 2012/13 surveys (maximum count of 490 individuals in a single survey), and GSMs were found scattered across approximately 30% of the offset property (Ecology and Heritage Partners 2013), and approximately 120 hectares offset property has been assessed as suitable habitat for GSM (Figure 3).

Surveys were conducted in accordance with the Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities '*Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)*' (DEWHA 2009a). More information on the GSM surveys for Stockyard Hill Wind Farm and Related Projects can be found in the report of Ecology and Heritage Partners (2014, Appendix A).

3 AVOIDANCE

3.1 Design – Pre 2011/12 Surveys

Prior to the 2011/12 surveys, GSM had not been detected within the project boundaries. As such, turbine placement and infrastructure was determined without regard to this species.

3.2 Design – Responding to 2011/12 Surveys

The EPBC Act Approval 2009/4719 required surveys for GSM, and these surveys were undertaken during the species' 2011/12 flight season.

In accordance with the 'Avoid, Minimise, Offset' principle, the infrastructure layout within the offset property was altered to reduce the impacts on the GSM population. Micro-siting of the infrastructure layout was carried out to minimise, and where possible, avoid impacts to GSM against the restrictions and requirements of the wind farm planning permit, along with technical requirements of access tracks and turbine positions. These included:

- Optimising and realigning access tracks, including the deletion of some tracks.
- Undertaking concept civil design works to provide upper limits to hardstand and drainage areas.
- Investigating measures for the protection and management of the extant GSM population within the offset property.

3.3 Design – Responding to 2012/13 Surveys

Additional surveys in 2012/13 provided a greater understanding of the known occurrence and distribution of the species across TP272841, and this resulted in a revised layout (as part of the amended WEF) to avoid habitat. Further refinement of the turbine and infrastructure layout has led to a further reduction in GSM habitat proposed to be impacted.

The responding design anticipates a total removal impact of 1.57 hectares of the 120 hectares of GSM habitat.

4 MITIGATION

In addition to the avoidance of impacts described in Section 3, a series of mitigation actions have been identified, and will be implemented to further minimise the impact of the wind farm on the known GSM population and associated habitat. These measures follow those recommended under the Significant Impact Guidelines for GSM (DEWHA 2009b).

4.1 Detailed Design Phase

The following mitigation measures will be implemented during the detailed design phase:

- Further minor adjustments to the infrastructure layout (at the detailed design level) will, where possible, be undertaken to reduce the area of impact. This may be through the use of micro-sited track routes or configuration of construction areas on a case-by-case basis to minimise the overall impact of 1.57 hectares of disturbance;
- Where possible, access track widths may be further reduced, and there is a commitment as part of this OMS that this will be investigated further;
- Reduction in turbine construction area footprints may be achieved within the offset property and this will be investigated; and
- Preparation of a GSMOMS for the site (the contents of this Plan are discussed in Section 6 below).

4.2 Construction Phase

The following mitigation measures will be implemented during the construction phase:

- Prior to construction, an Environmental Management Plan (EMP) will be developed and endorsed by the Minister for Planning. This will include particular provisions for the protection of GSM and its habitat. This is a condition of the Wind Energy Facility Planning Permit PL-SP/05/0548;
- The EMP will also include a Construction and Site Works Management Plan with specific requirements for the GSM and associated grassland habitat;
- Fencing and/or bunting will be erected around works areas in TP272841 to restrict impacts on habitat;
- GSM information, highlighting the importance of the local population and habitats, together with the actions that will be implemented to avoid and minimise impacts, will be included in site inductions; and
- Signs highlighting the importance and significance of the GSM will be erected at the entrance to TP272841, and in the site offices.

4.3 Operational Phase

The following mitigation measures will be implemented during the operational phase:

- Where areas are designed for rehabilitation after construction, this will include replanting of locally indigenous species; and
- Implement all aspects associated within this GSMOMS during the operational phase.

5 OFFSETS

Despite the efforts of SHWFPL to avoid and minimise impacts to the GSM, there will be a residual impact on the species as a result of the wind farm development.

5.1 The Impact Area

5.1.1 Extent

A maximum of 1.57 hectares of GSM habitat is proposed to be removed in two areas:

- A "through" road and hardstand for a single turbine along the ridgeline in the northern GSM habitat area; and
- A road and hardstand for a single turbine along a ridgeline in the south-western portion of the main GSM habitat area.

There has been a reduction of approximately 1.1 hectares of confirmed GSM habitat (2.67 hectares in the permitted WEF footprint compared with 1.57 hectares for the amended WEF footprint) across TP272841 (Figure 3). A concept plan has been prepared and this shows the areas of the proposed infrastructure layout that intersect with known GSM habitat (Figure 2).

5.1.2 Habitat

The habitat proposed to be removed consists of two Ecological Vegetation Classes (EVCs): Grassy Woodland (EVC 175) and Heathy Dry Forest (EVC 20) (Ecology and Heritage Partners Pty Ltd 2014). The vegetation in these areas comprises a variable canopy cover with a generally dense understorey of native tussock grasses, including wallaby grasses *Rytidosperma* spp, Kangaroo Grass *Themeda triandra* and spear grasses *Austrostipa* spp. These areas currently provide high quality habitat for GSM.

5.1.3 Significance of impact

Given that suitable habitat is proposed to be impacted the development will result in a 'significant impact' under the definition outlined in the Significant Impact Guidelines for GSM (DEWHA 2009b). Due to the large population of GSM within the offset property, and the extent of suitable habitat, it is highly unlikely that the proposed removal of habitat would lead to the loss of the local population. Given the amount proposed habitat to be removed as part of the WEF, there is unlikely to be any impacts on the long-term viability of GSM within the site, as:

- There will be no fragmentation of GSM habitat, as any breaks in habitat will be significantly less than the 200 metres, the limit of GSM dispersal ability (DEWHA 2009b);
- On-going works associated with the operation of the WEF will not impact any retained areas of GSM habitat within the offset property; and

- A range of mitigation measures have been identified in Section 4.1 (above), including a GSMOMS (Section 6), in the aim to further minimise impacts on GSM and provide security for the remaining habitat across TP272841.

Where impacts to GSM habitat are unavoidable, an appropriate Compensatory Offset Strategy will be required. Given the site is proposed to be secured in perpetuity as a GSM offset, the long-term viability of the population on TP272841 will remain as the habitat will principally be managed for the species, rather than current land use practices that are not necessarily sensitive to the requirements of the species.

5.2 The Offset Site

5.2.1 Extent

5.2.1.1 The entire GSM offset property

The proposed GSM offset property (Crown Allotments 23A, 23B, 24A and 24B Parish of Eurambeen) is approximately 263 hectares in size and is located in the north-west of the proposed WEF project area. The property is undulating, with two large rises in the north and south of the offset site, which are bisected by a low lying gully which runs east – west. The central gully area of the property supports significantly fewer trees and thus is more open than the rest of the offset site. The habitat is consistent with the areas proposed to be removed, and comprises Grassy Woodland and Heathy Dry Forest. The vegetation contains a variable canopy cover with a dense understorey of native tussock grasses, including wallaby grasses *Rytidosperma* spp, Kangaroo Grass and spear grasses *Austrostipa* spp.

