

Final Report

Preliminary Documentation: 410 Cooper Street and 315 O'Herns Road, Epping, Victoria (EPBC 2018/8167)

Prepared for

Frasers Property Australia Pty Ltd

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Ecology and Heritage Partners Pty Ltd

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GLOSSARY

Acronym	Description
CaLP	<i>Catchment and Land Protection Act 1994</i>
CMA	Catchment Management Authority
DELWP	Victorian Department of Environment, Land, Water and Planning
DEPI	(former) Victorian Department of Environment and Primary Industries
DoE	(former) Commonwealth Department of Environment
DoEE	Commonwealth Department of Environment and Energy
DSEWPaC	(former) Commonwealth Department of Sustainability, Environment, Water, Populations and Communities.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class
FFG Act	<i>Flora and Fauna Guarantee Act 1988</i>
FIS	Flora Information System
GSM	Golden Sun Moth <i>Synemon plana</i>
HabHa	Habitat Hectare
NES	National Environmental Significance
NVIM Tool	Native Vegetation Information Management Tool (DELWP)
P&E Act	<i>Planning and Environment Act 1987</i>
PMST	Protected Matters Search Tool (DoEE)
VBA	Victorian Biodiversity Atlas (DELWP)

SUMMARY

Background

Ecology and Heritage Partners Pty Ltd was commissioned by Frasers Property Australia Pty Ltd to prepare Preliminary Documentation for the proposed development at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria (the study area). A referral (EPBC 2018/8167) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was submitted to the Commonwealth Department of the Environment and Energy (DoEE) for the proposed development of the study area. On 9 May 2018 the proposed action was determined a 'Controlled Action' as it would lead to a 'significant impact' on Golden Sun Moth (critically endangered) which is a matter of National Environmental Significance (NES) under the EPBC Act. It has also been determined that the proposed action will be assessed by Preliminary Documentation. No other matters of NES will be impacted by the proposed action.

Study area

The site covers approximately 62.8 hectares and is bound by O'Herns Road to the north, Cooper Street to the south, Hume Freeway to the east and a quarry site to the west. The landscape is generally flat, with no ridges, crests or waterways within or immediately adjacent to the study area. There are no patches of remnant native grassland and the vegetation entirely comprises the introduced (noxious weed) Chilean Needle-grass *Nassella neesiana*. The study area is proposed to be subdivided and rezoned for industrial development.

Proposed Development

The study area is within an area identified as an appropriate location to accommodate future industrial land use and development (Section 2). The Development Plan Overlay ensures that the land is planned and developed in an integrated, strategic and comprehensive manner, and ensures that all applicable planning issues are resolved to the satisfaction of the Responsible Authority prior to commencement of any development.

It is proposed to subdivide and develop the land and activities will include:

- Removal of topsoil deposits for the construction of road/infrastructure corridors;
- Site levelling works;
- Sewer, water main and storm water drainage construction and associated trenching areas already cleared of topsoil deposits;
- Pavement works for pathways; and
- Construction of buildings on the lots together with car parking, fencing and landscaping.

The proposed action will lead to the removal of 54.36 hectares of confirmed Golden Sun Moth habitat and Frasers Property Australia will meet the offset obligations with two proposed offset sites supporting known habitat for the species.

Proposed Offset Sites

Frasers Property Australia intends will meet the offset obligations generated by the proposed removal of 54.36 hectares of Golden Sun Moth habitat at a suitable offset site (63 hectares) located at 222 Challicum Road, Buangor, Victoria, and at the Saxon Paddock and East Creek, and 860 Paddock (90 hectares), which is located

within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, approximately 60 kilometres north west of Geelong.

Buangor

A detailed Golden Sun Moth Offset Management Plan for the Buangor property is provided (Section 6.1) (Appendix 1).

Golden Sun Moth has previously been recorded at the offset site as recently as 2018 during targeted surveys. Several individuals were also previously observed during the 2011/12 flight season in the north-western portion of the proposed offset site in areas dominated by native grasses, during targeted surveys as part of the Western Highway Duplication.

Of the 64-hectare property, 63 hectares is proposed to be secured and managed as an offset site. This site supports Plains Grassy Woodland and suitable habitat for a known Golden Sun Moth population. The offset site at Buangor is in the process of being secured through a Trust for Nature covenant. Based on the EPBC Act offset calculator, the retention and management of 63 hectares of confirmed Golden Sun Moth habitat within the proposed offset site as an offset mitigates 103.72% of the impact of the removal of 22 hectares of the community. This exceeds the minimum 90% direct offset requirement and is in accordance with the Commonwealth environmental offset policy.

Warrambeen

A detailed Golden Sun Moth Offset Management Plan for the Warrambeen property is provided (Section 6.2) (Appendix 2).

The proposed offset site is located within an area known as the Saxon Paddock and East Creek, and 860 Paddock offset site, Warrambeen, Victoria. The paddock is located within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, Victoria, approximately 60 kilometres northwest of Geelong. The offset site, within the Saxon Paddock and East Creek, and 860 Paddock, comprise over 90 hectares of suitable grassland habitat [areas of which constitute Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)] and is known to support a resident population of Golden Sun Moth. Other areas within the paddock are currently secured and managed for the conservation of Golden Sun Moth and remnant NTGVVP (under previous EPBC Act decisions).

Golden Sun Moth was initially recorded during targeted surveys across the entire paddock, with 23 individuals recorded on 6 January 2011, seven individuals were recorded on 20 January 2011, and 62 moths observed on 15 November 2017 and 4 December 2017 during population monitoring across Saxon Paddock and East Creek as part of another offset site. In addition, moderate numbers of Golden Sun Moth were recently detected on 19 November and 1 December 2018. Golden Sun Moth was also recently detected (2018/19 flight season) across 860 Paddock, which is located to the south of Saxon and East Creek.

The main habitat type at the offset site comprises moderate to high Plains Grassland with areas containing a mix of native and introduced species.

Conclusion

All other approval processes in accordance with relevant environmental policy in Victoria are being complied with. Given that all the Golden Sun Moth habitat on the proposed impact site supports 100% Chilean Needle-grass, it is not considered practical to retain this habitat, as the continued spread of this noxious weed will result in a long-term reduction in other ecological values within the locality, and broader region.

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by Frasers Property Australia Pty Ltd to prepare Preliminary Documentation for the proposed development at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria (the study area) (Figure 1). A referral (EPBC 2018/8167) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was submitted to the Commonwealth Department of the Environment and Energy (DoEE) for the proposed development of the study area. On 9 May 2018 the proposed action was determined a 'Controlled Action' as it would lead to a 'significant impact' on Golden Sun Moth (critically endangered) which is a matter of National Environmental Significance (NES) under the EPBC Act. It has also been determined that the proposed action will be assessed by Preliminary Documentation. No other matters of NES will be impacted by the proposed action.

1.2 Site Context

The study area is located at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria, approximately 19 kilometres north of Melbourne's CBD (Figure 1). The site covers approximately 62.8 hectares and is bound by O'Herns Road to the north, Cooper Street to the south, Hume Freeway to the east and a quarry site to the west. The landscape is generally flat, with no ridges, crests or waterways within or immediately adjacent to the site. There are no patches of remnant native grassland and the vegetation entirely comprises the introduced (noxious weed) Chilean Needle-grass *Nassella neesiana*. The study area is proposed to be subdivided and rezoned for industrial development.

The study area is located to the south of the proposed Conservation Area 33 in the Melbourne Biodiversity Conservation Strategy (DEPI 2013).

According to the Department of Land Water and Planning (DELWP) Native Vegetation Information Management Tool (NVIM) (DELWP 2018a), the study area occurs within the Victorian Volcanic Plain bioregion. It is located within the jurisdiction of the Port Phillip Westernport Catchment Management Authority (CMA) and the City of Whittlesea. The study area is currently zoned Farming Zone (FZ) and Special Use Zone – Schedule 4 (SUZ4). A Design and Development Overlay – Schedule 2 (DDO2) applies to the site.

2 DESCRIPTION OF THE ACTION

The study area is within an area identified as an appropriate location to accommodate future industrial land use and development. The Development Plan Overlay ensures that the land is planned and developed in an integrated, strategic and comprehensive manner, and ensures that all applicable planning issues (including stormwater management, traffic, landscaping, heritage) are resolved to the satisfaction of the Responsible Authority prior to commencement of any development.

It is proposed to subdivide and develop the land and activities will include:

- Removal of topsoil deposits for the construction of road/infrastructure corridors;
- Site levelling works;
- Sewer, water main and storm water drainage construction and associated trenching areas already cleared of topsoil deposits;
- Pavement works for pathways; and,
- Construction of buildings on the lots together with car parking, fencing and landscaping.

Whilst the masterplan may be subject to modifications during the planning permit process, an indication of the type and extent of the development is provided below (Figure 2). At this stage the proposed development will occur in two stages, over a two-year period, with soil removed on a per stage basis. Some stockpiling may be needed on the northern stage, as part of the first stage, although the need for soil stockpiling will be determined once the contractor has been appointed.

The nature of the development is not expected to change significantly during this time. The study area would be developed principally for industrial purposes, with the remaining land accommodating a proposed Melbourne Water retarding basin and an existing gas easement along the eastern boundary of the property (Figure 2). This retarding basin and gas easement are included in the extent of the development of the site as it forms part of the proposed future development. A preliminary masterplan by Frasers Property Australia provides for approximately 90 lots ranging in size from 1,800 sqm to 33,000 sqm, to be developed over two stages (Deep End Services 2018).

Four of the larger lots would be retained and developed by Frasers Property Australia, with the remainder sold to a range of industrial occupants. The profile of occupants is likely to be similar to other industrial estates in the area, with a mix of larger warehousing and logistics businesses serving a broader regional, state and national market, and smaller warehouse-office product occupied by firms serving a local and subregional customer base (Deep End Services 2018). Once the subdivision is complete the street reserves will be landscaped and thereafter maintained initially by the developer and eventually by the local council.

The proposed action will result in the complete clearance of all vegetation and fauna habitat within the 62.8-hectare site. It is anticipated that the proposed action will commence in late 2019. Alternative locations are not available to the proponent and are therefore not considered. Alternative timeframes have not been considered as they would act only to postpone the proposed development. As this is an industrial subdivision, the development of the estate will be dependent on the market demands for this use.

3 THE ENVIRONMENT AND MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

3.1 Existing Site Condition

Several detailed ecological assessments, including targeted surveys for Stiped Legless Lizard *Delma impar* and Golden Sun Moth *synemon plana*, have previously been undertaken within the study area (Ecology and Heritage Partners 2014, 2015, 2018a, 2018b) (Figure 3). Based on these extensive site surveys, over several years, it has been documented that the study area is highly modified and dominated by a dense, almost continuous sward of exotic grasses, predominantly Chilean Needle-grass, Toowoomba Canary-grass *Phalaris aquatica* and Cocksfoot *Dactylis glomerata*, many of which are noxious and environmental weeds. Chilean Needle-grass a noxious weed (listed under the *Catchment and Land Protection Act*) and listed as a Weed of National Significance (WONS) is the dominant species, with Onion Grass *Romulea rosea*, and Meadow-grass *Poa annua* scattered throughout. Other weed species such as Cape Weed *Arctotheca calendula*, Wild Oat *Avena fatua*, Ribwort *Plantago lanceolata*, Galenia *Galenia pubescens* var. *pubescens*, Rye-grass *Lolium perenne*, Artichoke Thistle *Cynara cardunculus* and Spear Thistle *Cirsium vulgare* are also present throughout the study area. The site also supports two scattered remnant River Red-gums.

3.2 Matters of National Environmental Significance (NES)

A matters NES report was prepared for the proposed development and EPBC Act referral (Ecology and Heritage Partners 2018a). Four significant species and one ecologically significant community classified as matters of NES were assessed as part of the proposed development, and these included:

- Matted Flax-lily *Dianella amoena*;
- Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP);
- Golden Sun Moth *Synemon plana*;
- Striped Legless Lizard *Delma impar*, and;
- Growling Grass Frog *Litoria raniformis*

Golden Sun Moth was the only significant species recorded within the study area during targeted surveys during the species' 2017/18 flight season (Ecology and Heritage Partners 2014, 2018b). Targeted surveys for the other significant species that have potential to occur within the study area (i.e. due to either potentially suitable habitat, or known occurrence in similar habitats adjacent to, or within 10 kilometres surrounding the study area) were also undertaken.

3.2.1 Matted Flax-lily

Potential habitat for the EPBC Act-listed Matted Flax-lily was identified during previous ecological assessments undertaken on 315 O'Herns Road (Biosis 2013). Targeted surveys (22, 24 and 29 January 2018) for Matted Flax-lily *Dianella amoena* were undertaken by qualified botanists, to coincide with the known flowering period of Matted Flax-lily (November to February).

Matted Flax-lily was surveyed using the most up to date and minimum survey requirements for the species following standards:

- Targeted surveys were conducted by people familiar with recognising the species;
- The survey effort was directed to all potential habitat areas (i.e. remnant grassland and the degraded grassy areas surrounding the remnant grassland);
- Transects were walked at five-metre grid intervals through all potential habitat; and
- Where found, locations of Matted Flax-lily were recorded by GPS (accuracy of +/- 3 metres) and the number of plants per land parcel was totalled.

Despite the availability of potential habitat (albeit highly modified) no Matted Flax-lily was identified within the study area (Ecology and Heritage Partners 2018a).

3.2.2 Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)

Based on the site visits of the study area (Ecology and Heritage Partners 2015, 2017, 2018a) no remnant patches of native vegetation were identified, and therefore the study area does not support NTGVVP.

3.2.3 Golden Sun Moth

Targeted surveys for Golden Sun Moth were undertaken at the study area on four separate occasions on 11, 13, 18 December 2017 and 4 January 2018. Survey procedures were undertaken in accordance with the *Significant impact guidelines for the critically endangered golden sun moth* (DEWHA 2009), with the following tasks undertaken:

- A habitat assessment was completed detailing information on habitat quality, biomass levels, presence of weeds and floristic diversity. Based on this the entire site supports introduced vegetation (see Figure 3);
- Surveys were conducted by ecologists experienced in the detection and identification of Golden Sun Moth;
- The study area was surveyed on four separate occasions, with at least one week between surveys where possible;
- Surveys took place during the species' flight season (generally described as late October to early January). Moths were confirmed flying at known, nearby reference sites prior to undertaking each survey;
- Surveys were undertaken during weather conditions suitable for detecting the species (i.e. between 10am and 3pm on warm (over 20°C by 10am) days with minimal cloud cover and still conditions); and
- Surveys were conducted by qualified zoologists walking or driving (where access was permitted) 10 to 50-metre-wide parallel transects across all areas of suitable habitat.

Most of the study area support a high cover of the preferred food plant (Chilean Needle-grass) of the Golden Sun Moth. Targeted surveys recorded approximately 618 Golden Sun Moth across the study area on any given survey date, the results are outlined below (Table 1). The highest numbers of Golden Sun Moth were recorded in the northern section of the study area, although suitable habitat is homogenous across the study area with the species observed throughout. The study area supports 54.36 hectares of confirmed Golden Sun Moth habitat, all of which is dominated by the noxious and high-threat weed, Chilean Needle-grass.

Although there are very low levels of scattered native wallaby grasses, none of the vegetation meets the condition thresholds to constitute a 'patch' under the State Guidelines (DELWP 2017a).

Table 1 Golden Sun Moth survey results.

Date	Survey times	Temperature (°C)	Wind (km/hr) Direction	Cloud cover (%)	Days since rain	Approx. No. GSM
22/11/2017	13:05 – 15:00	31.8	7 NNW	0	5+	500-600
29/11/2017	13:00 – 16:00	33.2	15 N	15	2+	618
15/12/2017	10:30 – 11:00	24.2	22	2	2+	400-500
18/12/2017	10:30 – 13:00	26	12	80	2+	400-500

An updated Golden Sun Moth habitat assessment was undertaken on 26 March 2019 across the proposed development site. The total extent of suitable habitat within the proposed Impact Area has been revised down from 57.66 hectares, which was included in the EPBC Act referral, to 54.36 hectares. The reasons for the slight reduction is that areas previously mapped as suitable Golden Sun Moth habitat now support a high percentage cover (>80%) of Toowoomba Canary-grass *Phalaris aquatica* and other weeds, and contain either no or low cover (<10%) of Chilean Needle-grass, or are disturbed areas (e.g. spoil dumps, areas adjacent to planted trees) that do not contain Golden Sun Moth food plants. The reduction in the extent of suitable habitat has been reflected in this PD and OMPs.

3.2.4 Striped Legless Lizard

Targeted Striped Legless Lizard surveys were previously undertaken to investigate the quality and extent of Striped Legless Lizard habitat within the study area and determine the presence/ absence of the species (Ecology and Heritage Partners 2015) (Figure 3).

The surveys were conducted in accordance with the *EPBC Act Referral Guidelines for the Vulnerable Striped Legless Lizard, Delma impar* (SEWPaC 2011a) and involved the deployment of artificial refuge structures, through establishing tile grids in areas of suitable grassland habitat within the study area (Figure 3). The intention of establishing a grid of roof tiles is that individuals will use the artificial habitat for shelter, and to assist in thermoregulation. The set of artificial refuges provide a target for zoologists to focus search attempts in which tiles are lifted to check for the presence of lizards. The adopted methodology is widely accepted as the primary survey technique for this species, particularly in areas supporting surface rock cover (SEWPaC 2011a, 2011b).

In accordance with the Referral Guidelines (SEWPaC 2011a), tile grids were established within identified 'patches' of habitat likely to be impacted, with each consisting of a grid of 5 x 10 terracotta roof tiles (measuring approximately 25 metres x 50 metres). Twelve (12) tile grids were laid on 4 September 2014 at the following locations (Table 2, Figure 3):

Table 2. Location of tile grids placed within the study area.

Tile Grid Number	Eastings ¹	Northings	Tile Grid Number	Eastings	Northings
1	322799	5832693	7	322516	5832065
2	322647	5832626	8	322545	5831893
3	322514	5832474	9	322468	5831699
4	322402	5832287	10	322182	5831525
5	322512	5832265	11	322618	5831680
6	322655	5832152	12	322438	5831451

Note: 1) GDA94, MGA 55

The timing of the checks was undertaken in accordance with advice from DELWP who have extensive experience in undertaking surveys for the species. Tiles were checked on eight occasions between 22 September and 1 December 2014 (Table 3):

Table 3 Tile survey dates.

Tile Check Number	Date
1	22/09/2014
2	08/10/2014
3	20/10/2014
4	27/10/2014
5	07/11/2014
6	13/11/2014
7	20/11/2014
8	01/12/2014

3.2.5 Growling Grass Frog

The targeted survey was undertaken to investigate the quality and extent of habitat for Growling Grass Frog within the study area, and determine the presence and abundance, or absence of the species. Growling Grass Frog Surveys were undertaken in accordance with the methods outlined in the Significant Impact Guidelines for the Vulnerable Growling Grass Frog (SEWPaC 2009).

The targeted survey was completed on two separate occasions on 10 and 13 November 2017 in the low-lying ephemeral wetland in the northern third of the study area, near the western boundary of the site and north of the row of trees planted in an east-west direction. Surveys were conducted with reference to the prescribed methodology detailed in the following guidelines:

- Significant Impact Guidelines for the Vulnerable Growling Grass Frog (*Litoria raniformis*) EPBC Act Policy Statement 3.14 (DEWHA 2010a); and
- Survey Guidelines for Australia's Threatened Frogs (DEWHA 2010b).

Two Zoologists experienced in amphibian surveys, including significant species such as Growling Grass Frog, conducted nocturnal surveys during mild conditions. Spotlighting and active searching was undertaken during the surveys, both of which are reliable techniques used to detect the species. The margins (within ~30 metres) of the waterbody was carefully searched for active frogs using 30-watt 12-volt hand-held spotlights.

Although the weather conditions during the site surveys were conducive for frogs to be active, no Growling Grass Frogs were detected during the targeted surveys. During the surveys, no other species were recorded throughout the study area. The species is not likely to use habitat within the study area for breeding and dispersal.

3.2.6 Other EPBC Act-listed Species

Additional flora species either previously recorded from the local area (not within the study area), or that are listed under the EPBC Act Protected Matters Search Tool (PMST) as having potential to occur (DELWP 2017b, DoEE 2018) include:

- River Swamp Wallaby-grass *Amphibromus fluitans*
- Charming Spider-orchid *Caladenia amoena*
- Curly Sedge *Carex tasmanica*
- Clover Glycine *Glycine latrobeana*
- Adamson's Blown-grass *Lachnagrostis adamsonii*
- Basalt Peppercross *Lepidium hyssopifolium*
- Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*
- Maroon Leek-orchid *Prasophyllum frenchii*
- Leafy Greenhood *Pterostylis cucullata*
- Large-headed Fireweed *Senecio macrocarpus*
- Spiral Sun-orchid *Thelymitra matthewsii*
- Swamp Everlasting *Xerochrysum palustre*

In addition, fauna species either previously recorded from the local area (not within the study area), or that are listed under the EPBC Act Protected Matters Search Tool (PMST) as having potential to occur (DELWP 2017b, DoEE 2018) include:

- Spot-tailed Quoll *Dasyurus maculatus maculatus*
- Eastern Barred Bandicoot *Perameles gunnii*
- Brush-tailed Rock-wallaby *Petrogale penicillata*
- New Holland Mouse *Pseudomys novaehollandiae*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Australian Painted Snipe *Rostratula australis*
- Australasian Bittern *Botaurus poiciloptilus*
- Fairy Tern *Sternula nereis*
- Plains-wanderer *Pedionomus torquatus*
- Superb Parrot *Polytelis swainsonii*
- Swift Parrot *Lathamus discolor*
- Regent Honeyeater *Anthochaera phrygia*
- Orange-bellied Parrot *Neophema chrysogaster*
- Malleefowl *Leipoa ocellata*
- Pink-tailed Worm-Lizard *Aprasia parapulchella*
- Australian Grayling *Prototroctes maraena*
- Dwarf Galaxias *Galaxiella pusilla*
- Macquarie Perch *Macquaria australasica*
- Yarra Pygmy Perch *Nannoperca obscura*
- Eltham Copper *Paralucia pyrodiscus lucida*

There is no suitable habitat within the study area for any of these additional EPBC Act-listed species and therefore have not been considered further.

4 RELEVANT IMPACTS

4.1 Direct Impacts

The proposed action will have a direct impact on 54.36 hectares of confirmed Golden Sun Moth habitat. The study area supports a high cover of the noxious and high-threat weed, Chilean Needle-grass, and therefore is of low quality from a broader, ecological perspective. Based on a detailed habitat assessment and the multiple surveys days across the study area, the entire study area comprises introduced grasses (i.e. 100% and high biomass) and the extent of this habitat is shown below (Figure 3).

The removal of habitat will occur over several years as the site is subdivided and subsequently developed.

4.2 Indirect Impacts

Based on the most up to date data on site occupancy by Golden Sun Moth (e.g. DEPI 2013; DELWP 2017b; DELWP 2018b; EPBC Act referrals EPBC 2017/7198 and 2017/8008), there is not considered to be any indirect loss to Golden Sun Moth populations and associated habitats. There is known Golden Sun Moth habitat and populations located in other nearby properties to the south on Cooper Street (i.e. approximately 50 metres to the south on the southern side of Cooper Street). This property is also dominated by Chilean Needle-grass and is proposed to be developed (EPBC 2017/7198). Although this site is separated to the study area by Cooper Street, as the road reserve is only approximately 50 metres in width, it can be considered that this habitat and population are continuous with that known to occur within the study area (DEWHA 2009a).

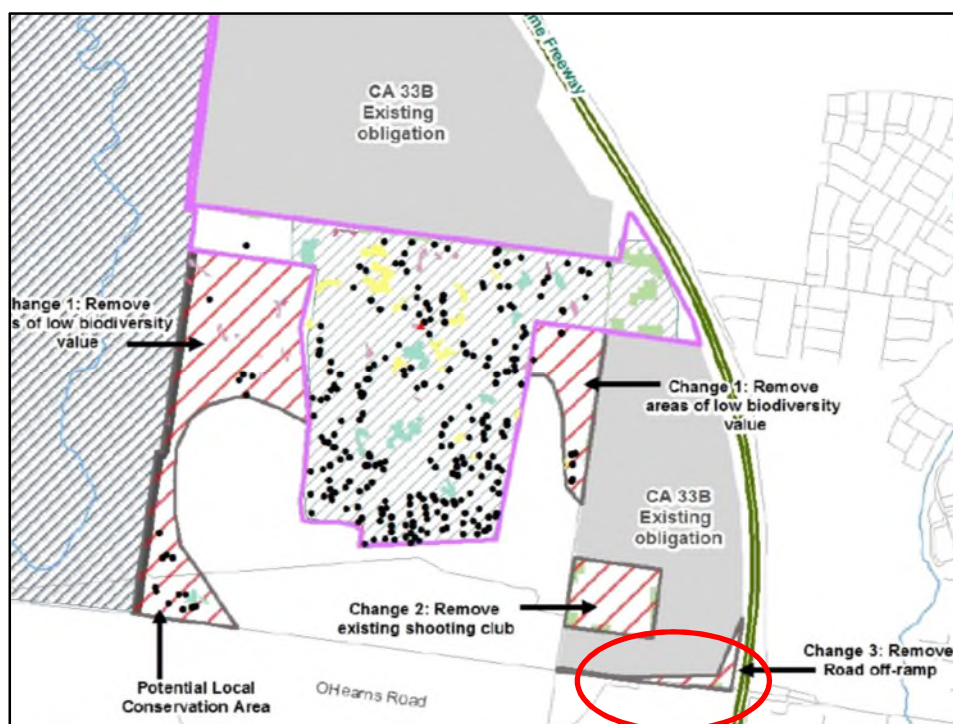
A large area (approximately 468.34 hectares) located north of the study area (i.e. north of O'Herns Road) is designated a Conservation Area (i.e. Conservation Area 33 – Northern Growth Corridor: O'Herns Road, Epping) under Melbourne's Biodiversity Conservation Strategy (BCS) (Page 114-115) (DEPI 2013), and this area will be protected and managed for conservation. The proposed removal of the Noxious Chilean Needle-grass from the study area will reduce the invasive potential of the weed into the proposed Conservation Area located to the north. It is important to note that an application to revise the boundary of Conservation Area 33 was made to DoEE in 2018 (DELWP 2018b) and an area in the south eastern corner of the conservation area, directly north of O'Herns Road has been excised from the Conservation Area (

Plate 1). O'Herns Road is currently proposed to be duplicated by VicRoads and is also subject to an EPBC Act referral and approval (EPBC 2017/8008).

Given the highly disturbed nature of the area to the west of the study area (i.e. existing quarry and landfill operations) and lack of suitable habitat the proposed removal of habitat is not likely to lead to indirect impacts to ant surrounding Golden Sun Moth populations (Figure 3). The study area is also not connected to any other population to the east of the study area, given the presence of the Hume Highway which is a barrier to any dispersal of individuals (Figure 3).

Due to the limited dispersal ability of the species, the Golden Sun Moth population within the study area is isolated from the population to the south and any existing populations to the north of the study area (DEWHA 2009). As such, there will be no indirect impacts to Golden Sun Moth populations or habitats outside of the study area associated with the proposed development.

Plate 1. Conservation Area 33 with adjusted boundaries, located north of the study area (DELWP 2018b).



4.3 Unknown, Unpredictable or Irreversible Impacts

There are no unknown or unpredictable impacts associated with the proposed development. However, the proposed loss of Golden Sun Moth habitat for the future development of the study area will be irreversible.

4.3.1 Local, Regional and National Scale Analysis of Impacts

Golden Sun Moth has been recorded at several locations in the local Epping area including:

- Cooper Street, Epping (south of the study area) (high numbers);
- Aurora Development, Epping (high numbers);
- Melbourne Wholesale Markets, Epping (high numbers prior to development);
- Greenvale Reservoir (moderate numbers);
- Cooper Street Grassland Reserve (low numbers); and,
- Mount Ridley Conservation Reserve (moderate numbers).

The large number of previous records demonstrates that the species is widespread in suitable habitat in the local area. It is noted that several sites within the local and regional scale that support Golden Sun Moth habitat have, or are proposed, to be developed in future. The City of Whittlesea is located within the Melbourne Strategic Assessment area, which as part of the BCS approved by the Commonwealth 2013. The BCS will result in the establishment of several Conservation Reserves (e.g. Conservation Area 33), several of which support Golden Sun Moth populations (DEPI 2013).

5 PROPOSED AVOIDANCE AND MITIGATION MEASURES

Given that the entire study area would be developed principally for industrial purposes, with the remaining land accommodating a Melbourne Water retarding basin and a gas easement along the eastern boundary of the property (see Section 2 above), this will result in the complete removal of the exotic grasses that current support the Golden Sun Moth population.

As outlined in Section 8.2 below, the study area is within an important area of industrial development known as Precinct 4 Gateway – Emerging Industry within the draft Cooper Street West Position Paper prepared by City of Whittlesea. The land is within the defined Cooper Street Employment Precinct which in recent years has accommodated significant investment in industrial and commercial activity and in state-significant economic infrastructure in the form of the Melbourne Wholesale Fruit Vegetable and Flower Market. It is anticipated that the proposed action will commence in late 2019 and alternative locations are not available to the proponent and are therefore not considered. Alternative timeframes have not been considered as they would act only to postpone the proposed development.

Consequently, the study area, or portions of the study area sections have not been strategically identified (e.g. through the broader council precinct planning process) to be permanently protected and managed for the conservation of Golden Sun Moth, or other environmental values. Therefore, no avoidance or mitigation measures for Golden Sun Moth habitat and associated habitats is proposed. The entire 54.36 hectares of Golden Sun Moth habitat is dominated by Chilean Needle-grass, and therefore it is not practical to retain this habitat, as any continued spread of this weed will result in a long-term reduction in other ecological values within the locality, and broader region. No specific Golden Sun Moth mitigation or management requirements (slashing, biomass control, habitat enhancement) are proposed within the study area, and two suitable offset sites have been sourced and satisfies the EPBC Act offset policy to compensate for the proposed removal of 54.36 hectares of Golden Sun Moth habitat (see below, Appendix 1 and 2).

Development of the site will be conducted in accordance with all relevant State and local approvals. For example, a Planning Scheme Amendment is requirement along with a planning permit to subdivide the land for future industrial development and should any native vegetation (e.g. scattered native grasses) be removed then approval under Clause 52.17 of the City of Whittlesea planning scheme. Given that the study area is privately owned a permit under the *Flora and Fauna Guarantee Act 1998* is not required.

The proposed development will not impact any other matters of National Environmental Significance (MNES) (see Section 3.2), and therefore there no avoidance and minimisation measures are planned as part of the proposed development. In addition, given that the proposed development will be confirmed to the study area as shown on Figure 1, indirect or offsite impacts to any MNES (e.g. properties located to the north or south of the study area) from the proposed development is likely to occur.

6 RESIDUAL IMPACTS AND PROPOSED OFFSETS

Fraser Property Australia intends to meet the offset obligations generated by the proposed removal of 54.36 hectares of Golden Sun Moth habitat at two separate offset sites located at 222 Challicum Road, Buangor, Victoria (63 hectares of habitat), and at the 'Saxon Paddock and East Creek', and 860 Paddock (90 hectares), which is located within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, approximately 60 kilometres north west of Geelong.

6.1 Buangor Offset Site (63 Hectares)

6.1.1 Previous records

Golden Sun Moth has previously been recorded at the offset site as recently as 2018 during targeted surveys (Ecology and Heritage Partners Pty Ltd 2018c). Several individuals were also previously observed during the 2011/12 flight season in the north-western portion of the proposed offset site in areas dominated by native grasses, during targeted Golden Sun Moth surveys as part of the Western Highway Duplication (Ecology and Heritage Partners 2012a) (Figure 4).

6.1.2 Habitat

A total of 63 hectares is proposed to be managed as an offset site (Figure 4). This site supports Plains Grassy Woodland (EVC 55) with an open structure with a variable understorey of native (primarily wallaby grasses *Rytidosperma* spp., Kangaroo Grass *Themeda* spp. and spear grasses *Austrostipa* spp) and exotic grasses (annual and perennial species). Many areas where Golden Sun Moth was detected support a high percentage cover (>50%) of native grasses, while other areas are dominated by either a mix of native and exotic grasses (Plates 2-7). The property is currently lightly grazed and hasn't experience pasture improvement (superphosphate application) for several decades. There are low levels of regenerating River Red-gums *Eucalypts camaldulensis*. There are low to moderate levels of disturbance from sheep grazing. Consistent with the Golden Sun Moth Significant Impact Guidelines (DEWHA 2009), the proposed offset site is open with minimal shading with areas comprising bare or sparsely covered ground between grass tussocks (inter-tussock space). The Golden Sun Moth Offset Management Plans are provided in Appendix 1 and 2 (Ecology and Heritage Partners 2019a, 2019b).

Plates 2-7. Photos of the study area (November 2017)

Plate 2



Plate 3



Plate 4

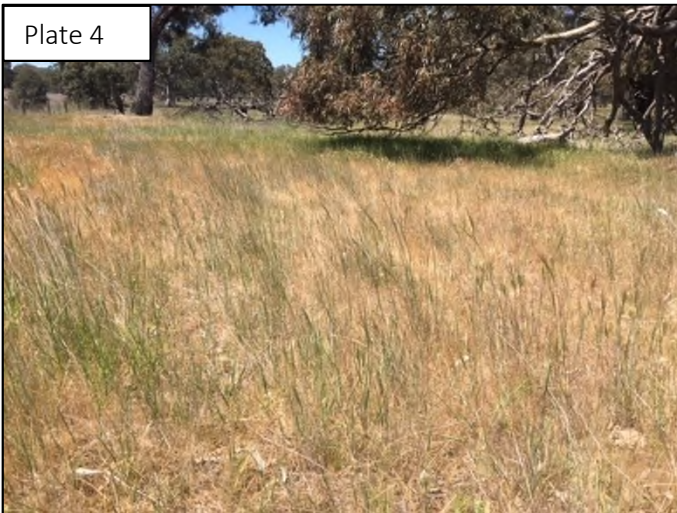


Plate 5

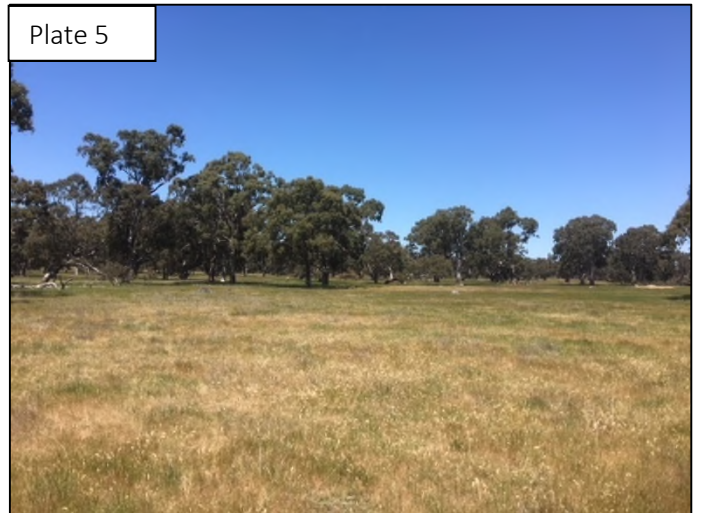


Plate 6



Plate 7



6.2 Saxon Paddock and East Creek, Warrambeen (90 Hectares)

The proposed offset site is located within an area known as the Saxon Paddock and East Creek, and 860 Paddock Offset Site, Warrambeen, Victoria. These paddocks are located within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, Victoria, approximately 60 kilometres northwest of Geelong. The offset site supports suitable grassland habitat [areas of which many areas constitute Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)] and is known to support a resident population of Golden Sun Moth (Figure 5). Other areas within Saxon Paddock and East Creek are currently secured and managed for the conservation of Golden Sun Moth and remnant NTGVVP (under previous EPBC Act decisions). The Warrambeen Demonstration Landcare Farm is privately owned and supports extensive areas of remnant native grassland.

