



V4 – 1 September 2022

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**Forestry Place Redevelopment (Block 7, Section 4, Yarralumla, ACT) –  
Assessment of the Significance of the Impact on Golden Sun Moth  
*Synemon plana***

**Capital Ecology project no. 3008**

Dear Mr Micallef,

Oakstand Pty Ltd is currently progressing the planning and approval process for the proposed Forestry Place Redevelopment of Block 7, Section 4, Yarralumla, ACT (the 'proposed action'). As part of this process, the proposed action was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) on 17 May 2021 (Referral No. EPBC 2021/8937). On 17 June 2021, Kate Gowland as a Delegate for the Minister for the Environment decided that the proposed action is a controlled action that will be assessed by preliminary documentation and requested further information on 8 July 2021 to enable a full assessment of the proposed action.

The controlled action determination was due, in part, to DAWE considering that the Golden Sun Moth *Synemon plana* is likely to be significantly impacted by the proposed action.

It is noted that the conservation status of the Golden Sun Moth under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was changed from Critically Endangered to Vulnerable effective from 7 December 2021<sup>1</sup>.

This letter therefore assesses the significance of the impact of the proposed action on the EPBC Act Vulnerable listed Golden Sun Moth.

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<sup>1</sup> <http://www.environment.gov.au/biodiversity/threatened/species/pubs/25234-conservation-advice-07122021.pdf>

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We acknowledge the Traditional Custodians of the land on which we work. We pay our respects to Elders past and present.

## 1. The Proposed Action Area

The 'proposed action area' is 10.94 ha, encompasses the whole of Block 7, Section 4, Yarralumla, ACT, and is zoned 'Designated – DES; Suburban Zone – RZ1' under the Territory Plan<sup>2</sup> (Figure 1). As shown in Figure 1 and Figure 2, the proposed action area is located within the long-established south Canberra suburb of Yarralumla and is bordered by:

- Royal Canberra Golf Club to the northwest;
- Banks Street and the Forestry Oval to the east; and
- Bentham Street to the south.

Throughout this locality the majority of the natural vegetation and habitat was cleared during establishment of the suburb and little now remains of the original vegetation or other natural ecosystem elements. This is particularly true in the proposed action area, the entirety of which was cleared for the establishment of the CSIRO facility and associated development. The proposed action area now contains numerous buildings associated with the CSIRO facility, together with a wide variety of planted native and exotic trees. The trees appear to have been planted for research purposes given the grouping and labelling of trees of similar species. This is reflected in aerial photography from 1955<sup>3</sup>, which shows the current CSIRO facility already present in the proposed action area and numerous arboretum-style groupings of trees.

## 2. The Proposed Action

As shown in Figure 3, the proposed action aims to establish a mixed-use/residential commercial precinct, including the construction of 250 – 300 apartment units, a small boutique hotel, aged care facility, and commercial offices.

The proposed action in its original design impacted all Golden Sun Moth habitat in the proposed action area. In response to the finding that Golden Sun Moths occur in the proposed action area, the design of the proposed action was altered to avoid the southern patch of Golden Sun Moth habitat (Figure 6). Specifically, the previously planned planting across the southern patch of Golden Sun Moth habitat will no longer occur. Instead, this patch of Golden Sun Moth habitat will be retained and protected (refer to Figure 3 and Figure 6).

As a result, the proposed action avoids impacts to 60% of the Golden Sun Moth habitat that occurs in the proposed action area.

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<sup>2</sup> <https://app.actmapi.act.gov.au/actmapi/index.html?viewer=territoryplan>

<sup>3</sup> <https://www.actmapi.act.gov.au/hap/1951/2/5101.pdf>

### 3. Database Searches

#### 3.1 ACTmapi

No 'significant species, vegetation communities, and registered trees' are identified as occurring in the proposed action area on ACTmapi<sup>4</sup>. However, ACTmapi does identify the following 'significant species, vegetation communities, and registered trees' in the locality of the proposed action area.

- A strip of registered Atlas Cedar *Cedrus atlantica* trees immediately to the east of the proposed action area along Banks Street.
- Golden Sun Moth habitat to the east, west, and south of the proposed action area.
- Natural Temperate Grassland of the South Eastern Highlands to the east and west of the proposed action area.
- Murray Cod *Maccullochella peelii peelii* habitat to the north of the proposed action area in Lake Burley Griffin.
- Spotted-tailed Quoll *Dasyurus maculatus* habitat in the Yarralumla locality.