5.2.1.2 Proposed GSM offsets for the SHWF project

Golden Sun Moth is known to occur across approximately 120 hectares of the entire property which is approximately 263 hectares in size (Figure 1). Of this, a total of 173 hectares is proposed to be secured as an offset property for the species (i.e. a conservation covenant will be placed over the 173 hectares) (Figure 2).

In accordance with the EPBC Act Offset Assessment Guide, given that 173 hectares will exceed the offset requirement (i.e. for removal of 1.57 hectares of GSM habitat) (Appendix A2), therefore, only nine hectares will be used to compensate for the removal of suitable habitat associated with this project (Figure 2) (Appendix A1). However, the entire 173 hectares will be managed for the conservation of Golden Sun Moth, and the surplus offsets (i.e. 167 hectares) will be available as offset(s) for future projects (i.e. separate to the SHWF).

5.2.2 Security of the offset site

Options for the long-term security of the offset include:

- A conservation agreement under the EPBC Act;
- A land management agreement under Section 69 of the *Conservation Forests and Lands Act 1987*; or
- A conservation covenant under the *Victorian Conservation Trust Act 1972*.

5.2.3 Management

For the offset area to qualify as an appropriate offset to compensate for the permitted removal of suitable habitat associated with the WEF, management actions will need to be undertaken to maintain, and where relevant, increase the quality of habitat of the protected area (see Appendix A and the EPBC Act offset calculator for details).

5.2.3.1 High quality habitat

High quality GSM habitat typically includes the following (DEPI 2013b, O'Dwyer and Attiwill 2000):

- At least 40% cover of *Rytidosperma* spp.;
- Little or no cover of weed species; and
- Some inter-tussock space.

5.2.3.2 Considerations

Grazing will be maintained at the current regime (i.e. intensity, timing and duration) as one of the management options to improve GSM habitat quality. Management actions to provide a net benefit for the GSM will also focus on monitoring, habitat improvement through weed control, encouragement of revegetation and beneficial habitat management techniques such as slashing and/or burning.

Note that for all management options on the offset site, there will be no planned disturbance to GSM habitat during the flying season, which is typically late October to the end of December.

5.3 Benefit of the Impact / Offset Approach against a 'Do Nothing' Scenario

The management actions detailed in this Conservation Strategy for the offset area have been designed to provide a net benefit when compared with a 'do nothing' scenario for the GSM within the development area.

Under a 'do nothing' approach, existing land management practices would continue, without regard to the GSM population present. While the recent practices have maintained a habitat suitable for the species, there is no guarantee that this would continue in the future, as the land is not being specifically managed for the conservation of the species. Altering of grazing pressure or not managing the spread of weeds may have a negative impact on the GSM population. However, these may occur without consideration of the species' response under a 'do nothing' scenario. Extreme events, such as grass fires, also will not be specifically managed to protect GSM habitat.

Protection of the area as an offset site provides certainty as to future habitat suitability for the GSM, facilitates habitat improvement and removes the current uncertainty about future management actions and their impact on the species. This will provide a net conservation benefit for the species over the 'do nothing' scenario.

6 OFFSET MANAGEMENT STRATEGY

The offset site will be protected under land title agreements to ensure that the sites are secured and managed appropriately in perpetuity.

The following report section discusses the actions required to implement the GSMOMS. The plan details methods for the management and conservation of GSM habitat at the offset site over the requisite ten year management period and into perpetuity.

It is anticipated that the management works will begin prior to the clearing of native vegetation associated with the WEF, and that all works will be conducted by suitably qualified contractors.

6.1 Strategy for Offset Site

The offset site is to be secured and managed for conservation purposes in perpetuity. The management strategy for the proposed offset site consists of implementing a vegetation management plan incorporating weed and biomass control, as well as regular monitoring specifically tailored to the ecological requirements of GSM and the maintenance of Plains Grassland. Details of security and management responsibility are shown in Table 1.

Table 1. Security and Management Responsibility

Offset Security and Management Responsibility	
Who is liable/responsible for meeting offset requirements?	Approval Holder and Landowners
Type of security i.e. Planning Permit Condition, Section 69 of the *Conservation, Forest and Lands Act 1987 (Vic),* Section 173 of the *Planning and Environment Act 1987 (Vic)* Covenant under the *Victorian Conservation Trust Act 1972 (Vic)*	To be completed on approval of OMS by DAWE
Agreement or Planning Permit Number (ID)	To be completed on approval of OMS by DAWE
Date 10-year offset management to commence	To be completed on approval of OMS by DAWE
Date 10-year offset management expires	To be completed on approval of OMS by DAWE
Registered on title? (Yes/No)	To be completed on approval of OMS by DAWE
Offset site management responsibility (i.e. Landowner, Authority Name)	Approval holder and Landowner
Offset Monitoring Responsibility (i.e. Responsible Authority, DELWP)	Responsible Authority / Landowner

6.2 Adaptive Management Approach

The GSMOMS will use an Adaptive Management Approach to allow the flexibility to respond appropriately and effectively to the uncertainties involved in ecological processes. This will ensure that management objectives are being met while allowing for altered circumstances to be included in the GSMOMS.

6.3 Management Objectives

The offset site will be managed for the purposes of conservation and will involve physical protection of the proposed offset site, the control of pest animals and environmental weeds, biomass reduction and general maintenance of the character and quality of the native vegetation, consistent with its historic context. This OMS and specified management actions will form a strategy for the long-term management of GSM and its habitat.

6.4 Management Costings

Indicative management costings for the 10 year offset strategy are provided in Appendix B. This will account for the installation of new fencing, repairing existing fencing (and ongoing maintenance), pest animal and weed control, GSM population monitoring, reporting and project management. An option for burning has also been provided for Years 5, 7 and 9 as an additional management measure to strategic rotational grazing by sheep. The proposed management actions for the GSMOMS are provided in more detail in Section 6.5 below.

6.5 Management Actions

The following section discusses the actions required to implement the management strategy for the ongoing protection of the existing GSM population and Plains Grassland vegetation. The offset site is to be secured and managed for conservation purposes in perpetuity. Management actions described below are to be implemented for a mandatory period of 10 years. However, there are several standard actions which must be followed if the offset site is to be considered suitable as an offset site. These include:

- No cropping, no drainage/hydrology alteration;
- No use of boom sprayers;
- No rock removal or cropping;
- No artificial stock feeding within the offset area;
- Weed cover is managed in perpetuity to ensure it does not increase beyond the level attained at year 10 of management;
- Pest animals are controlled in perpetuity to the level attained at year 10 of the management;
- GSM populations and habitat are maintained or improved; and

Any proposed uses or development of the site which conflict with the landowners commitments are not permitted under this plan.