6.2.1 Previous records

Golden Sun Moth was initially recorded during targeted surveys across the entire paddock in January 2011. The result of the population monitoring at the current offset site known as Saxon (located in the north east corner of Saxon Paddock and East Creek) is provided below (Table 1).

More than 100 moths were recorded during habitat monitoring on 20 November and 7 December 2018 across the southern offset site known as the Hydrox offset (Figure 4). This previous offset site is located within the same paddock and abuts the proposed offset site. In addition, several individuals were recently detected during targeted surveys across 860 Paddock, during the 2018/19 flight period (Biosis unpub. data.).

The species has been recorded predominantly within areas of open ground containing preferred host plants, including wallaby-grasses. The species was recently detected in the highest abundances since the commencement of monitoring which indicates that the active management of the offset is resulting in a higher stocking rate / population of the species across the offset site (Ecology and Heritage Partners 2018d). Targeted surveys were undertaken in accordance with the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009).

Table 2. Golden Sun Moth Population Monitoring within the Saxon Paddock and East Creek offset site.

Survey Year	Golden Sun Moth Abundances	Management Recommendations
2011/12	9	Based on the previous survey results during the 2011/12 targeted surveys and the results of the 2014/15 monitoring, Golden Sun Moth populations have not been reduced within the Saxon Paddock offset site. Active biomass control will provide more areas of open ground and higher native vegetation cover for the species in subsequent years.
2014/15	53	
2015/16	15	While the number of Golden Sun Moth was lower this is likely due to the timing of the surveys as opposed to the quality of habitat on site given conditions have not decreased in quality over the past year.
2017/18	62	The species was detected in high numbers.
2018/19	21 at Saxon offset	The species was detected in high numbers demonstrating that the species still resides in high population numbers within the offset site.

Survey Year	Golden Sun Moth Abundances	Management Recommendations
	*100's across the broader Hydrox offset site and surrounding the Saxon offset	

Note: * Moths were observed flying over the Hydrox offset site to the south of the Saxon offset during the 20 November and 7 December 2018.

6.2.2 Habitat

The main habitat type at the offset site comprises moderate to high Plains Grassland with areas containing a mix of native and introduced species (e.g. Wild Oat *Avena fatua* and Spear Thistle *Cirsium vulgare*) (Plates 8 and 9). Plains Grassland within the proposed offset area is dominated by Knead Spear-grass *Austrostipa bigeniculata*, Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, with a lesser presence of Kangaroo Grass *Themeda triandra*, wallaby-grasses *Rytidosperma* spp., Common Tussock-grass *Poa labillardierei*, Common Wheat-grass *Elymus scaber* var. *scaber* and Long-hair Plume-grass *Dichelachne crinita*. Native herb species present include Chocolate Lily *Arthropodium strictum*, Lemon Beauty-head *Calocephalus citreus*, Common Everlasting *Chrysocephalum apiculatum*, Blue Devil *Eryngium ovinum*, Tall Bluebell *Wahlenbergia stricta* and Scaly Buttons *Leptorhynchus squamatus*.

Areas dominated by pasture included exotic species such as Perennial Rye-grass *Lolium perenne*, Cocksfoot *Dactylis glomerata*, Toowoomba Canary Grass *Phalaris aquatica* and Narrow-leaf Clover *Trifolium angustifolium* var. *angustifolium*. Introduced weeds also present within the proposed offset area include Cat's Ear *Hypochoeris radicata*, Long Stork's-bill *Erodium botrys*, Onion Grass *Romulea rosea*, Yorkshire Fog *Holcus lanatus*, Sweet Vernal-grass *Anthoxanthum odoratum* and Ribwort *Plantago lanceolata*.



Plate 8. Wild Oat across the southern sections of the Saxon Paddock, Warrambeen.



Plate 9. Wild Oat and Spear Thistle across areas of the Saxon Paddock, Warrambeen.



Plate 10. Suitable Golden Sun Moth within proposed Saxon offset site.



Plate 11. Remnant grassland with open areas within the Saxon Paddock.

6.3 Compliance with Offset Principles

The 'EPBC Act Environmental Offsets Policy' (DSEWPac 2012a) outlines a set of principles that a proposed offset must meet to be assessed under the referral process. These principles are detailed below, along with how the proposed offset meets these requirements.

6.3.1.1 Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.

The proposed action at 410 Cooper Street and 315 O'Herns Road, Epping will result in the loss of 54.36 hectares of Golden Sun Moth. The proposed offset sites at Buangor and Warrambeen will protect 153 hectares of Golden Sun Moth habitat of higher quality than the area being removed. The security, protection and long-term management of the offset sites will result in the Golden Sun Moth persisting at both sites. Management actions that will be undertaken to ensure the protection and improvement in habitat quality of the species are outlined in the Golden Sun Moth Offset Management Plans (Appendix 1 and 2), and principally

includes biomass control, weed and pest animal control. There will also be a requirement to ensure that the offset site is secured and managed for conservation purposes in perpetuity.

Management actions described in the Offset Management Plans (Appendix 1 and 2) are to be implemented for a mandatory period of 10 years, and the primary objective of management, which is consistent with the Golden Sun Moth Significant Impact Guidelines (Page 7 in DEWHA 2009), is to ensure actions that may lead to the loss, degradation or fragmentation of Golden Sun Moth habitat are avoided. These actions include:

- Clearing of grassland or grassy woodland, including soil cultivation;
- Modification of habitat (e.g. changes to shading, hydrology, wind patterns, species composition);
- Management practices (e.g. changes in fire regime, slashing, mowing, increases or decreases in the intensity of a grazing regime);
- Weed cover is managed in perpetuity to ensure it does not increase beyond the level attained at year 10 of management, and prevention and control of any new and emerging weeds; and,
- Chemical application (e.g. pesticides, herbicides, fertilisers).

The offsets will be achieved through the active implementation of the Offset Management Plans and ensuring weed levels are reduced and native grass cover is maintained and enhanced. This will deliver improved conservation outcomes for the species, which is aligned with the objectives outlined in Golden Sun Moth Significant Impact Guidelines (DEWHA 2009).

6.3.1.2 Suitable offsets must be built around direct offsets but may include other compensatory measures.

Offsets for the proposed removal of Golden Sun Moth habitat will be achieved through direct offsets. Based on the EPBC offset calculators, the retention and management of 153 hectares of Golden Sun Moth habitat at the proposed offset sites located at Buangor and Warrambien mitigates 103.72% and 100.74%, respectively, of the proposed removal of 54.36 hectares of habitat (Appendix 3). This exceeds the minimum 90% direct offset requirement and is in accordance with the Commonwealth Environmental Offset Policy (DSEWPac 2012a).

The offset sites will be permanently protected via Trust for Nature covenants.

6.3.1.3 Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.

Golden Sun Moth is listed as critically endangered under the EPBC Act. The proposed removal of Golden Sun Moth habitat has been processed through the Offset Assessment Guide offset calculator (DSEWPac 2012b). The proposed offsets are in proportion to the level of statutory protection that applies to the community. The protection of 153 hectares of Golden Sun Moth habitat will exceed the offset requirement for a direct offset (Appendix 3).

6.3.1.4 Suitable offsets must effectively account for and manage the risks of the offset failing.

The use of a direct offset presents a lower risk than other compensatory measures as permanent security, and ongoing management and monitoring is more likely to result in a conservation gain for Golden Sun Moth and associated habitat. An on-title security agreement is currently being prepared for both of the proposed offset sites, with a Golden Sun Moth Offset Management Plan site being included on-title once approved. The

existing size, the landscape context and the quality of the proposed offset at Buangor and Warrambeen greatly reduces the risk of the offsets failing. The offset sites support known Golden Sun Moth populations and grassland habitat that will be actively managed to promote and enhance the existing values (e.g. there is a commitment from both landowners to improve the habitat quality and stocking rate of the species at the offset sites). Key threats such as weed spread, lack of biomass removal and/or over grazing will all be proactively managed by the landowners in accordance with the approved Offset Management Plans, and the management of these threats will ensure that Golden Sun Moth population and habitats present across the sites are protected and expanded, thus delivering an improved conservation outcome for the species.

The Offset Management Plans outline management and monitoring actions that must be implemented to maintain and improve the offset sites. Adaptive management under each element will identify the procedures to be followed if the objectives have not been met. The landowner will report to DoEE and also Trust for Nature against the habitat management actions, and specific monitoring and auditing obligations established under the EPBC Act approval conditions.

6.3.1.5 Offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under schemes or programs.

The offset sites are privately owned and is currently zoned Farming Zone (FZ), with the northern portion of the Buangor property covered by a Vegetation Protection Overlay (VPO). The local planning regulations that apply to the offset sites do not require any offsets to be established under any existing schemes or programs. The landowner is not in receipt of any stewardship funding from any conservation programs or schemes.

The 153-hectare area proposed for the Golden Sun Moth offset is not already in use as an offset site for any other projects or past planning outcomes, nor has the two offset sites previously been reserved for any other conservation program. As such, the proposed offsets are additional to what is required under the planning regulations or determined by law, thus meeting the additionality requirement to qualify as suitable offsets.

At present, pasture improvement activities and fertiliser application, along with high stocking rates, remain existing rights at the proposed offset sites, and without a security agreement in place and an approved management plans, there is a high probability that the Golden Sun Moth population and habitat will be degraded or lost.

The proposed offset sites are proposed to meet offset obligations under Commonwealth policy and are not proposed to meet offset obligations under the Victorian native vegetation policy as no State offsets are required for the proposed development.

6.3.1.6 Offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.

Direct protection and management of 153 hectares of Golden Sun Moth habitat is the most effective and efficient means of achieving offsets. For the current project, offsets are to be secured and implemented as soon as approval for the action is provided. The Offset Management Plans contain known management practices to protect and manage remnant native vegetation present at the offset sites (Appendix 1 and 2).

6.3.1.7 *Suitable offsets must have transparent governance arrangements, including being able to be readily measured, monitored, audited and enforced.*

The Offset Management Plans include clear objectives, detailed management actions, and monitoring and reporting requirements. In addition, the landowners and Fraser Property Australia will report against required management actions, monitoring and auditing obligations established under the EPBC Act approval conditions.

In accordance with DoEE's requirements, monitoring reports are required to be submitted over the 10 years of the management plan.

6.3.2 Offset Management Plans

Two Offset Management Plans have been prepared that outline the ongoing security and management arrangements, including management actions and the roles and responsibilities of the various parties in establishing and managing the offset site (Appendix 1 - Ecology and Heritage Partners 2019a, Appendix 2 – Ecology and Heritage Partners 2019b). For these OMP, the Landowners shall also be the Land Manager.

6.3.3 Completed Offset Assessment Guide Calculator

The EPBC Act Environmental Offset Policy (DSEWPac 2012a) provides the details of the offsetting approach for matters of National Environmental Significance; this includes an Offset Assessment Guide and offset calculator.

The Offset Assessment Guide offset calculator (DSEWPac 2012b) has been completed to determine the area of offset required to adequately compensate for the removal of 54.36 hectares of Golden Sun Moth habitat as part of the proposed development. The Offset Assessment Guide / offset calculator for the two proposed offset sites are provided in Appendix 2, with a justification for the scores given provided below.

As outlined in DSEWPac (2012a) the key principals pertaining to the suitability of a proposed offset have been considered as part of the selection and preparation of the proposed OMPs for the two offset sites (i.e. Buangor and Warrambeen). Consistent with the policy (DSEWPac 2012a) the proposed offset sites achieve the following:

1. Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment (i.e. Golden Sun Moth) that is protected by national environment law and affected by the proposed action;
2. Is built around direct offsets but may include other compensatory measures;
3. Is in proportion to the level of statutory protection that applies to the protected matter;
4. Is of a size and scale proportionate to the residual impacts on the protected matter;
5. Accounts for and manage the risks of the offset not succeeding;
6. Is additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs;
7. Is efficient, effective, timely, transparent, scientifically robust and reasonable; and,
8. Has transparent governance arrangements, including being able to be readily measured, monitored, audited and enforced.

Additionally, in accordance with the EPBC Act Environmental Offset Policy (DSEWPaC 2012a) the proposed offset sites and management actions are anticipated to achieve the required conservation gains by;

1. The improvement of existing habitat for Golden Sun Moth (2-point improvement score of habitat);
2. Creating new habitat for Golden Sun Moth through the provision of revegetation / direct seeding of native grasses; and
3. Averting the loss of known Golden Sun Moth habitat by placing an on-title security mechanism which will prevent any future development intensification of land use such as dairy farming or increased stocking rates and cropping.

6.3.4 Offset Calculator Justification

Based on the EPBC offset calculators, the retention and management of 153 hectares of Golden Sun Moth habitat at the proposed offset sites located at Buangor and Warrambeen mitigates 103.72% and 100.74%, respectively, of the proposed removal of 54.36 hectares of habitat (Appendix 3). This exceeds the minimum 90% direct offset requirement and is in accordance with the Commonwealth Environmental Offset Policy (DSEWPaC 2012a).

6.3.5 Details of Offset Site Security

The broader offset site is currently in the process of being protected in perpetuity through a Trust for Nature covenant. It is intended that the Offset Management Plans prepared for the offset sites will be included as part of the Trust for Nature covenants, and the management actions contained within these Plans will be need to be implemented to ensure the ongoing management of Golden Sun Moth habitat.

6.3.6 Estimated Cost of Offset

The final cost of the offsets will ultimately be negotiated and finalised between the Proponent and the landowner.

7 OTHER APPROVALS AND CONDITIONS

7.1 State Approvals

As outlined above (Section 2) the study area is within an area identified as an appropriate location to accommodate future industrial land use and development. The Development Plan Overlay ensures that the land is planned and developed in an integrated, strategic and comprehensive manner, and ensures that all applicable planning issues (including stormwater management, traffic, landscaping, heritage) are resolved to the satisfaction of the Responsible Authority prior to commencement of any development.

The Development Plan has been endorsed by the City of Whittlesea, with a subsequent planning permit for development required from the City of Whittlesea. The permit will contain conditions provided by DELWP relating to compliance with the State's native vegetation policy.

7.1.1 *Planning and Environment Act 1987*

The Planning and Environment Act 1987 outlines the legislative framework for planning in Victoria and for the development and administration of planning schemes. All planning schemes contain native vegetation provisions at Clause 52.17 which require a planning permit from the relevant local Council to remove, destroy or lop native vegetation on a site of more than 0.4 hectares, unless an exemption under clause 52.17-7 of the Victorian Planning Schemes applies.

The study area is located within the City of Whittlesea municipality. The following zoning and overlays will apply (DELWP 2018c):

- Industrial 1 Zone (IN1Z);
- Design and Development Overlay – Schedule 2 (DDO2); and
- Development Plan Overlay – Schedule 24.

There are no other specific environmental or biodiversity-related implications contained in the application requirements or decision guidelines of these zones and overlays. A planning permit to remove scattered individual native grasses [although there are no 'patches' as defined under the Guidelines (DELWP 2017)] may be required under Clause 52.17 of the City of Whittlesea planning scheme.

7.1.2 *Flora and Fauna Guarantee Act 1988*

The FFG Act is the primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna in Victoria. Proponents are required to apply for an FFG Act Permit to 'take' listed and/or protected flora species, listed vegetation communities and listed fish species in areas of public land (i.e. within road reserves, drainage lines and public reserves). An FFG Act permit is generally not required for removal of species or communities on private land, or for the removal of habitat for a listed terrestrial fauna species.

There is suitable habitat within the study area for species listed or protected under the FFG Act. However, the study area is privately owned, as such a permit under the FFG Act is not required.

7.1.3 ***Catchment and Land Protection Act 1994***

The *Catchment and Land Protection Act 1994* (CaLP Act) contains provisions relating to catchment planning, land management, noxious weeds and pest animals. Landowners are responsible for the control of any infestation of noxious weeds and pest fauna species to minimise their spread and impact on ecological values.

Weeds listed as noxious under the CaLP Act were recorded (~90-100% cover) during the assessment (Chilean Needle-grass, Artichoke Thistle, Spear Thistle, and Sweet Briar). Similarly, there is evidence that the study area is currently occupied by several pest fauna species listed under the CaLP Act (European Rabbit; Red Fox).

7.1.4 ***Wildlife Act 1975 and Wildlife Regulations 2013***

The *Wildlife Act 1975* (and associated Wildlife Regulations 2013) is the primary legislation in Victoria providing for protection and management of wildlife. Authorisation for habitat removal may be obtained under the *Wildlife Act 1975* through a licence granted under the *Forests Act 1958*, or under any other Act such as the *Planning and Environment Act 1987*. Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*, issued by DELWP.

There is unlikely to be any ongoing management or monitoring requirements relating to ecology that will be stipulated as a planning permit condition for the proposed development.

8 SOCIAL AND ECONOMIC CONSIDERATIONS

8.1 Planning Context

The study area was included within the Urban Growth Boundary introduced in 2002 and with subsequent iterations of the Metropolitan Melbourne Strategy it has been identified for future urban purposes. The most recent update to the 2014 Metropolitan Strategy was completed in 2017 and referred to as Plan Melbourne Refresh. Public consultation for that major review occurred between October and December 2015, and involved 266 participants from 99 organisations with 397 submissions lodged. The study area has been identified as a future State Significant Industrial Precinct.

At a local municipal level, the City of Whittlesea began a review of the subject site and surrounding area in April 2016 for the purpose of seeking feedback on Council's position for future use and development in the precinct. The Draft Cooper Street West Position Paper was placed on non-statutory public consultation between 11 April to 6 May 2016 with letters sent to landowners, occupiers and stakeholders surrounding the precinct. Eleven submissions were received citing general support and clarifications. Several State agencies responded including: Merri Creek Management Committee, Sustainability Victoria, Minerals Development Victoria, VicRoads, DELWP and the Environment Protection Authority. The position paper supported the industrial development on the subject site and was adopted by Council in June 2017 and subsequently reaffirmed in October 2017.

The rezoning of the subject site was commenced in February 2017 when City of Whittlesea sought authorisation to planning Scheme Amendment C113. The Minister for Planning provided consent for the process to commence, and also approved a limited notification of the amendment under s20(2) of the *Planning and Environment Act 1987* given the level of prior consultation. Council adopted the amendment following the normal planning process at its meeting in December 2017. There were no outstanding submissions, and therefore a Ministerial Appointed Independent Planning Panel was not required. Amendment C113 was gazetted in the Victorian Government Gazette and the land formally rezoned to an Industrial 1 Zone on 11 October 2018.

8.2 Social and Economic Benefits

The Explanatory Report prepared prior to the approved rezoning stated the following social benefits relating to the proposed rezoning:

The amendment will provide a number of positive social and economic effects. The rezoning of the land will expand the boundaries of the existing Cooper Street Employment Precinct, and this will facilitate further employment opportunities in the northern growth corridor of Melbourne in line with Council and State policy.

The proposed planning scheme amendment is also in line with the community priorities and Council's response in delivering on community needs as such the need for "growing our economy" and identifies "a diverse economy offers varied career opportunities, so people can live and work in Whittlesea". The continuation of strategic planning for these areas for future industrial purposes allows for more industry to develop in this important employment precinct and increases the range and potential for jobs within the municipality, which provides significant economic benefits.

The social benefits of the amendment come from the increased potential for local residents to work closer to home.

In addition, the economic assessment for the proposed Cooper Street West Industrial Rezoning has been undertaken by Deep End Services (Deep End Services 2018) (Appendix 3) and it is stated that:

The land is identified as Precinct 4 Gateway – Emerging Industry within the draft Cooper Street West Position Paper prepared by City of Whittlesea in 2016. More generally, the land is within the defined Cooper Street Employment Precinct which in recent years has accommodated significant investment in industrial and commercial activity and in state-significant economic infrastructure in the form of the Melbourne Wholesale Fruit Vegetable and Flower Market.

The employment precinct adjoins, and has links with, the Central Epping activity centre ('Epping Central') which is planned as a municipal focus for higher intensity retail, commercial, community, and residential development.

Furthermore, as outlined in Deep End Services (2018):

On the basis of the above, the proposed development would generate a total of 1,330 direct jobs over the construction period. This estimate relates to full-time job-years and would be spread over the period during which construction activity takes place. The total number of people employed on site would be higher, reflecting the fact that construction teams typically employ a mixture of full-time, part-time and casual workers.

With a construction employment multiplier of 2.752 (ABS, 1996-7), a further 2,330 jobs would be indirectly generated elsewhere in the economy.

A further 1,760 direct on-going jobs are projected from the development of the land together with an additional 4,320 indirect jobs generated within the wider local economy. Wider State and National level economic benefits that would be realised include:

- Productivity benefits associated with the location of new employment close to major existing transport infrastructure in the form of the Hume Freeway and the nationally-important Hume economic corridor.
- Efficiency gains associated with the provision of new employment generation capability close to a major urban growth front, therefore reducing travel-to-work times for residents and creating improved city-wide efficiencies.
- Agglomeration effects associated with an expansion to an already-successful industrial precinct, therefore creating opportunities for economic linkages between firms.

9 ENVIRONMENTAL RECORD OF PROPONENT

Frasers Property Australia Pty Ltd have been in the land development industry for a combined total of more than 90 years of operation in Australia. During that period, there have been no breaches of environmental management requirements and standards, including under the EPBC Act.

The proposed action will be undertaken accordance with the Frasers Property Australia Environmental Policy, which has objectives and targets to minimise their environmental footprint by working with stakeholders in compliance with legal and other requirements and be a role model for others to follow in land development practices. Frasers Property Australia have previously referred several projects under the EPBC Act, including:

- 2015/7628 Deebing Heights Residential Development, Queensland
- 2015/7531 Australand Business Park, Queensland
- 2013/6871 West Baldivis Residential Development, Western Australia
- 2010/5694 Greenvale Residential Development, Victoria

Frasers Property Australia holds certification against ISO 14001-2004: Environmental Management System and also accredited under the Federal Safety Commissioner requirements. A Copy of the Health Safety Environment Policy can be down loaded at www.frasersproperty.com.au/about-frasers-property/our-community-investments/health-and-safety.

10 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The National Strategy for Ecologically Sustainable Development (1992) sets out the policy framework for the Australian Government to make decisions and take actions to pursue ecologically sustainable development (ESD).

The National Strategy requires government departments to develop institutional arrangements to ensure that the principles and objectives of ESD are delivered and sets out the following core objectives for achieving ESD:

- To enhance individual and community well-being by following a path of economic development that safeguards the welfare of future generations
- To provide for equity within and between generations
- To protect biological diversity and maintain essential ecological processes and life-support systems.

The project response to the EPBC Act principals of ESD are provided below:

The proposed action has long-term and short-term economic, environmental, social and equitable considerations.

The proposed development will provide several positive social and economic effects. The rezoning of the land will expand the boundaries of the existing Cooper Street Employment Precinct, and this will facilitate further employment opportunities in the northern growth corridor of Melbourne. The purpose of this policy is to provide both industrial and commercial employment opportunities to the precinct. The proximity of the development to ongoing residential development throughout the City of Whittlesea ensures that the following considerations are met:

- Economic and Social: by providing employment opportunities to the residents in the immediate surrounds; and,
- Environmental: by providing the opportunity to reduce commuting times for nearby residents, minimising greenhouse gas emissions and traffic congestion.

The precautionary principle which states that a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation where there are threats of serious or irreversible environmental damage.

Robust environmental assessments have been completed to assess the impacts of the project, including ecological assessments, cultural and historic heritage assessments, stormwater assessments and a landfill gas risk assessment. The level of assessment undertaken for this project provides a sound basis for understanding the known project impacts and in developing effective Offset Management Plans to compensate for the project impacts.

The principle of inter-generational equity which states that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

Given that Golden Sun Moth habitat comprises noxious weed (Chilean Needle-grass), it is not considered practical to retain this habitat, as the continued spread of this weed will result in a long-term reduction in other ecological values within the locality, and broader region.

The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.

As outlined above, given that Golden Sun Moth habitat comprises Chilean Needle-grass, it is not considered practical to retain this habitat, as the continued spread of this weed will result in a long-term reduction in other ecological values within the locality, and broader region.

Improved valuation, pricing and incentive mechanisms should be promoted.

This ESD principal is not considered to apply to this project. Frasers Property Australia has a strong track record in sustainable development philosophy (e.g. green star/living building challenge) and have won numerous awards for their developments across Australia (Urban Development Institute of Australia and Property Council Australia).

11 PROPOSED CONDITIONS

Fraser Property Australia intends to meet the offset obligations generated by the proposed removal of 54.36 hectares of Golden Sun Moth habitat at suitable offset sites located at 222 Chalicum Road, Buangor, Victoria (63 hectares), and at the Saxon Paddock and East Creek, and 860 Paddock (90 hectares), within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, Victoria. Golden Sun Moth has recently been recorded at both of the proposed offset sites during targeted surveys (Ecology and Heritage Partners Pty Ltd 2018c). Both offset sites will be protected and managed in perpetuity.

The project should be approved subject to conditions, including the proposed security and management of the two proposed offset sites, along with regular reporting and auditing requirements to ensure the management commitments outlined in the Golden Sun Moth Offset Management Plans (Appendix 1 and 2) are undertaken, and that the Golden Sun Moth populations persists across both sites.

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FIGURES

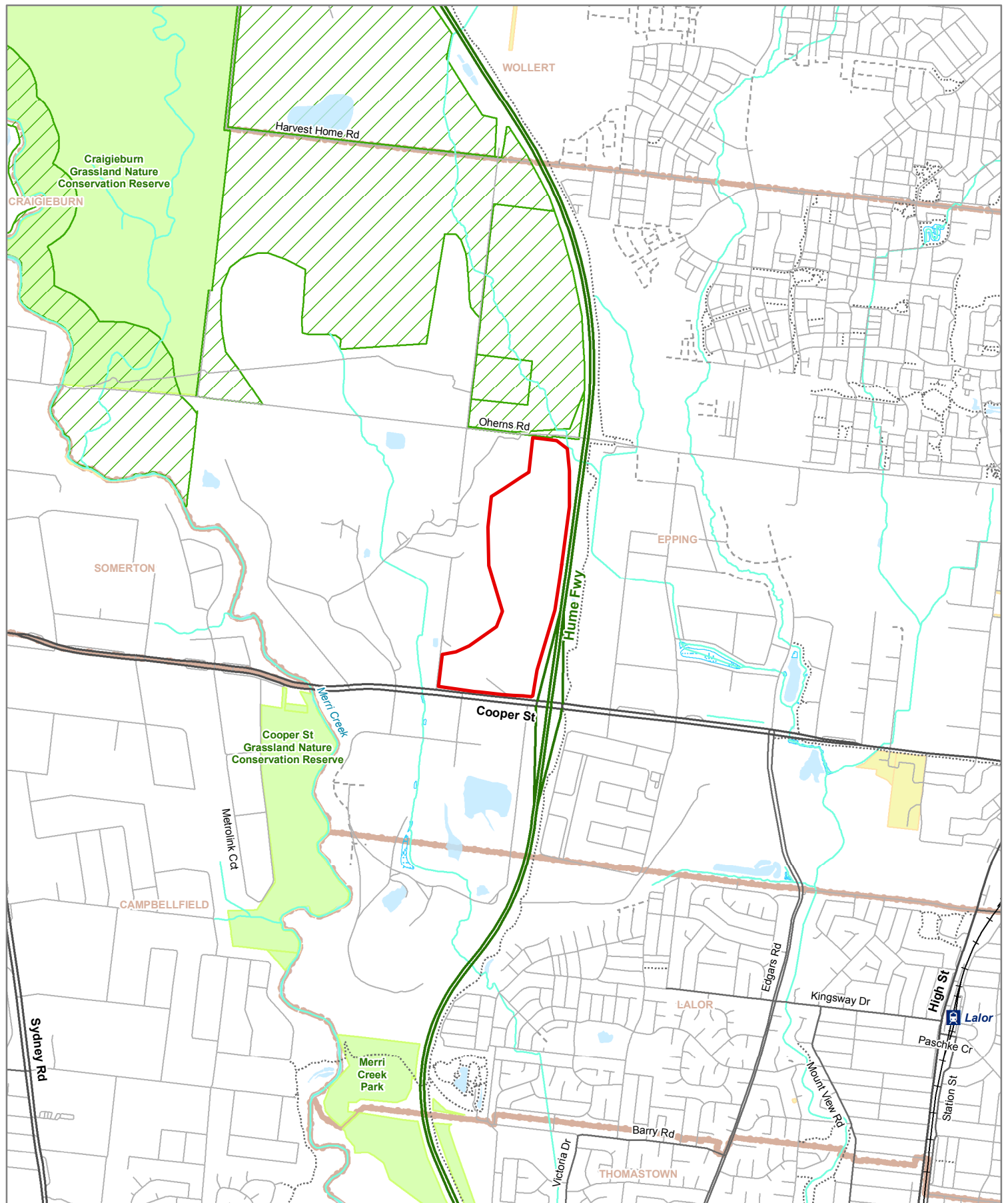
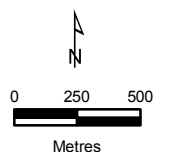


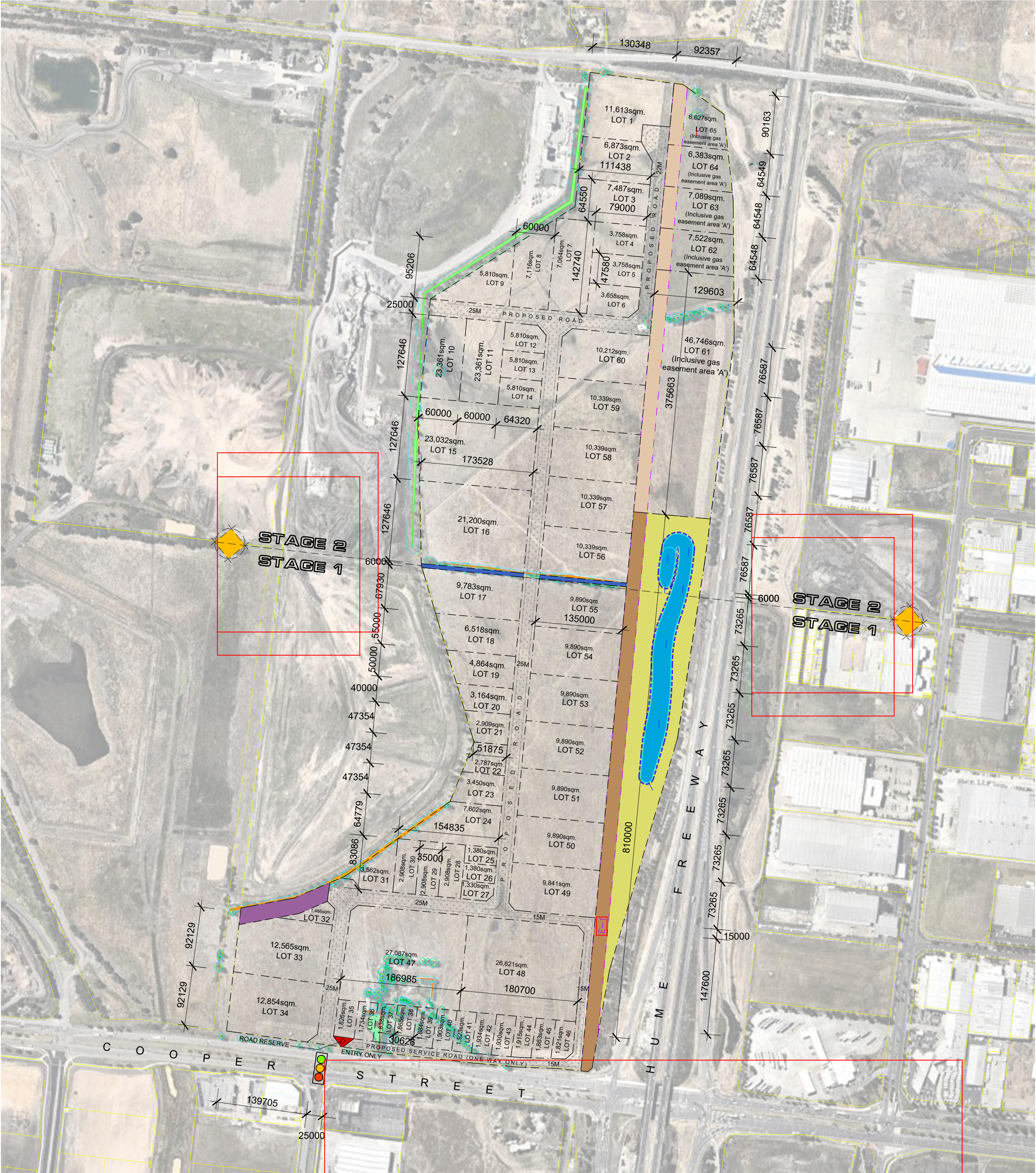
Figure 1
Location of the Study Area
 315 O'Herns Road,
 Epping

Legend

- | | |
|--|--|
| Study Area | Permanent Waterbody |
| Railway | Wetland/Swamp |
| Freeway | BCS Conservation Area |
| Major Road | Parks and Reserves |
| Collector Road | Crown Land |
| Minor Road | Localities |
| Proposed Road | |
| Walking Track | |
| Minor Watercourse | |



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Melbourne Water Land Take Up = 46,950sqm.