#### 3.2 Canberra Nature Map

No threatened flora or fauna species are identified as occurring in the proposed action area on Canberra Nature Map<sup>5</sup>. However, Canberra Nature Map does identify the following 'very rare / threatened species' within 1 km of the proposed action area.

- Golden Sun Moth to the south and east of the proposed action area.
- Brown Gerygone *Gerygone mouki* to the west of the proposed action area.

### 4. Previous Ecological Studies

Capital Ecology (2019)<sup>6</sup> and Capital Ecology (2020)<sup>7</sup> are the key documents which have been used to inform this assessment. The main findings from these documents are summarised below.

#### 4.1 Ecological Values and Constraints Assessment (Capital Ecology 2019)

Capital Ecology (2019) completed an Ecological Values and Constraints Assessment (EVCA) for the proposed action area. The EVCA was prepared based on:

- the results of database searches for the proposed action area, including EPBC Act Protected Matters Search Tool (PMST), ACTmapi, and Canberra Nature Map;
- a review of relevant studies and other background information;

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<sup>4</sup> <https://app.actmapi.act.gov.au/actmapi/index.html?viewer=ssvcr>

<sup>5</sup> <https://canberra.naturemapr.org/>

<sup>6</sup> Capital Ecology (2019). *Ecological Values and Constraints Assessment for Block 7, Section 4, Yarralumla, ACT*. Project No. 2847, 8 August 2019.

<sup>7</sup> Capital Ecology (2020). *Block 7, Section 4, Yarralumla, ACT – Targeted Golden Sun Moth Survey*. Project No. 2878, 20 January 2020.

- a field survey on 28 February 2019, completed to record and assess the ecological values of the proposed action area; and
- the knowledge of the authors regarding the biota of the locality, specifically the threatened ecological communities, flora, and fauna (and associated habitat) with the potential to occur in the lowland ecosystems of the ACT and region.

The EVCA concluded the following key points.

1. The proposed action area's climax vegetation communities have been highly degraded by the land use history and urban development in the Yarralumla area. The proposed action area now contains primarily planted exotic vegetation.
2. None of the vegetation in the proposed action area meets the listing criteria for a Threatened Ecological Community (TEC) under the EPBC Act or *Nature Conservation Act 2014* (NC Act).
3. In total, 0.56 ha (5%) of the study may have enough native groundcover to be classified as 'native vegetation' under the NC Act. However, the land is zoned as Designated Land (DES) (i.e. Commonwealth land). As such, the NC Act does not apply to the proposed action area and the land is assessed under the EPBC Act under a whole of environment context.
4. 1.16 ha (11%) of the proposed action area contains open grassy areas that support the appropriate food species to constitute potential Golden Sun Moth habitat. This species is listed as Vulnerable under the EPBC Act.
5. The ACT Wildlife Atlas records the proposed action area as historical habitat for the Spotted-tailed Quoll. However, the species is unlikely to visit the proposed action area given the degradation and urbanisation of the surrounding habitat. No sign of Spotted-tailed Quoll was detected during field surveys.

The EVCA recommended the following actions before planning any development in the proposed action area.

1. Conduct targeted surveys for the Golden Sun Moth, noting that the surveys must occur during the appropriate season (generally November-December).

#### 4.2 Targeted Golden Sun Moth Survey (Capital Ecology 2020)

As detailed in Capital Ecology (2020), a targeted survey consistent with Commonwealth Government survey guidelines<sup>8</sup> for Golden Sun Moth was conducted across the proposed action area to address recommendations from the EVCA (i.e. Capital Ecology 2019), which identified several small patches of vegetation with the potential to support the Golden Sun Moth. The targeted survey was therefore performed to confirm the presence/absence of the Golden Sun Moth within these patches of potential habitat.

The results of the targeted survey are presented in detail in Section 6.1. In summary, 10 Golden Sun Moth males were recorded in two separate areas during the survey program. These two areas were therefore identified as confirmed Golden Sun Moth habitat (total area = 0.55 ha, which represents 5% of the proposed action area).

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<sup>8</sup> Commonwealth of Australia (2009). *Background Paper to EPBC Act Policy Statement 3.12 - Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)*

## 5. General Environment of the Proposed Action Area

As described in Section 4, the ecological values of proposed action area were investigated by Capital Ecology (2019) and Capital Ecology (2020). The findings of these studies are summarised in Section 4 and are described in detail in Section 5 and Section 6.