6.5.1 Security Arrangements

The offset site will have an on-title legal agreement to ensure the land is secured and managed appropriately in perpetuity.

6.5.2 Access Control

Without active management and appropriate fencing, unrestricted access into the offset site may result in loss of native vegetation cover, soil disturbance and compaction, and weed facilitation. The perimeter of the GSM offset site will be enclosed by permanent post-and-wire fencing.

Actions

Access control will proceed in accordance with the following:

- Maintain permanent fences surrounding the perimeter of the offset site. Any new fencing will be permanent post-and-wire fencing and constructed with minimal impact to the offset site (i.e. no stock piling of fencing materials or soil during construction); and
- Fence condition will be constantly monitored given that much of the broader property is still used for the controlled grazing of sheep. Any gaps or holes in fencing will be repaired immediately.

Performance Measures

The following key performance target has been provided to measure the success of the access control:

- Permanent stock-proof fencing maintained to prevent accidental or unauthorised access into the offset site from adjoining areas of the offset property.

6.5.3 Biomass Control

The current biomass reduction method applied throughout the offset site consists of low-intensity rotational grazing by sheep. All sheep are to be removed during September. Adaptive management via crash grazing may be implemented under the guidance of a suitably qualified ecologist between October to December. Sheep are to be retained on site for a maximum of 7 days and removed for a minimum or 14 days in any given month between October to December to reduce biomass levels (**Note:** a higher abundance of sheep over a shorter period is preferred). Total vegetation cover will not exceed 70% (particularly in seasonally wet years) and open bare ground must also be maintained between 20 and 40% to allow adequate recruitment space for native flora species. All sheep are to be removed annually from the site between January and February to allow the critical flowering/reproductive period for native species. The reintroduction of grazing may return to reduce biomass levels over autumn and winter (March to August). In any circumstance sheep must be removed should total vegetation cover fall to or below 70% and open bare ground between 20 and 40%. Temporary fencing may be installed within the offset site to meet the biomass control objectives of this management plan. An adaptive grazing regime is considered an appropriate method for managing biomass given that remnant vegetation has persisted throughout the site as a direct result of the grazing disturbance regime.

It is envisaged that low intensity mosaic burns could be used in the future to maintain biomass levels, as well as aid in the recruitment and persistence of indigenous flora species. Should the use of fire be considered as a biomass control mechanism, such an activity must be conducted outside of the normal active period for GSM (approximately October to February) through the incorporation of cool autumn burns. The need for biomass reduction via prescribed burns will be assessed on an annual basis and be implemented on an as-needs basis according to an approved burn plan.

Actions

Biomass control will proceed in accordance with the following:

- Ensure adequate grazing to reduce biomass to acceptable cover levels (i.e. 70%);
- Spell offset site containing Plains Grassland areas from approximately late September through to late January (or as advised by a suitably qualified ecologist where adaptive management is required); and
- An appropriate land manager/contractor will co-ordinate weed control works with the grazing regime.

Performance Measures

The following key performance target has been provided to measure the success of the biomass control:

- Vegetation cover is maintained at greater than 70% throughout the study area, and the space (i.e. bare ground) available for native flora species recruitment is between 20% and 40%;
- GSM populations are not reduced;
- A herb-rich diversity and open ground cover is maintained and enhanced;
- No evidence of an increase in soil pugging; and
- The maintenance of open structured Plains Grassland community suitable for the ecological requirements of Golden Sun Moth.

6.5.4 Pest Control

6.5.4.1 Weed Control

The control of weed species is a key management action within the offset area and is critical to the maintenance of indigenous vegetation cover and species diversity. Effective weed control will promote the regeneration of existing populations of indigenous species and encourage recruitment from soil seed banks. Weed control work will be carried out by a suitably qualified contractor.

Whilst the ultimate objective is to eliminate or reduce all weed species to less than 1-5% cover, emphasis will be placed on priority weeds within the offset site and adjacent land. Priority weeds include woody weeds, all noxious weeds listed under the *Catchment and Land Protection Act 1994* (CaLP), or any other high threat weed species (DPI 2008).

Management Guidelines

The following management guidelines will be taken as general management principles in regards to weed control:

- Weed control methodology for eradicating graminoid and herbaceous weeds will consist of manual removal and/or spot spraying weeds with an appropriate herbicide. Care will be taken when spraying herbicide to ensure that the poison does not affect native vegetation in the local application area. Weed species will be treated before seed is set, which may involve localised slashing if spot-spraying proves ineffective. A dye will be used in the spray to mark where the spraying has occurred;

- Selective herbicide application is preferable to broad area application but clearly the loss of non-target species needs to be balanced with the threat of incomplete control of the existing weed population;
- Weed control actions will be conducted outside of the normal active period for GSM (approximately October to February) and activities will also be conducted in a mosaic fashion to avoid any unexpected impacts potentially affecting the entire GSM population at the same time, as the effects of herbicides on GSM larvae remain unknown. Likewise, herbicide application will proceed with great care for at least six weeks post flying season to avoid contact with any GSM eggs that may have been oviposited on indigenous grass species;
- Any weed control will be done in a manner that minimises soil disturbance;
- All herbicide application will use waterway sensitive products and non-residual herbicides to avoid unwanted off-target effects;
- Pest plants that reproduce sexually (by seed) are best controlled before seed set. If herbicide application is proposed after seed set, slashing will be undertaken to ensure seed does not reach maturity; and
- Weed control works will be monitored regularly to assess their effectiveness, and evaluated for follow up actions.

Actions

The following key management actions will be undertaken to ensure success of the weed management program:

- Introduced Weeds. These will be mapped across the site, and monitored annually, to determine when eradication is required. Results will be used to evaluate eradication actions from previous seasons;
- Eliminate high threat environmental weeds (cover reduced to <1%) and control medium threat environmental weeds within all habitat zones (cover reduced to <5%);
- Identify new infestations of weed species and implement control as appropriate;
- Control all other weeds within all habitat zones (ideally at a reduced cover of current levels);

Performance Measures

The following key performance targets will be used to measure the success of the weed management program and include at a minimum:

- The reduction of high threat weed cover to <1%;
- The reduction of medium threat weed cover to <5%; and
- The maintenance of all other weeds ideally at a reduced cover to current levels.

6.5.4.2 Pest Animal Control

European Rabbits remain a threat for the regeneration/recruitment of native species throughout western Victoria. All vermin harbour (i.e. burrows) will be treated, without disturbance to native vegetation or significant soil disturbance.

The landowner/contractor is to monitor pest animal use of the offset site whilst undertaking vegetation management works. Any changes in the influences of pest animals may require a change in the management actions.