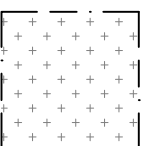
21M Gas Easement 'A' = 13,924sqm.
(Excluding development land area - Lots 61, 62, 63, 64 ,65)



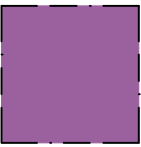
21M Gas Easement 'B' = 18,053sqm.



Road Reserve = 263sqm.



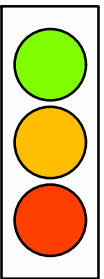
Proposed Internal Road = 62,602sqm.



Future Acquired Land for Road Extension = 3,566sqm.



Drainage Reserve = 1,760sqm.



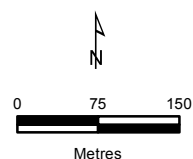
Future Signalized Intersection.



Figure 3
Areas of Golden Sun
Moth Habitat and
location of Tile Grids
 315 O'Herns Road,
 Epping

Legend

- Study Area
- Golden Sun Moth Habitat (54.36 ha)
- Striped Legless Lizard Tile Grids
- Not suitable habitat (cleared areas and/or dominated by phalaris)



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Legend

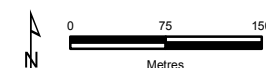
- Study Area
- Proposed offset site (63 ha)
- 6m internal buffer

Golden Sun Moth records

- Survey date: 23/11/2017
- Survey date: 28/11/2017
- Survey date: 16/12/2017
- Previously recorded Golden Sun Moth records (2011)



Figure 4
Proposed Offset Site
Challicum Road, Buangor



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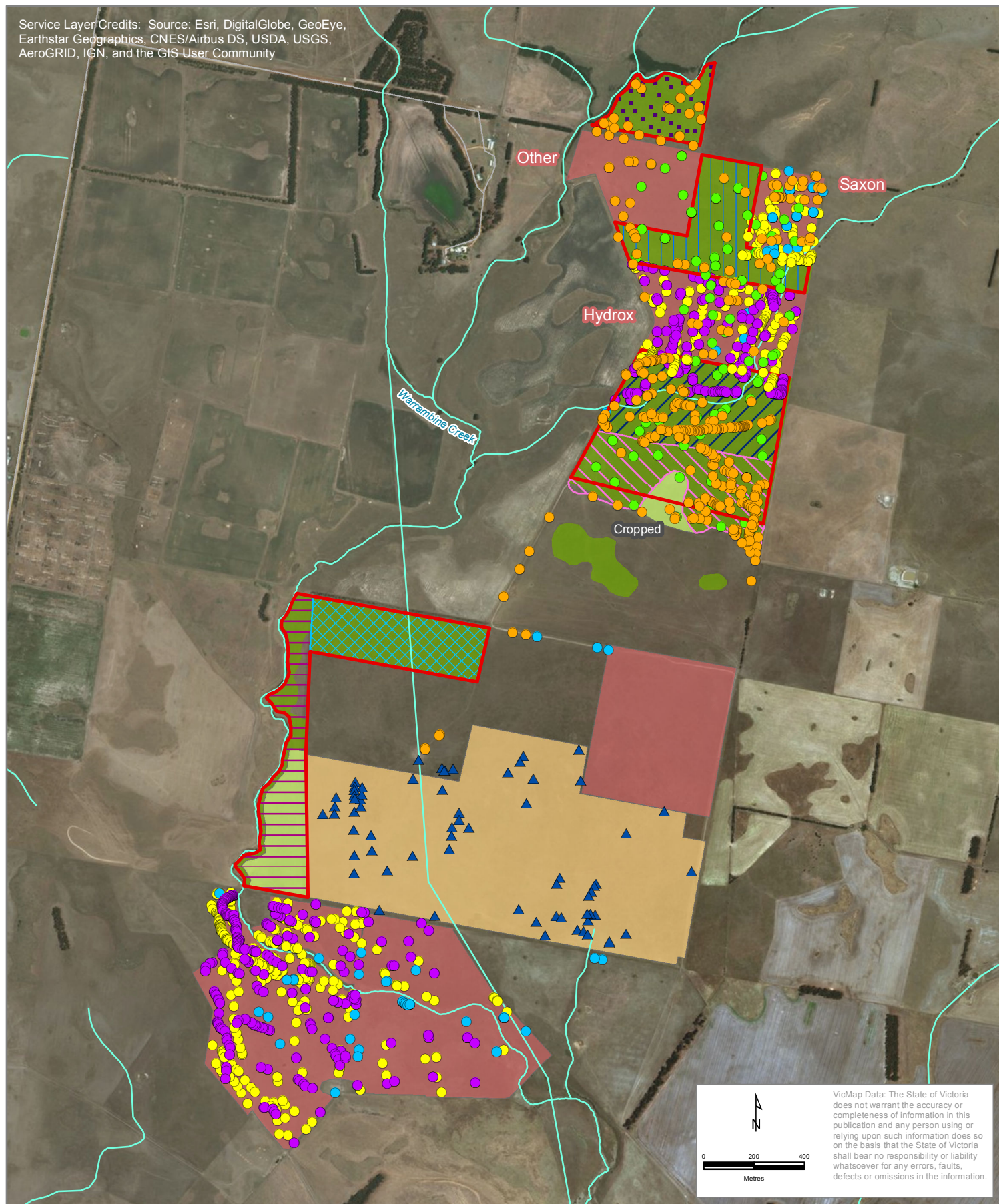


Figure 5
Proposed Golden Sun Moth offset site, previous Golden Sun Moth records and weed cover
Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer

Legend

- Proposed offset sites (90 ha)
- Existing offset sites
- Potential offset site (Biosis 2018/19)

Vegetation

- Plains Grassland
- Native and exotic grasses

- ▲ Confirmed Golden Sun Moth sightings (Biosis 2018/19)

Golden Sun Moth records (Ecology and Heritage Partners):

- 2018
- 2017
- 2016
- 2015
- 2011

Weed cover

- 10% (Wild Oats and Spear thistle)
- 10-15% (Wild Oats and Spear thistle)
- 15-20% Oats
- 20% Oats
- 25-30% (Wild Oats and Phalaris)
- 60-70% Oats

APPENDICES

APPENDIX 1. GOLDEN SUN MOTH OFFSET MANAGEMENT PLAN (BUANGOR)

Final Report

Golden Sun Moth *Synemon plana* Offset Management Plan: 222 Challicum Road, Buangor, Victoria (EPBC 2018/8167)

Prepared for

Frasers Property Australia Pty Ltd

April 2018



Ecology and Heritage Partners Pty Ltd

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DOCUMENT CONTROL

Assessment	Golden Sun Moth <i>Synemon plana</i> Offset Management Plan for proposed offset site: Buangor, Victoria
Address	222 Challicum Road, Buangor, Victoria
Project number	10246
Project manager	Andrea Fullagar (Zoologist)
Report author(s)	Andrea Fullagar (Zoologist)
Report reviewer	Aaron Organ (Director / Principal Ecologist)
Mapping	Monique Elsley
File name	10246_EHP_GSM-OMP_Buangor_FINAL_23042019
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Finalv4	No comments. Minor updates made	AO	23042019

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- Frasers Property Australia Pty Ltd for project and site information.
- The landowner for access onto the proposed offset site and site information.
- Commonwealth Department of the Environment and Energy (DoEE) for providing comments on the Plan.
- Victorian Department of Environment, Land, Water and Planning (DELWP) for access to online ecological databases.

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DECLARATION OF ACCURACY

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan (EPBC 2018/8167: Golden Sun Moth Offset Management Plan: 222 Challicum Road, Buangor, Victoria) is complete, current and correct.
2. I am duly authorised to sign this declaration on behalf of the approval holder.
3. I am aware that:
 - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
 - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

Full name (please print)

Organisation (please print)

Date

EXECUTIVE SUMMARY

Introduction

Frasers Property Australia Pty Ltd (Frasers Property), propose to subdivide a property located at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria into an industrial estate. Targeted surveys at this site were undertaken during the 2011/12 and 2017/18 flight seasons of the critically endangered (listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) Golden Sun Moth *Synemon plana*. A Golden Sun Moth population was confirmed at the site.

An EPBC Act referral was submitted to the Commonwealth Department of the Environment and Energy (DoEE) for the proposed development (EPBC Act Referral 2018/8167) and on 9 May 2018 the proposed action was determined a 'Controlled Action' as it would lead to a 'significant impact' on Golden Sun Moth. The proposed development will be assessed by Preliminary Documentation.

Offset site

The Golden Sun Moth offset site is 63 hectares in size and is located at 222 Challicum Road, Buangor. The offset site supports a population of Golden Sun Moth (confirmed during targeted surveys in 2012) has been identified, and this site will be secured and managed to compensate for any permitted removal of confirmed Golden Sun Moth population and habitat at the proposed development site. This Golden Sun Moth Offset Management Plan (GSMOMP) forms part of the requirement to address '*Section 6 Residual Impacts and Proposed Offsets*' of the Preliminary Documentation.

Habitat

This site supports Plains Grassy Woodland (EVC 55) with an open structure with a variable understorey of native (primarily wallaby grasses *Rytidosperma* spp., Kangaroo Grass *Themeda* spp. and spear grasses *Austrostipa* spp) and exotic grasses (annual and perennial species, including *Phalaris*). Many areas where Golden Sun Moth was detected support a high percentage cover (>50%) of native grasses, while other areas are dominated by either a mix of native and exotic grasses. The property is currently lightly grazed and hasn't experience pasture improvement (superphosphate application) for several years. There are low levels of regenerating River Red-gums *Eucalypts camaldulensis*. There are low to moderate levels of disturbance from sheep grazing. Consistent with the Golden Sun Moth Significant Impact Guidelines, the proposed offset site is open with minimal shading with areas comprising bare or sparsely covered ground between grass tussocks (inter-tussock space).

Objectives of the Offset Management Plan

This GSMOMP provides detailed management actions for the identified Golden Sun Moth population at the offset site that will lead to a net benefit for the species. The proposed removal of suitable habitat at the development site will be offset through the protection of 63 hectares of suitable Golden Sun Moth habitat. Accordingly, this GSMOMP takes an adaptive management approach to conserving the species.

The objectives of the GSMOMP are to provide:

- A summary of the results of the previous targeted surveys undertaken at the offset site;
- A description of the offset site and an evaluation of its suitability as an offset;
- Detailed management actions to protect and enhance habitat present on the site;

- A detailed 10-year Management Plan; and,
- Outline monitoring and reporting requirements to satisfy the requirements under the EPBC Act.

This GSMOMP will allow for a net benefit to the Golden Sun Moth through long-term protection and management of the existing population at the proposed offset site.

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1 INTRODUCTION

1.1 Background

Frasers Property Australia Pty Ltd (Frasers Property), propose to subdivide a property located at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria into an industrial estate (Figure 1). Targeted surveys at this site were undertaken during the 2013/14 and 2017/18 flight seasons of the Critically Endangered (listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) Golden Sun Moth *Synemon plana* (Ecology and Heritage Partners Pty Ltd 2018a, 2018b). A Golden Sun Moth population was confirmed at the site.

An EPBC Act referral was submitted to the Commonwealth Department of the Environment and Energy (DoEE) for the proposed development (EPBC Act Referral 2018/8167) and on 9 May 2018 the proposed action was determined a 'Controlled Action' as it would lead to a 'significant impact' on Golden Sun Moth. The proposed development will be assessed by Preliminary Documentation (Ecology and Heritage Partners 2018c).

A suitable offset site located at 222 Challicum Road, Buangor that supports a population of Golden Sun Moth (confirmed during targeted surveys, Ecology and Heritage Partners 2018d) has been identified, and this site will be secured and managed to compensate for any permitted removal of confirmed Golden Sun Moth population and habitat at the proposed development site (Figure 1). This Golden Sun Moth Offset Management Plan (GSMOMP) forms part of the requirement to address 'Section 6 Residual Impacts and Proposed Offsets' of the Preliminary Documentation.

1.2 Objectives

This GSMOMP sets out the approach to be taken by Frasers Property Australia to ensure that the development of the project has a net benefit to Golden Sun Moth at the offset site. The offset site will be managed solely for Golden Sun Moth and all actions will be undertaken by personnel experienced in the management of grassland / grassy woodland habitats. The objectives of the GSMOMP are to provide:

- A summary of the results of the previous targeted surveys undertaken at the offset site;
- A description of the offset site and an evaluation of its suitability as an offset;
- Detailed management actions to protect and enhance habitat present on the site;
- A detailed 10-year Management Plan; and,
- Outline monitoring and reporting requirements to satisfy the requirements under the EPBC Act.

1.3 Previous Records

Golden Sun Moth has previously been recorded at the offset site as recently as 2018 during targeted surveys (Ecology and Heritage Partners Pty Ltd 2018d) (Plate 1). Several individuals were also previously observed during the 2011/12 flight season in the north-western portion of the proposed offset site in areas dominated by native grasses, during targeted surveys as part of the Western Highway Duplication (Ecology and Heritage Partners 2012) (Figure 3).

Targeted surveys were undertaken in accordance with the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009). The most recent surveys were undertaken on 23 and 28 November, and 16 December 2017 (Ecology and Heritage Partners Pty Ltd 2018d) during the species' flight season, and although four site surveys are generally required to confirm presence of the species at a site (DEWHA 2009), three separate survey days were considered adequate to determine the presence of the species, and to obtain an understanding of numbers of moths and distribution across the proposed offset site.

2 OBJECTIVES AND CONTEXT OF THE PROJECT

2.1 The Impact Area

2.1.1 Extent

A maximum of 54.36 hectares of Golden Sun Moth habitat is proposed to be removed for industrial development in Epping. A masterplan has been prepared and the proposed development of the site will result in the removal of all Golden Sun Moth habitat (Figure 2). The plan relates to the offset of 22 hectares of Golden Sun Moth habitat, while the remaining 29.66 hectares of habitat will be offset at another site in western Victoria.

2.1.2 Habitat

The habitat proposed to be removed is 100% cover by the noxious Chilean Needle Grass *Nassella neesiana*, with the occasional native wallaby grasses scattered throughout (Ecology and Heritage Partners 2018a, 2018b). These areas currently provide suitable habitat for Golden Sun Moth.

2.1.3 Significance of Impact

Given that habitat known to support Golden Sun Moth is proposed to be impacted, the development has resulted in a 'significant impact' under the definition outlined in the Significant Impact Guidelines for Golden Sun Moth (DEWHA 2009b). As the entire Epping site is proposed to be developed, this will result in the complete removal of known Golden Sun Moth habitat on that site. As such, an offset site (off-site) at Buangor, Victoria will be secured and managed to ensure that there is a net gain in the population and associated habitats over the 10 years. The proposed offset site has recent records of Golden Sun Moth and contains suitable Golden Sun Moth habitat, and active management of the site result in the long-term conservation of the species (see below).

2.2 The Offset Site

2.2.1 Golden Sun Moth Offset Site Location and Characteristics

The proposed Golden Sun Moth offset site is 63 hectares in size and is located at 222 Challicum Road, Buangor (Figure 2). The study area is zoned Farming (FZ) and has a Vegetation Protection Overlay (VPO1: Significant and Remnant Vegetation Areas) which covers a small portion of the study area to the north.

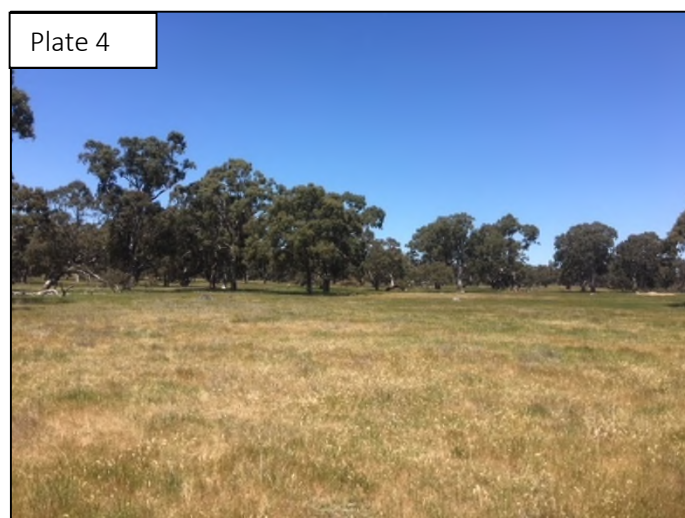
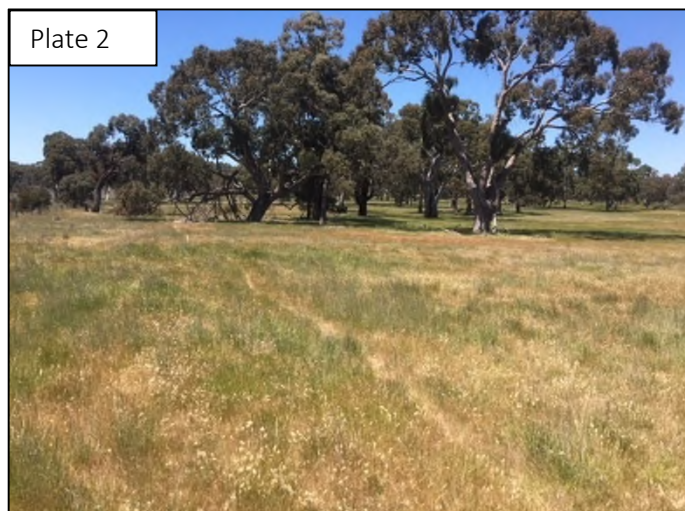
This site supports Plains Grassy Woodland (EVC 55) with an open structure with a variable understorey of native (primarily wallaby grasses *Rytidosperma* spp., Kangaroo Grass *Themeda* spp. and spear grasses *Austrostipa* spp) and exotic grasses (annual and perennial species, including *Phalaris*). Many areas where Golden Sun Moth was detected support a high percentage cover (>50%) of native grasses, while other areas are dominated by either a mix of native and exotic grasses (Figure 3) (Plates 2-6).

The property is currently lightly grazed and hasn't experience pasture improvement (superphosphate application) for several years. There are low levels of regenerating River Red-gums *Eucalypts camaldulensis*. There are low to moderate levels of disturbance from sheep grazing. Consistent with the Golden Sun Moth Significant Impact Guidelines (DEWHA 2009), the proposed offset site is open with minimal shading with areas comprising bare or sparsely covered ground between grass tussocks (inter-tussock space).

2.2.2 Vegetation Condition

The proposed offset site comprises Plains Grassy Woodland in varying condition (Plates 1 – 6). The conditions across the site is largely consistent, although some areas (mainly in the centre and eastern portion of the property) support a higher percentage cover of weeds. The most common weed species include Rats-tail Fescue *Vulpia bromoides*, Toowoomba Canary-grass *Phalaris aquatica*, Yorkshire Fog *Holcus lanatus* and Brown-top Bent *Agrostis capillaris*, and these species will be actively managed to ensure the percentage cover of biomass meets the objectives of this offset plan (Section 5). The removal of weeds will expand the extent and increase the quality of Golden Sun Moth habitat, thus leading to an increase in habitat quality from a starting quality of 5 to a target habitat quality of 7.

Plates 1-6. Photos of the study area (November 2017)



2.2.2.1 Surrounding landscape

The offset site is bound by an existing railway line to the north and to the north of that open grazed areas similar to the proposed offset site (Figure 3). Land to the immediate west is currently used for broad acre cropping, while there are open grazed paddocks to the south and east of the site (Figure 3). The paddocks directly to the north and north west of the site support similar understorey habitat (i.e. modified Plains Grassy Woodland, and derived native grassland in areas) to the proposed offset site. These areas are partially connected to the proposed offset site where Golden Sun Moth has also either been positively identified on these properties (Ecology and Heritage Partners 2012) or have a moderate to high potential to support resident populations.

2.2.3 Objectives of the Golden Sun Moth Offset Site

A total of 63 hectares is proposed to be secured and managed as an offset for the species (Figure 3). This plan details methods for the management and conservation of Golden Sun Moth habitat at the offset site over the requisite 10- year management period and into perpetuity. The primary objectives of the Golden Sun Moth offset site are as follows:

- 1) Adequately compensate for the proposed removal of occupied habitat at the proposed impact site;
- 2) Ensure that extant Golden Sun Moth populations will not be destroyed (i.e. cultivated or receive superphosphate); and,
- 3) Ensure Golden Sun Moth site occupancy (distribution) and population (numbers of moths) on average over the 10 years increase as vegetation / habitat quality improves, thus ensuring that the population is viable / persists in perpetuity.

It is anticipated that the management works outlined in this OMP will begin as soon as the offset site is secured and the OMP is approved by DoEE prior to the commencement of the proposed development at Epping.

2.2.4 Security of the offset site

The proposed offset site will be secured via a Trust for Nature covenant and this type of security mechanism meets the requirements under the offset policy (DSEWPac 2012a).

2.2.5 Management

For the offset site to qualify as an appropriate offset to compensate for the approved removal of suitable habitat associated with the proposed industrial development, management actions will be undertaken to increase the quality of habitat of the protected area (Appendix 2). Management actions described in Appendix 3 are to be implemented for a mandatory period of 10 years, and the primary objective of management, which is consistent with the Golden Sun Moth Significant Impact Guidelines (Page 7 in DEWHA 2009), is to ensure actions that may lead to the loss, degradation or fragmentation of Golden Sun Moth habitat are avoided. These actions include:

- Clearing of grassland or grassy woodland, including soil cultivation;
- Modification of habitat (e.g. changes to shading, hydrology, wind patterns, species composition);
- Management practices (e.g. changes in fire regime, slashing, mowing, increases or decreases in the intensity of a grazing regime);
- Weed cover is managed in perpetuity to ensure that weeds are reduced beyond the level attained at year 10 of management, and prevention and control of any new and emerging weeds; and,
- Chemical application (e.g. pesticides, herbicides, fertilisers).

The offsets will be achieved through the active implementation of this OMP and ensuring weed levels are reduced and native grass cover is enhanced. This will deliver improved conservation outcomes for the species, which is aligned with the objectives outlined in Golden Sun Moth Significant Impact Guidelines (DEWHA 2009).

2.2.5.1 *High quality habitat*

High quality Golden Sun Moth 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.

2.2.5.2 *Considerations*

As one of the management options to improve Golden Sun Moth habitat quality, the grazing regime (i.e. intensity, timing and duration) will be maintained or altered from its current rate. A maximum of 200 sheep are currently periodically grazing the property, which is a reduced stocking rate (i.e. the property has a carrying capacity of at least 450 sheep). This may be reduced to ensure that the property is not overgrazed. Biomass management is required to ensure there is sufficient inter-tussock space so that it remains conducive for Golden Sun Moth breeding. Management actions to provide a net benefit for the Golden Sun Moth will focus on habitat improvement actions such as weed control, facilitation of regeneration and active revegetation of native understorey species (i.e. grasses, forbs and herbs).

In addition, cultivation of the land and / or application of superphosphate (fertilizer) will be prohibited.

2.3 Benefit of the Impact / Offset Approach against a 'Do Nothing' Scenario at the proposed Offset Site

The management actions detailed in this Offset Management Plan for the offset area have been designed to provide a net benefit when compared with a 'do nothing' scenario for the Golden Sun Moth within the impact area.

Under a 'do nothing' approach, existing land management practices would continue, without regard to the Golden Sun Moth 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. Alteration of grazing pressure, or not managing the spread of weeds may have a negative impact on the Golden Sun Moth population.

Protection of the area as an offset site provides a degree of certainty as to the future conservation of Golden Sun Moth habitat and facilitates habitat improvement actions, and this removes the current uncertainty around future management actions and their impact on the species. The proposed offset will provide a net conservation benefit for the species compared with a 'do nothing' scenario.

3 RISK ASSESSMENT

An assessment of potential risks associate with the objectives of this plan are outlined within Table 1. All risks are considered manageable and actions within subsequent sections of this OMP address relevant risks.

Table 1. Risk assessment and management table for specific offset site.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
To legally secure approved offset property for conservation	Failure to legally secure approved offset site	Ecology and Heritage Partners will facilitate the security agreement on behalf of the landowner. This will be undertaken as there will be a commitment by the landowner and proponent to do this. IN addition, DELWP will require this for the site to be registered as an offset site for Golden Sun Moth. This is a process that is undertaken regularly and accepted.	Unlikely	Moderate	Low	n/a	Engage a consultant	<u>Low risk</u> : the site is currently in the process of being secured with an on-title agreement through a Trust for Nature Covenant.
	Legislative reform prejudices proposed tenure arrangements for offset properties.	Monitor DoEE, DELWP, LGAs and other legislative bodies on developments regarding offsets. This is a low risk as the process is undertaken regularly.	Rare	High	Low	Newsletters, expert liaison, press releases and direct contact.	Adjust offset calculations accordingly.	
	Landowner-approval holder agreements fail to adequately	Engage an expert to manage the process. Ensure all impacts are suitably offset. The expert will have proven	Unlikely	High	Medium	Quality assurance and monitoring	Revise on-title and/or approval holder agreements.	The site will be protected through a Trust for Nature Covenant. This agreement has a rigorous quality assurance process for all offset sites

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
To achieve performance targets and completion criteria for Golden Sun Moth	address management commitments in the offset plan	experience with the development of the plan. DoEE and DELWP will undertake their QA/QC process to ensure that regularly reporting and demonstration that the actions have been appropriately implemented for the conservation of Golden Sun Moth for the life of the OMP and in perpetuity.						to ensure the landowner agreements address the management commitments in the plan, and that the management actions are adequately implemented during the life of the OMP.
To achieve performance targets and completion criteria for Golden Sun Moth	Adjacent/regional landowner's land management practices fail to support attainment of offset outcomes.	If deemed necessary, liaise with adjacent landholders. Ensure understanding of offset objectives. However, the site is bound by a road to the south and west, a railway line to the north, and an adjoining property to the east, therefore the risk of adjacent landowner management actions impacting the offset site is very low (currently fenced and private property).	Unlikely	High	Medium	Adjacent land practices begin to negatively impact offset site.	Take steps to halt negative impacts. Follow up with stakeholder discussions.	The land parcel to the east of the proposed offset site is agricultural land (grazing). There are no dwellings within 50m of the site. Based on the current land management practices in the region and it is unlikely that any foreseeable land management practices within the vicinity will impact the offset site. In addition, the property is bound by a road to the south and west of the property and a railway line to the north, and therefore being protected from disturbances from adjoining landowners.
	Insufficient funds provided by approval holder to implement the plan.	The proponent will be responsible for adequate funding of the 10-year management actions outlined in this OMP. This will be a requirement of the approval.	Unlikely	High	Medium	Monitoring and/or annual reporting	Review plan for cost efficiencies.	The landholder is committed in ensuring that the offset is managed principally for conservation, and the offset funds provided by the proponent will be paid to the landowner to ensure management

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
To achieve performance targets and completion criteria for Golden Sun Moth		Regular reporting against the management actions at the offset site will be an approval requirement under the EPBC Act for the proposed development.						actions can be adequately implemented. An annual report will be prepared by the landholder for a period of 10 years.
	Stochastic events (wildfire/drought/flood) prejudice attainment of interim performance targets and/or completion criteria for Golden Sun Moth.	Ensure appropriate biomass management. Plan for scheduling delays.	Possible	High	Medium	Monitoring and/or annual reporting	Apply adaptive management to ensure the objectives of the OMP are not compromised.	-
	Approved development on/near project/offset prejudicing plan outcomes.	Ensure proper stakeholder engagement to prevent poor outcomes.	Unlikely	High	Medium	Advertisement of planning scheme amendments/planning permit applications.	Objection to proposed development/laisse with proponent to ensure the proposed development does not compromise the objectives of the OMP.	The offset site is within a rural agricultural landscape, as such, there is a low likelihood of development within adjacent properties. However, should there be any proposed development or intensification of land (e.g. cropping) adjacent to the proposed offset site it is highly unlikely that this will impact the long-term suitability of the site, as the ecological values within the offset site do not rely on habitat values within adjacent land.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
Golden Sun Moth habitat maintained and improved	Drought	Apply adaptive management to ensure the site is not over-grazed	Likely	Moderate	Medium	Drought Event	Apply adaptive management to ensure the site is not over-grazed.	Golden Sun Moth habitat is located within a mosaic of native and introduced grassland, historically subject to drought and occasional wildfire. As such, the Golden Sun Moth habitat and known population on the site is likely to survive / persist after such an event.
	Wildfire		Likely	Moderate	Medium	Wildfire Event		

Notes. L = Likelihood; C = Consequence; RR = Residual Risk

4 UNAVOIDABLE LOSS AND OFFSET OBLIGATIONS

4.1 Unavoidable Loss

The proposed industrial development at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria will result in the removal of a maximum of 54.36 hectares of Golden Sun Moth habitat.

The habitat proposed to be removed consists of Plains Grassland of the Victorian Volcanic Plain bioregion. The vegetation in these areas is dominated (100% cover) by the noxious Chilean Needle Grass, with the occasional native wallaby grasses scattered throughout.

4.2 Offset Obligations

The protection and management of 63 hectares of Golden Sun Moth habitat at the proposed offset site mitigates the impact of the proposed removal of 22 hectares of habitat at the development site. The remaining 20 hectares will be offset at another site in Western Victoria.

5 OFFSET MANAGEMENT PLAN (IMPLEMENTATION)

The offset site will be protected via a Trust for Nature Covenant to ensure that it is secured and managed appropriately in perpetuity. The following section discusses the actions required to implement the GSMOMP. As outlined above, it is anticipated that the management works outlined in this OMP will begin as soon as the offset site is secured and the OMP is approved by DoEE prior to the commencement of the proposed development at Epping.

5.1 Plan for Offset Site

The offset site is to be secured and managed for conservation purposes in perpetuity. The GSMOMP for the proposed offset site consists of implementing a vegetation management plan incorporating weed and biomass control, revegetation, as well as regular monitoring specifically tailored to the ecological requirements of Golden Sun Moth and the maintenance of Plains Grassy Woodland. Details of security and management responsibility are shown below (Table 2).

Table 2. Security and Management Responsibility

Offset Security and Management Responsibility	
Who is liable/responsible for meeting offset requirements?	Approval Holder
Type of security through a covenant under the <i>Victorian Conservation Trust Act 1972 (Vic)</i>	Trust for Nature covenant
Agreement or Planning Permit Number (ID)	TBC
Date 10-year offset management to commence	2019
Date 10-year offset management expires	2029
Registered on title? (Yes/No)	Yes
Offset site management responsibility (i.e. Landowner, Authority Name)	Landowner
Offset Monitoring Responsibility (i.e. Responsible Authority, DELWP)	Landowner

5.2 Adaptive Management Approach

The GSMOMP 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 GSMOMP.

5.3 Management Objectives and Performance Measures

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. The GSMOMP and specified management actions will form a Plan for the long-term management of Golden Sun Moth and its habitat. Management actions described in the OMP (Appendix 1) are to be implemented for a

mandatory period of 10 years, and the primary objective of management, which is consistent with the Golden Sun Moth Significant Impact Guidelines (Page 7 in DEWHA 2009).

As outlined above (Section 2.2.2) the primary objectives of the Golden Sun Moth offset site and the successful implementation of the GSMOMP are as follows:

- 1) Adequately compensate for the proposed removal of occupied habitat at the proposed impact site;
- 2) Ensure that extant Golden Sun Moth populations will not be destroyed (i.e. cultivated or receive superphosphate); and,
- 3) Ensure Golden Sun Moth site occupancy (distribution) and population (numbers and densities of moths) on average over the 10 years increase as vegetation / habitat quality improves, thus ensuring that the population is viable / persists in perpetuity. Although, it is well known that the number of Golden Sun Moth varies within and between flight periods, on average a 10-20% increase in population size and densities is proposed at the offset site.

The overarching key performance measures to demonstrate that the objectives of the Golden Sun Moth offset site and the successful implementation of the GSMOMP have been met are:

- 1) The site is secured (via an on-title agreement) as an offset for the ongoing protection of the Golden Sun Moth and associated habitats; and,
- 2) Golden Sun Moth site occupancy and populations have increases and are self-sustaining in perpetuity (i.e. after the 5 years).

Detailed performance measures for each management actions are provided below (Section 5.5).

The implementation of the GSMOMP will deliver improved conservation outcomes for the species, which is aligned with the objectives outlined in Golden Sun Moth Significant Impact Guidelines (DEWHA 2009).

5.4 Management Costings

Indicative management costings for the 10-year offset plan are provided in Appendix 3. This will account for weed control, revegetation and Golden Sun Moth population monitoring, reporting and project management. The management costs provided below (Appendix 3) have been obtained through detailed discussions with land management contractors (i.e. weed control and revegetation contractors), along with direct seeding companies such as Flora Victoria. Consequently, the costs associated with the implementation of the 10-year plan are based on up to date industry rates that accurately reflect the current market costs for management. However, these management costs are likely to vary in the future depending on who is employed to undertake the management actions, and the type and intensity of specific management actions required across the property to ensure that the GSMOMP objectives are being adequately met.

5.5 Management Actions

The following section discusses the actions required to implement the GSMOMP for the ongoing protection of the existing Golden Sun Moth population. 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, a five-year review will be undertaken to ensure that the management actions and the performance targets have been met over the first 5 years (i.e. time until ecological benefit).

There are several standard actions that 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 rock removal or cropping;
- Limited 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; and,
- Golden Sun Moth populations and habitat are maintained or improved.

Implementation of this management plan is the overall responsibility of the landowner. However, direct management responsibility may be delegated to a designated site manager and/or managing ecologist with annual reports submitted to DoEE and Frasers Property Australia Pty Ltd.

Funding for undertaking security, management and monitoring actions prescribed in this GSMOMP has been agreed between the landowner and Frasers Property Australia Pty Ltd.

Any proposed uses or development of the site which conflict with the landowner's commitments are not permitted under this plan. The sensitivities of the site must be considered with all management actions and all contractors entering the site need to be made aware of the values.