In combination, the existing information from the above studies provides a comprehensive description of the ecological values that occur across the proposed action area.

### 5.1 Vegetation

The proposed action area contains numerous buildings associated with the CSIRO facility, together with a wide variety of planted native and exotic trees. The planted trees appear to have been planted for research purposes, given the arboretum-style grouping and labelling of trees of similar species. No remnant trees are present in the proposed action area as none of the eucalypts are either locally indigenous species or of sufficient age to be identified as remnant. The midstorey and shrubstorey are comprised of exotic species and non-local native cultivars.

The groundstorey across the proposed action area is predominantly exotic, the dominant species being Chilean Needle Grass *Nassella neesiana*, African Love Grass *Eragrostis curvula*, and Couch Grass *Cynodon dactylon*. Several small patches of the proposed action area are characterised by a mixture of these exotic grasses with local native grasses such as Red-leg Grass *Bothriochloa macra*, Tall Speargrass *Austrostipa bigeniculata*, and several Wallaby Grasses *Rytidosperma* spp..

Throughout the locality, the majority of the natural vegetation and habitat was cleared during establishment of the Yarralumla suburb and little now remains of the original vegetation or other natural ecosystem elements. This is particularly true in the proposed action area, the entirety of which was cleared for the establishment of the CSIRO facility and associated development.

Due to the heavily modified nature of the proposed action area and lack of remnant vegetation, it is difficult to accurately determine the climax vegetation community. Historically, natural grasslands were chosen first to develop for both agricultural and urban use (due to the preferential landscape position, relatively fertile soils, and lack of required tree clearance). However, the woodland to the east suggests that at least part of the proposed action area may have required clearance of woodland vegetation for the current development. Based on these factors it is reasonable to suggest that the ecotone between Natural Temperate Grassland and Box-Gum Woodland may occur within or nearby the proposed action area.

Capital Ecology (2019) assessed and mapped the vegetation within the proposed action area, categorising it according to its potential climax communities and current condition. Appendix A provides the lists of flora and fauna species recorded within proposed action area during the field survey performed for Capital Ecology (2019).

Illustrated in Figure 4, the proposed action area has been divided into two vegetation zones; 'Planted Overstorey Vegetation with Exotic Groundstorey' and 'Planted Overstorey Vegetation with a Mixed Native and Exotic Groundstorey'. As none of the proposed action area contains remnant trees, the canopy cover was not used to classify vegetation zones during mapping.

- Planted Overstorey Vegetation with Exotic Groundstorey – This vegetation zone consists of a maximum of 10.38 ha of planted overstorey vegetation, consisting of a variety of experimentally planted Pines *Pinus* spp., eucalypts, and other species. The groundstorey is dominated by exotic species such as Chilean Needle Grass, African Love Grass, and Couch Grass.

- Planted Overstorey Vegetation with a Mixed Native and Exotic Groundstorey – This vegetation zone consists of 0.56 ha of land with or without planted overstorey vegetation. The groundstorey comprises a mix of native and exotic grasses and forbs, the native proportion being over 50% in some areas.

### 5.3 Threatened Ecological Communities

As discussed above, the proposed action area is considered likely have supported areas of Natural Temperate Grassland and Box-Gum Woodland pre-1750. However, no traces of remnant woodland or moderately intact grassland/derived grassland remain. As a result, the vegetation in the proposed action area:

- does not meet the listing criteria for Natural Temperate Grassland of the South Eastern Highlands as outlined in Commonwealth of Australia (2016<sup>9</sup>); and
- does not meet the listing criteria for Box-Gum Woodland as outlined in Commonwealth of Australia (2006<sup>10</sup>).

### 5.3 Threatened Flora

No EPBC Act and/or NC Act listed threatened flora species were recorded in the proposed action area during the completed surveys (Capital Ecology 2019, 2020), nor are any identified as occurring in the proposed action area on ACTmapi or Canberra Nature Map (refer to Section 3). This is consistent with the fact that the land use history and associated disturbance of the proposed action area is likely to preclude the persistence of threatened or rare flora species.

### 5.4 Threatened Fauna

As recorded during the completed surveys (Capital Ecology 2019, 2020), the proposed action area supports the following threatened fauna habitat features.