Actions

The following key management actions will be undertaken to ensure success of the pest animal program:

- Monitor the population of pest animals (namely rabbits, hares, feral cats and foxes) during weed control works and adapt management as considered appropriate (i.e. if an increase in pest animal activity is observed then a targeted pest animal control program should be implemented.);
- Identify potential harbour and burrows, and destroy if soil disturbance can be minimised and all native vegetation retained; and
- If necessary, undertake a pest animal control program (e.g. baiting, trapping and shooting of foxes, hares, rabbits or feral cats).

Performance Measures

The following key performance targets have been provided to measure the success of the pest animal management:

- No increase in pest animal activity from approval of this plan; and
- Minimal soil disturbance and no native vegetation loss from pest animal management activities.

6.6 Monitoring and Reporting

Monitoring of GSM habitat will be undertaken by a suitably qualified ecologist for the first four years of management to ensure key performance targets are met and the responsible authorities notified of the success and or failure of works through regular progress reports. Progress reports will be provided to the responsible authority at the end of year 2, 4, 6 and 10 of the program (Table 2).

6.6.1 Monitoring

Golden Sun Moth populations are known to vary on spatial and temporal scales depending upon habitat conditions at a particular site. Monitoring is required to determine if GSM has persisted in grassland areas and to ensure that management actions and habitats are suitable for a viable GSM population in the future.

Annual monitoring of GSM populations will be undertaken for an initial four year period, and then in years 6, 8 and 10 (within the ten year management timeframe).

If, at the end of the four year monitoring program, the results indicate a decline in the population size or degradation to habitat is evident, this OMS will be re-evaluated and adapted accordingly.

Specific survey procedures will follow those approved monitoring guidelines for GSM prepared by the DAWE (DEWHA 2009a). The following measures will be undertaken as part of population and habitat monitoring for GSM in the initial four year period (and extended if required):

- Collection of baseline data to be used as a reference point to assess the impacts of management actions. This action will comprise targeted GSM surveys undertaken throughout the extent of the offset site, and the remainder of the property where possible;
- Surveys are to be conducted by suitably trained observers;
- Surveys must take place during the species' flight season. This is generally late October to early January. Ensure moths are active on the day of assessment by using a reference site where the species is known to be present;
- Surveys must be undertaken during conditions suitable for detecting the species. Male moths generally fly between 9am and 4pm on warm (over 20˚C by 10am) days with minimal cloud cover and still conditions. However, if males are observed flying after 3pm or during moderately windy conditions surveys can continue until males are no longer observed flying; and
- Surveys will be conducted using 50 metre wide, parallel transects with two observers walking or, if terrain permits, driving in a car at < 10 km / hour (flying male moths can be readily seen from a vehicle) until moths are observed. Tracks (transects) must be recorded with a GPS to show where survey has been undertaken.

6.6.1.1 Other Monitoring

Information relating to fencing, weed control and pest animal control will be provided by landowners and the relevant contractors, with a landowner monitoring form completed on an annual basis (see below). This information will be included in the progress report, discussed below.

6.6.2 Reporting

Progress reports will be provided to the responsible authority at the end of years 2, 4, 6 and 10 of the program. Information to be provided in the progress report includes:

- A copy of the Management Actions Table (Table 2) detailing actions completed during the reporting period;
- Landowner monitoring and reporting forms;
- A description of the specific monitoring results from ecological surveys undertaken;
- Results of weed and pest animal control work;
- Successful management tools (i.e. techniques used to control weed species, monitoring technique, etc.);
- Any problems or issues experienced (i.e. new infestation of weed species, etc.);

- Any corrective actions and contingency measures where monitoring indicates that there has been a deterioration in the native vegetation or GSM population; and
- Photographs showing evidence of works.

In order to meet EPBC Act referral conditions, all records/evidence of management actions must be maintained, and be submitted to DAWE upon request, and any proposed management changes must be submitted to DAWE prior to the changes being undertaken.

If any agreed management actions or commitments are incomplete or have not been undertaken in the times specified, the landowner is to document the justification and the actions that will be undertaken to implement the requirement.

6.6.2.1 Landowner Monitoring and Reporting Form

Information relating to fencing, weed control and pest animal control will be provided by landowners and the relevant contractors, with a landowner monitoring form completed on an annual basis (see below). The template for a landowner monitoring and reporting form is shown in Table 3.

If any agreed management actions or commitments are incomplete or have not been undertaken in the times specified, the responsible party must explain the reasons why and what program of action/s will be undertaken to implement the action. If no action has been undertaken, please explain the reason(s) and how the targets specified will be met.

6.7 Review

The OMS will be reviewed every five years to include new information, consider the relevance of monitoring, each management action, the validity of trigger value, and to ensure that the objectives of the Plan are being met.

6.8 Management Actions Table

Management actions are summarised below (Table 2). The actions constitute the minimum management requirements for the offset site over the mandatory 10 year management period.

Table 2: Summary of Management Actions for a 10 Year Monitoring Program.