The following management and monitoring actions detailed in this OMP have regard to the following legislations and/or policies:

- *Environment Protection and Biodiversity Conservation) Act 1999;*
- *Flora and Fauna Guarantee Act 1988 (FFG Act);*
- *Catchment and Land Protection Act 1994 (CaLP Act);*
- Commonwealth's Threat abatement plan for competition and land degradation by rabbits (DoEE 2016);
- Sub-regional strategy for the Golden Sun Moth (DEPI 2013b).
- Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*) (DEWHA 2009)
- Approved Conservation Advice for *Synemon plana* (Golden Sun Moth) (DoE 2013)
- Commonwealth Listing Advice on *Synemon plana* (Golden Sun Moth) (TSSC 2002).

Of particular note, weed invasion and inappropriate grazing regimes (overgrazing, or loss of inter-tussock space due to under grazing/lack of fire) are two of the main demonstrated threats to Golden Sun Moth (DEWHA 2009; DoE 2013).

This GSMOMP addresses these demonstrated threats by including management actions aimed at reducing the likelihood of weed invasion, the preparation of an appropriate grazing regime sensitive to the values that exist in the offset site and surrounds.

Further, the actions contained in this GSMOMP address several Priority Actions included in the conservation advice (DoE 2013) that will be undertaken to support to recovery of Golden Sun Moth, including:

- Habitat Loss, Disturbance and Modification:
 - Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate and/or secure inclusion in reserve tenure if possible;
 - Minimise disturbance in areas where the Golden Sun Moth occurs, excluding necessary actions to manage the conservation of the species. Retain and protect natural grassland remnants within the known distribution of the species;
 - Do not destroy habitat and surrounding areas by ploughing;
 - Ensure remnant populations remain connected or linked to each other; in case where remnants have become isolated, consider revegetation to re-establish links and aid dispersal
 - Manage any changes to hydrology that may result in changes to water table levels and/or increased run-off, salinity, or pollution;
 - Monitor known populations to determine the species' status;
 - Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary; and,
 - Identify populations of high conservation priority. Search for the species in suitable habitat in areas that are proposed for development
- Invasive Weeds
 - Control invasions of environmental weeds and pasture species and consider the impact of herbicide use in habitat. Where possible, use methods that directly target weeds such as spot spraying, and hand removal to minimise the adverse impact on Golden Sun Moth; and,
 - Consider re-introducing an appropriate control method where Kangaroo-grass *Themeda australis* has the potential to out-compete wallaby grasses in previously grazed or slashed areas in the proposed offset.
- Trampling, Browsing or Grazing
 - Manage the extent and intensity of grazing to minimise any direct adverse effects on the Golden Sun Moth or its habitat. Indeed, the proposed grazing regime will be suitable for Golden Sun Moth persistence and spread across the site.

5.5.1 Security Arrangements

The offset site will be secured via a Trust for Nature covenant to ensure that the property is managed primarily for conservation purposes in perpetuity.

5.5.2 5 Year Performance Targets

The following interim performance targets have been provided to ensure that the time until ecological benefit is achieved at the proposed offset site after 5 years of the commencement of the OMP:

- Offset site secured via a Trust for Nature covenant;
- An average of 40% native understorey / grass cover;
- Percentage cover of high threat weeds <10%;
- Percentage cover of woody weeds <1%;
- A 20% to 40% cover of bare ground or inter-tussock space;
- The persistence of a Golden Sun Moth population;
- An 20-30% increase in the distribution of Golden Sun Moth;
- Based on targeted Golden Sun Moth survey data the current species' stocking rate at the proposed offset site is estimated to be 2 moths / hectare and the objective of management actions is to increase this to at least 10-20 moths / hectare;
- External fences maintained;
- Areas supporting weeds will be removed (scalped or sprayed) and replaced (direct seeding) with native grasses, with an overall target of at least 60-80% cover of native vegetation in treated areas; and,
- Pest animals such as rabbits controlled with no detectable impacts (i.e. extensive soil disturbance, over grazing) to habitat.

5.5.3 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 entire perimeter of the proposed Golden Sun Moth offset site is currently fenced.

5.5.3.1 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.

5.5.3.2 Performance Targets / Indicators

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;
- No unpermitted access within the offset site, by personnel, vehicles, or stock.

5.5.3.3 *Responsible Personnel*

Monitoring and access within the offset site is the responsibility of the landowner.

5.5.4 Biomass Control

The objective of biomass control within the offset area is to promote and maintain the floristic diversity through the provision of inter-tussock space for germination and recruitment of native flora associated with Plains Grassy Woodland. In addition, these actions will enhance habitat quality for existing flora present within the offset site and assist with minimising the weed growth.

Biomass management is essential to enhance the ecological values throughout the offset site. Biomass management is also required to maintain inter-tussock spaces and prevent excessive competition to grassland forbs. Biomass control will aim to maintain 20% to 40% cover of bare ground or inter-tussock space to allow sufficient space for recruitment of herbs and grasses. If Golden Sun Moth habitat is less than 20% bare ground then biomass reduction will be implemented at the earliest opportunity (with consideration of seasonality to minimise risk to ecological values, life and assets). These targets are based on other offset sites (e.g. Aurora, Epping, in northern Melbourne and at other established offsets in western Victoria such as Warrambeen Landcare Estate).

The current biomass reduction method applied throughout the offset site consists of low-intensity rotational grazing. Sheep are removed during the critical flowering/reproductive period for native species (October to January) then sheep are return to graze between March and September. The current grazing regime is considered an appropriate method for managing biomass given that native vegetation has persisted across the property as a direct result of the grazing disturbance regime.

5.5.4.1 *Managed Grazing (lower stocking rates)*

The offset property has historically been subject to unrestricted grazing. Sheep grazing to reduce biomass is reliable to maintain and improve the ecological values within the offset area. Grazing will be undertaken in a controlled manner to ensure that biomass accumulation control within the offset site is consistent with the standards for management of ecological grazing provided by DELWP (DSE 2009). Grazing of domestic stock will be restricted to the use of sheep. Grazing by other domestic stock, including, but not restricted to, cattle, goats and horses are excluded from the offset site by this plan.

Grazing will occur between February and September and will not exceed a comparatively low stocking rate of 300 sheep for the 63 hectares. The timing of grazing will be strictly controlled to preventing pugging and other soil disturbance within the offset site, and to enhance opportunities for native grasses to grow and set seed during Spring and early Summer.

5.5.4.2 *Actions*

In accordance with the priority actions outlined with the Conservation Advice for the species (DoE 2013, p3-4) and the Significant Impact Guidelines (DEWHA 2009, p4), which outlines re-introduction of control measures to ensure sufficient inter-tussock space and mitigate competition of Wallaby-grasses by Kangaroo-grass, the following management actions will be undertaken:

- Biomass will be managed by sheep grazing to reduce vegetation cover and to ensure 20% to 40% cover of bare ground or inter-tussock space to allow sufficient space for recruitment of herbs and grasses;

- If Golden Sun Moth habitat is less than 20% bare ground then biomass reduction will be implemented at the earliest opportunity (with consideration of seasonality to minimise risk to ecological values, life and assets; and,
- Where required, no stock, or very low numbers of stock (e.g. up to 200 sheep) will be present on the property during the Golden Sun Moth flight period (i.e. between October and late January).
- Ensure adequate grazing to reduce biomass to acceptable cover levels;
- If deemed important for the species in any year, remove sheep, or reduce the stocking rate from the offset site between October to late January. Although this will depend on site conditions; and
- An appropriate land manager/contractor will co-ordinate weed control works with the grazing regime.

5.5.4.3 *Performance Targets / Indicators*

The following key performance targets have been provided to meet the conservation outcomes for Golden Sun Moth, as outlined within the Conservation Advice (DoE 2013, p3-4) and the Significant Impact Guidelines (DEWHA 2009, p4):

- Maintenance and improvement of current vegetation condition, including species diversity and richness;
- Maintenance of suitable vegetation structure throughout the site (i.e. low to moderate biomass levels), and suitable inter-tussock spaces for natural recruitment maintained/provided;
- The maintenance of open structured Plains Grassy Woodland community suitable for the ecological requirements of Golden Sun Moth.

Specific measurable indicators to measure the success of these targets comprise:

- Vegetation cover is maintained at greater than 70% throughout the proposed offset site, and the space (i.e. bare ground) available for native flora species recruitment is between 20% and 40%;
- No greater than 300 sheep will graze the property at any one time. This stocking rate is consistent with previous stocking rates across the property, however this may vary (i.e. more or less stock) depending on seasonal conditions such as rainfall to achieve 20% to 40% cover of bare ground / inter-tussock space;
- Golden Sun Moth populations are not reduced (populations to be monitored as per Section 5.6); and,
- Reduction in soil pugging.

These performance indicators must be recorded during site monitoring and included within annual reports (Section 5.6).

5.5.4.4 *Adaptive Management*

Highly seasonal conditions are not uncommon across western Victoria and can result in variable conditions from year to year (Mavromihalis *et al.* 2013). This is acknowledged within the offset management plan by allowing for a flexible approach to the timing and duration of grazing at the discretion of the Landowner.

5.5.4.5 *Anticipated Outcomes*

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth, as outlined within the Conservation Advice (DoE 2013, p3-4; Section 5.5) and the Significant Impact Guidelines (DEWHA 2009, p4). Specifically, management of grazing and inter-tussock space. The grazing regime specified is consistent with the standards for management of ecological grazing provided by DELWP (DSE 2009), and targets align with the desirable level of open space required for Golden Sun Moth (ACT Government 1998).

5.5.4.6 *Responsible Personnel*

Monitoring and control of grazing within the offset site is the responsibility of the landowner, however, management actions must be undertaken by suitably qualified personnel.

5.5.5 **Weed Control**

The objectives of weed control within the offset site is to enhance the existing Golden Sun Moth habitat by reducing/minimising future invasion by exotic flora. This will be achieved through a combination of controlled pulse grazing (to limit opportunities for weed establishment and seed set in exotic flora), and through on-ground management activities.

The control of weed species is a key management action across 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 undertaken by a suitably qualified contractor or someone with proven plant identification skills.

5.5.5.1 *Woody Weeds*

Few woody weeds are present within the site. Monitoring for new and emerging woody weeds will be conducted throughout the year for the term of the agreement, and any new and emerging woody weeds eliminated.

5.5.5.2 *Herbaceous Weeds*

Whilst the ultimate objective is to eliminate or reduce all weed species to less than 10% 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.

The aim of management is to reduce weed cover below current levels. Several weeds are present across offset site and these weeds will be actively controlled using the methods provided (Table 3) and will be replaced with the key plant species. Monitored will occur every year to ensure that weed cover is reduced. Weeds will be treated before the plant has flowered and set seed.

Annual weeds within the offset site are not considered a significant threat in this environment and will be managed using grazing to reduce their prominence.

Spot spraying with appropriate herbicide is the main method for reducing weed cover. Spot spraying will be undertaken regularly, particularly in spring and early summer, with a focus on killing weed plants prior to seed set. Biomass control is also considered as an effective method for controlling and reducing weed levels.

Biomass control at the site will include controlled sheep grazing, and potentially ecological burning. Spot spraying will be completed in a manner which minimises non-target (i.e. native species) damage. Spot spraying will not occur during high wind days.

The cover of species within the offset site is likely to change over time in response to seasonal conditions, or because of pulse grazing. Weed cover and species will therefore be monitored and management adapted in response to achieve desired outcomes outlined in this management plan.

Weed control will consist of manual removal and/or spot spraying 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

5.5.5.3 New and emerging herbaceous weeds

Monitoring for new and emerging herbaceous weeds will be conducted throughout the year for the term of the agreement, and any new and emerging weeds eliminated.

Any other significant environmental weeds identified within the broader property during monitoring will also be controlled. Other high threat weeds, such as Chilean Needle-grass *Nassella neesiana*, which is known to occur in the region, but not on the offset site, will be controlled should the species be detected on the site.

Table 3. A selection of herbaceous weeds to be controlled – method and timing

Common name	Scientific name	% total cover at inception	Method	Timing
Spear Thistle	<i>Cirsium vulgare</i>	<1%	Manual Removal, Annual Spraying (before seeding)	All Year
Cocksfoot	<i>Dactylis glomerata</i>	1%	Spot Spray before seeding	Spring
Rats-tail Fescue	<i>Vulpia bromoides</i>	10%	Spot Spray before seeding	Spring
Yorkshire Fog	<i>Holcus lanatus</i>	10%	Spot Spray before seeding	Spring
Toowoomba grass Canary-	<i>Phalaris aquatica</i>	20%	Controlled pulse crash grazing by sheep to prevent seed set; spot spraying of herbicide;	Summer, Autumn (grazing) Spot Spray (Spring)
Brown-top Bent	<i>Agrostis capillaris</i>	5%	Controlled pulse crash grazing by sheep to prevent seed set; spot spraying of herbicide;	Summer, Autumn (grazing) Spot Spray (Spring)
Ribwort	<i>Plantago lanceolata</i>	2%	Manual Removal, Annual Spraying (before seeding), Chip	All Year
Bromus spp., Aira spp., Quaking-grass, Squirrel-tail Fescue	Annual Grasses	10%	Controlled pulse crash grazing by sheep to limit opportunities for weed establishment; spot spraying of herbicide.	Summer, Autumn Sport Spray (Spring)

Note: this is not an exhaustive list of all weeds either present or that have the potential to occur on the site in the future.

5.5.5.4 *Spot Spraying*

The application of herbicides is an effective and efficient control technique for a range of woody, herbaceous and grass weeds. The correct use and application of herbicides can provide targeted control of a range of species. However, all herbicides must be used in accordance with the manufacturer's specifications and occupational health and safety policies.

Application methods for herbicides include: spot spraying with a knapsack, dabbing of weeds in sensitive areas with a foam-tipped application device, rig spraying with a pump for larger areas, dabbing of cut stumps and injection of woody weeds.

Timing of the interval of spot spraying is dependent upon many factors such as plant age and growth seasons, plant stress levels and climatic factors. Surrounding native plants' susceptibility to herbicides and ongoing uses of the treated areas must also be considered when choosing the herbicide to be used in a weed control program, as some herbicides are residual and may persist within the soil for varying durations.

Weed control will ideally be conducted when Golden Sun Moth are not flying, and control will typically be conducted in a mosaic fashion to avoid any unexpected impacts to the species.

5.5.5.5 *Actions*

In accordance with the priority actions outlined with the Conservation Advice for the species (DoE 2013, p3-4) and the Significant Impact Guidelines (DEWHA 2009, p4), which outlines weed invasion as a key threat, the following key management actions will be undertaken:

- Introduced Weeds. These will be mapped across the site, and monitored annually, to determine when control is required;
- Control environmental weeds to a cover of <10%;
- Periodic spot spraying of weeds with appropriate herbicide will be undertaken, particularly through spring and early summer as detailed in Table 3;
- Any populations of new and emerging high threat weeds will be treated promptly and eliminated;
- During weed control, natural regeneration of indigenous flora will be protected from off-target damage;
- Undertake pulse crash grazing within the offset site to reduce weed cover; and,
- Annual monitoring to demonstrate the effectiveness of weed control works and the results will be used to adapt future control works and targets.

5.5.5.6 *Performance Targets / Indicators*

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

- Environmental weed cover of <10%;
- New and emerging weeds eliminated where possible.
- Reduction in the cover of weed species within the offset site (Table 4);

- Where herbicide application is employed, waterway sensitive products and non-residual herbicides are to be used; and,
- Off-target damage to indigenous plants minimised where it doesn't impact the suitability of Golden Sun Moth habitat.

These performance indicators have been selected as there are measurable and reflect the priority actions as outlined within the Conservation Advice (DoE 2013, p3-4) and Significant Impact Guidelines (DEWHA 2009, p4). These performance indicators must be recorded during site monitoring and included within annual reports (Section 5.6).

5.5.5.7 Adaptive Management

- Respond to the annual monitoring report and associated recommendations;
- If objectives and performance indicators are not being met:
 - Review grazing regime; and/or
 - Increase frequency of control activities.

5.5.5.8 Anticipated Outcomes

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth, as outlined within the Conservation Advice (DoE 2013, p3-4; Section 5.5). Specifically, management of weed encroachment. The management actions outline measures to minimise potential negative impacts to Golden Sun Moth (e.g. through the use of a combination of approaches such as spot spraying and strategic grazing) and aim to enhance habitat for Golden Sun Moth through reducing competition for food plants (Wallaby-grass) from weed species.

5.5.5.9 Responsible Personnel

Monitoring and control of weeds within the offset site is the responsibility of the landowner, however, management actions must be undertaken by suitably qualified personnel.

5.5.6 Direct Seeding

Direct seeding will be undertaken in areas with low cover of native flora. This will primarily occur in areas with high weed cover (i.e. the centre of the property) (Figure 3). It is important to note that direct seeding will lead to a noticeable improvement in the quality of Golden Sun Moth habitat. While no areas were identified requiring this treatment during site assessments to date, future site monitoring may identify areas suitable for improvement of Golden Sun Moth habitat through direct seeding. If natural regeneration of native grasses does not occur within these areas containing low cover of native flora following implementation of other actions within this plan (e.g. controlled grazing, weed/rabbit control), supplementary direct seeding will be implemented, with the aim of ensuring that cover of native grasses and inter-tussock space is achieved in accordance within performance measures outlined in Section 5.5.5.2. Direct seeding will focus on establishment of wallaby-grasses, as these species are known to be the primary food source of Golden Sun Moth.

5.5.6.1 *Actions*

The following key management actions will be undertaken to maintain contiguous habitat for Golden Sun Moth throughout the offset site:

- Mechanically scalping areas containing a high percentage cover of weeds (i.e. >70-80% cover of weeds) outside of the species flight season. This will remove the weeds and nutrients in the topsoil;
- Leave the scalped area for 2-3 months and control any weeds that emerge.
- Once weeds have been successfully removed across the scalped area, direct seed using an indigenous species mix supplied by a reliable contractor;
- Similarly, outside of the scalped areas where weed control has occurred, and where there is a lack of regeneration of native grasses, native grass seed will be sown during late-spring or early-autumn.
- Annual monitoring to demonstrate the effectiveness of direct seeding establishment and the results will be used to adapt future direct seeding activities and targets.

5.5.6.2 *Performance Targets / Indicators*

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

- Proposed in areas that support a higher proportion of weeds with less cover of native grasses (Figure 3);
- Although dependent on site and seasonal (e.g. rainfall) conditions, site preparation (scalping) of areas will occur between in late May and September, with direct seeding will occur in October and/or November;
- Areas supporting weeds will be removed and replaced with native grasses (wallaby-grasses, spear grasses spp.), with an overall target of at least 60-80% cover of native vegetation;
- 80% cover in area the establishment and,
- Areas of bare ground re-established with wallaby-grasses, spear grasses spp. and native herbs and forbs.

5.5.6.3 *Anticipated Outcomes*

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth. Specifically, retention and enhancement of habitat. The management actions aim to enhance habitat for Golden Sun Moth though increasing the total extent and connectivity of host-plants (wallaby-grass) throughout the offset site.

5.5.6.4 *Responsible Personnel*

Direct seeding within the offset site is the responsibility of the landowner. However, it is likely that a suitably qualified contractor will be engaged to prepare areas across the offset site, and to undertake direct seeding and ongoing maintenance.

5.5.7 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 land owner/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.

5.5.7.1 Actions

In accordance with the priority actions outlined with the Threat Abatement Plan for Rabbits (DoE 2013) 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) 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 may need to 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 rabbits and hares).

5.5.7.2 Performance Measures

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

- Any rabbit warrens are controlled immediately following detection;
- All monitoring and management activities are effectively documented;
- Reduction in pest animal activity from approval of this plan; and
- Minimal soil disturbance and no native vegetation loss from pest animal management activities.

These performance indicators have been selected as there are measurable, and reflect the above priority actions; the performance indicators must be recorded during site monitoring, and included within annual reports.

5.5.7.3 Adaptive Management

The following adaptive management actions are proposed:

- If pest animal management fails to achieve a reduction, or effectively control rabbits, or if impacts to Golden Sun Moth habitat that are attributable to pest animals increase, a review of the current procedures and management measures will be undertaken;
- Review performance of pest animal contractor;
- Increase active monitoring of pest animal activity; and,
- Incorporate additional control measures (i.e. spotlighting and shooting).

5.5.7.4 *Anticipated Outcomes*

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth. Specifically, retention and enhancement of habitat. The management actions aim to enhance habitat for Golden Sun Moth through maintaining and increasing the distribution and connectivity of host-plants (Wallaby-grass) throughout the study area.

5.5.7.5 *Responsible Personnel*

Monitoring and control of pest animals within the offset site is the responsibility of the landowner, however, management actions must be undertaken by suitably qualified personnel.

5.6 Monitoring and Reporting

5.6.1 Golden Sun Moth Monitoring

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

Annual monitoring of Golden Sun Moth populations will be undertaken for **four**-years, and then in Years 6, 8 and 10 (within the 10-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, the management actions will be adjusted accordingly.

Specific survey procedures will follow those approved monitoring guidelines for Golden Sun Moth prepared by the DoEE (DEWHA 2009a). The following measures will be undertaken as part of population and habitat monitoring for Golden Sun Moth 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 Golden Sun Moth surveys undertaken throughout the offset site;
- Surveys are to be conducted by suitably trained observers;
- Surveys must take place during the species' flight season. In western Victoria 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 driving in a car at < 10 km / hour (flying male moths can be readily seen from a vehicle) until moths are observed.

5.6.1.1 *Responsible Personnel*

The monitoring and reporting of Golden Sun Moth populations within the offset site is the responsibility of the landowner, however, surveys must be undertaken by a suitably qualified ecologist, experienced in the identification of Golden Sun Moth.

5.6.1.2 Other Monitoring

Information relating to fencing, weed control and pest animal control, and revegetation will be provided by the landowner and 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.

This GSMOMP requires the Landowner to submit a report to DoEE after years 1, 2, 5 and 10 of management. The reports will include a review of past management works against the performance targets and objectives contained within this OMP. Future management priorities will also be detailed in these reports.

The Landowner will establish five permanent photo-points in the offset site. These points will be marked via GPS and shown on a Figure. Photographs taken from these points will be representative of the Golden Sun Moth habitat management objectives of the GSMOMP.

Photographs will be taken between October and early December each year and clearly labelled. Each photo will be taken from as near to the same point each year and will use the same direction, trajectory and camera settings as is practicable. Photographs and Annual Reports are to be submitted at least 2 months prior to the anniversary date of the execution of the agreement to allow time for compliance to be assessed before the anniversary date.

Data collected will be consistent with the specific management actions outlined above, and the proposed monitoring and reporting will reflect the performance measures for each action.

The Annual Report addresses progress against the commitments set out in this agreement. Annual Reports will provide sufficient detail in the form of written comments and supporting evidence that an assessor can easily determine the completion of/progress against the management commitments. The template for a landowner monitoring and reporting form is shown in Table 4. Information to be provided in the reporting form includes:

- A copy of the Management Action Table from the OMP with information on which actions have been completed for year/s of this reporting period;
- A description of the specific monitoring results from surveys undertaken (i.e. Golden Sun Moth surveys);
- Percentage cover of native and exotic grasses;
- Percentage of open and bare ground;
- Weed inventory and percentage cover of high threat weed species;
- Extent (area) of weed and pest animal control, indication of the success or failure;
- Area of direct seeding and revegetation, and indication of the success or failure; and,
- Any corrective actions and contingency measures where monitoring indicates that there has been a deterioration in the native vegetation or Golden Sun Moth population;
- Provide photographs showing evidence of works.

- Identification and management of current, new and emerging threats to Golden Sun Moth habitat.

If any agreed management actions or commitments are incomplete or have not been undertaken in the times specified, the contractor is to document the justification and the actions that will be action/s will be undertaken to implement the requirement. All records/evidence of management actions will be maintained to DoEE upon request.

5.6.1.3 Responsible Personnel

Ongoing monitoring of the effectiveness of the management actions undertaken, identification of new threats, and annual reporting is the responsibility of the landowner.

5.6.1.4 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 (Table 4).

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. Should a proposed action not have been undertaken the reason(s) will be provided.

Table 4. 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		

5.7 Review

The protection and management of the nominated offset area is in perpetuity. The GSMOMP will be reviewed after five years from the date of approval. If the 5-year performance targets outlined in Section 5.5.2 are not being met, the GSMOMP will be updated to include remediation or additional actions to ensure the 10 year targets will be met. If the GSMOMP needs to be updated, then this will be submitted to the Commonwealth Minister for approval.

The focus of the 5-year review will be to determine the GSMOMP effectiveness in the protection, management and enhancement of Golden Sun Moth habitat. Should the management actions that have been undertaken are not meeting the performance targets and satisfactorily meeting the objectives of the GSMOMP, then it may be prudent at that time to reassess the type, extent and intensity of the management actions outlined in this plan to ensure the Golden Sun Moth habitat and populations are protected and enhanced in perpetuity.

5.8 Management Actions

Management actions are summarised below (Table 5). The actions constitute the minimum management requirements for the offset site over the mandatory 10-year management period.

Table 5. 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 DoEE	
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	Landowner and its contractors	Within three months of this plan being approved by DoEE	
1	1.2	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
1	1.3	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
1	1.4	Conduct monitoring for Golden Sun Moth (<u>no report</u>)	Suitably qualified ecological specialist	One year after commencement of OMP	
1	1.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner	Summer/Autumn	
2	2.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
2	2.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
2	2.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Two years after commencement of OMP	
2	2.4	Maintain fences	Landowner and its contractors	As required	
2	2.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner	Summer/Autumn	
2	2.6	Monitor and assess works, and prepare two-year progress report	Suitably qualified ecological specialist	Two years after commencement of OMP	
3	3.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
3	3.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
3	3.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Three years after commencement of OMP	
3	3.4	Maintain fences	Landowner and its contractors	As required	
3	3.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
3	3.6	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Three years after commencement of OMP	
4	4.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
4	4.2	Monitor populations of pest animals and conduct control works if required	Landowner 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 OMP	
4	4.4	Maintain fences	Landowner and its contractors	As required	
4	4.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
4	4.6	Monitor and assess works, and prepare four-year progress report	Suitably qualified ecological specialist	Four years after commencement of OMP	
5	5.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
5	5.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
5	5.3	Maintain fences	Landowner and its contractors	As required	
5	5.4	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
5	5.5	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Five years after commencement of OMP	
6	6.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
6	6.2	Monitor populations of pest animals and conduct control works if required	Landowner 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 OMP	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
6	6.4	Maintain fences	Landowner and its contractors	As required	
6	6.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
6	6.6	Monitor and assess works, and prepare six-year progress report	Suitably qualified ecological specialist	Six years after commencement of OMP	
7	7.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
7	7.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
7	7.3	Maintain fences	Landowner and its contractors	As required	
7	7.4	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
7	7.5	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Seven years after commencement of OMP	
8	8.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
8	8.2	Monitor populations of pest animals and conduct control works if required	Landowner 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	Landowner and its contractors	As required	
8	8.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
8	8.6	Monitor and assess works, and prepare eight-year progress report	Suitably qualified ecological specialist	Eight years after commencement of OMP	
9	9.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
9	9.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
9	9.3	Maintain fences	Landowner and its contractors	As required	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
9	9.4	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
9	9.5	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Nine years after commencement of OMP	
10	10.1	Conduct weed control, direct seeding and revegetation actions	Landowner and its contractors	Species dependent for weeds and early spring for revegetation and direct seeding	
10	10.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
10	10.3	Conduct monitoring for Golden Sun Moth	Suitably qualified ecological specialist	Ten years after commencement of OMP	
10	10.4	Maintain fences	Landowner and its contractors	As required	
10	10.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
10	10.6	Monitor and assess works, and prepare final report	Suitably qualified ecological specialist	Ten years after commencement of OMP	

Note: As outlined in Section 5.5.1 it is important that the protection and management actions outlined above achieve the following performance targets:

- An average of 40% native understorey / grass cover;
- Percentage cover of high threat weeds <10%;
- Percentage cover of woody weeds <1%;
- A 20% to 40% cover of bare ground or inter-tussock space;
- The persistence of a Golden Sun Moth population;
- An 20-30% increase in the distribution of Golden Sun Moth;
- An increased in the species' stocking rate to at least 10-20 moths / hectare;
- External fences maintained;
- Areas supporting weeds will be removed (scalped or sprayed) and replaced (direct seeding) with native grasses, with an overall target of at least 60-80% cover of native vegetation in treated areas; and,
- Pest animals such as rabbits controlled with no detectable impacts (i.e. extensive soil disturbance, over grazing) to habitat.

6 CONTINGENCY RESPONSE AND CORRECTIVE ACTIONS

The landholder 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 management of the site.

If after Year 5 of management, the actions detailed in this OMP are not leading to the ongoing maintenance and improvement of Golden Sun Moth habitat, a review will be undertaken, and a new management plan prepared for the remaining 5 years of management.

Any proposed changes to the management contrary to that specified within this plan will be approved DoEE, prior to implementation. Any proposed uses or development of the site which conflict with the landowners' commitments or maintenance/improvement of Golden Sun Moth habitat are not permitted under this plan.

Highly seasonal conditions are not uncommon across western Victoria, and can result in variable conditions from year to year. This is acknowledged within the OMP by allowing for a flexible approach to the timing of grazing at the discretion of the Landowner.

6.1 Managing Uncertainty

An assessment of potential risks associated with the objectives of this plan are outlined within Table 1. All risks are considered manageable and actions within subsequent sections of this OMP address the relevant risks.

7 EMERGENCY CONTACTS AND PROCEDURES

Should any environmental emergency occur on-site that poses a risk to the objectives of this plan, the relevant contacts (Table 6) must be notified as soon as possible, and no later than 12 hours following the event. At a minimum, DoEE and the landholder must be notified, and CFA and Victoria Police may need to be notified if assistance is required from these emergency services (e.g. control of wildfire). Emergency services must be advised of the on-site protections to avoid inadvertent damage to ecological values (e.g. creation of graded earthen fire breaks within the site, which unless necessary, must be avoided).

Table 6. Emergency contacts

Contact	Role	Telephone
Country Fire Authority (CFA)	Bushfire emergency	000
Victoria Police	Various (e.g. unauthorised access)	000
DoEE	Offset Monitoring Responsibility	1800 803 772

8 REFERENCES

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9 FIGURES

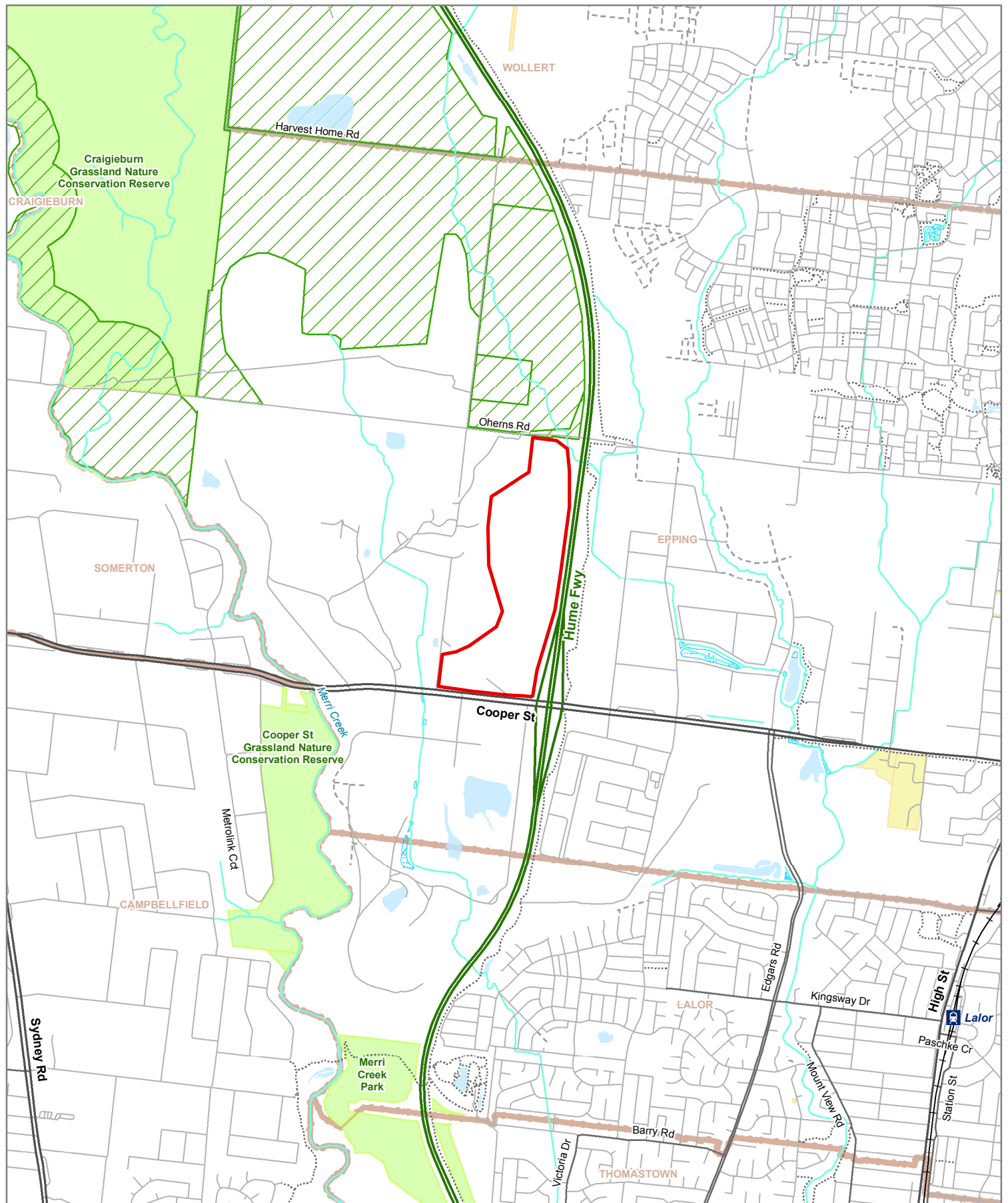
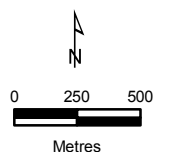


Figure 1
Location of the Study Area
 315 O'Herns Road,
 Epping

Legend

- | | |
|--|--|
| Study Area | Permanent Waterbody |
| Railway | Wetland/Swamp |
| Freeway | BCS Conservation Area |
| Major Road | Parks and Reserves |
| Collector Road | Crown Land |
| Minor Road | Localities |
| Proposed Road | |
| Walking Track | |
| Minor Watercourse | |



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Legend

- Study Area
- Proposed offset site (63 ha)
- 6m internal buffer

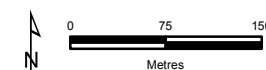
Golden Sun Moth records

- Survey date: 23/11/2017
- Survey date: 28/11/2017
- Survey date: 16/12/2017
- Previously recorded Golden Sun Moth records (2011)



Figure 2

Proposed Offset Site
Challicum Road, Buangor



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10246_Fig02_PropOffsetSites 10/12/2018 melsley



Legend

- Study Area
- Indicative areas for direct seeding
- Proposed offset site (63 ha)
- 6m internal buffer

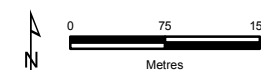
Golden Sun Moth records

- Survey date: 23/11/2017
- Survey date: 28/11/2017
- Survey date: 16/12/2017
- Previously recorded Golden Sun Moth records (2011)



Figure 3

Indicative Areas for Direct Seeding
Challicum Road, Buangor



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10246_Fig03_IndArea_Seeding 10/12/2018 melsjv

10 APPENDIX 1 – TARGETED GOLDEN SUN MOTH SURVEY

Targeted Golden Sun Moth *Synemon plana* surveys for a proposed offset site, 222 Challicum Road, Buangor, Victoria

Author: Andrea Fullagar (Zoologist) and Aaron Organ (Director / Principal Ecologist)

Our reference: 10246

Date: 22nd May 2018

Introduction

Ecology and Heritage Partners Pty Ltd was engaged by Frasers Property Australia Pty Ltd to undertake targeted surveys for the nationally significant Golden Sun Moth *Synemon plana* across a property located at 222 Challicum Road, Buangor, Victoria (herein referred to as the study area) (Figure 1). This study area was identified as a potential offset site for a proposed industrial development at 415 Cooper Street and 315 O'Herns Road, Epping, where a population of the nationally significant [currently listed as critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)] Golden Sun Moth is present.