- Two small patches of low-quality grassland which were confirmed via targeted survey to contain a small number of Golden Sun Moths (total area = 0.55 ha, which represents 5% of the proposed action area). The results of the targeted survey are presented in detail in Section 6.1.
- Low-quality potential foraging habitat for many common native birds, several EPBC Act and/or NC Act listed birds, and numerous other species considered conservation dependant in the region. However, given the urban location, lack of threatened bird observations in the locality (refer to Section 3), and that the overstorey consists primarily of exotic tree species, the proposed action area is considered unlikely to be of significance to any listed species.

### 5.5 Habitat connectivity

As mentioned previously, the original woody vegetation (canopy, midstorey, and shrubstorey) has been historically cleared across the entire proposed action area. However, much of the proposed action area currently supports planted overstorey vegetation, consisting of a variety of experimentally planted Pines, eucalypts, and other species. This planted vegetation is likely to be of some habitat value to a variety of native fauna and is therefore likely to contribute to habitat connectivity throughout the

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<sup>9</sup> Commonwealth of Australia (2016). *Approved conservation advice for the Natural Temperate Grassland of the South Eastern Highlands (NTG–SEH) ecological community.*

<sup>10</sup> Commonwealth of Australia (2006). *Policy Statement 3.5: White Box – Yellow Box – Blakely’s Red Gum grassy woodlands and derived native grasslands. Environment Protection and Biodiversity Conservation Act 1999.* Commonwealth Department of Environment and Heritage.

immediate locality. However, as the proposed action area is surrounded by road infrastructure, urban development, and a golf course, the noted habitat connectivity is only likely to be of limited significance to highly mobile species such as birds.

## 6. EPBC Act Threatened Species and Communities in the Proposed Action Area

The following Matters of National Environmental Significance (MNES) were identified in the proposed action area during field surveys (Capital Ecology 2019, 2020). All surveys were carried out in accordance with the relevant Commonwealth and/or ACT survey guidelines. Data of particular relevance to MNES in the proposed action area are included in Appendix A.

### 6.1 Golden Sun Moth

Golden Sun Moth occur in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the groundlayer is generally dominated by Wallaby Grasses, and to a lesser extent Tall Speargrass and Kangaroo Grass *Themeda triandra*. The larvae of the species will also feed on Chilean Needle Grass and Serrated Tussock *N. trichotoma*. The groundlayer structure is characterised by tussocks with a low to moderate grass height, moderate to high native grass cover, and areas of bare ground (inter-tussock space). Occupied sites are generally flat or gently sloping, have minimal shading, and have not been pasture improved (through the application of fertiliser) or ploughed.

Golden Sun Moth surveys were conducted through all patches of suitable habitat in the proposed action area during suitable survey conditions when Golden Sun Moth activity was confirmed at other ACT/NSW sites (refer to Appendix A).

A total of 10 male Golden Sun Moths were recorded across the four surveys. Eight male Golden Sun Moths were recorded flushed and spontaneously flying on 11 November 2019, with six recorded in the north-west patch of identified potential habitat and two in the south-east patch. Two male Golden Sun Moths were recorded spontaneously flying on 22 November 2019 in the south-east patch of potential habitat. No female Golden Sun Moths or pupal cases were recorded.

The 10 recorded Golden Sun Moths occurred in two small patches of low-quality grassland (total area = 0.55 ha, Figure 5).

- The southern patch (area = 0.33 ha) contains a groundstorey dominated by Chilean Needle Grass, African Love Grass, and Couch Grass.
- The northern patch (area = 0.22 ha) contains a groundstorey of native grasses, comprising several Wallaby Grass species, Red-leg Grass, and Tall Speargrass, with a mixture of the exotic grasses found throughout.

The patches of identified Golden Sun Moth habitat in the proposed action area are likely to be functionally isolated from one-another and from all other known Golden Sun Moth populations in the locality, the nearest of which are located approximately 550 m to the north-east and 500 m to the south (Figure 7). For this reason, it is unlikely that the confirmed habitat in the proposed action area comprises a component of a larger population or provides any functional link between populations.

As outlined in ACT Government (2017<sup>11</sup>), the following difficulties arise when attempting to estimate population size in the Golden Sun Moth.