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
0	0.1	Implement on-title legal agreements for the offset site	Liaise between the landowner, Trust for Nature, DELWP and/or Council.	Within three months of this plan being approved by DAWE	
0	0.2	Prepare tenders for relevant management contractors where required	Landowners / engaged consultants	Prior to commencement of development	
1	1.1	Check permanent fences surrounding the offset property are secure	SHWFPL and its contractors	Within three months of this plan being approved by DAWE	
1	1.2	Conduct weed control	SHWFPL and its contractors	Species dependent	
1	1.3	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
1	1.4	Conduct monitoring for GSM (no report)	Suitably qualified ecological specialist	One year after commencement of OMS	
1	1.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner	Summer/Autumn (or as required as part of adaptive management)	
2	2.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
2	2.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
2	2.3	Conduct monitoring for GSM	Suitably qualified ecological specialist	Two years after commencement of OMS	
2	2.4	Maintain fences	SHWFPL and its contractors	As required	
2	2.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
2	2.6	Monitor and assess works, and prepare two year progress report	Suitably qualified ecological specialist	Two years after commencement of OMS	
3	3.1	Conduct weed control	SHWFPL and its contractors	Species dependent	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
3	3.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
3	3.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Three years after commencement of OMS	
3	3.4	Maintain fences	SHWFPL and its contractors	As required	
3	3.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
3	3.6	Monitor and assess works (no report)	Suitably qualified ecological specialist	Three years after commencement of OMS	
4	4.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
4	4.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
4	4.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Four years after commencement of OMS	
4	4.4	Maintain fences	SHWFPL and its contractors	As required	
4	4.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
4	4.6	Monitor and assess works, and prepare four year progress report	Suitably qualified ecological specialist	Four years after commencement of OMS	
5	5.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
5	5.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
5	5.3	Maintain fences	SHWFPL and its contractors	As required	
5	5.4	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
5	5.5	Monitor and assess works (no report)	Suitably qualified ecological specialist	Five years after commencement of OMS	
6	6.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
6	6.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
6	6.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Six years after commencement of OMS	
6	6.4	Maintain fences	SHWFPL and its contractors	As required	
6	6.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
6	6.6	Monitor and assess works, and prepare six year progress report	Suitably qualified ecological specialist	Six years after commencement of OMS	
7	7.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
7	7.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
7	7.3	Maintain fences	SHWFPL and its contractors	As required	
7	7.4	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
7	7.5	Monitor and assess works (no report)	Suitably qualified ecological specialist	Seven years after commencement of OMS	
8	8.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
8	8.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
8	8.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Eight years after commencement of OMP	
8	8.4	Maintain fences	SHWFPL and its contractors	As required	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
8	8.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
8	8.6	Monitor and assess works, and prepare eight year progress report	Suitably qualified ecological specialist	Eight years after commencement of OMS	
9	9.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
9	9.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
9	9.3	Maintain fences	SHWFPL and its contractors	As required	
9	9.4	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
9	9.5	Monitor and assess works (no report)	Suitably qualified ecological specialist	Nine years after commencement of OMS	
10	10.1	Conduct weed control	SHWFPL and its contractors	Species dependent	
10	10.2	Monitor populations of pest animals and conduct control works if required	SHWFPL and its contractors	After peak breeding season - late summer/early autumn	
10	10.3	Conduct monitoring for GSM	Suitably qualified ecological specialist	Ten years after commencement of OMS	
10	10.4	Maintain fences	SHWFPL and its contractors	As required	
10	10.5	Monitor biomass density and implement stock grazing regime or develop ecological burn/ fuel reduction plan if appropriate	SHWFPL/landowner/CFA	Summer/Autumn (or as required as part of adaptive management)	
10	10.6	Monitor and assess works, and prepare final report	Suitably qualified ecological specialist	Ten years after commencement of OMS	

Table 3. Landowner Monitoring and Reporting Form

Landowner of offset site		
Location and address of offset site		
Offset site number (if applicable)		
Offset plan reference number (if applicable)		
Responsible Authority		
Report #		
Actions completed within the offset site (since commencement)	**Date and details of action**	**Key performance target met (Y/N)**
Signature		
Date		

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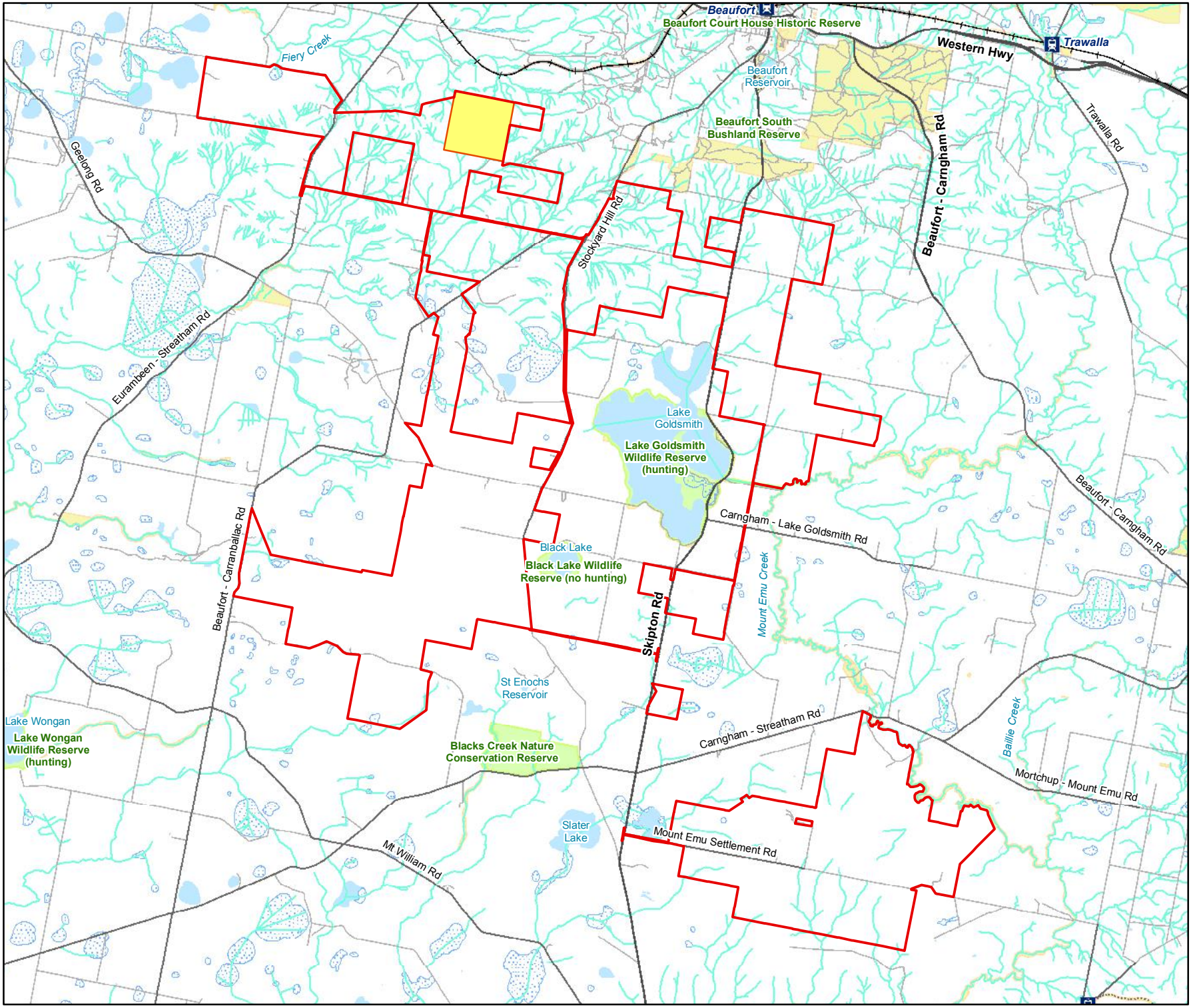
8 FIGURES



Legend

- Stockyard Hill Wind Farm boundary
- SHWF offset property
- Railway
- Major Road
- Collector Road
- Minor Road
- Walking Track
- Minor Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Wetland/Swamp
- Parks and Reserves
- Crown Land