Targeted surveys were undertaken during the 2017/18 Golden Sun Moth flight season to determine the status and distribution of the species across the study area. Golden Sun Moth has previously been recorded (2011) on the property as part targeted surveys for the Western Highway Duplication Project (Section 2) (Ecology and Heritage Partners Pty Ltd 2012).

Study Area

The study area is approximately 61 hectares (150 acres) in size and is bound by Gravel Route Road to the west, Challicum Road to the south, a railway reserve to the north and private property to the east (Figure 1). The study area is zoned Farming (FZ) and a Vegetation Protection Overlay (VPO1: Significant and Remnant Vegetation Areas) covers a small portion of the study area in the north.

The study area comprises a mix of remnant native and exotic grasses and forbs in the understorey, with over 200 very large old River Red-gums (>200 years). The study area has historically been grazed and has not been cultivated, or experienced pasture improvement (i.e. superphosphate / nutrient application) over at least the past 20-30 years.

According to the Department of Environment, Land Water and Planning (DELWP) NatureKit (DLEWP 2018a), the study area occurs on the edge of the Central Victorian Uplands and Victorian Volcanic Plain bioregions. However, based on geology mapping, older volcanic soils have been mapped as occurring across the study area, and therefore the study area more appropriately aligns with the Victorian Volcanic Plain bioregion. The study area lies within the Glenelg Hopkins Catchment Management Authority (CMA) and Ararat Rural City Council.

Golden Sun Moth *Synemon plana*

Golden Sun Moth is listed under EPBC Act, threatened under the Victorian *Flora and Fauna Guarantee Act 1988*, and critically endangered on the Advisory List for Threatened Invertebrate Fauna in Victoria (DSE 2013). The species typically occurs in native grassland and grassy woodland dominated by wallaby-grass *Rytidosperma* spp. , spear grass *Austrostipa* spp. and Kangaroo Grass *Themeda triandra*, as well as in degraded grasslands dominated by the exotic Chilean Needle-grass *Nassella nessiana* (DEWHA 2009, Enderby and Koehler 2006).

Prior to European settlement, Golden Sun Moths were widespread and relatively continuous throughout grassy open woodlands and grassland in south-eastern Australia, although the species now mainly occurs in small, isolated sites (DSE 2004). Male flight is typically low to the ground and rapid, but males are generally not recorded flying more than 100 metres from suitable habitat (Clarke and O'Dwyer 2000). Females have only limited flight ability and are rarely recorded in comparison with males.

Methods

Commencement of the Golden Sun Moth flight season

Targeted Golden Sun Moth survey was undertaken during the 2017/18 flight season. Given that the timing of the flight season varies annually and geographically, commencement of the flight season needed to be determined before survey could be undertaken. The primary indicator of the survey period for Golden Sun Moth is the presence of flying males at known local sites. Pre-season checks were undertaken by Ecology and Heritage Partners and other organisations (e.g. ecological consultants, DELWP regional personnel, naturalists) at various known sites ('reference' sites) in western and north-western Victoria from mid-November to determine the commencement of the Golden Sun Moth flight season.

Golden Sun Moths began flying in north western Victoria (Nhill Sun Moth Reserve) on 6, 7 and 8 November 2017 (Clive Crouch pers. obs. – Golden Sun Moth diary), with the species being detected in higher numbers (20+ males) at the Nhill Sun Moth Reserve and Salisbury Reserve east of Nhill on 12 November 2017 (Golden Sun Moth diary, DELWP). Similarly, moths were detected flying near Ararat (approximately 20 kilometres north west of the study area) on 14 and 21 November 2017 (Golden Sun Moth diary, DELWP).

The study area is itself a reference site given that it is known to support a Golden Sun Moth population from previous targeted surveys as part of the Western Highway Duplication (Ecology and Heritage Partners 2012). Several individuals were previously observed in the north-western portion of the study area (in areas dominated by native grasses) (Ecology and Heritage Partners 2012), and observers visited this area initially to confirm moths were flying.

Targeted surveys

Surveys were undertaken in accordance with the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009). Targeted surveys were undertaken on 23 and 28 November, and 16 December 2017 during the species' flight season, and although four site surveys are generally required to confirm presence of the species at a site (DEWHA 2009), three separate survey days were considered adequate to determine the presence of the species, and to obtain an understanding of numbers of moths and distribution across the study area.

Surveys were undertaken between 10am and 3pm at a time when it was suitable for detecting the species (i.e. generally >20°C, bright, full sun, absence of rain and wind other than a light breeze), and as outlined above, when Golden Sun Moth was confirmed flying in western Victoria (e.g. Ararat) (Table 1).

Qualified zoologists, experienced in the survey and detection of Golden Sun Moth, walked 5-10 metre transects in an east and west direction across the entire study area. The survey took approximately 3-4 hours to complete. General habitat characteristics of the study area were recorded during Golden Sun Moth survey.

Results

Survey results

A total of 172 Golden Sun Moth (all males) were recorded during the targeted survey (Table 1, Figure 2, Plate 4). The highest number of Golden Sun Moth (exceeding 100 individuals) were recorded in the first two surveys during November 2017. Indeed, the large number of moths observed is consistent with previous surveys when large numbers have been known to emerge during October and November, compared with sites around Melbourne where larger numbers are often observed during the latter part (i.e. between late November and early January) of the species' flight season (author pers. obs.). Given that Golden Sun Moth was recorded across the study area during the three surveys, it was deemed unnecessary to undertake the fourth survey.

Habitat assessment

A habitat assessment was also undertaken during the Golden Sun Moth surveys, and all 70 hectares of the study area provides suitable habitat for the species (Figure 2, Plates 1-6). The study area supports areas dominated by native wallaby grasses *Rytidosperma* spp. and spear grass *Austrostipa* spp. (e.g. along the north-western and western portion of the study area) and a mix of native and exotic grasses (e.g. Toowoomba canary grass *Phalaris aquatica*) (Plates 2, 3, 4 and 6). It has been grazed for many years (recently at a low grazing intensity), and during the site surveys, biomass levels were low and there were areas of bare ground (~10% bare ground). Although not a relevant habitat feature for Golden Sun Moth, the study area supports over 200 mature River Red-gums with some eucalypt regeneration, while the shrub layer is largely absent (Plate 5).

The vegetation is modelled as Grassy Woodland/Heathy Dry Forest Complex Ecological Vegetation Class (EVC 896) and Heathy Dry Forest (EVC 20) (DELWP 2017). However, the vegetation within the study area has a closer affiliation with Plains Grassy Woodland (EVC 55), which is an endangered EVC in the bioregion. Native species recorded in the rail reserve adjacent to the northern boundary of the study area, include Kangaroo Grass *Themeda triandra*, spear grasses and Blue Devil *Eryngium ovinum*.

Table 1. Golden Sun Moth survey results

Date	Survey times	Reference Site	Temperature (°C) (9am and 3pm)		Wind (km/hr)	Cloud cover (eighths)	No. of days since rain	No. GSM
23/11/2017	1000 – 1305	Ararat (DELWP GSM diary)	19	30	15	5	7	94
28/11/2017	1030 – 1410	Ararat (DELWP GSM diary)	13	28	13	0	1	76
16/12/2017	1130 – 1414	Ararat (DELWP GSM diary)	10	24	2 - 6	1	8	2

^Temperature taken from the Melbourne weather station (No. 079101) (Bureau of Meteorology 2014: accessed 16 May 2018). *(0= no cloud, 8 = full cover)

Discussion

The surveys confirmed the results of the previous targeted surveys (Ecology and Heritage Partners 2012), in that a resident population of the species persists within the study area. The study area supports a large population of Golden Sun Moth with 172 individuals recorded across the 70-hectares of suitable habitat.

The property is proposed to be used as an offset site to compensate for the proposed removal of highly modified Golden Sun Moth habitat (i.e. 100% Chilean Needle-grass *Nassella neesiana*) for an industrial development at 410 Cooper Street and 315 O'Herns Road, Epping. The proposed offset site supports higher quality habitat (i.e. a large consolidated area with suitable food plants for Golden Sun Moth) than that proposed to be removed as part of the proposed development, and this is a key requirement under the EPBC Act Environmental Offsets Policy (DSEWPac 2012a).

A decision was made (9 May 2017) by the Department of the Energy and Environment (DoEE) that the proposed develop (EPBC Ref 2018/8167) at 410 Cooper Street and 315 O'Herns Road, Epping will result in a significant impact on a matter of National Environmental Significance (NES) (i.e. Golden Sun Moth). The completion of the EPBC Act Offsets Assessment Guide (DSEWPac 2012b) pertaining to the proposed impact site and the proposed offset site (i.e. the study area), together with the required management actions that will be implemented across the study area will be outlined in a detailed Golden Sun Moth Conservation Management Plan (CMP). The CMP will form part of the Preliminary Documentation prepared for the project as part of the assessment and approval under the EPBC Act, to demonstrate that the permitted removal of Golden Sun Moth habitat at the proposed development site can be satisfactorily offset with the security and management (in perpetuity) of confirmed habitat within the study area.

Plates 1-6. Photos of the study area (November 2017)

Plate 1



Plate 2



Plate 3

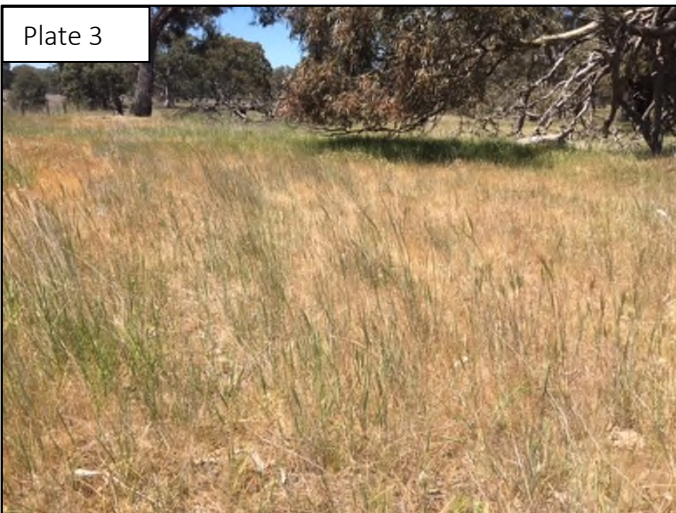


Plate 4

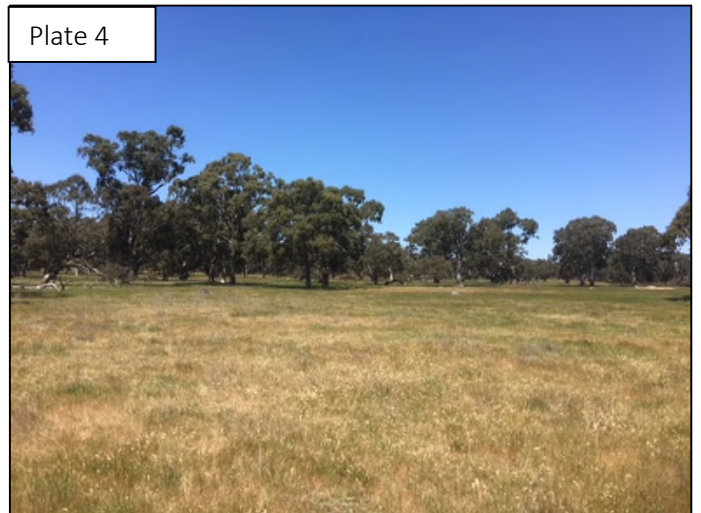


Plate 5

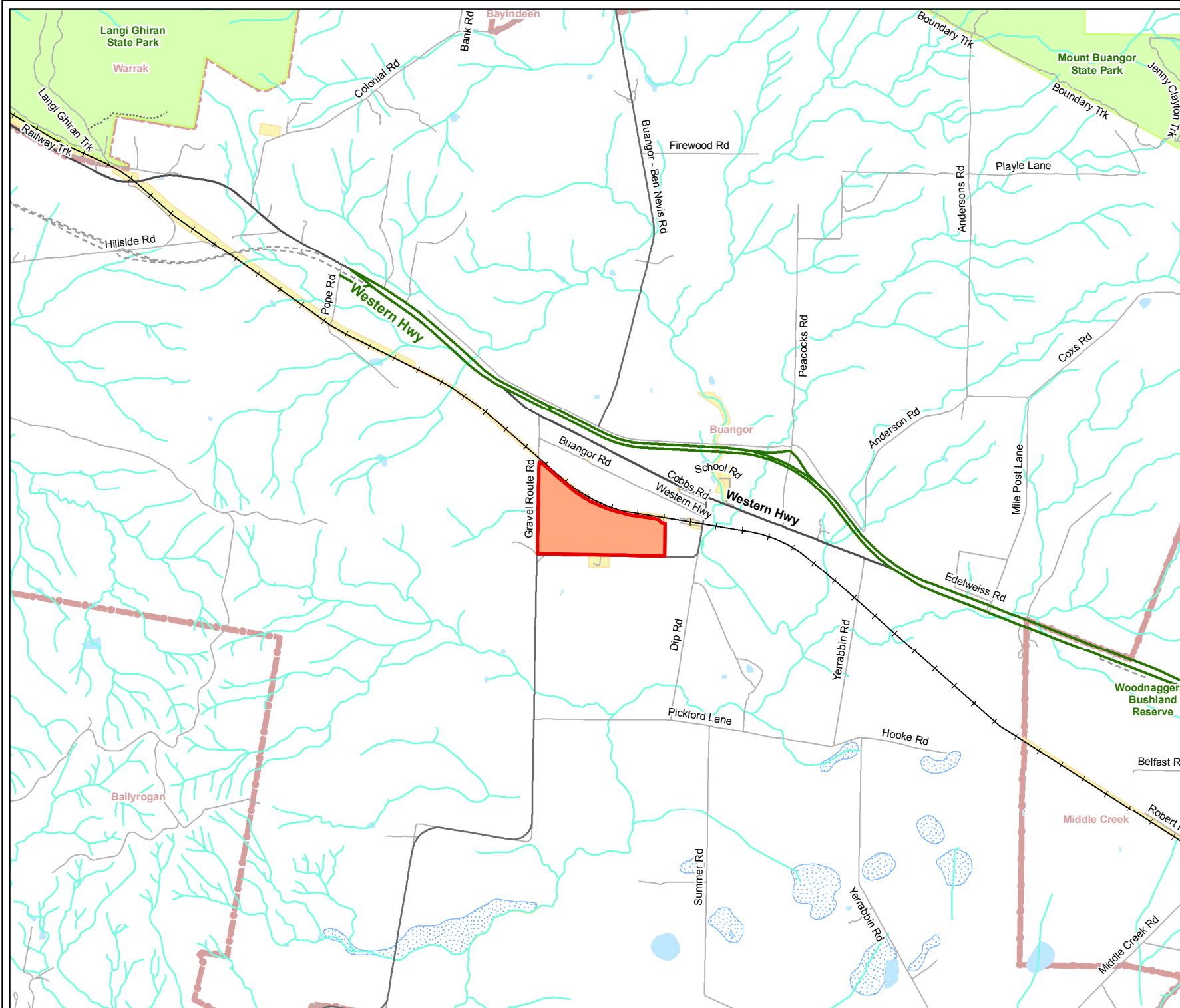


Plate 6



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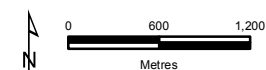


Legend

- Study Area
- Railway
- Freeway
- Major Road
- Collector Road
- Minor Road
- Proposed Road
- Walking Track
- Minor Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Parks and Reserves
- Crown Land
- Localities

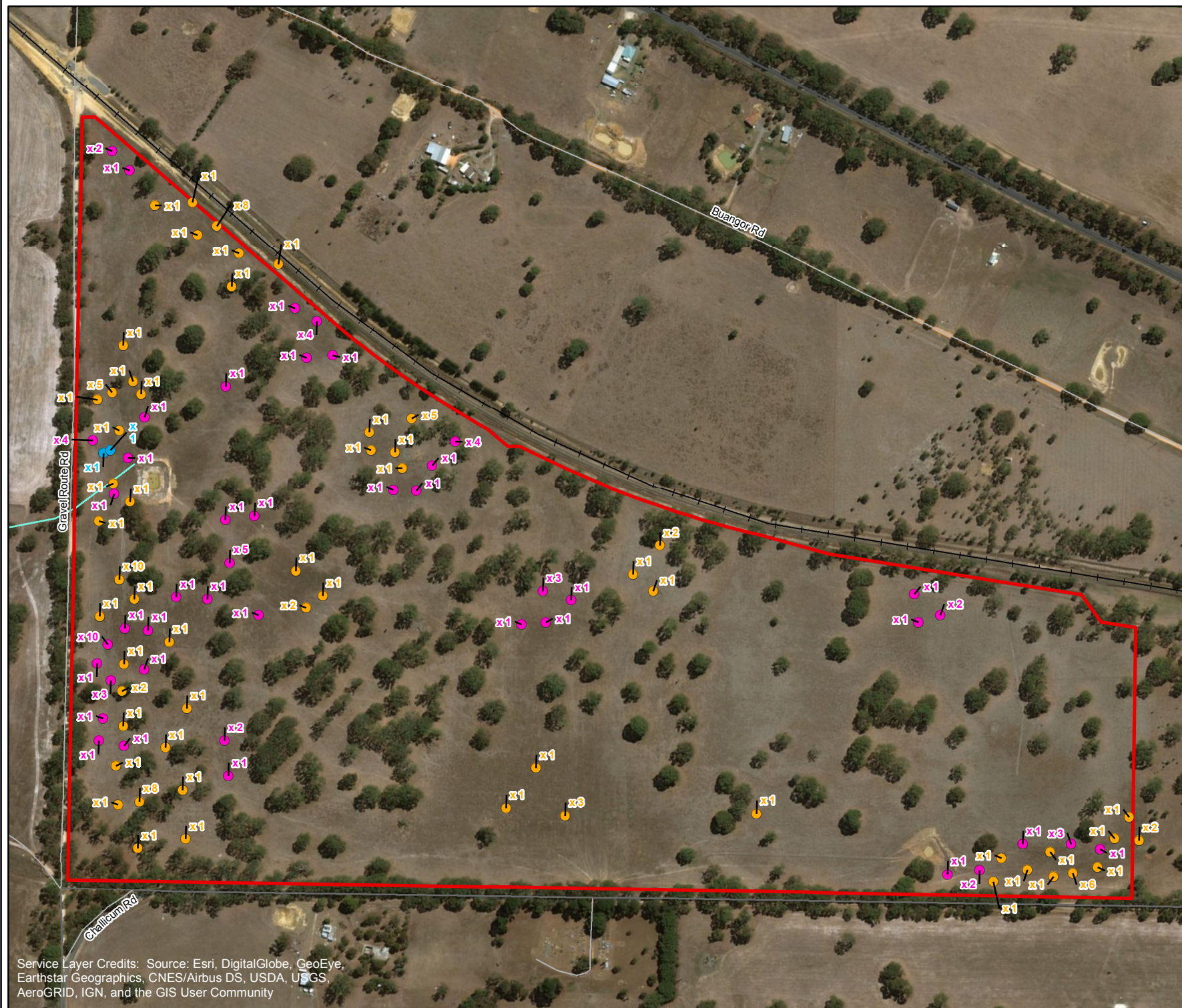


Figure 1
Location of the study area
Targeted Golden Sun Moth
survey for *Challicum Road*,
Buangor




ecology & heritage
partners

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Legend

Study Area

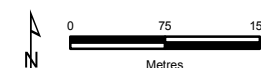
Golden Sun Moth records

- Survey date: 23/11/2017
- Survey date: 28/11/2017
- Survey date: 16/12/2017



Figure 2

Survey Results
Targeted Golden Sun Moth
survey for Challicum Road,
Buangor



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10246 Fig02_SurveyResults 9/05/2018 psorensen

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11 APPENDIX 2

11.1 EPBC Act Environment Offset Policy

Table 7. Assessment summary of the Golden Sun Moth 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 the entire offset site located at 222 Challicum Road, Buangor. A total of 63 hectares is proposed to be secured as an offset property for the species (i.e. a conservation covenant will be placed over the 63 hectares).
Be built around direct offsets but may include other compensatory measures	Except for those management actions outlined in Section 5 and the associated land management costs listed within Appendix 3 no additional compensatory measures are proposed.
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 2), if managed appropriately (as planned), the offset site that comprises 63 hectares of moderate quality Golden Sun Moth habitat. This will exceed the offset requirements associated with the proposed removal of 22 hectares of suitable Golden Sun Moth 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, the proposed offset site is 63 hectares in size and therefore exceeds the offset requirement.
Effectively account for and manage the risks of the offset failing	Appropriate management actions detailed in Section 5 of this OMP will be implemented for a 10-year period and are designed to enhance current Golden Sun Moth 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)	The 63-hectare area proposed for the Golden Sun Moth offset is not already in use as an offset site for any other projects or past planning outcomes, nor has it previously been reserved for any other conservation program. As such, the proposed offset is additional to what is required under the planning regulations or determined by law, thus meeting the additionality requirement to qualify as a suitable offset.
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offsets will provide sufficient offset outcomes for the impacts to Golden Sun Moth as part of this project. The GSMOMP will be supported by species population monitoring and habitat management for a minimum of 10 years (Section 5.6).
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	The offset site will be secured via a Trust for Nature covenant. Frasers Property Australia and landowner will submit relevant reporting to the DoEE to document the progress of the offset site and Golden Sun Moth populations and associated habitat conditions.

11.2 EPBC Act Offset Calculator Analysis

Table 8. Impact Calculator

Condition	Value	Comments
Area of habitat to be cleared	22	As provided by Frasers Property Australia
Quality of area to be cleared	5	<p>5/10. Golden Sun Moth habitat within the impact site does not meet the description that defines a high-quality remnant of the community. Golden Sun Moth habitat to be removed is of low quality, relatively species poor, and has been subjected to high levels of disturbance in the form of frequent slashing, historical grazing and soil disturbance. The proposed development will result in the removal of a high cover of noxious weeds dominated by Chilean Needle-grass <i>N. neesiana</i>.</p> <p>The impact site does not support native habitat typically occupied / preferred by the species (TSSC 2002; DEWHA 2009a, 2009b; DEPI 2013). The site would ordinarily be given a score of 2 or 3, although given that the site supports a population the quality of the area proposed to be cleared has been given a conservative score of 5.</p> <p>The quality of the offset area is of higher quality than the area to be cleared. It is a large area of remnant Plains Grassy Woodland with a mix of native and exotic grasses in the understorey. Based on the Offset Assessments Guide (DSEWPac 2012b) three primary variables are used to determine the quality of habitat and these include site condition, site context and species stocking rates. A summary is provided.</p> <p><u>Site Condition</u></p> <p>Based on the previous habitat assessments undertaken on the impact site, the site supports low quality vegetation that is dominated by a dense cover of weeds. There are no patches of native vegetation present and the habitat present at the site is not currently managed for Golden Sun Moth. There are several disturbances such as soil disturbance that have, and continue to occur across the site, and the site has historically been used for grazing.</p> <p><u>Site Context</u></p> <p>The site is isolated is not connected to other areas of high-quality Golden Sun Moth (i.e. the site is isolated).</p> <p>Species Stocking Rate</p> <p>A large number of moths were detected over several separate survey periods.</p>

Table 9. Offset calculator

Condition	Value	Comments
Time over which loss is averted (max. 20 years)	20	The Landowner is committed to protect and manage the offset site for the life of the management plan. Although the offset will be managed for 10 years, it will be protected in perpetuity and therefore a timeframe of 20 years is applied.
Time until ecological benefit	5	<p>Scalping and direct seeding will occur over the first 3-5 years, while similarly, weed control will be more extensive over the first 5 years, and therefore given the known success of habitat enhancement for the species at other sites, it is likely that the time until ecological benefit will be 5 years.</p> <p>The 5 years is ecological justified given that the plant species (i.e. grasses) being enhanced, regenerated and reintroduced are known to rapidly grown and become established, and therefore provide a suitable foraging</p>

Condition	Value	Comments
		<p>resource for Golden Sun Moth within 5 years. It is highly likely that the distribution, density and overall population size of Golden Sun Moth across the study area will increase significantly from the current situation. This is particularly relevant for this species as it has a relatively short lifecycle (i.e. two years underground before emergence).</p> <p>Notwithstanding the time until ecological benefit, management actions will be 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 Golden Sun Moth population on site and proposed improvements will occur within five years with targeted management actions outlined in this OMP. The management Golden Sun Moth populations and associated habitats have been successful at several other sites, including an area at the Warrambeen Landcare Centre / Estate (approximately 55 kilometres north west of Geelong), Salisbury Bushland Reserve (east of Nhill) in north western Victoria, and the Nhill Sun Moth Reserve which is located on a private allotment at 16 Belcher Street, Nhill Moth (Clive Crouch pers. comms.).</p> <p>At the Nhill Sun Moth Reserve a degraded area dominated by introduced grasses (a couple of hectares in size), and that was located adjacent to the exiting population of the species in the reserve, was sown with native grasses (primarily wallaby grasses) and actively managed (i.e. weed control). Within a short period of time (1-2 years) a large number of moths colonised the rehabilitated area (i.e. actively seen using the grassland for breeding), and the overall number of moths observed flying over this area increased significantly compared prior to direct seeding and management actions. A large population of Golden Sun Moth persists in this area of the Reserve. This demonstrates that with appropriate management of a site (i.e. weed control, biomass management and direct seeding), particularly sites that contain contiguous habitat with an extant population of Golden Sun Moth, the time of ecological benefit for this species is relatively short (i.e. within 1-2 breeding seasons). Unlike offset sites for other matters of National Environmental Significance (e.g. Natural Temperate Grassland of Victorian Volcanic Plain, or habitat trees or wetlands for fauna) where the time of ecological benefit would be at least 10 years, the management of a grassy understorey so that it is suitable for Golden Sun Moth is relatively short (i.e. within 5 years). As such, there is a high level of confidence that due to the site context the proposed management actions outlined in this Plan will result in the significant expansion ('step change') of Golden Sun Moth distribution and populations across the property within a short period of time (i.e. within 5 years, possibly sooner).</p>
Start area (hectares)	63 ha (Offset Site)	63 hectares will be secured and managed as an offset.
Start quality	5	<p>5 The quality of the offset area is of similar quality than the area to be cleared. It is a large area of remnant Plains Grassy Woodland with a mix of native and exotic grasses in the understorey. Based on the Offset Assessments Guide (DSEWPac 2012b) three primary variables are used to determine the quality of habitat and these include site condition, site context and species stocking rates.</p> <p><u>Site Condition – (higher quality than the impact site)</u></p> <p>Based on the results of the targeted surveys and habitat assessment undertaken across the proposed offset site (Ecology and Heritage Partners 2018d) (Appendix 1) the proposed offset site supports the required vegetation floristics and structure required to support a population of Golden Sun Moth. For example, the site supports a variable cover of the key food plants for the species, namely a diversity of wallaby grasses <i>Rytidosperma</i> spp. and spear grass <i>Austrostipa</i> spp. with areas of bare</p>

Condition	Value	Comments
		<p>ground (i.e. ~10% bare ground). The site has been grazed for many years (recently at a low grazing intensity), and during the site surveys, biomass levels were low.</p> <p>However, there are sections of the property such as the central and eastern portions that support a comparatively higher weed cover (e.g. greater than 70%) and lower intertussock space (i.e. 1-5% open areas) (Figure 2). In these lower quality areas, moths were either not recorded, or were detected in lower numbers and densities. One of the main management objectives at the proposed offset site will be to expand the percentage cover of higher quality habitat over time (i.e. percentage cover of wallaby grass).</p> <p><u>Site Context</u></p> <p>The vegetation on the site supports Plains Grassy Woodland (EVC 55), which is an endangered EVC in the bioregion. The site is connected to other properties supporting a mix of native and introduced vegetation to the north and east of the property (Figure 2). The site is also located directly to the south of an existing rail reserve which contains suitable understorey vegetation (i.e. wallaby grasses, spear grasses, Kangaroo Grass <i>Themeda triandra</i> with a diversity of native forbs and herbs such as Blue Devil <i>Eryngium ovinum</i>). However, it is not known whether these surrounding properties support a Golden Sun Moth population, and if they do, what the species distribution and population size is at surrounding sites.</p> <p>The site is one of a few documented sites where the species is known west of Ballarat. Other than grazing and the potential for cultivation and the application of superphosphate, there are no land use threats (e.g. residential development, roads etc.) within or directly adjoining the site.</p> <p><u>Species Stocking Rate</u></p> <p>Several moths (n=172 males) were detected over four separate survey periods during the species 2017/18 flight season (Ecology and Heritage Partners 2018d). Several individuals were also recorded during targeted surveys (surveys were restricted to a small linear strip along the northern boundary of the property within one of the proposed road option alignments the northern as part of the Western Highway Duplication (Ecology and Heritage Partners 2012) (Figure 3). This demonstrates that the proposed offset site has supported an extant Golden Sun Moth population for several years. The highest number of Golden Sun Moth (exceeding 100 individuals) were recorded in the first two surveys during November 2017, with the greatest density of moths detected in the western, north-western and northern portion of the property (Figure 3) where there is a comparatively higher cover of native grasses, herbs and forbs.</p>
Risk of loss (%) without offset	5	<p>5%. There is a risk that the habitat would be lost without being used as an offset site. The site is not currently managed for Golden Sun Moth, and future decisions would not necessarily 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) are likely to occur.</p>
Future quality without offset	4	<p>4/10. Given the current land use (i.e. grazing) at the proposed offset, the absence of a security arrangement and dedicated management of the understory specifically for Golden Sun Moth, it is possible that the habitat will decline in quality in the future (i.e. incompatible grazing regime, increase weed levels, introduction of high threat weeds).</p>
Risk of loss (%) with offset	1	<p>1%. Current and future risks of loss will be averted through the security agreement placed on the property title and the implementation of appropriate actions outlined in this OMP. The security agreement will</p>

Condition	Value	Comments
		<p>prevent the land from being developed and will ensure protection and management actions area implemented.</p> <p>With specific management of the site as a Golden Sun Moth Conservation / Offset Area, there is a very small risk that the population on the site will be lost through current or future threatening processes. All key threats will be appropriately managed. As outlined above the species has persisted on the site for several years and the risk of loss (i.e. site extinction) with the offset is significantly lower as the management actions provided in this Plan are well known and proven (not unorthodox or innovative), and therefore there is a high prospect that the species will persist across the site.</p>
Future quality with offset	7	<p>7/10. It is expected that this Plan, and the actions detailed within, will lead to an increase of the habitat quality. There is a high level of confidence that the future quality of the Golden Sun Moth offset site will increase through the active implementation of the various actions outlined in this Plan (i.e. appropriate grazing, weed control, habitat enhancement through direct seeding, no tree planting). There are many examples of successful management of sites for Golden Sun Moth (e.g. Aurora, north of Melbourne, reserves in Victoria and ACT specifically managed for Golden Sun Moth), and therefore there is a high likelihood that the management actions provided in the Offset Management Plan will lead to an increase in the species' habitat quality, site occupancy and population size. The management actions outlined in this Plan are well known and proven, and therefore there is a high likelihood that the quality of the habitat will improve in the future (DEWHA 2009a, 2009b).</p> <p>Current and future risks at the proposed offset site are being averted or managed through the security agreement placed on the property title and the implementation of appropriate actions outlined in this Plan.</p> <p>Finally, due to the commitment of the current landowner and investment in the active management of the site these factors provide a high level of confidence that the future quality of the offset will increase (i.e. a score of 7 is realistic).</p>
Confidence of results:	90% and 85%	<p>90% and 85%. Given the proposed security and active management of the offset site and the proven enhancement of grassland habitat at other sites occupied by Golden Sun Moth (including other offset sites), there is a high-level confidence of the future quality of the proposed offset site (i.e. score of 7/10). Similarly, given the short life cycle of the species and the ability of rehabilitate degraded areas with key food plants of the species (principally wallaby grasses) the time of ecological benefit (i.e. 5 years) is realistic.</p>

APPENDIX 2. EPBC ACT OFFSET ASSESSMENT CALCULATIONS – OFFSET SITE (63 HA)

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	22	Hectares	Field mapping
				Quality	5	Scale 0-10	
	Total quantum of impact			11.00	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	11.20	Adjusted hectares	63	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	63	Risk of loss (%) without offset	5%	Risk of loss (%) with offset	1%	2.52	90%	2.77	0.61	11.41	103.72%	Yes	\$40K – 60K / hectare
					Time until ecological benefit	5	Start quality (scale of 0-10)	5	Future quality without offset (scale of 0-10)	4	Future quality with offset (scale of 0-10)	7	3.00								

12 APPENDIX 3

12.1 Golden Sun Moth Offset Management Plan Costs (Indicative Only)

Table 10. Golden Sum Moth Offset Management Plan costs

Proposed Offset area	63
----------------------	----

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)	\$65,000	\$45,500	\$45,500	\$32,500	\$32,500	\$32,500	\$26,000	\$26,000	\$26,000	\$26,000	\$357,500	\$35,750	\$393,250
Weed control (woody weeds)	\$4,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$1,200	\$1,200	\$1,200	\$1,200	\$18,800	\$1,880	\$20,680
Revegetation and direct seeding (grasses, herbs and forbs)	\$20,000	\$115,000	\$115,000	\$1,000	\$1,000	\$20,000	\$20,000	\$1,500	\$1,500	\$1,500	\$296,500	\$29,650	\$326,150
Pest animal control	\$3,000	\$3,060	\$2,448	\$1,958	\$1,567	\$1,410	\$1,269	\$1,142	\$1,028	\$925	\$17,807	\$1,781	\$19,588
Fence installation	\$40,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$40,000	\$4,000	\$44,000
Fence maintenance, rubbish removal	\$2,200	\$2,244	\$2,289	\$2,335	\$2,381	\$2,429	\$2,478	\$2,527	\$2,578	\$2,629	\$24,089	\$2,409	\$26,498
Site Inspection and Monitoring	\$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
Project management and reporting	\$4,000	\$4,080	\$4,162	\$4,245	\$4,330	\$4,416	\$4,505	\$4,595	\$4,687	\$4,780	\$43,799	\$4,380	\$48,179
SUB TOTAL	\$148,200	\$182,084	\$181,802	\$54,650	\$54,602	\$73,796	\$66,713	\$48,451	\$48,709	\$48,986	\$907,993	\$90,799	\$998,792

Cost basis
Direct Seed Mix and direct seeding (sowing of native grass seeds) and revegetation
Weed control (grass and herbaceous weeds)
Weed control (woody weeds)
Pest animal control
Fence maintenance, rubbish removal
Site Inspection and Monitoring
Project management and reporting

\$4,500.00 / hectare for the seed mixture of native grasses. This assumes that supplementary planting will occur in Years 2 and 3, and then repeated in Years 6 and 7
Ongoing weed control will reduce weed density over time. Weed control intensity is greatest in Year 1, followed by 30% reduction from in Years 2-3, and a further 20% reduction in cost in Years 4-6 and a further 10% reduction in cost in years 7-10.
Ongoing weed control will reduce weed density over time. Weed control intensity is greatest in Year 1, followed by 50% reduction in intensity in Year 2-6, further 20% reduction in Year 7-10.
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.
Costs consistent. Annual 2% CPI has been applied.
Costs consistent. Annual 2% CPI has been applied.
Costs consistent. Annual 2% CPI has been applied.