- Flying adult males are the only stage and sex that are readily detected and counted, but they are short-lived and emerge across a season of many weeks.
- Counts on any particular day only reflect a single emergence cohort, and daily emergence is strongly affected by weather conditions.
- More adults emerge on hot dry days, making it difficult to differentiate between short-term weather effects and the actual size of a population.
- The length of the larval period is unclear, and it is unknown what proportion of the standing population is represented by the number of adults that fly in a given season.
- Seasonal conditions have a large effect on overall Golden Sun Moth numbers (e.g. there is a tendency for seasons to result in high, moderate, or low abundance of flying males at most sites across a large geographic area). Therefore, it is difficult to make an accurate assessment of population size based on one season of survey.

Given these difficulties, measures of relative abundance and/or maximum daily abundance combined with habitat size, condition, and connectivity are likely to provide a more appropriate measure of a population than the absolute number of recorded individuals.

The proposed action area therefore supports populations with the following characteristics.

- 0.55 ha of low-quality Golden Sun Moth habitat.
- A low-density and small population, with a total of 10 male Golden Sun Moths recorded across four surveys.
- The Golden Sun Moth populations in the proposed action area are considered likely to be functionally isolated from one-another and from any surrounding Golden Sun Moth populations.

## 7. Avoidance and Mitigation Measures

### 7.1 Avoidance

The proposed action in its original design impacted all 0.55 ha of Golden Sun Moth habitat in the proposed action area. In response to the finding that Golden Sun Moths occur in the proposed action area, the design of the proposed action was altered to avoid the larger southern patch of Golden Sun Moth habitat in its entirety (Figure 6). As a result, the proposed action avoids impacts to 0.33 ha (60%) of the Golden Sun Moth habitat that occurs in the proposed action area.

### 7.2 Mitigation

The 0.33 ha patch of avoided Golden Sun Moth habitat contains a groundstorey dominated by Chilean Needle Grass, African Love Grass, and Couch Grass and occurs along a road verge that is managed and regularly mown. Given that Golden Sun Moths have persisted within this area under such a

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<sup>11</sup> ACT Government (2017). *ACT native grassland conservation strategy and action plans*. Environment, Planning and Sustainable Development, Canberra.



management regime, as detailed in Table 1, the mitigation measures proposed are limited to those required to protect the 0.33 ha of avoided Golden Sun Moth habitat during construction and to maintain the habitat via continuation of the same management regime. Table 1 is also provided as Appendix B.

**Table 1. Mitigation measures to protect and manage avoided Golden Sun Moth habitat**

Mitigation Measure	Description	Predicted Effectiveness
Exclusion fencing during construction.	Appropriate exclusion fencing will be established prior to commencement of construction and maintained throughout the life of the construction phase. This fencing will ensure that impacts from construction occurring on the adjoining land do not extend into the avoided Golden Sun Moth habitat.	High
Continuation of existing biomass management regime.	It is proposed not to change the existing management of the avoided Golden Sun Moth habitat, rather it will be managed in the same manner that it has been for many years. Notably, the grass in the patch will continue to be regularly mown to maintain the grass sward so that it is suitable for Golden Sun Moth habitat (i.e. height generally maintained between 10 cm and 25 cm) and generally consistent with that on the adjoining road verges. This mowing will either continue to be undertaken by ACT Government contractors or will be undertaken by personnel engaged by the proponent/landowner.	High
Monitoring of fencing and biomass.	The exclusion fence and the grass biomass in the patch will be monitored regularly (i.e. monthly) to ensure that: <ol style="list-style-type: none"> <li>the fence continues to be effective in protecting the patch of avoided Golden Sun Moth habitat from impacts from construction; and</li> <li>the grass biomass remains suitable for Golden Sun Moth habitat (i.e. height generally maintained between 10 cm and 25 cm).</li> </ol> The findings of this monitoring will be provided to the proponent/landowner who will take any actions necessary to ensure that a. and b. are achieved.	High

### Consistency with the EPBC Act Conservation Advice

The proposed mitigation measures outlined in Table 1 are consistent with the EPBC Act Approved Conservation Advice for the Golden Sun Moth<sup>12</sup> (the 'Golden Sun Moth Conservation Advice'), noting that the key mitigation measure necessary for the protection of the avoided patch of Golden Sun Moth habitat during construction is to '*Control incidental damage of retained native vegetation and habitat during construction*'. This key mitigation measure is consistent with the '*Conservation and management priorities - Habitat loss, degradation and fragmentation*' section of the Conservation Advice which lists measures that should be implemented to mitigate impacts on the Golden Sun Moth, relevantly including the following.