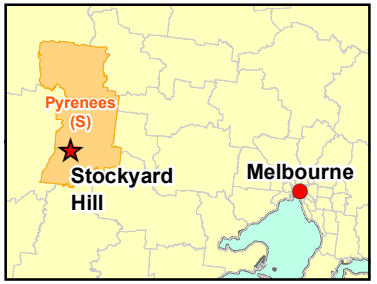


Figure 1

Location of the study area

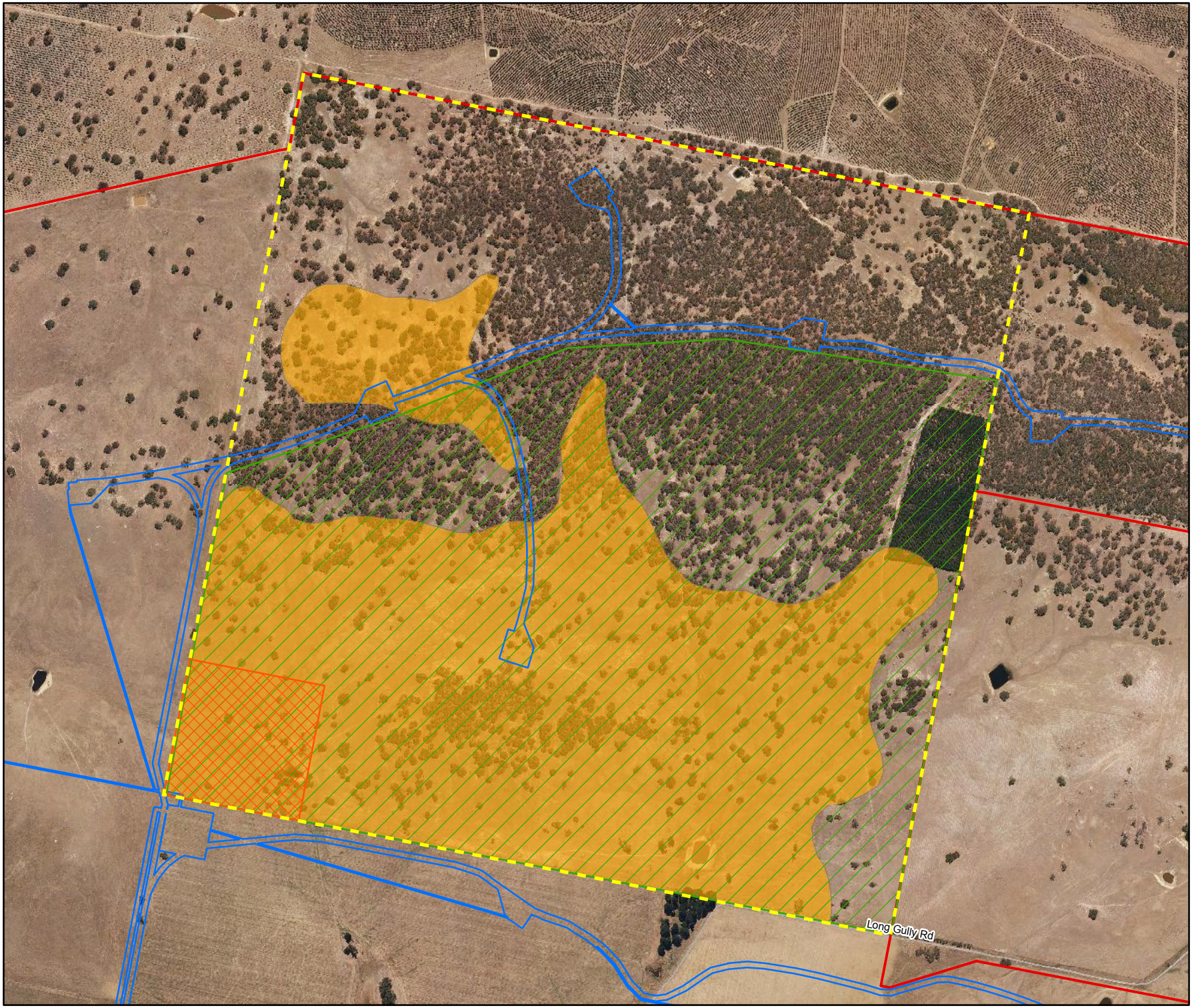
Golden Sun Moth Offset Strategy, Stockyard Hill Wind Farm

N

0 2,000 4,000

Metres

ecology & heritage partners



Legend

- Stockyard Hill Wind Farm boundary
- SHWF offset property
- Confirmed Golden Sun Moth habitat
- GSM covenant area (173ha)
- GMS project Offset Area (9ha)
- Amended WEF footprint

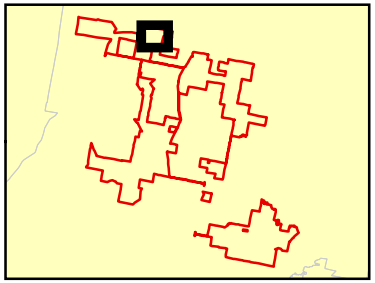


Figure 2

Areas of suitable Golden Sun Moth habitat

Golden Sun Moth Offset Strategy, Stockyard Hill Wind Farm

N

0 150 300

Metres

ecology & heritage partners

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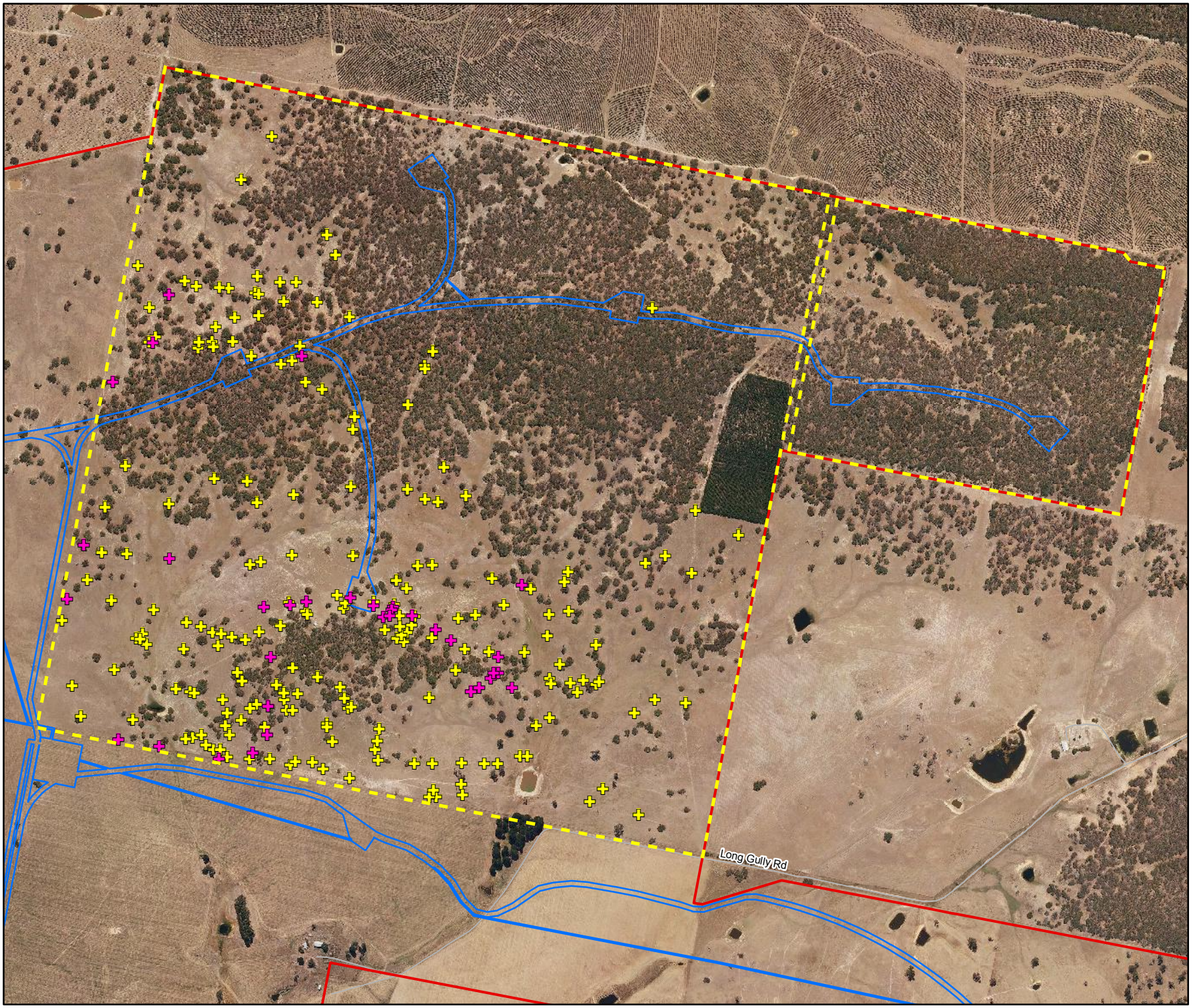