APPENDIX 2. GOLDEN SUN MOTH OFFSET MANAGEMENT PLAN (WARRAMBEEN)

Final Report

Golden Sun Moth *Synemon plana* Offset Management Plan: Saxon Paddock and East Creek, 815 Gumley Road, Mount Mercer, Victoria (EPBC 2018/8167)

Prepared for

Frasers Property Australia Pty Ltd

April 2019



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DOCUMENT CONTROL

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DECLARATION OF ACCURACY

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan (EPBC 2018/8167: Golden Sun Moth Offset Management Plan: Saxon Paddock and East Creek, 815 Gumley Road, Mount Mercer, Victoria) is complete, current and correct.
2. I am duly authorised to sign this declaration on behalf of the approval holder.
3. I am aware that:
 - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
 - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

Full name (please print)

Organisation (please print)

Date

EXECUTIVE SUMMARY

Introduction

Frasers Property Australia Pty Ltd (Frasers Property), propose to subdivide a property located at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria into an industrial estate. Targeted surveys at this site were undertaken during the 2011/12 and 2017/18 flight seasons of the critically endangered (listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) Golden Sun Moth *Synemon plana*. A Golden Sun Moth population was confirmed at the site.

An EPBC Act referral was submitted to the Commonwealth Department of the Environment and Energy (DoEE) for the proposed development (EPBC Act Referral 2018/8167) and on 9 May 2018 the proposed action was determined a 'Controlled Action' as it would lead to a 'significant impact' on Golden Sun Moth. The proposed development will be assessed by Preliminary Documentation.

Offset site

The proposed offset site is located within an area known as the Saxon Offset and East Creek, Warrambeen, Victoria. The paddock is located within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, Victoria, approximately 60 kilometres northwest of Geelong. The offset site, within the Saxon Paddock and 860 Paddock, consists of over 90 hectares of suitable grassland habitat [areas of which constitute Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)] and is known to support a resident population of Golden Sun Moth. Other areas within the paddock are currently secured and managed for the conservation of Golden Sun Moth and remnant NTGVVP (under previous EPBC Act decisions). The Warrambeen Demonstration Landcare Farm is privately owned and supports extensive areas of remnant native grassland.

Previous Golden Sun Moth records

Golden Sun Moth was initially recorded during targeted surveys across the entire paddock, with 23 individuals recorded on 6 January 2011, seven individuals recorded on 20 January 2011, and 62 moths observed on 15 November 2017 and 4 December 2017. Golden Sun Moth was recently detected during population monitoring across the Saxon Paddock as part of two other offset sites. This previous offset site is located within the same paddock and abuts the proposed offset site. In addition, Golden Sun Moth was detected flying across 860 Paddock during the species' 2018/19 flight season (Biosis unpub. data.)

Habitat

The main habitat type at the offset site comprises moderate to high Plains Grassland with areas containing a mix of native and introduced species. Plains Grassland across the proposed offset area is dominated by Kneel Spear-grass *Austrostipa bigeniculata*, Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, with a lesser presence of Kangaroo Grass *Themeda triandra*, wallaby-grasses *Rytidosperma* spp., Common Tussock-grass *Poa labillardierei*, Common Wheat-grass *Elymus scaber* var. *scaber* and Long-hair Plume-grass *Dichelachne crinita*.

Areas supporting a mix of native and introduced grass species, including Perennial Rye-grass *Lolium perenne*, Cocksfoot *Dactylis glomerata*, Toowoomba Canary Grass *Phalaris aquatica* and Narrow-leaf Clover *Trifolium angustifolium* var. *angustifolium*. Introduced weeds also present within the proposed offset area include Cat's Ear *Hypochoeris radicata*, Long Stork's-bill *Erodium botrys*, Onion Grass *Romulea rosea*, Yorkshire Fog *Holcus lanatus*, Sweet Vernal-grass *Anthoxanthum odoratum* and Ribwort *Plantago lanceolata*.

Objectives of the Offset Management Plan

This Golden Sun Moth Offset Management Plan (GSMOMP) provides detailed management actions for the identified Golden Sun Moth population at the offset site that will lead to a net benefit for the species. The proposed removal of suitable habitat at the development site will be offset through the protection of 90 hectares of suitable / confirmed Golden Sun Moth habitat. The objectives of the GSMOMP are to provide:

- A summary of the results of the previous targeted surveys undertaken at the offset site;
- A description of the offset site and an evaluation of its suitability as an offset;
- Detailed management actions to protect and enhance habitat present on the site;
- A detailed 10-year Management Plan; and,
- Outline monitoring and reporting requirements to satisfy the requirements under the EPBC Act.

This GSMOMP will allow for a net benefit to the Golden Sun Moth through long-term protection and management of the existing population at the proposed offset site.

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1 INTRODUCTION

1.1 Background

Frasers Property Australia Pty Ltd (Frasers Property), propose to subdivide a property located at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria into an industrial estate (Figure 1). Targeted surveys at this site were undertaken during the 2013/14 and 2017/18 flight seasons of the Critically Endangered (listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) Golden Sun Moth *Synemon plana* (Ecology and Heritage Partners Pty Ltd 2018a, 2018b). A Golden Sun Moth population was confirmed at the site.

An EPBC Act referral was submitted to the Commonwealth Department of the Environment and Energy (DoEE) for the proposed development (EPBC Act Referral 2018/8167) and on 9 May 2018 the proposed action was determined a 'Controlled Action' as it would lead to a 'significant impact' on Golden Sun Moth. The proposed development will be assessed by Preliminary Documentation (Ecology and Heritage Partners 2018c).

The proposed offset site is located within an area known as the Saxon Paddock and East Creek, and 860 Paddock Offset Site, Warrambeen, Victoria (Figure 2). The paddocks are located within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, Victoria, approximately 60 kilometres northwest of Geelong. The offset site, within the Saxon and East Creek paddocks and 860 Paddock, comprise over 90 hectares of suitable grassland habitat [areas of which constitute Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)] and is known to support a resident population of Golden Sun Moth (Figure 3). Other areas within the Saxon Paddock and East Creek are currently secured and managed for the conservation of Golden Sun Moth and remnant NTGVVP (under previous EPBC Act decisions). The Warrambeen Demonstration Landcare Farm is privately owned and supports extensive areas of remnant native grassland.

1.2 Objectives

This GSMOMP sets out the approach to be taken by Frasers Property Australia to ensure that the development of the project has a net benefit to Golden Sun Moth at the offset site. The offset site will be managed solely for Golden Sun Moth and all actions will be undertaken by personnel experienced in the management of grassland habitats. The objectives of the GSMOMP are to provide:

- A summary of the results of the previous targeted surveys undertaken at the offset site;
- A description of the offset site and an evaluation of its suitability as an offset;
- Detailed management actions to protect and enhance habitat present on the site;
- A detailed 10-year Management Plan; and,
- Outline monitoring and reporting requirements to satisfy the requirements under the EPBC Act.

1.3 Previous Records

Golden Sun Moth was initially recorded during targeted surveys across the entire paddock in January 2011. The result of the population monitoring at the current offset site known as Saxon (located in the north east corner of Saxon Paddock and East Creek is provided below (Table 1).

More than 100 moths were recorded during habitat monitoring on 20 November and 7 December 2018 across the southern offset site known as the Hydrox offset (Figure 4). This previous offset site is located within the same paddock and abuts the proposed offset site.

In addition, several individuals were recently detected during targeted surveys across 860 Paddock, during the 2018/19 flight period (Biosis unpub. data.) (Figure 4).

The species has been recorded predominantly within areas of open ground containing preferred host plants, including wallaby-grasses. The species was recently detected in the highest abundances since the commencement of monitoring which indicates that the active management of the offset is resulting in a higher stocking rate / population of the species across the offset site (Ecology and Heritage Partners 2018d). Targeted surveys were undertaken in accordance with the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009).

Table 1. Golden Sun Moth Population Monitoring within the Saxon Paddock and East Creek offset site.

Survey Year	Golden Sun Moth Abundances	Management Recommendations
2011/12	9	Based on the previous survey results during the 2011/12 targeted surveys and the results of the 2014/15 monitoring, Golden Sun Moth populations have not been reduced within the Saxon Paddock offset site. Active biomass control will provide more areas of open ground and higher native vegetation cover for the species in subsequent years.
2014/15	53	
2015/16	15	While the number of Golden Sun Moth was lower this is likely due to the timing of the surveys as opposed to the quality of habitat on site given conditions have not decreased in quality over the past year.
2017/18	62	The species was detected in high numbers.
2018/19	21 at Saxon offset *100's across the broader Hydrox offset and surrounding the Saxon offset	The species was detected in high numbers demonstrating that the species still resides in high population numbers within the offset site.

Note: * Moths were observed flying over the Hydrox offset site to the south of the Saxon offset during the 20 November and 7 December 2018 (Figure 4).

1.3.1 Habitat

The main habitat type at the offset site comprises moderate to high Plains Grassland, including areas co-dominated by native and introduced species (e.g. Wild Oat *Avena fatua* and Spear Thistle *Cirsium vulgare*) (Plates 1-4). Plains Grassland within the proposed offset area supports a high percentage

over of native species, including Kneed Spear-grass *Austrostipa bigeniculata*, Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, with a lesser presence of Kangaroo Grass *Themeda triandra*, Wallaby-grasses *Rytidosperma* spp., Common Tussock-grass *Poa labillardierei*, Common Wheat-grass *Elymus scaber* var. *scaber* and Long-hair Plume-grass *Dichelachne crinita*. Native herb species present include Chocolate Lily *Arthropodium strictum*, Lemon Beauty-head *Calocephalus citreus*, Common Everlasting *Chrysocephalum apiculatum*, Blue Devil *Eryngium ovinum*, Tall Bluebell *Wahlenbergia stricta* and Scaly Buttons *Leptorhynchos squamatus*.

Areas supporting a mix of native and exotic species such as Wild Oat, Perennial Rye-grass *Lolium perenne*, Cocksfoot *Dactylis glomerata*, Toowoomba Canary Grass *Phalaris aquatica* and Narrow-leaf Clover *Trifolium angustifolium* var. *angustifolium*. Introduced weeds also present within the proposed offset area include Cat's Ear *Hypochoeris radicata*, Long Stork's-bill *Erodium botrys*, Onion Grass *Romulea rosea*, Yorkshire Fog *Holcus lanatus*, Sweet Vernal-grass *Anthoxanthum odoratum* and Ribwort *Plantago lanceolata*.



Plate 1. Wild Oat across sections of the Saxon Paddock and East Creek paddock, Warrambeen.



Plate 2. Wild Oat across sections of the Saxon Paddock and East Creek paddock, Warrambeen.



Plate 3. Suitable Golden Sun Moth within proposed Saxon paddock, Warrambeen.



Plate 4. Remnant grassland with open areas within the Saxon Paddock, Warrambeen.

2 OBJECTIVES AND CONTEXT OF THE PROJECT

2.1 The Impact Area

2.1.1 Extent

A maximum of 54.36 hectares of Golden Sun Moth habitat is proposed to be removed for industrial development in Epping. A masterplan has been prepared and the proposed development of the site will result in the removal of all Golden Sun Moth habitat. The plan relates to the offset of 32.36 hectares of Golden Sun Moth habitat, while the remaining 22 hectares of habitat will be offset at another site in western Victoria.

2.1.2 Habitat

The habitat proposed to be removed is 100% cover by the noxious Chilean Needle Grass *Nassella neesiana*, with the occasional native wallaby grasses scattered throughout (Ecology and Heritage Partners 2018a, 2018b). These areas currently provide suitable habitat for Golden Sun Moth.

2.1.3 Significance of Impact

Given that habitat known to support Golden Sun Moth is proposed to be impacted, the development has resulted in a 'significant impact' under the definition outlined in the Significant Impact Guidelines for Golden Sun Moth (DEWHA 2009b). As the entire Epping site is proposed to be developed, this will result in the complete removal of known Golden Sun Moth habitat on that site. As such, an offset site (off-site) at Mount Mercer, Victoria will be secured and managed to ensure that there is a net gain in the population and associated habitats over the 10 years. The proposed offset site has recent records of Golden Sun Moth and contains suitable Golden Sun Moth habitat, and active management of the site result in the long-term conservation of the species (see below).

2.2 The Offset Site

2.2.1 Golden Sun Moth Offset Site Location and Characteristics

The proposed offset site is 90 hectares in size and is located at Saxon Paddock and East Creek Offset, and 860 Paddock, Warrambeen, Victoria. The offset site is located within the Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer, Victoria, approximately 60 kilometres northwest of Geelong. The study area is zoned Farming (FZ) and has a Vegetation Protection Overlay (VPO1: Significant and Remnant Vegetation Areas) which covers a small portion of the study area to the north.

This site supports Plains Grassland (EVC 132) dominated by wallaby grasses *Rytidosperma* spp., Kangaroo Grass *Themeda* spp. and spear grasses *Austrostipa* spp.) and exotic grasses (annual and

perennial species, including *Phalaris*). Many areas where Golden Sun Moth was detected (recorded over several years) support a high percentage cover (>50%) of native grasses, while other areas are dominated by either a mix of native and exotic grasses (Figure 3) (Plates 2-6). There are low to moderate levels of disturbance from sheep grazing. Consistent with the Golden Sun Moth Significant Impact Guidelines (DEWHA 2009), the proposed offset site is a grassland comprising bare or sparsely covered ground between grass tussocks (inter-tussock space).

2.2.2 Vegetation Condition

The proposed offset site comprises Plains Grassland in varying condition (Plates 5 – 8). The conditions across the site is relatively homogeneous, with the predominant variation in conditions being an infestation of Spear Thistle *Carthamus lanatus* across the site, including the drainage line (2-3% cover).

The predominant weed within the study area was Wild Oat *Avena fatua*, which will require active management to ensure the percentage cover of biomass meets the objectives of this offset plan (Section 5). The removal of weeds will expand the extent and increase the quality of Golden Sun Moth habitat, thus leading to an increase in habitat quality from a starting quality of 5 to a target habitat quality of 7.



Plate 5. Native vegetation within the offset site (Ecology and Heritage Partners Pty Ltd 22/11/2017).



Plate 6. Native vegetation within the offset site (Ecology and Heritage Partners Pty Ltd 22/11/2017).



Plate 7. Native vegetation within the offset site (Ecology and Heritage Partners Pty Ltd 22/11/2017).



Plate 8. Native vegetation within the offset site (Ecology and Heritage Partners Pty Ltd 22/11/2017).

2.2.3 Objectives of the Golden Sun Moth Offset Site

This plan details methods for the management and conservation of Golden Sun Moth habitat at the offset site over the requisite 10- year management period and into perpetuity. The primary objectives of the Golden Sun Moth offset site are as follows:

- 1) Adequately compensate for the proposed removal of occupied habitat at the proposed impact site;
- 2) Ensure that extant Golden Sun Moth populations will not be destroyed (i.e. cultivated or receive superphosphate); and,
- 3) Ensure Golden Sun Moth site occupancy (distribution) and population (numbers of moths) on average over the 10 years increase as vegetation / habitat quality improves, thus ensuring that the population is viable / persists in perpetuity.

It is anticipated that the management works outlined in this OMP will begin as soon as the offset site is secured and the OMP is approved by DoEE prior to the commencement of the proposed development at Epping.

2.2.3.1 Surrounding landscape

The proposed offset site abuts three existing offset sites that have been secured and are currently being managed (various stages of the 10-year management plan) for Golden Sun Moth (Figure 3). Areas surrounding the proposed offset site support varying quality grassland and areas that are cropped periodically.

2.2.4 Security of the offset site

The proposed offset site will be secured via a Trust for Nature covenant and this type of security mechanism meets the requirements under the offset policy (DSEWPac 2012a).

2.2.5 Management

For the offset site to qualify as an appropriate offset to compensate for the approved removal of suitable habitat associated with the proposed industrial development, management actions will be undertaken to increase the quality of habitat of the protected area. Management actions described below are to be implemented for a mandatory period of 10 years, and the primary objective of management, which is consistent with the Golden Sun Moth Significant Impact Guidelines (Page 7 in DEWHA 2009), is to ensure actions that may lead to the loss, degradation or fragmentation of Golden Sun Moth habitat are avoided. These actions include:

- Clearing of grassland or grassy woodland, including soil cultivation;
- Modification of habitat (e.g. changes to shading, hydrology, wind patterns, species composition);
- Management practices (e.g. changes in fire regime, slashing, mowing, increases or decreases in the intensity of a grazing regime);
- Weed cover is managed in perpetuity to ensure it does not increase beyond the level attained at year 10 of management, and prevention and control of any new and emerging weeds; and,
- Chemical application (e.g. pesticides, herbicides, fertilisers).

The offsets will be achieved through the active implementation of this OMP and ensuring weed levels are reduced and native grass cover is enhanced. This will deliver improved conservation outcomes for the species, which is aligned with the objectives outlined in Golden Sun Moth Significant Impact Guidelines (DEWHA 2009).

2.2.5.1 High quality habitat

High quality Golden Sun Moth 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.

2.2.5.2 Considerations

As one of the management options to improve Golden Sun Moth habitat quality, the grazing regime (i.e. intensity, timing and duration) will be maintained or altered from its current rate. The current stocking frequency and duration will remain the same as what has previously occurred across the offset site. However, this may vary depending on the site conditions to ensure that the property is not overgrazed. Biomass management is required to ensure there is sufficient inter-tussock space so that it remains conducive for Golden Sun Moth breeding. Management actions to provide a net benefit for the Golden Sun Moth will focus on habitat improvement actions such as weed control, facilitation of regeneration and active revegetation of native understorey species (i.e. grasses, forbs and herbs). In addition, cultivation of the land and / or application of superphosphate (fertilizer) will be prohibited.

2.3 Benefit of the Impact / Offset Approach against a 'Do Nothing' Scenario at the proposed Offset Site

The management actions detailed in this Offset Management Plan for the offset area have been designed to provide a net benefit when compared with a 'do nothing' scenario for the Golden Sun Moth within the impact area.

Under a 'do nothing' approach, existing land management practices would continue, without regard to the Golden Sun Moth 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. Alteration of grazing pressure, or not managing the spread of weeds may have a negative impact on the Golden Sun Moth population.

Protection of the area as an offset site provides a degree of certainty as to the future conservation of Golden Sun Moth habitat and facilitates habitat improvement actions, and this removes the current uncertainty around future management actions and their impact on the species. The proposed offset will provide a net conservation benefit for the species compared with a 'do nothing' scenario.

3 RISK ASSESSMENT

An assessment of potential risks associate with the objectives of this plan are outlined within Table 2. All risks are considered manageable and actions within subsequent sections of this OMP address relevant risks.

Table 2. Risk assessment and management table for specific offset site.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
To legally secure approved offset property for conservation	Failure to legally secure approved offset site	Ecology and Heritage Partners will facilitate the security agreement on behalf of the landowner. This will be undertaken as there will be a commitment by the landowner and proponent to do this. IN addition, DELWP will require this for the site to be registered as an offset site for Golden Sun Moth. This is a process that is undertaken regularly and accepted.	Unlikely	Moderate	Low	n/a	Engage a consultant	<u>Low risk</u> : the site is currently in the process of being secured with an on-title agreement through a Trust for Nature Covenant.
	Legislative reform prejudices proposed tenure arrangements for offset properties.	Monitor DoEE, DELWP, LGAs and other legislative bodies on developments regarding offsets. This is a low risk as the process is undertaken regularly.	Rare	High	Low	Newsletters, expert liaison, press releases and direct contact.	Adjust offset calculations accordingly.	

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
To achieve performance targets and completion criteria for Golden Sun Moth	Landowner-approval holder agreements fail to adequately address management commitments in the offset plan	Engage an expert to manage the process. Ensure all impacts are suitably offset. The expert will have proven experience with the development of the plan. DoEE and DELWP will undertake their QA/QC process to ensure that regularly reporting and demonstration that the actions have been appropriately implemented for the conservation of Golden Sun Moth for the life of the OMP and in perpetuity.	Unlikely	High	Medium	Quality assurance and monitoring	Revise on-title and/or approval holder agreements.	The site will be protected through a Trust for Nature Covenant. This agreement has a rigorous quality assurance process for all offset sites to ensure the landowner agreements address the management commitments in the plan, and that the management actions are adequately implemented during the life of the OMP.
	Adjacent/regional landowner's land management practices fail to support attainment of offset outcomes.	If deemed necessary, liaise with adjacent landholders. Ensure understanding of offset objectives. However, the site is bound by a road to the south and west, a railway line to the north, and an adjoining property to the east, therefore the risk of adjacent landowner management actions impacting the offset site is very low (currently fenced and private property).	Unlikely	High	Medium	Adjacent land practices begin to negatively impact offset site.	Take steps to halt negative impacts. Follow up with stakeholder discussions.	Three existing offset area adjoin the proposed offset site. There are no dwellings within 50m of the site. Based on the current land management practices in the region it is unlikely that any foreseeable land management practices within the vicinity of the proposed offset site will impact the offset site.
	Insufficient funds provided by approval holder to implement the plan.	The proponent will be responsible for adequate funding of the 10-year management actions outlined in this OMP. This will be a requirement of the approval. Regular reporting against the	Unlikely	High	Medium	Monitoring and/or annual reporting	Review plan for cost efficiencies.	The landholder is committed in ensuring that the offset is managed principally for conservation, and the offset funds provided by the proponent will be paid to the landowner to ensure management actions can be adequately

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
		management actions at the offset site will be an approval requirement under the EPBC Act for the proposed development.						implemented. An annual report will be prepared by the landholder for a period of 10 years.
	Stochastic events (wildfire/drought/flood) prejudice attainment of interim performance targets and/or completion criteria for Golden Sun Moth.	Ensure appropriate biomass management. Plan for scheduling delays.	Possible	High	Medium	Monitoring and/or annual reporting	Apply adaptive management to ensure the objectives of the OMP are not compromised.	-
	Approved development on/near project/offset prejudicing plan outcomes.	Ensure proper stakeholder engagement to prevent poor outcomes.	Unlikely	High	Medium	Advertisement of planning scheme amendments/planning permit applications.	Objection to proposed development/laisse with proponent to ensure the proposed development does not compromise the objectives of the OMP.	The offset site is within a rural agricultural landscape, as such, there is a low likelihood of development within adjacent properties. However, should there be any proposed development or intensification of land (e.g. cropping) adjacent to the proposed offset site it is highly unlikely that this will impact the long-term suitability of the site, as the ecological values within the offset site do not rely on habitat values within adjacent land.
Golden Sun Moth habitat improved	Drought	Apply adaptive management to ensure the site is not over-grazed	Likely	Moderate	Medium	Drought Event	Apply adaptive management to ensure the site is not over-grazed.	Golden Sun Moth habitat is located within a mosaic of native and introduced grassland, historically subject to drought and occasional

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
	Wildfire		Likely	Moderate	Medium	Wildfire Event		wildfire. As such, the Golden Sun Moth habitat and known population on the site is likely to survive / persist after such an event.
	Uncontrolled grazing	Maintain fences and install temporary fencing, if required (Section 5.5.1)	Highly Likely	Moderate	Unlikely	Continual monitoring	Repair permanent fences, and/or install temporary exclusion fences.	The strategic grazing regimes specified within this plan aim to shift species dominance to favour native species abundance and diversity, improving the ecological condition and habitat.
		Exclude stock during (October-January [generally]) (see Section 5.5.1 and 5.5.2.4 for further information on exclusion period)						
	High biomass levels preventing establishment of native herbs (see Section 5.5.2 for performance indicators)	Undertake pulse grazing (Section 5.5.2)	Highly Likely	Moderate	Possible	Annual monitoring	Apply pulse grazing in appropriate season to reduce biomass levels (Section 5.5.2)	Further, strategic grazing strategies will improve and maintain recruitment space required for native plants to establish, further improving species diversity over time.
		Exclude stock during (October-January [generally]) (see Section 5.5.1 and 5.5.2.4 for further information on exclusion period)						
	Loss of biodiversity due to competition with weeds (see Section 5.5. 3 for performance indicators)	Spot spraying of weeds (Section 5.5.3)	Likely	Moderate	Possible	Annual monitoring	Undertake weed control activities (Section 5.5.3)	The Offset Management Plan includes actions to reduce weed cover, improving the ecological condition of the site over the ten-year period.
		Undertake pulse grazing (Section 5.5.3)						
		Annual monitoring to adapt future control works and targets (Section 5.5.3)						
	Loss of biodiversity due to pest animal activity (see Section 5.5.4 for	Rabbit warrens or fox dens are controlled (Section 5.5.4)	Likely	Moderate	Possible	Annual monitoring	Undertake pest control activities (Section 5.5.4)	The Offset Management Plan includes actions to reduce pest animal activity, thereby reducing grazing/soil disturbance by Rabbits.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity(ies)	Feasible/effective corrective actions	Notes
			L	C	RR			
	performance indicators)							As a result, the Golden Sun Moth habitat is likely to improve.

Notes. L = Likelihood; C = Consequence; RR = Residual Risk

4 UNAVOIDABLE LOSS AND OFFSET OBLIGATIONS

4.1 Unavoidable Loss

The proposed industrial development at 410 Cooper Street and 315 O'Herns Road, Epping, Victoria will result in the removal of a maximum of 54.36 hectares of Golden Sun Moth habitat.

The habitat proposed to be removed consists is dominated (100% cover) by the noxious Chilean Needle Grass, with the occasional native wallaby grasses scattered throughout.

4.2 Offset Obligations

The protection and management of 90 hectares of Golden Sun Moth habitat at the proposed offset site mitigates the impact of the proposed removal of 32.36 hectares of habitat at the development site.

5 OFFSET MANAGEMENT PLAN (IMPLEMENTATION)

The offset site will be protected via a Trust for Nature Covenant to ensure that it is secured and managed appropriately in perpetuity. The following section discusses the actions required to implement the GSMOMP. As outlined above, it is anticipated that the management works outlined in this OMP will begin as soon as the offset site is secured and the OMP is approved by DoEE prior to the commencement of the proposed development at Epping.

5.1 Plan for Offset Site

The offset site is to be secured and managed for conservation purposes in perpetuity. The GSMOMP for the proposed offset site consists of implementing a vegetation management plan incorporating weed and biomass control, revegetation, as well as regular monitoring specifically tailored to the ecological requirements of Golden Sun Moth and the maintenance of Plains Grassland. Details of security and management responsibility are shown below (Table 3).

Table 3. Security and Management Responsibility

Offset Security and Management Responsibility	
Who is liable/responsible for meeting offset requirements?	Approval Holder
Type of security through a covenant under the <i>Victorian Conservation Trust Act 1972 (Vic)</i>	Trust for Nature covenant
Agreement or Planning Permit Number (ID)	TBC
Date 10-year offset management to commence	2019
Date 10-year offset management expires	2029
Registered on title? (Yes/No)	Yes
Offset site management responsibility (i.e. Landowner, Authority Name)	Landowner
Offset Monitoring Responsibility (i.e. Responsible Authority, DELWP)	Landowner

5.2 Adaptive Management Approach

The GSMOMP 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 GSMOMP.

5.3 Management Objectives and Performance Measures

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. The GSMOMP and specified management actions will form a Plan for the long-term management of Golden Sun Moth and its habitat. Management actions described in this OMP are to be implemented for a mandatory

period of 10 years, and the primarily objective of management, which is consistent with the Golden Sun Moth Significant Impact Guidelines (Page 7 in DEWHA 2009).

The overarching key performance measures to demonstrate that the objectives (see Section 2.2.3) of the Golden Sun Moth offset site and the successful implementation of the GSMOMP have been met are:

- 1) Adequately compensate for the proposed removal of occupied habitat at the proposed impact site;
- 2) Ensure that extant Golden Sun Moth populations will not be destroyed (i.e. cultivated or receive superphosphate); and,
- 3) Ensure Golden Sun Moth site occupancy (distribution) and population (numbers and densities of moths) on average over the 10 years increase as vegetation / habitat quality improves, thus ensuring that the population is viable / persists in perpetuity. Although, it is well known that the number of Golden Sun Moth varies within and between flight periods, the objective is to increase the species' stocking rate (population) from the current 10 moths / hectare to 20-25 moths / hectare.

Detailed performance measures for each management actions are provided below (Section 5.5).

The implementation of the GSMOMP will deliver improved conservation outcomes for the species, which is aligned with the objectives outlined in Golden Sun Moth Significant Impact Guidelines (DEWHA 2009).

5.4 Management Costings

Indicative management costings for the 10-year offset plan are provided in Appendix 3. This will account for weed control, revegetation and Golden Sun Moth population monitoring, reporting and project management. The management costs provided below (Appendix 3) have been obtained through detailed discussions with land management contractors (i.e. weed control). Consequently, the costs associated with the implementation of the 10-year plan are based on up to date industry rates that accurately reflect the current market costs for management. However, these management costs are likely to vary in the future depending on who is employed to undertake the management actions, and the type and intensity of specific management actions required across the property to ensure that the GSMOMP objectives are being adequately met.

5.5 Management Actions

The following section discusses the actions required to implement the GSMOMP for the ongoing protection of the existing Golden Sun Moth population. 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, a five-year review will be undertaken to ensure that the management actions and the performance targets have been met over the first 5 years (i.e. time until ecological benefit).

There are several standard actions that 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 rock removal or cropping;
- Weed cover is managed in perpetuity to ensure it does not increase beyond the level attained at year 10 of management; and,

- Golden Sun Moth populations and habitat are improved.

Implementation of this management plan is the overall responsibility of the land owner. However, direct management responsibility may be delegated to a designated site manager and/or managing ecologist with annual reports submitted to DoEE and Frasers Property Australia Pty Ltd.

Funding for undertaking security, management and monitoring actions prescribed in this GSMOMP has been agreed between the landowner the Proponent (Frasers Property Australia Pty Ltd).

Any proposed uses or development of the site which conflict with the landowner's commitments are not permitted under this plan. The sensitivities of the site must be considered with all management actions and all contractors entering the site need to be made aware of the values.

The following management and monitoring actions detailed in this OMP have regard to the following legislations and/or policies:

- *Environment Protection and Biodiversity Conservation) Act 1999;*
- *Flora and Fauna Guarantee Act 1988 (FFG Act);*
- *Catchment and Land Protection Act 1994 (CaLP Act);*
- Commonwealth's Threat abatement plan for competition and land degradation by rabbits (DoEE 2016);
- Sub-regional strategy for the Golden Sun Moth (DEPI 2013b).
- Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*) (DEWHA 2009)
- Approved Conservation Advice for *Synemon plana* (Golden Sun Moth) (DoE 2013)
- Commonwealth Listing Advice on *Synemon plana* (Golden Sun Moth) (TSSC 2002).

Of particular note, weed invasion and inappropriate grazing regimes (overgrazing, or loss of inter-tussock space due to undergrazing/lack of fire) are two of the main demonstrated threats to Golden Sun Moth (DEWHA 2009; DoE 2013).

This GSMOMP addresses these demonstrated threats by including management actions aimed at reducing the likelihood of weed invasion, the preparation of an appropriate grazing regime sensitive to the values that exist in the offset site and surrounds.

Further, the actions contained in this GSMOMP address several Priority Actions included in the conservation advice (DoE 2013) that will be undertaken to support to recovery of Golden Sun Moth, including:

- Habitat Loss, Disturbance and Modification:
 - Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate and/or secure inclusion in reserve tenure if possible;
 - Minimise disturbance in areas where the Golden Sun Moth occurs, excluding necessary actions to manage the conservation of the species. Retain and protect natural grassland remnants within the known distribution of the species;
 - Do not destroy habitat and surrounding areas by ploughing;

- Ensure remnant populations remain connected or linked to each other; in case where remnants have become isolated, consider revegetation to re-establish links and aid dispersal
- Manage any changes to hydrology that may result in changes to water table levels and/or increased run-off, salinity, or pollution;
- Monitor known populations to determine the species' status;
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary; and,
- Identify populations of high conservation priority. Search for the species in suitable habitat in areas that are proposed for development
- Invasive Weeds
 - Control invasions of environmental weeds and pasture species, and consider the impact of herbicide use in habitat. Where possible, use methods that directly target weeds such as spot spraying, and hand removal to minimise the adverse impact on Golden Sun Moth; and,
 - Consider re-introducing an appropriate control method where Kangaroo-grass (*Themeda australis*) has the potential to out-compete wallaby grasses in previously grazed or slashed areas in the proposed offset.
- Trampling, Browsing or Grazing
 - Manage the extent and intensity of grazing to minimise any direct adverse effects on the Golden Sun Moth or its habitat. Indeed, the proposed grazing regime will be suitable for Golden Sun Moth persistence and spread across the site.