Legend

- Stockyard Hill Wind Farm boundary
- Property Boundary
- Amended WEF footprint

Golden Sun Moth records

- 2012/13 targeted survey
- 2011/12 targeted survey

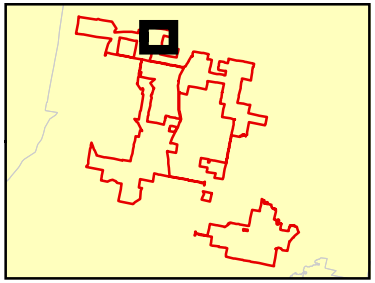

Figure 3

Previous Golden Sun Moth records from 2011/12 and 2012/13 targeted surveys

Golden Sun Moth Offset Strategy, Stockyard Hill Wind Farm

N

0 150 300

Metres

ecology & heritage partners

8073_Fig02_GSMRecords 2/02/2017 melsley

9 APPENDIX A

9.1 EPBC Act Environment Offset Policy

Assessment summary of the GSM Offset against the EPBC Act Environment Offset Policy

Principle of suitable offset	Assessment
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	Golden Sun Moth is known to occur across approximately 120 hectares of the entire 263 hectare offset property. A total of 173 hectares is proposed to be secured as an offset property for the species (i.e. a conservation covenant will be placed over the 173 hectares). In accordance with the EPBC Act Offset Assessment Guide, given that 173 hectares will exceed the offset requirement (i.e. 1.57 hectares of GSM habitat).
Be built around direct offsets but may include other compensatory measures	No additional compensatory measures are proposed with the exception of those mitigation measures outlined in Section 4 and the associated land management costs listed within Appendix C.
Be in proportion to the level of statutory protection that applies to the protected matter	In accordance with the EPBC Act Offset Assessment Guide (Appendix B), if managed appropriately (as planned), the offset site that comprises nine hectares of high quality habitat will exceed the offset requirements associated with the proposed removal of 1.57 hectares of GSM habitat as part of the development.
Be of a size and scale proportionate to the residual impacts on the protected matter	In accordance with the EPBC Act Offset Assessment Guide, given that 173 hectares will exceed the offset requirement (i.e. 1.57 hectares of GSM habitat). However, only nine hectares will be used to compensate for the removal of suitable habitat associated with this project (Figure 2).
Effectively account for and manage the risks of the offset not succeeding	Appropriate management actions detailed in Section 6 of this OMS will be implemented for a 10 year period and are designed to maintain and enhance current GSM habitat within the offset site.
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)	This offset relates directly with the impacts to GSM habitat removed as part of the WEF and associated access tracks and turbine locations onsite within this proposed offset site (Figure 3).
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offsets will provide sufficient offset outcomes for the impacts to GSM as part of this project. The offset strategy will be supported by species population monitoring and habitat management for a minimum of 10 years (Section 6).
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	Options for the long-term security of the offset include: • A conservation agreement under the EPBC Act; • A land management agreement under Section 69 of the *Conservation Forests and Lands Act 1987*; or • A conservation covenant under the *Victorian Conservation Trust Act 1972*. The SHWFPL and landowner will also be required to submit relevant reporting to the DAWE to document the progress of the offset site and GSM populations and associated habitat conditions.

9.2 EPBC Act Offset Calculator and Associated Notes for GSM Offsets at the SHWF

Impact Calculator

Condition	Value	Comments
Area of habitat to be cleared	1.57	As provided by SHWFPL (Figure 3).
Quality of area to be cleared	7	The habitat is of high quality, as it meets the most of the optimum habitat specifications for the species. Large number of individuals have been recorded flying within the impact area (or immediately adjacent), which supports its high habitat rating.

Offset calculator

Condition	Value	Comments
Time over which loss is averted (max. 20 years)	20	SHWFPL plans to maintain the offset site for at least 10 years. Although the offset will be managed for 10 years, it will be protected in perpetuity and therefore a timeframe of 20 years is used.
Time until ecological benefit	5	Works are being carried out over a 10 year management period to improve the habitat. Additional management actions (e.g., removal of weeds, revegetation) are not expected to affect the GSM population on site and potential improvements are likely to occur within five years with focused management efforts under this OMS.
Start area (hectares)	9 ha (Offset Site) and 173ha (Offset Property)	As per the total area mapped on Figure 3.
Start quality	7	The quality of the offset area is considered the same quality as the area to be cleared as offsets are to be secured on-site.
Risk of loss (%) without offset	20	There is a low – medium risk that the habitat would be lost without being designated as an offset. The site is not managed for GSM, and future decisions would not take the species' conservation requirements into consideration. Over the 10 years that this offset considers, changes in management to the detriment of the GSM population (e.g. over-grazing, habitat degradation) would be likely to occur. The whole population may also be at risk of burning though grass fires, and the site is not currently protected from this eventuality.
Future quality without offset	6	It is assumed that the habitat quality will remain at its current level if management actions associated with the offset site are not undertaken.
Risk of loss (%) with offset	10	With specific management of the site as a GSM conservation area, there is a much smaller risk that the habitat will be lost through poor management decisions. Fire prevention measures will also be implemented, which will reduce the chances of the area being lost to grass fire.
Future quality with offset	8	It is expected that this OMS, and the actions detailed within, will lead to an increase of the habitat quality. Given that the habitat quality is already high, if a conservative approach is taken, the nominated increase is likely to be small overall.
Confidence of results:	90%	There is a high confidence that the management of the site as an offset will result in habitat improvement and improve the long-term viability and size of the GSM population within the site.