5.5.1 5 Year Performance Targets

The following interim performance targets have been provided to ensure that the time until ecological benefit is achieved at the proposed offset site after 5 years of the commencement of the OMP:

- Offset site secured via a Trust for Nature covenant;
- A 10% increase in the extent of native vegetation patches;
- An average 10% increase in the quality (i.e. the condition score) of areas that support patches of native vegetation patches that are defined in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines) (2017);
- Percentage cover of high threat weeds <10%;
- Percentage cover of woody weeds <1%;
- A 20% to 40% cover of bare ground or inter-tussock space;
- The persistence of a Golden Sun Moth population;
- A 20-30% increase in the distribution of Golden Sun Moth;

- Based on targeted Golden Sun Moth survey data the current species' stocking rate at the proposed offset site is estimated to be 10 moths / hectare, and the objective of management actions is to increase this to 20-25 moths / hectare;
- External fences maintained; and,
- Pest animals such as rabbits controlled with no detectable impacts (i.e. extensive soil disturbance, over grazing) to grassland habitat.

5.5.2 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 entire perimeter of the proposed Golden Sun Moth offset site is currently fenced.

5.5.2.1 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.

5.5.2.2 Performance Targets / Indicators

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;
- No unpermitted access within the offset site, by personnel, vehicles, or stock.

5.5.2.3 Responsible Personnel

Monitoring and access within the offset site is the responsibility of the landowner.

5.5.3 Biomass Control

The objective of biomass control within the offset area is to promote the floristic diversity through the provision of inter-tussock space for germination and recruitment of native flora associated with Plains Grassland. In addition, these actions will improve habitat quality for existing flora present within the offset site and assist with minimising the weed growth.

Biomass management is essential to enhance the ecological values throughout the offset site. Biomass management is also required to maintain inter-tussock spaces and prevent excessive competition to grassland forbs. Biomass control will aim to maintain 20% to 40% cover of bare ground or inter-tussock space to allow sufficient space for recruitment of herbs and grasses. If Golden Sun Moth habitat is less than 20% bare ground then biomass reduction will be implemented at the earliest opportunity (with consideration of seasonality to

minimise risk to ecological values, life and assets). These targets are based on other offset sites in the Saxon Paddock (i.e. surrounding the proposed offset site).

The current biomass reduction method applied throughout the offset site consists of low-intensity rotational grazing. Sheep are removed during the critical flowering/reproductive period for native species (October to January) then sheep are return to graze between March and September. The current grazing regime is considered an appropriate method for managing biomass given that native vegetation has persisted across the property as a direct result of the grazing disturbance regime.

5.5.3.1 *Managed Grazing (lower stocking rates)*

The offset property has historically been subject to unrestricted grazing. Sheep grazing to reduce biomass is reliable to improve the ecological values within the offset area. Grazing will be undertaken in a controlled manner to ensure that biomass accumulation control within the offset site is consistent with the standards for management of ecological grazing provided by DELWP (DSE 2009). Grazing of domestic stock will be restricted to the use of sheep. Grazing by other domestic stock, including, but not restricted to, cattle, goats and horses are excluded from the offset site by this plan.

Grazing will occur between February and September (although some grazing outside this period may be required to allow for seasonal variation in plant growth) and will not exceed a comparatively low stocking rate. The timing of grazing will be strictly controlled to preventing pugging and other soil disturbance within the offset site, and to enhance opportunities for native grasses to grow and set seed during Spring and early Summer.

5.5.3.2 *Actions*

In accordance with the priority actions outlined with the Conservation Advise for the species (DoE 2013, p3-4) and the Significant Impact Guidelines (DEWHA 2009, p4), which outlines re-introduction of control measures to ensure sufficient inter-tussock space and mitigate competition of Wallaby-grasses by Kangaroo-grass, the following management actions will be undertaken:

- Biomass will be managed by sheep grazing to reduce vegetation cover and to ensure 20% to 40% cover of bare ground or inter-tussock space to allow sufficient space for recruitment of herbs and grasses;
- If Golden Sun Moth habitat is less than 20% bare ground then biomass reduction will be implemented at the earliest opportunity (with consideration of seasonality to minimise risk to ecological values, life and assets; and,
- Where required, no stock, or very low numbers of stock (e.g. up to 200 sheep) will be present on the property during the Golden Sun Moth flight period (i.e. between October and late January).
- Ensure adequate grazing to reduce biomass to acceptable cover levels;
- If deemed important for the species in any year, remove sheep, or reduce the stocking rate from the offset site between October to late January. Although this will depend on site conditions; and
- An appropriate land manager/contractor will co-ordinate weed control works with the grazing regime.

5.5.3.3 *Performance Targets / Indicators*

The following key performance targets have been provided to meet the conservation outcomes for Golden Sun Moth, as outlined within the Conservation Advice (DoE 2013, p3-4) and the Significant Impact Guidelines (DEWHA 2009, p4):

- Maintenance and improvement of current vegetation condition, including species diversity and richness;
- Maintenance of suitable vegetation structure throughout the site (i.e. low to moderate biomass levels), and suitable inter-tussock spaces for natural recruitment maintained/provided;
- The maintenance of open structured Plains Grassland community suitable for the ecological requirements of Golden Sun Moth.

Specific measurable indicators to measure the success of these targets comprise:

- Vegetation cover is maintained at greater than 70% throughout the proposed offset site, and the space (i.e. bare ground) available for native flora species recruitment is between 20% and 40%;
- Ensure stocking rate is suitable to maintain low biomass and inter-tussock space. The stocking rate, may vary (i.e. more or less stock) depending on seasonal conditions such as rainfall to achieve 20% to 40% cover of bare ground / inter-tussock space;
- Golden Sun Moth populations are not reduced (populations to be monitored as per Section 5.6); and,
- No evidence of an increase in soil pugging.

These performance indicators must be recorded during site monitoring and included within annual reports (Section 5.6).

5.5.3.4 *Adaptive Management*

Highly seasonal conditions are not uncommon across western Victoria and can result in variable conditions from year to year (Mavromihalis *et al.* 2013). This is acknowledged within the offset management plan by allowing for a flexible approach to the timing and duration of grazing at the discretion of the Landowner.

5.5.3.5 *Anticipated Outcomes*

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth, as outlined within the Conservation Advice (DoE 2013, p3-4; Section 5.5) and the Significant Impact Guidelines (DEWHA 2009, p4). Specifically, management of grazing and inter-tussock space. The grazing regime specified is consistent with the standards for management of ecological grazing provided by DELWP (DSE 2009), and targets align with the desirable level of open space required for Golden Sun Moth (ACT Government 1998).

5.5.3.6 *Responsible Personnel*

Monitoring and control of grazing within the offset site is the responsibility of the landowner, however, management actions must be undertaken by suitably qualified personnel.

5.5.4 Weed Control

The objectives of weed control within the offset site is to enhance the existing Golden Sun Moth habitat by reducing/minimising future invasion by exotic flora. This will be achieved through a combination of controlled pulse grazing (to limit opportunities for weed establishment and seed set in exotic flora), and through on-ground management activities.

The control of weed species is a key management action across 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 undertaken by a suitably qualified contractor or someone with proven plant identification skills.

The following general guidelines should be considered as basic management principles in regard to weed control:

- Any weed control should be done in a manner that minimises soil disturbance;
- Where herbicide application is necessary, waterway sensitive products such as Roundup Biactive®, Weedmaster Duo® or Weedmaster 360® should be employed, without the addition of surfactant;
- Where herbicides are used, selective 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;
- Selective herbicides and those that kill plants quickly and are rapidly inactivated, leaving no residues ('knockdown' herbicides) are generally preferable to residual herbicides;
- Pest plants that reproduce sexually (by seed) are best controlled before seed ripens;
- To reduce the amounts of herbicide used, the target biomass should be reduced (e.g. grazed) before application so the herbicide can also be absorbed by the actively regrowing plants. Herbicides are only effective when plants are actively growing;
- Weed control works should be monitored regularly to assess their effectiveness, perform follow up works and evaluate the feasibility of management objectives; and,
- Weed control works following grazing periods are considered essential.

5.5.4.1 Woody Weeds

Few woody weeds are present on the offset site. Monitoring for new and emerging woody weeds will be conducted throughout the year for the term of the agreement, and any new and emerging woody weeds eliminated.

5.5.4.2 Herbaceous Weeds

Whilst the ultimate objective is to eliminate or reduce all weed species to less than 10% 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.

The aim of management is to reduce weed cover below current levels. Several weeds are present across offset site and these weeds will be actively controlled using the methods provided (Table4) and will be replaced with the key plant species. Monitored will occur every year to ensure that weed cover is reduced. Weeds will be treated before the plant has flowered and set seed.

Annual weeds within the offset site are not considered a significant threat in this environment and will be managed using grazing to reduce their prominence.

Spot spraying with appropriate herbicide is the main method for reducing weed cover. Spot spraying will be undertaken regularly, particularly in spring and early summer, with a focus on killing weed plants prior to seed set. Biomass control is also considered as an effective method for controlling and reducing weed levels.

Biomass control at the site will include controlled sheep grazing, and potentially ecological burning. Spot spraying will be completed in a manner which minimises non-target (i.e. native species) damage. Spot spraying will not occur during high wind days.

The cover of species within the offset site is likely to change over time in response to seasonal conditions, or because of pulse grazing. Weed cover and species will therefore be monitored and management adapted in response to achieve desired outcomes outlined in this management plan.

Weed control will consist of manual removal and/or spot spraying 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

5.5.4.3 New and emerging herbaceous weeds

Monitoring for new and emerging herbaceous weeds will be conducted throughout the year for the term of the agreement, and any new and emerging weeds eliminated.

Any other significant environmental weeds identified within the broader property during monitoring will also be controlled. Other high threat weeds, such as Chilean Needle-grass *Nassella neesiana*, which is known to occur in the region, but not on the proposed offset site, will be controlled should the species be detected on the site.

Table 4. A selection of herbaceous weeds to be controlled – method and timing

Common name	Scientific name	% total cover at inception	Method	Timing
Wild Oat	<i>Avena fatua</i>	15-60% (fewer weeds in the northern part of the offset site)	Spray before seeding	Spring
Spear Thistle	<i>Cirsium vulgare</i>	<1%	Manual Removal, Annual Spraying (before seeding)	All Year
Cocksfoot	<i>Dactylis glomerata</i>	5%	Spot Spray before seeding	Spring
Serrated Tussock	<i>Nassella trichotoma</i>	<1%	Spot Spray before seeding	Spring
Long Stork's-bill	<i>Erodium botrys</i>	<1%	Spot Spray before seeding	Spring
Perennial Rye- grass	<i>Lolium perenne</i> .	10%	Spot Spray before seeding	Spring

Common name	Scientific name	% total cover at inception	Method	Timing
Yorkshire Fog	<i>Holcus lanatus</i>	10%	Spot Spray before seeding	Spring
Toowoomba Canary-grass	<i>Phalaris aquatica</i>	10%	Controlled pulse crash grazing by sheep to prevent seed set; spot spraying of herbicide;	Summer, Autumn (grazing) Spot Spray (Spring)
Brown-top Bent	<i>Agrostis capillaris</i>	10%	Controlled pulse crash grazing by sheep to prevent seed set; spot spraying of herbicide;	Summer, Autumn (grazing) Spot Spray (Spring)
Ribwort	<i>Plantago lanceolata</i>	5%	Manual Removal, Annual Spraying (before seeding), Chip	All Year
Bromus spp., Aira spp., Quaking-grass, Squirrel-tail Fescue	Annual Grasses	10%	Controlled pulse crash grazing by sheep to limit opportunities for weed establishment; spot spraying of herbicide.	Summer, Autumn Sport Spray (Spring)

Note: this is not an exhaustive list of all weeds either present or that have the potential to occur on the site in the future.

5.5.4.4 Spot Spraying

The application of herbicides is an effective and efficient control technique for a range of woody, herbaceous and grass weeds. The correct use and application of herbicides can provide targeted control of a range of species. However, all herbicides must be used in accordance with the manufacturer's specifications and occupational health and safety policies.

Application methods for herbicides include: spot spraying with a knapsack, dabbing of weeds in sensitive areas with a foam-tipped application device, rig spraying with a pump for larger areas, dabbing of cut stumps and injection of woody weeds.

Timing of the interval of spot spraying is dependent upon many factors such as plant age and growth seasons, plant stress levels and climatic factors. Surrounding native plants' susceptibility to herbicides and ongoing uses of the treated areas must also be considered when choosing the herbicide to be used in a weed control program, as some herbicides are residual and may persist within the soil for varying durations.

Weed control will ideally be conducted when Golden Sun Moth are not flying, and control will typically be conducted in a mosaic fashion to avoid any unexpected impacts to the species.

5.5.4.5 Actions

In accordance with the priority actions outlined with the Conservation Advice for the species (DoE 2013, p3-4) and the Significant Impact Guidelines (DEWHA 2009, p4), which outlines weed invasion as a key threat, the following key management actions will be undertaken:

- Introduced Weeds. These will be mapped across the site, and monitored annually, to determine when control is required;
- Control environmental weeds to a cover of <10%;
- Periodic spot spraying of weeds with appropriate herbicide will be undertaken, particularly through spring and early summer;
- Any populations of new and emerging high threat weeds will be treated promptly and eliminated;

- During weed control, natural regeneration of indigenous flora will be protected from off-target damage;
- Undertake pulse crash grazing within the offset site to reduce weed cover; and,
- Annual monitoring to demonstrate the effectiveness of weed control works and the results will be used to adapt future control works and targets.

5.5.4.6 *Performance Targets / Indicators*

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

- Environmental weed cover of <10%;
- New and emerging weeds eliminated where possible.
- Reduction in the cover of weed species within the offset site (Table 4);
- Where herbicide application is employed, waterway sensitive products and non-residual herbicides are to be used; and,
- Off-target damage to indigenous plants minimised where it doesn't impact the suitability of Golden Sun Moth habitat.

These performance indicators have been selected as there are measurable and reflect the priority actions as outlined within the Conservation Advice (DoE 2013, p3-4) and Significant Impact Guidelines (DEWHA 2009, p4). These performance indicators must be recorded during site monitoring and included within annual reports (Section 5.6).

5.5.4.7 *Adaptive Management*

- Respond to the annual monitoring report and associated recommendations;
- If objectives and performance indicators are not being met:
 - Review grazing regime; and/or
 - Increase frequency of control activities.

5.5.4.8 *Anticipated Outcomes*

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth, as outlined within the Conservation Advice (DoE 2013, p3-4; Section 5.5). Specifically, management of weed encroachment. The management actions outline measures to minimise potential negative impacts to Golden Sun Moth (e.g. using a combination of approaches such as spot spraying and strategic grazing) and aim to enhance habitat for Golden Sun Moth though reducing competition for food plants (Wallaby-grass) from weed species.

5.5.4.9 *Responsible Personnel*

Monitoring and control of weeds within the offset site is the responsibility of the landowner, however, management actions must be undertaken by suitably qualified personnel.

5.5.5 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 land owner/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.

5.5.5.1 Actions

In accordance with the priority actions outlined with the Threat Abatement Plan for Rabbits (DoE 2013) 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) 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 may need to 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 rabbits and hares).

5.5.5.2 Performance Measures

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

- Any rabbit warrens are controlled immediately following detection;
- All monitoring and management activities are effectively documented;
- Reduction in pest animal activity from approval of this plan; and
- Minimal soil disturbance and no native vegetation loss from pest animal management activities.

These performance indicators have been selected as there are measurable, and reflect the above priority actions; the performance indicators must be recorded during site monitoring, and included within annual reports.

5.5.5.3 Adaptive Management

The following adaptive management actions are proposed:

- If pest animal management fails to achieve a reduction, or effectively control rabbits, or if impacts to Golden Sun Moth habitat that are attributable to pest animals increase, a review of the current procedures and management measures will be undertaken;
- Review performance of pest animal contractor;
- Increase active monitoring of pest animal activity; and,
- Incorporate additional control measures (i.e. spotlighting and shooting).

5.5.5.4 *Anticipated Outcomes*

The proposed management actions and performance indicators aim to meet the conservation outcomes for Golden Sun Moth. Specifically, retention and enhancement of habitat. The management actions aim to enhance habitat for Golden Sun Moth through increasing the distribution and connectivity of host-plants (Wallaby-grass) throughout the study area.

5.5.5.5 *Responsible Personnel*

Monitoring and control of pest animals within the offset site is the responsibility of the landowner, however, management actions must be undertaken by suitably qualified personnel.

5.6 Monitoring and Reporting

5.6.1 Golden Sun Moth Monitoring

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

Annual monitoring of Golden Sun Moth populations will be undertaken for **four**-years, and then in Years 6, 8 and 10 (within the 10-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, the management actions will be adjusted accordingly.

Specific survey procedures will follow those approved monitoring guidelines for Golden Sun Moth prepared by the DoEE (DEWHA 2009a). The following measures will be undertaken as part of population and habitat monitoring for Golden Sun Moth 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 Golden Sun Moth surveys undertaken throughout the offset site;
- Surveys are to be conducted by suitably trained observers;
- Surveys must take place during the species' flight season. In western Victoria 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 driving in a car at < 10 km / hour (flying male moths can be readily seen from a vehicle) until moths are observed.

5.6.1.1 *Responsible Personnel*

The monitoring and reporting of Golden Sun Moth populations within the offset site is the responsibility of the landowner, however, surveys must be undertaken by a suitably qualified ecologist, experienced in the identification of Golden Sun Moth.

5.6.1.2 Other Monitoring

Information relating to fencing, weed control and pest animal control, and revegetation will be provided by the landowner and 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.

This GSMOMP requires the Landowner to submit a report to DoEE after years 1, 2, 5 and 10 of management. The reports will include a review of past management works against the performance targets and objectives contained within this OMP. Future management priorities will also be detailed in these reports.

The Landowner will establish five permanent photo-points in the offset site. These points will be marked via GPS and shown on a Figure. Photographs taken from these points will be representative of the Golden Sun Moth habitat management objectives of the GSMOMP.

Photographs will be taken between October and early December each year and clearly labelled. Each photo will be taken from as near to the same point each year and will use the same direction, trajectory and camera settings as is practicable. Photographs and Annual Reports are to be submitted at least 2 months prior to the anniversary date of the execution of the agreement to allow time for compliance to be assessed before the anniversary date.

Data collected will be consistent with the specific management actions outlined above, and the proposed monitoring and reporting will reflect the performance measures for each action.

The Annual Report addresses progress against the commitments set out in this agreement. Annual Reports will provide sufficient detail in the form of written comments and supporting evidence that an assessor can easily determine the completion of/progress against the management commitments. The template for a landowner monitoring and reporting form is shown in Table 4. Information to be provided in the reporting form includes:

- A copy of the Management Action Table from the OMP with information on which actions have been completed for year/s of this reporting period;
- A description of the specific monitoring results from surveys undertaken (i.e. Golden Sun Moth surveys);
- Percentage cover of native and exotic grasses;
- Percentage of open and bare ground;
- Weed inventory and percentage cover of high threat weed species;
- Extent (area) of weed and pest animal control, indication of the success or failure;
- Any corrective actions and contingency measures where monitoring indicates that there has been a deterioration in the native vegetation or Golden Sun Moth population;
- Provide photographs showing evidence of works; and
- Identification and management of current, new and emerging threats to Golden Sun Moth habitat.

If any agreed management actions or commitments are incomplete or have not been undertaken in the times specified, the contractor is to document the justification and the actions that will be action/s will be undertaken to implement the requirement. All records/evidence of management actions will be maintained to DoEE upon request.

5.6.1.3 Responsible Personnel

Ongoing monitoring of the effectiveness of the management actions undertaken, identification of new threats, and annual reporting is the responsibility of the landowner.

5.6.1.4 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 (Table 5).

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. Should a proposed action not have been undertaken the reason(s) will be provided.

Table 5. 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		

5.7 Review

The protection and management of the nominated offset area is in perpetuity. The GSMOMP will be reviewed after five years from the date of approval. If the 5-year performance targets outlined in Section 5.5.2 are not being met, the GSMOMP will be updated to include remediation or additional actions to ensure the 10-year targets will be met. If the GSMOMP needs to be updated, then this will be submitted to the Commonwealth Minister for approval.

The focus of the 5-year review will be to determine the GSMOMP effectiveness in the protection, management and enhancement of Golden Sun Moth habitat. Should the management actions that have been undertaken are not meeting the performance targets and satisfactorily meeting the objectives of the GSMOMP, then it may be prudent at that time to reassess the type, extent and intensity of the management actions outlined in this plan to ensure the Golden Sun Moth habitat and populations are protected and enhanced in perpetuity.

5.8 Management Actions

Management actions are summarised below (Table 6). The actions constitute the minimum management requirements for the offset site over the mandatory 10-year management period.

Table 6. 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.	Within three months of this plan being approved by DoEE	
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	Landowner and its contractors	Within three months of this plan being approved by DoEE	
1	1.2	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
1	1.3	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
1	1.4	Conduct monitoring for Golden Sun Moth (<u>no report</u>)	Suitably qualified ecological specialist	One year after commencement of OMP	
1	1.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner	Summer/Autumn	
2	2.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
2	2.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
2	2.3	Conduct monitoring for Golden Sun Moth (prepare report)	Suitably qualified ecological specialist	Two years after commencement of OMP	
2	2.4	Maintain fences	Landowner and its contractors	As required	
2	2.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner	Summer/Autumn	
2	2.6	Monitor and assess works, and prepare two-year progress report	Suitably qualified ecological specialist	Two years after commencement of OMP	
3	3.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
3	3.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
3	3.3	Conduct monitoring for Golden Sun Moth (prepare report)	Suitably qualified ecological specialist	Three years after commencement of OMP	
3	3.4	Maintain fences	Landowner and its contractors	As required	
3	3.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
3	3.6	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Three years after commencement of OMP	
4	4.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
4	4.2	Monitor populations of pest animals and conduct control works if required	Landowner 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 OMP	
4	4.4	Maintain fences	Landowner and its contractors	As required	
4	4.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
4	4.6	Monitor and assess works, and prepare four-year progress report	Suitably qualified ecological specialist	Four years after commencement of OMP	
5	5.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
5	5.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
5	5.3	Maintain fences	Landowner and its contractors	As required	
5	5.4	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
5	5.5	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Five years after commencement of OMP	
6	6.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
6	6.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
6	6.3	Conduct monitoring for Golden Sun Moth (prepare report)	Suitably qualified ecological specialist	Six years after commencement of OMP	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
6	6.4	Maintain fences	Landowner and its contractors	As required	
6	6.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
6	6.6	Monitor and assess works, and prepare six-year progress report	Suitably qualified ecological specialist	Six years after commencement of OMP	
7	7.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
7	7.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
7	7.3	Maintain fences	Landowner and its contractors	As required	
7	7.4	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
7	7.5	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Seven years after commencement of OMP	
8	8.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
8	8.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
8	8.3	Conduct monitoring for Golden Sun Moth (prepare report)	Suitably qualified ecological specialist	Eight years after commencement of OMP	
8	8.4	Maintain fences	Landowner and its contractors	As required	
8	8.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
8	8.6	Monitor and assess works, and prepare eight-year progress report	Suitably qualified ecological specialist	Eight years after commencement of OMP	
9	9.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
9	9.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
9	9.3	Maintain fences	Landowner and its contractors	As required	
9	9.4	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	

Year	Action	Management action	Responsible authority / personnel	Timing of action	Date completed
9	9.5	Monitor and assess works (<u>no report</u>)	Suitably qualified ecological specialist	Nine years after commencement of OMP	
10	10.1	Conduct weed control	Landowner and its contractors	Species dependent for weeds	
10	10.2	Monitor populations of pest animals and conduct control works if required	Landowner and its contractors	After peak breeding season - late summer/early autumn	
10	10.3	Conduct monitoring for Golden Sun Moth (prepare report)	Suitably qualified ecological specialist	10 years after commencement of OMP	
10	10.4	Maintain fences	Landowner and its contractors	As required	
10	10.5	Monitor biomass density and implement a suitable stock grazing regime	Landowner and its contractors	Summer/Autumn	
10	10.6	Monitor and assess works, and prepare final report	Suitably qualified ecological specialist	Ten years after commencement of OMP	

Note: As outlined in Section 5.5.1 it is important that the protection and management actions outlined above achieve the following performance targets:

- A 10% increase in the extent of native vegetation patches;
- An average 10% increase in the quality (i.e. the condition score) of areas that support patches of native vegetation patches;
- Percentage cover of high threat weeds <10%;
- Percentage cover of woody weeds <1%;
- A 20% to 40% cover of bare ground or inter-tussock space;
- The persistence of a Golden Sun Moth population;
- A 20-30% increase in the distribution of Golden Sun Moth;
- An increase in the species' stocking rate to 20-25 moths / hectare;
- External fences maintained; and,
- Pest animals such as rabbits controlled with no detectable impacts to grassland habitat.

6 CONTINGENCY RESPONSE AND CORRECTIVE ACTIONS

The landholder 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 management of the site.

If after Year 5 of management, the actions detailed in this OMP are not leading to the ongoing maintenance and improvement of Golden Sun Moth habitat, a review will be undertaken, and a new management plan prepared for the remaining 5 years of management.

Any proposed changes to the management contrary to that specified within this plan will be approved DoEE, prior to implementation. Any proposed uses or development of the site which conflict with the landowners' commitments or maintenance/improvement of Golden Sun Moth habitat are not permitted under this plan.

Highly seasonal conditions are not uncommon across western Victoria, and can result in variable conditions from year to year. This is acknowledged within the OMP by allowing for a flexible approach to the timing of grazing at the discretion of the Landowner.

6.1 Managing Uncertainty

An assessment of potential risks associated with the objectives of this plan are outlined within Table 1. All risks are considered manageable and actions within subsequent sections of this OMP address the relevant risks.

7 EMERGENCY CONTACTS AND PROCEDURES

Should any environmental emergency occur on-site that poses a risk to the objectives of this plan, the relevant contacts (Table 7) must be notified as soon as possible, and no later than 12 hours following the event. At a minimum, DoEE and the landholder must be notified, and CFA and Victoria Police may need to be notified if assistance is required from these emergency services (e.g. control of wildfire). Emergency services must be advised of the on-site protections to avoid inadvertent damage to ecological values (e.g. creation of graded earthen fire breaks within the site, which unless necessary, must be avoided).

Table 7. Emergency contacts

Contact	Role	Telephone
Country Fire Authority (CFA)	Bushfire emergency	000
Victoria Police	Various (e.g. unauthorised access)	000
DoEE	Offset Monitoring Responsibility	1800 803 772

8 REFERENCES

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- Ecology and Heritage Partners Pty Ltd 2018c. Preliminary Documentation: 410 Cooper Street and 315 O'Herns Road, Epping, Victoria (EPBC 2018/8167).

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9 FIGURES

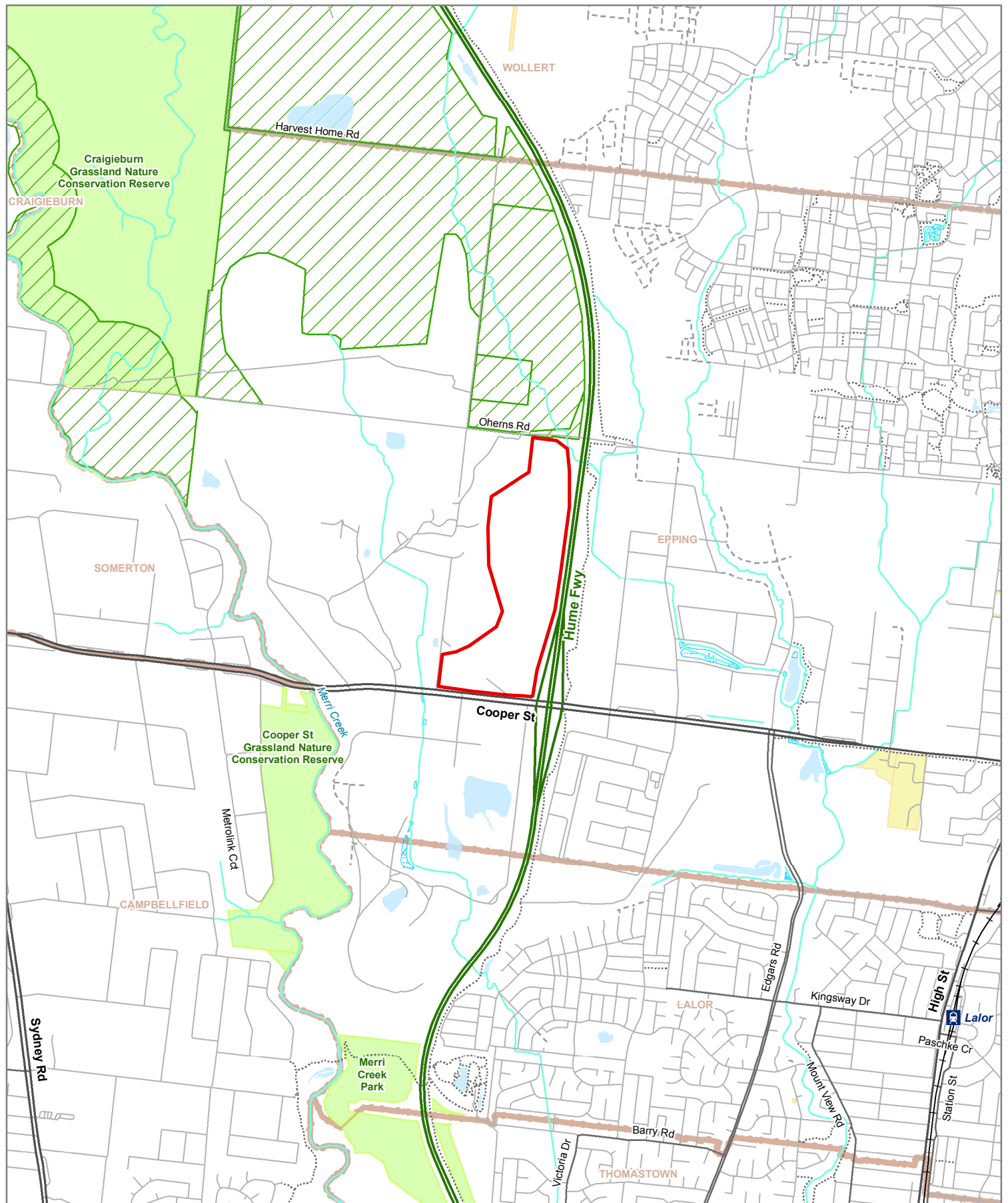
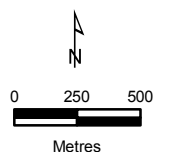


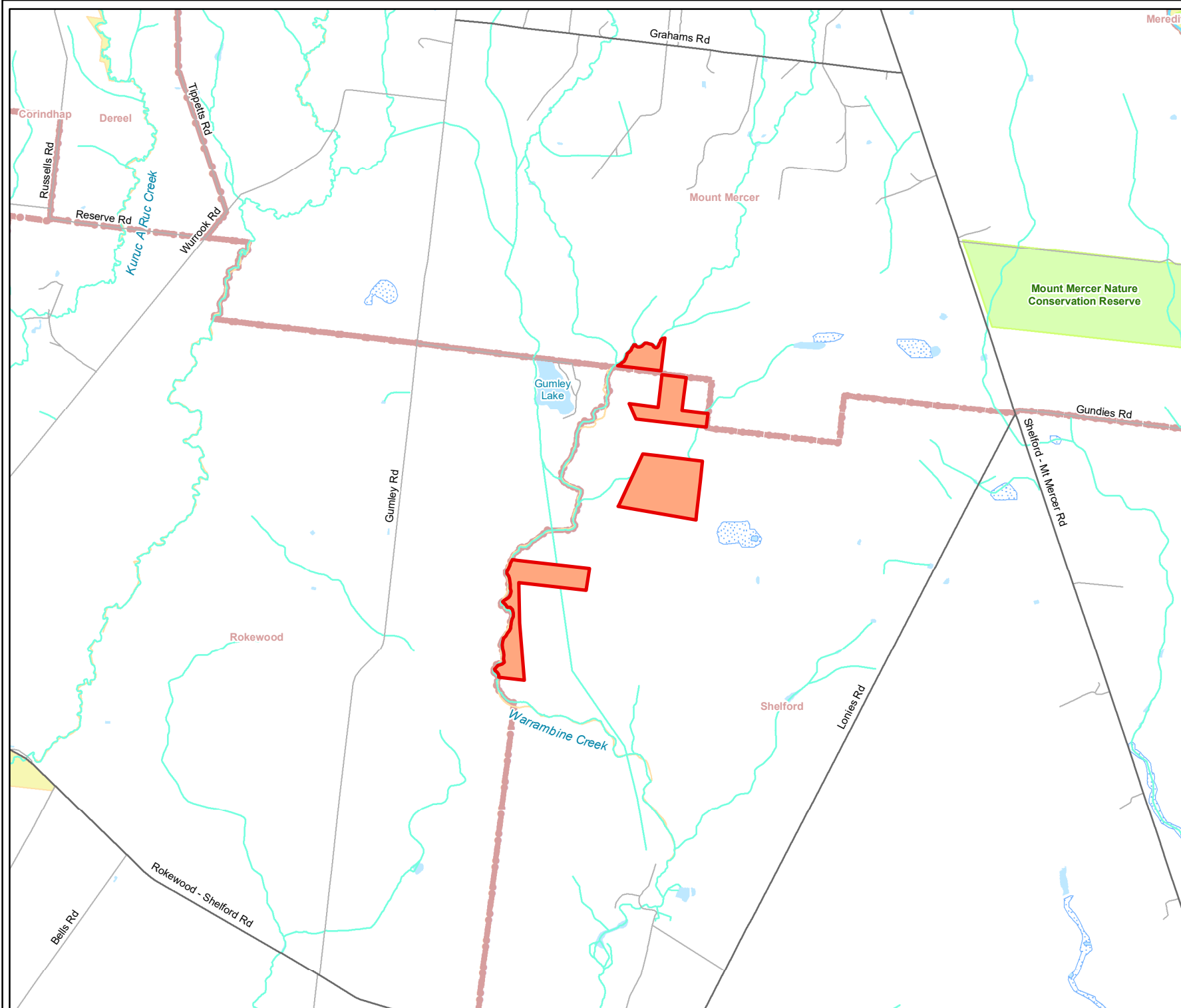
Figure 1
Location of the Study Area
 315 O'Herns Road,
 Epping

Legend

- | | |
|--|--|
| Study Area | Permanent Waterbody |
| Railway | Wetland/Swamp |
| Freeway | BCS Conservation Area |
| Major Road | Parks and Reserves |
| Collector Road | Crown Land |
| Minor Road | Localities |
| Proposed Road | |
| Walking Track | |
| Minor Watercourse | |



VicMap Data: The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

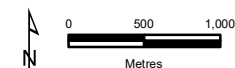


Legend

- Study Area
- Collector Road
- Minor Road
- Minor Watercourse
- Major Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Parks and Reserves
- Crown Land
- Localities



Figure 1
Location of the study area
Warrambien Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer



VicMap Data: The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

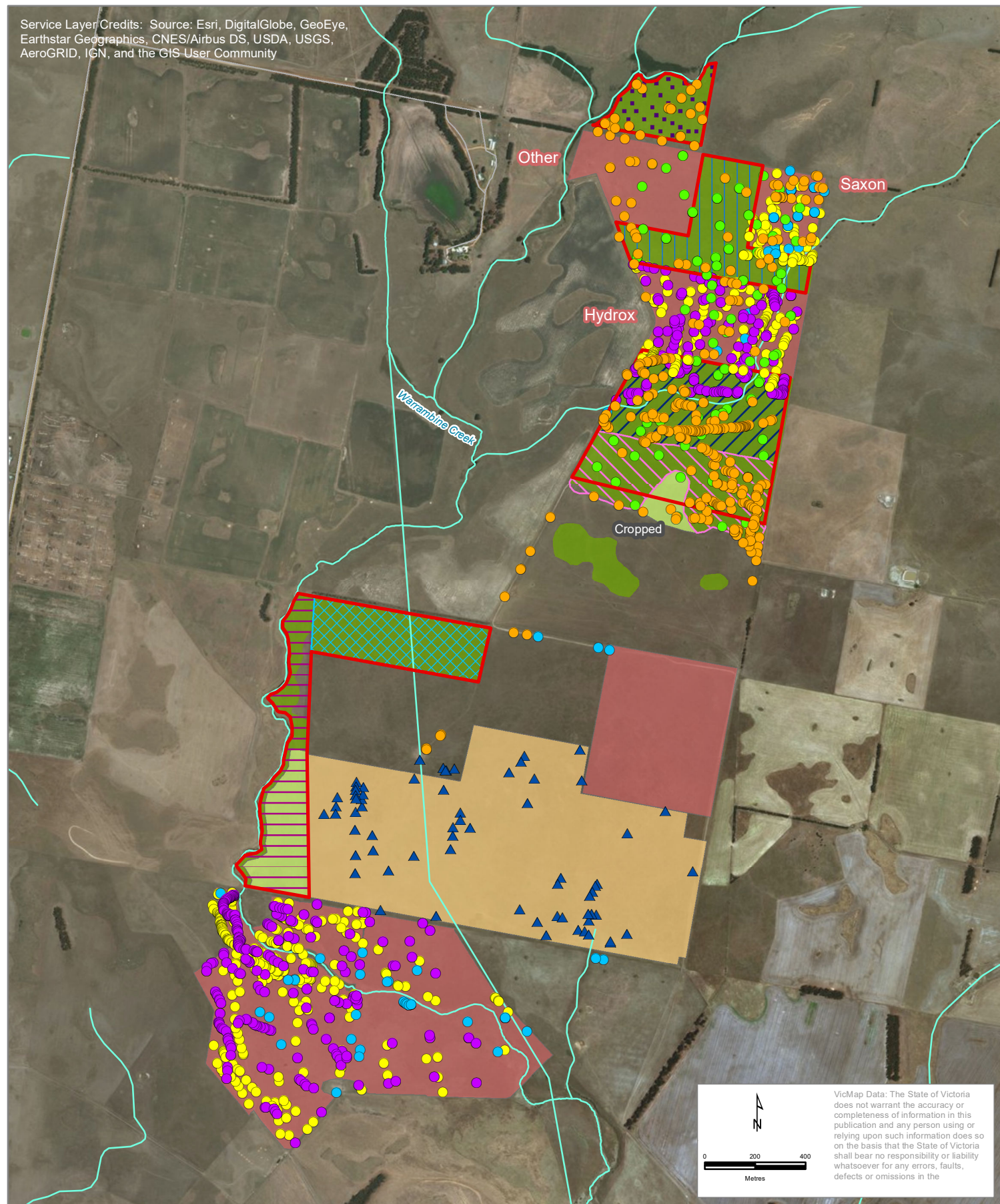


Figure 2
Proposed Golden Sun Moth offset site, previous Golden Sun Moth records and weed cover
Warrambeen Demonstration Landcare Farm, 815 Gumley Road, Mount Mercer

Legend

- Proposed offset sites (90 ha)
- Existing offset sites
- Potential offset site (Biosis 2018/19)

Vegetation

- Plains Grassland
- Native and exotic grasses

- ▲ Confirmed Golden Sun Moth sightings (Biosis 2018/19)

Golden Sun Moth records (Ecology and Heritage Partners):

- 2018
- 2017
- 2016
- 2015
- 2011

Weed cover

- 10% (Wild Oats and Spear thistle)
- 10-15% (Wild Oats and Spear thistle)
- 15-20% Oats
- 20% Oats
- 25-30% (Wild Oats and Phalaris)
- 60-70% Oats

10 APPENDIX 1

10.1 EPBC Act Environment Offset Policy

Table 8. Assessment summary of the Golden Sun Moth 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 the entire offset site located at 815 Gumley Road, Mount Mercer, Victoria. A total of 90 hectares is proposed to be secured as an offset property for the species as part of the proposed removal of 32.36 hectares (i.e. a conservation covenant will be placed over the 90 hectares).
Be built around direct offsets but may include other compensatory measures	Except for those management actions outlined in Section 5 and the associated land management costs listed within Appendix 3 no additional compensatory measures are proposed.
Be in proportion to the level of statutory protection that applies to the protected matter	In accordance with the EPBC Act Offset Assessment Guide, if managed appropriately (as planned), the offset site that comprises 90 hectares of moderately high-quality Golden Sun Moth habitat. This will exceed the offset requirements associated with the proposed removal of 32.36 hectares of suitable Golden Sun Moth 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, the proposed offset site is 90 hectares in size and therefore exceeds the offset requirement.
Effectively account for and manage the risks of the offset failing	Appropriate management actions detailed in Section 4 of this OMP will be implemented for a 10-year period and are designed to maintain and enhance current Golden Sun Moth 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)	The 90-hectare area proposed for the Golden Sun Moth offset is not already in use as an offset site for any other projects or past planning outcomes, nor has it previously been reserved for any other conservation program. As such, the proposed offset is additional to what is required under the planning regulations or determined by law, thus meeting the additionality requirement to qualify as a suitable offset.
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offsets will provide sufficient offset outcomes for the impacts to Golden Sun Moth as part of this project. The GSMOMP will be supported by species population monitoring and habitat management for a minimum of 10 years (Section 5).
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	The offset site will be secured through a Trust for Nature covenant. Fraser's Property Australia and landowner will submit relevant reporting to the DoEE to document the progress of the offset site and Golden Sun Moth populations and associated habitat conditions.

10.2 EPBC Act Offset Calculator Analysis

Table 9. Impact Calculator

Condition	Value	Comments
Area of habitat to be cleared	32.36	As provided by Frasers Property Australia
Quality of area to be cleared	5	<p>5/10. Golden Sun Moth habitat within the impact site does not meet the description that defines a high-quality remnant of the community. Golden Sun Moth habitat to be removed is of low quality, relatively species poor, and has been subjected to high levels of disturbance in the form of frequent slashing, historical grazing and soil disturbance. The proposed development will result in the removal of a high cover of noxious weeds dominated by Chilean Needle-grass <i>N. neesiana</i>.</p> <p>The impact site does not support native habitat typically occupied / preferred by the species (TSSC 2002; DEWHA 2009a, 2009b; DEPI 2013). The site would ordinarily be given a score of 2 or 3, although given that the site supports a population the quality of the area proposed to be cleared has been given a conservative score of 5.</p> <p>The quality of the offset area is of higher quality than the area to be cleared. It is a large area of remnant Plains Grassy Woodland with a mix of native and exotic grasses in the understorey. Based on the Offset Assessments Guide (DSEWPaC 2012b) three primary variables are used to determine the quality of habitat and these include site condition, site context and species stocking rates. A summary is provided.</p> <p><u>Site Condition</u></p> <p>Based on the previous habitat assessments undertaken on the impact site, the site supports low quality vegetation that is dominated by a dense cover of weeds. There are no patches of native vegetation present and the habitat present at the site is not currently managed for Golden Sun Moth. There are several disturbances such as soil disturbance that have, and continue to occur across the site, and the site has historically been used for grazing.</p> <p><u>Site Context</u></p> <p>The site is isolated from larger grassland areas that also support high quality Golden Sun Moth.</p> <p><u>Species Stocking Rate</u></p> <p>A large number of moths were detected over several separate survey periods.</p>

Table 10. Offset calculator

Condition	Value	Comments
Time over which loss is averted (max. 20 years)	20	The Landowner will protect and manage the offset site for the life of the management plan. Although the offset will be managed for 10 years, it will be protected in perpetuity and therefore a timeframe of 20 years is applied.
Time until ecological benefit	5	<p>5 years. The 5 years is ecological justified given that the plant species (i.e. grasses) being enhanced, regenerated and reintroduced are known to rapidly grown and become established, and therefore provide a suitable foraging resource for Golden Sun Moth within 5 years.</p> <p>It is highly likely that the distribution, density and overall population size of Golden Sun Moth across the study area will increase significantly from the current situation. This is particularly relevant for this species as it has a relatively short lifecycle (i.e. two years underground before emergence).</p> <p>Notwithstanding the time until ecological benefit, management actions will be carried out over a 10-year management period to improve the habitat.</p> <p>During the 2017/18 flight period, the species was detected in the highest numbers across a current offset site at the Saxon Paddock since the commencement of monitoring, and this indicates that the species still resides in high population numbers within the offset site and numbers have increased since active management was undertaken.</p>
Start area (hectares)	90	90 hectares will be secured and managed as an offset.
Start quality	5	<p>5/10. The quality of the offset area is of higher quality than the area to be cleared. It is a large area of remnant Plains Grassland (areas constitute the EPBC Act-listed NTGVVP) with a mix of native and exotic grasses in the understorey. It is connected to other suitable Golden Sun Moth habitat. However, the reason why the start quality of the offset site is not higher is because in areas of the proposed 90-hectare offset site there are a higher cover of introduced grasses (i.e. Perennial Rye-grass, Cocksfoot, Toowoomba Canary Grass, Yorkshire Fog and Sweet Vernal-grass) with a low inter-tussock space, and the comparatively lower numbers of moths recorded.</p>
Risk of loss (%) without offset	5	<p>5%. As outlined in Offset Assessments Guide (DSEWPac 2012b) the risk of loss is a percentage figure that describes the chance that the habitat on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter) over the foreseeable future (either the life of the offset or 20 years, whichever is shorter).</p> <p>Golden Sun Moth was originally detected across the Saxon Paddock (including the proposed offset area) on 6 January 2011 and 20 January 2011, on 15 November 2017 and 4 December 2017, and in November and December 2018 (Figure 2). This demonstrates that the current land use practice(s) (i.e. grazing) have been conducive to support a population of the species over several years.</p> <p>The risk of loss without the offset is low given that other parts of the Saxon Paddock are currently protected and being managed for Golden Sun Moth and other MNES, and therefore the potential for dramatic changes in land use and management that leads to the loss or degradation of habitat is reduced.</p> <p>There are current controls in the local planning scheme (Clause 52.17) that require a planning permit to removal native vegetation [i.e. Guidelines for</p>

Condition	Value	Comments
		the removal, destruction or lopping of native vegetation (DELWP 2017a)], these planning controls influence the risk of loss without the offset.
Future quality without offset	4	4/10. Given the current land use (i.e. grazing) at the proposed offset, the absence of a security arrangement and dedicated management of the understory specifically for Golden Sun Moth, it is likely that the habitat will decline in quality in the future from an initial quality score of 5 to 3.
Risk of loss (%) with offset	1	<p>1%. Current and future risks of loss will be averted through the security agreement placed on the property title and the implementation of appropriate actions outlined in this OMP. The security agreement will prevent the land from being cultivated (used for cropping) and will ensure protection and management actions are implemented.</p> <p>With specific management of the site as a Golden Sun Moth Conservation / Offset Area, there is a very small risk that the population on the site will be lost through current or future threatening processes. All key threats will be appropriately managed. As outlined above the species has persisted on the site for several years and the risk of loss (i.e. site extinction) with the offset is significantly lower as the management actions provided in this Offset Management Plan are well known and proven, and therefore there is a high prospect that the species will persist across the site.</p>
Future quality with offset	7	<p>7/10. There is a high level of confidence that the future quality of the Golden Sun Moth offset site will increase through the active implementation of the various actions outlined in the Offset Management Plan. As outlined above, there are many examples of successful management of sites for Golden Sun Moth, and therefore there is a high likelihood that the management actions provided in the Offset Management Plan will lead to an increase in the species' habitat quality, site occupancy and population size. The management actions outlined in this Plan are well known and proven, and therefore there is a high likelihood that the quality of the habitat will improve in the future (DEWHA 2009a, 2009b).</p> <p>Due to the commitment of the current landowner and investment in the active management of the site these factors provide a high level of confidence that the future quality of the offset will increase (i.e. a score of 7 is realistic). This has been demonstrated at other current offset sites across the Warrambeen Demonstration Landcare Farm. The key step change in quality will be the higher percentage of cover of native food plants for Golden Sun Moth, namely in the southern part of the offset site where the vegetation supports a lower percentage cover of wallaby and spear grasses, and a moderate to high cover of Wild Oat (Figure 3). There is a key commitment to reduce the Wild Oat cover from ~60% cover to <10%.</p> <p>The objective of management actions is to increase the species' stocking rate from approximately <u>10 moths / hectare</u> to <u>20-25 moths / hectare</u>).</p>
Confidence of results:	90% and 85%	90% and 85%. Given the proposed security and active management of the offset site and the proven enhancement of grassland habitat by the current landowner at other sites occupied by Golden Sun Moth across the Saxon Paddock and East Creek, there is a high-level confidence of the future quality of the proposed offset site (i.e. score of 7/10). Similarly, given the short life cycle of the species and the ability of rehabilitate degraded areas

Condition	Value	Comments
		with key food plants of the species (principally wallaby grasses) the time of ecological benefit (i.e. 5 years) is realistic.

A summary of the habitat quality assessment at the Impact Site and at the proposed Warrambeen Offset site is provided below (Table 11).

Table 11. Habitat quality at the proposed Impact Site and the Warrambeen Offset Site.

Habitat Quality	Site Condition	Site Context	Stocking Rate	Subtotal	Weighted Quality Score
Impact Site	4	4	8	16	5
Current Quality at proposed Warrambeen Offset site (average across the proposed offset area)	6	7	3	16	5
Future Quality with Offset at Warrambeen	8	7	6	21	7

The three habitat components that are used to determine habitat quality are scored out of 10. The Weighted Quality Score (i.e. overall habitat quality) is determined by dividing the subtotal by a maximum possible total of 30 and then multiplied by 10 (rounded to the nearest whole number).

The objective of management actions outlined in the Warrambeen Golden Sun Moth OMP is to increase the site condition from 6 to 8. This will be achieved by the appropriate grazing regime, weed control, and where required, direct seeding. The current and future Site Context at the Warrambeen Offset site has been assessed as the same (i.e. a score of 7).

Based on available targeted Golden Sun Moth survey data the current stocking rate at the proposed offset site (excluding the 24 hectares in 860 Paddock) is estimated to be 10 moths / hectare. The objective of management actions is to increase the species' stocking rate from 3 to 6 (i.e. from 10 moths / hectare to 20-25 moths / hectare). As a comparison, to achieve an increase in the stocking rate score to 8, a stocking rate of 30-35 moths / hectare would need to be achieved, while to achieve an increase in the stocking rate score to 9 or 10, a stocking rate of 36-50+ moths / hectare would need to be achieved.

The offset also supports other matters of National Environmental Significance (i.e. areas known to constitute Natural Temperate Grassland of the Victorian Volcanic Plain and suitable habitat for Striped Legless Lizard).

11 APPENDIX 2. EPBC ACT OFFSET ASSESSMENT CALCULATIONS

Impact Calculator							
IMPACT CALCULATOR	Threatened species habitat						
	Area of habitat	Yes	Golden Sun Moth habitat	Area	32.36	Hectares	Field mapping
				Quality	5	Scale 0-10	
				Total quantum of impact	16.18	Adjusted hectares	
	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact	Units	Information source	
	<div>Clear row</div>						
	Number of features e.g. Nest hollows, habitat trees	No					
	<div>Clear row</div>						
Condition of habitat Change in habitat condition, but no change in extent	No						
<div>Clear row</div>							

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	16.18	Adjusted hectares	90	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	90	Risk of loss (%) without offset	5%	Risk of loss (%) with offset	1%	3.60	90%	3.24	0.87	16.30	100.74%	Yes	\$40K – 60K / hectare

12 APPENDIX 3. GOLDEN SUN MOTH OFFSET MANAGEMENT PLAN COSTS

12.1 Golden Sun Moth Offset Management Plan Costs (Indicative Only)

Table 12. Golden Sun Moth Offset Management Plan costs for the 90-hectare offset site.

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)	\$90,000	\$45,000	\$45,000	\$45,000	\$45,000	\$45,000	\$27,000	\$27,000	\$27,000	\$27,000	\$423,000	\$42,300	\$465,300
Weed control (woody weeds)	\$7,000	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	\$2,100	\$2,100	\$2,100	\$2,100	\$32,900	\$3,290	\$26,190
Pest animal control	\$8,000	\$8,160	\$6,528	\$5,222	\$4,178	\$3,760	\$3,384	\$3,046	\$2,741	\$2,467	\$47,486	\$4,749	\$52,235
Fence installation	\$50,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$50,000	\$5,000	\$55,000
Fence maintenance, rubbish removal	\$2,500	\$2,550	\$2,601	\$2,653	\$2,706	\$2,760	\$2,815	\$2,872	\$2,929	\$2,988	\$27,374	\$2,737	\$30,112
Site Inspection and Monitoring	\$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
Project management and reporting	\$4,000	\$4,080	\$4,162	\$4,245	\$4,330	\$4,416	\$4,505	\$4,595	\$4,687	\$4,780	\$43,799	\$4,380	\$48,179
SUB TOTAL	\$171,500	\$73,490	\$72,195	\$71,232	\$70,538	\$70,477	\$50,016	\$51,099	\$51,174	\$51,286	\$734,057	\$73,406	\$807,462

Assumptions

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 5% reduction in intensity in Years 2 and 3, further 10% reduction in Years 4 and 5, and 15% 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.

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 maintenance, rubbish removal

Costs consistent. Annual 2% CPI has been applied.

Site Inspection and Monitoring

Costs consistent. Annual 2% CPI has been applied.

Project management and reporting

Costs consistent. Annual 2% CPI has been applied.

APPENDIX 3. EPBC ACT OFFSET CALCULATORS

EPBC Act Offset Calculations for the proposed Buangor Offset Site

Impact Calculator							
IMPACT CALCULATOR	Threatened species habitat						
	Area of habitat	Yes	Golden Sun Moth habitat	Area	22	Hectares	Field mapping
				Quality	5	Scale 0-10	
				Total quantum of impact	11.00	Adjusted hectares	
	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact	Units	Information source	
	<div>Clear row</div>						
	Number of features e.g. Nest hollows, habitat trees	No					
<div>Clear row</div>							
Condition of habitat Change in habitat condition, but no change in extent	No						
<div>Clear row</div>							

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	11.00	Adjusted hectares	63	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	63	Risk of loss (%) without offset	5%	Risk of loss (%) with offset	1%							
													2.52	90%	2.77	0.61				
						Time until ecological benefit	5	Start quality (scale of 0-10)	5	Future quality without offset (scale of 0-10)	4	Future quality with offset (scale of 0-10)	7	3.00	85%	2.55	1.84			

EPBC Act Offset Calculations for the proposed Warrambeen Offset Site

Impact Calculator							
IMPACT CALCULATOR	Threatened species habitat						
	Area of habitat	Yes	Golden Sun Moth habitat	Area	32.36	Hectares	Field mapping
				Quality	5	Scale 0-10	
				Total quantum of impact	16.18	Adjusted hectares	
	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact	Units	Information source	
	<div>Clear row</div>						
	Number of features e.g. Nest hollows, habitat trees	No					
	<div>Clear row</div>						
	Condition of habitat Change in habitat condition, but no change in extent	No					
	<div>Clear row</div>						

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	16.18	Adjusted hectares	90	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	90	Risk of loss (%) without offset	5%	Risk of loss (%) with offset	1%							

APPENDIX 4. ECONOMIC ASSESSMENT OF THE PROPOSED DEVELOPMENT

21 May 2018

John Roan
Planning Manager
Frasers Property Australia
Level 9, 484 St Kilda Road
Melbourne VIC 3004

By email: joan.roan@frasersproperty.com.au

Dear John

Economic assessment for proposed Cooper Street West industrial rezoning

This letter presents economic analysis of the likely employment outcomes associated with the development of the properties at 410 Cooper Street and 315 O'Herns Road in Epping for industrial purposes.

The land is currently partly within the Farming Zone ('FZ') and partly within the Special Use Zone ('SUZ') but is proposed to be placed in the Industrial 1 Zone ('IN1Z') as a result of Amendment C113 to the Whittlesea Planning Scheme which is currently waiting for Ministerial approval.

This economic analysis is being undertaken in the context of a referral to the Commonwealth under the Environment Protection and Biodiversity Conservation Act ('EPBC Act') for development of the land for industrial purposes to be considered a controlled action under that legislation.

Background

The subject properties contain a combined 61.4 hectares of land situated immediately west of Hume Freeway and between Cooper Street to the south and O'Herns Road to the north (refer Figure 1).

The land is identified as *Precinct 4 Gateway – Emerging Industry* within the draft Cooper Street West Position Paper prepared by Whittlesea City Council in 2016. I am advised that the position paper has since been adopted by Council.

More generally, the land is within the defined *Cooper Street Employment Precinct* which in recent years has accommodated significant investment in industrial and commercial activity and in state-significant economic infrastructure in the form of the Melbourne Wholesale Fruit Vegetable and Flower Market.

The employment precinct adjoins, and has links with, the Central Epping activity centre ('Epping Central') which is planned as a municipal focus for higher intensity retail, commercial, community, and residential development.

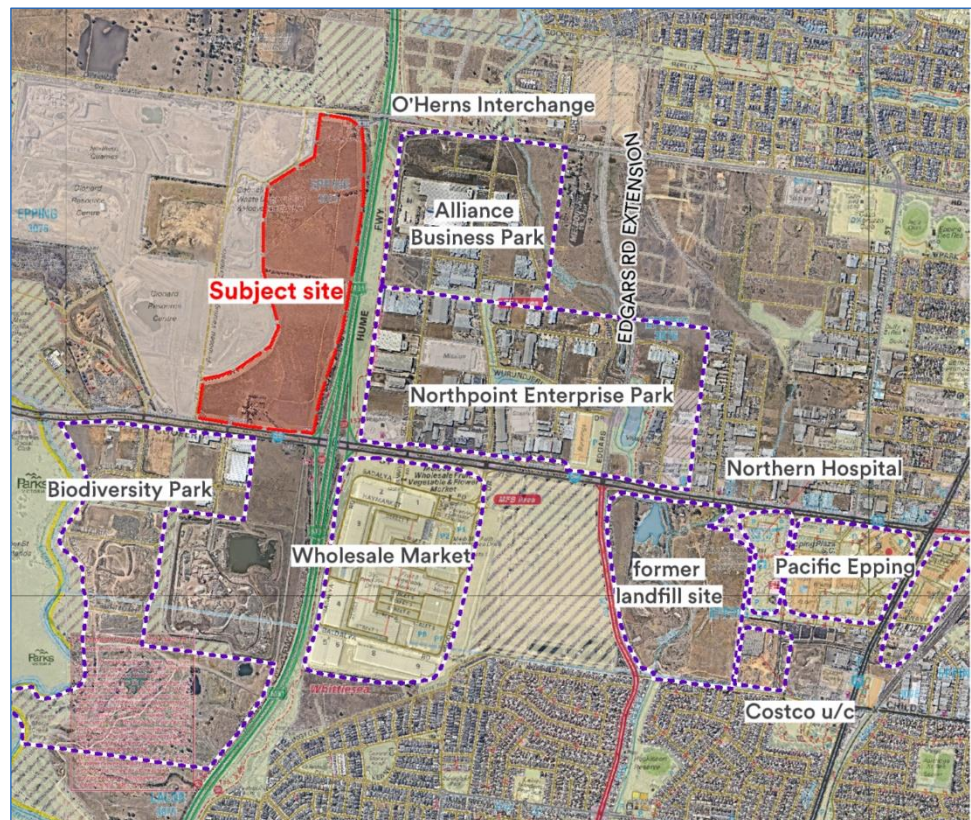
Industrial development in the area consists of:

- The Northpoint Enterprise Park, located north of Cooper Street and east of Hume Freeway, which has been developed by McMullin Group and is nearing completion
- The Alliance Business Park, to the north of Northpoint and south of O'Herns Road, which is being developed by MAB and is anchored by Mainfreight
- Biodiversity Business Park, to the south of Cooper Street and west of the Hume Freeway, which is currently under development by Vaughan Construction.

The industrial estates above have proved to be very successful, with Northpoint almost fully sold, and Alliance Park about to release Stage 7. The first lots at Biodiversity Park have been completed, and Stage 2 is being marketed.

Future development in the area will occur on the former landfill site immediately west of the Northern Hospital, and on land earmarked for the easterly expansion of the wholesale market and related activities.

Figure 1—Location context



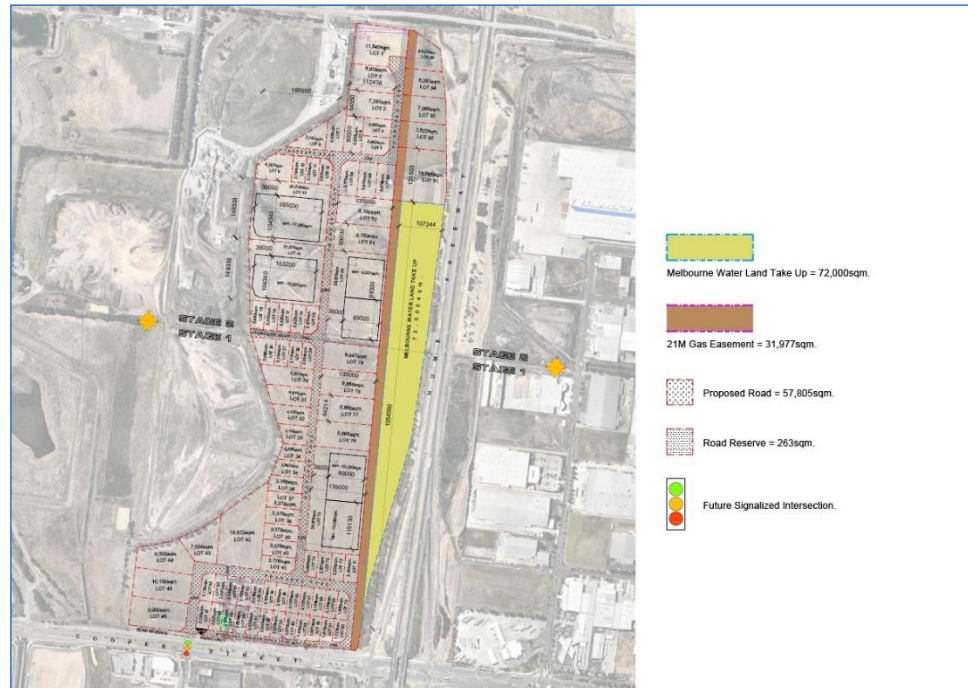
Proposed development

The subject site would be developed principally for industrial purposes, with the remaining land accommodating a Melbourne Water retarding basin and a gas easement. A preliminary masterplan by Frasers provides for approximately 90 lots ranging in size from 1,800 sqm to 33,000 sqm (refer Figure 2), to be developed over two stages.

Four of the larger lots would be retained and developed by Frasers, with the remainder sold to a range of industrial occupants. The profile of occupants is likely to be similar to other industrial estates in the area, with a mix of larger warehousing and logistics businesses serving a broader regional, state and national market; and smaller warehouse-office product occupied by firms serving a local and sub-regional customer base.

Figure 2—Indicative masterplan

Source: Frasers Property



Estimated construction employment

Employment will be generated during the construction phase, associated with the provision of estate-level infrastructure and works associated with site preparation, road construction etc; and the construction of individual buildings and fit-out for incoming tenants. The employment effects during construction have been estimated on the basis of the following methodology and assumptions:

1. The subdivision layout is as shown on the preliminary masterplan, which provides for 87 parcels inclusive of the four larger parcels retained by Frasers.
2. Built floorspace is estimated by applying an average site coverage ratio of 60% for lots up to 5,000 sqm, and a ratio of 50% for larger lots greater than 5,000 sqm. These site coverage ratio assumptions incorporate an expectation that some developments would have mezzanine offices, and are based on information from other industrial developments and advice from Frasers.
3. Per sqm construction costs are applied at the following rates:
 - a. For lots less than 1,500 sqm: \$1,150/sqm
 - b. 1,500 – 2,499 sqm: \$1,050/sqm
 - c. 2,500 – 4,999 sqm: \$975/sqm
 - d. 5,000 sqm or more: \$950/sqm.
4. Cost estimates for the retained lots have been provided by Frasers Property.
5. Cost estimates for estate-wide infrastructure works have been provided by Frasers Property.
6. Employment outcomes during construction are based on application of the following industry averages:
 - a. Labour costs account for an average 40% of the total construction cost
 - b. Average weekly earnings for full-time construction workers are \$1,700 based on latest ABS data, representing an average annual labour cost of \$88,000 per full-time job created.

On the basis of the above, the proposed development would generate a total of 1,330 direct jobs over the construction period (refer Table 1). This estimate relates to *full-time job-years*, and would be spread over the period during which construction activity takes place. The total number of people employed on site would be higher, reflecting the fact that construction teams typically employ a mixture of full-time, part-time and casual workers.

With a construction employment multiplier of 2.752 (ABS, 1996-7), a further 2,330 jobs would be indirectly generated elsewhere in the economy.

**Table 1—
Construction
employment**

Notes: refer text for assumptions

Sources: Deep End Services; Frasers Property; ABS, Average Weekly Earnings Australia (Nov 17)

Item	Measure
Development details:	
Number of lots	87
Total gross area	473,257sqn
Built floorspace	265,294sqn
Construction costs:	
Site works	\$26.1m
Property development	\$267.3m
Total construction cost	\$293.4m
Employment estimates	
Labour cost	\$117.3m
Average wage	\$88,400
Direct employment generation	1,330

Estimated ongoing employment

The number of ongoing jobs generated on the subject site as a result of its development for industrial purposes has been estimated by applying the following average floorspace-employment ratios:

- For lots with less than 1,500 sqm built area: 100 sqm/job
- 1,500 – 2,499 sqm built area: 125 sqm/job
- 2,500 – 4,999 sqm built area: 150 sqm/job
- 5,000 – 9,999 sqm built area: 175 sqm/job
- 10,000 sqm or more built area: 250 sqm/job

The above ratios have been determined by examining employment outcomes in comparable precincts across Melbourne, utilising information from the following sources:

- Urban Development Program (DELWP)
- Census 2016 travel to work employment data (ABS)
- Industrial occupant staff surveys (Fraser's Property).

As the calculations in Table 2 show, development of the site for industrial purposes would directly generate approximately 1,760 ongoing jobs. These jobs would be in a range of sectors, from logistics operations and freight forwarding services, to wholesaling, mechanical repairs, construction services and small-scale manufacturing.

The average employment generation rate is estimated at approximately 150 sqm (built floorspace) per job, which can also be described as 0.3 jobs per 100sqm of industrial zoned land.

With an average multiplier of 3.4 for the types of industry sectors described above (ABS, 1996-7), a further 4,230 jobs would be indirectly generated elsewhere in the economy.

Table 2—Ongoing employment

Source: Deep End Services; ABS; DELWP; Fraser's Property

Item	Lot size (sqm)					Total
	< 1,500	1,500 - 2,499	2,500 - 4,999	5,000 - 9,999	10,000 +	
Number of lots	41	20	18	3	5	87
Total built floorspace (sqm)	53,410	40,070	68,190	20,340	83,284	265,294
Average employment ratio (sqm/job)	100	125	150	175	250	151
Direct employment (jobs)	535	320	455	115	335	1,760

Distribution of economic effects

The employment generation effects described above will accrue mainly to the local and regional economies surrounding the site, providing employment opportunities for people already living there or moving into the area.

However, there are important wider State and National level economic benefits that would be realised, including the following:

- Productivity benefits associated with the location of new employment close to major existing transport infrastructure in the form of the Hume Freeway and the nationally-important Hume economic corridor.
- Efficiency gains associated with the provision of new employment generation capability close to a major urban growth front, therefore reducing travel-to-work times for local residents and creating improved city-wide efficiencies.
- Agglomeration effects associated with an expansion to an already-successful industrial precinct, therefore creating opportunities for economic linkages between firms.

Conclusion

The measurable economic benefit will be in the form of employment creation, including 1,330 direct job-years during the construction phase, and 1,760 direct ongoing jobs once the land is developed. Indirect effects through the operation of the employment multiplier are in addition to this.

Overall, the rezoning of the land will provide significant economic benefits for the local area and the region surrounding the site, as well as for the wider State and National economies.

I trust this advice is helpful, but please contact me if you wish any additional analysis.

Kind regards

A handwritten signature in dark ink, appearing to read 'Matthew Lee', with a stylized, flowing script.

Matthew Lee
Principal