APPENDIX A1. EPBC ACT OFFSET ASSESSMENT CALCULATIONS – OFFSET SITE (6ha)

Impact calculator							
Impact calculator	**Protected matter attributes**	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
	Threatened species habitat						
	Area of habitat	Yes	GSM habitat	**Area**	1.57	Hectares	Field mapping
				Quality	**7**	Scale 0-10	
				Total quantum of impact	1.10	Adjusted hectares	

Offset calculator																		
Offset calculator	**Protected matter attributes**	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**	**Start area and quality**	**Future area and quality without offset**	**Future area and quality with offset**	**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value (adjusted hectares)**	**% of impact offset**	**Minimum (90%) direct offset met?**	**Cost ($ total) (Ex GST)**	**Source**
	Threatened species habitat																
	Area of habitat	Yes	1.10	Adjusted hectares	Within the same property as proposed losses	**Time over which loss is averted (max. 20 years)** 20	**Start area (hectares)** 9	**Risk of loss (%) without offset** 20% **Future area without offset (adjusted hectares)** 7.2	**Risk of loss (%) with offset** 10% **Future area with offset (adjusted hectares)** 8.1	0.90	90%	0.81	0.22	1.11	100.69%	Yes	$385,0000(*)	Habitat quality based on EHP Pty Ltd 2014
						Time until ecological benefit 5	**Start quality (scale of 0-10)** 7	**Future quality without offset (scale of 0-10)** 6	**Future quality with offset (scale of 0-10)** 8	2.00	90%	1.80	1.30					

Cost ($Total) Note(*): This amount refers to 'Indicative Management Costs Only' as per Appendix C below. Any additional fees associated with acquiring the land have not been included.

APPENDIX A2. EPBC ACT OFFSET ASSESSMENT CALCULATIONS – OFFSET PROPERTY (173HA)

Impact calculator							
Impact calculator	**Protected matter attributes**	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
	Threatened species habitat						
	Area of habitat	Yes	GSM habitat	**Area**	1.57	Hectares	Field mapping
				Quality	**7**	Scale 0-10	
				Total quantum of impact	1.10	Adjusted hectares	

Offset calculator

Offset calculator	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset met?	Cost ($ total) (Ex GST)	Source
	Threatened species habitat																				
	Area of habitat	Yes	1.10	Adjusted hectares	Within the same property as proposed losses	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	173	**Risk of loss (%) without offset**	20%	**Risk of loss (%) with offset**	10%	17.30	90%	15.57	8.06	40.02	3641.41%	Yes	$385,0000(*)	Habitat quality based on EHP Pty Ltd 2014
										Future area without offset (adjusted hectares)	138.4	**Future area with offset (adjusted hectares)**	155.7								
						Time until ecological benefit	2	**Start quality (scale of 0-10)**	7	**Future quality without offset (scale of 0-10)**	6	**Future quality with offset (scale of 0-10)**	9	3.00	90%	2.70	2.37				

Cost ($Total) Note(*): This amount refers to 'Indicative Management Costs Only' as per Appendix C below. Any additional fees associated with acquiring the land have not been included.

10 APPENDIX B

10.1 Golden Sun Moth Conservation Reserve Management Costs (Indicative Only)

GSM Offset Site Costings (area in hectares)	173
New fencing required (kilometres)	1.7

Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Subtotal	GST	Total
Weed control (grass and herbaceous weeds)	$10,000	$10,200	$10,404	$10,612	$10,824	$11,041	$11,262	$11,487	$11,717	$11,951	$109,497	$10,950	$120,447
Biomass reduction (burning as an optional to sheep grazing)	$0	$0	$0	$0	$10,000	$0	$10,200	$0	$10,404	$0	$30,604	$3,060	$33,664
Pest animal control (rabbits and hare)	$10,000	$10,200	$8,160	$6,528	$5,222	$4,700	$4,230	$3,807	$3,426	$3,084	$59,358	$5,936	$65,294
Fence installation (1700 metres for new northern offset site boundary)	$28,900	$0	$0	$0	$0	$0	$0	$0	$0	$0	$28,900	$2,890	$31,790
Fence repairs (5300 metres for perimeter of offset site)	$45,050	$0	$0	$0	$0	$0	$0	$0	$0	$0	$45,050	$4,505	$49,555
Fence maintenance (of existing farm fencing)	$0	$1,000	$1,020	$1,040	$1,061	$1,082	$1,104	$1,126	$1,149	$1,172	$9,755	$975	$10,730
Golden Sun Moth Monitoring	$12,200	$12,444	$12,693	$12,947	$0	$13,206	$0	$13,470	$0	$13,739	$90,698	$9,070	$99,768
Project management	$1,000	$1,020	$1,040	$1,061	$1,082	$1,104	$1,126	$1,149	$1,172	$1,195	$10,950	$1,095	$12,045
SUB TOTAL	**$107,150**	**$34,864**	**$33,317**	**$32,188**	**$28,190**	**$31,133**	**$27,922**	**$31,039**	**$27,867**	**$31,141**	**$384,812**	**$38,481**	**$423,293**

Assumptions

General	Where costs are consistent across years, an annual 2% CPI has been applied.
Weed control (grass and herbaceous weeds)	Ongoing weed control will reduce weed density over time. Weed control intensity is greatest in Year 1, followed by 25% reduction in intensity in Years 2 and 3, further 20% reduction in Years 4 and 5, and 10% annual reduction Years 6-10.
Weed control (woody weeds)	Ongoing weed control will reduce weed density over time. Weed control intensity is greatest in Year 1, followed by 65% reduction in intensity in Year 2, further 50% reduction in Year 3, 20% reduction in Years 4 and 5, and 10% annual reduction Years 6-10.
Biomass reduction (burning)	Every 2 years commencing Year 5 (optional task/cost).
Pest animal control	Pest animal control requirements will reduce over time. Pest animal control intensity is greatest in Years 1 and 2, followed by 20% reduction in intensity in Years 3 - 5, and 10% annual reduction Years 6-10.
Fence installation	$17.00 per metre for materials and labour.
Fence maintenance	Costs consistent. Annual 2% CPI has been applied.
Golden Sun Moth Monitoring	Undertaken in Years 1–4, 6, 8 and 10 Includes four monitoring events/year, mileage, reporting and project management. Annual 2% CPI has been applied.
Project management	Costs consistent. Annual 2% CPI has been applied.