- *Search for the species in habitat that is proposed for development or management actions.*

<sup>12</sup> Commonwealth of Australia (2013b). *Approved Conservation Advice for Synemon plana (golden sun moth)*. Approved by the delegate of the Minister on 17 December 2013.

The proponent has engaged professional ecologists to search for Golden Sun Moths within the proposed action area and accurately determine the extent of the habitat.

- *Do not change management of sites where Golden Sun Moth exists unless changes are likely to be beneficial.*

It is proposed not to change the existing management of the avoided patch of Golden Sun Moth habitat, rather it will be protected during construction and then managed in the same manner that it has been for many years.

- *Do not destroy habitat and surrounding areas by ploughing or other soil disturbance activities.*

The proposed action has been designed to avoid direct impacts to the avoided patch of Golden Sun Moth habitat, and exclusion fencing will be established and maintained to ensure that the habitat is not destroyed or damaged.

- *Mark known sites onto operational maps and plans.*

The extent of the avoided patch of Golden Sun Moth habitat has been accurately defined. This has been used to inform the development layout, and it will carry through onto the operational plans and maps used for the construction phase of the proposed action.

- *Ensure land managers where the Golden Sun Moth occurs are aware of the species' presence and provide protection measures against key and potential threats.*

The proponent has engaged professional ecologists to search for Golden Sun Moths within the site and accurately determine the extent of the habitat. The proponent is aware of the results of this study.

### **Consistency with the Threat Abatement Plan for Competition and Land Degradation by Rabbits**

The Golden Sun Moth Conservation Advice identifies '*Habitat degradation by the introduced Rabbit (Oryctolagus cuniculus)*' as a threat to the Golden Sun Moth, and the EPBC Act Threat Abatement Plan for Competition and Land Degradation by Rabbits<sup>13</sup> outlines the following main objectives to minimise the impact of rabbits. Responses regarding the relevance/application of each of these objectives for the avoided patch of Golden Sun Moth habitat are provided under each.

1. *Strategically manage rabbits at the landscape scale and suppress rabbit populations to densities below threshold levels in identified priority areas.*

The avoided patch of Golden Sun Moth habitat is located immediately adjoining Banks Street which is located centrally in the residential suburb of Yarralumla. No evidence of rabbits was recorded during the completed surveys, and the proposed action area is not known to support a substantial rabbit population if any. If rabbits were to become an issue in the future, then the proponent/landowner would work with the ACT Government to manage them as part of its strategic pest fauna control program. As such, it is highly unlikely that rabbits are, or will become, a significant threat to the ongoing preservation of the patch of avoided Golden Sun Moth habitat.

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<sup>13</sup> Commonwealth of Australia (2016). *Threat abatement plan for competition and land degradation by rabbits*. Department of the Environment and Energy (2016), Canberra, ACT: Commonwealth of Australia.

2. *Improve knowledge and understanding of the impact of rabbits and their interactions with other species and ecological processes.*

N/A – Not relevant for the proposed action.

3. *Improve the effectiveness of rabbit control programs.*

As noted above, if rabbits were to become an issue in the future, then the proponent/landowner would work with the ACT Government to manage them as part of its strategic pest fauna control program.

4. *Increase engagement of, and awareness by, the community of the environmental impacts of rabbits and the need for integrated control.*

N/A – Not relevant for the proposed action.

## 8. Residual Impacts of the Proposed Action on MNES

### 8.1 Direct Impacts to MNES

The proposed action will permanently remove 0.22 ha of Golden Sun Moth habitat, which represents approximately 40% of that which occurs in the proposed action area (Figure 6). The 0.22 ha of impacted habitat is characterised by a groundstorey of native grasses, comprising several Wallaby Grass species, Red-leg Grass, and Tall Speargrass, with a mixture of the exotic grasses found throughout.

### 8.2 Indirect Impacts to MNES

The proposed action has the potential to indirectly impact avoided and/or adjacent vegetation and habitat. However, ongoing indirect impacts beyond that which already occur across the proposed action area are considered unlikely given that:

- the proposed action area is the site of a current CSIRO facility;
- the proposed action area is located within the long-established south Canberra suburb of Yarralumla; and
- the proposed action area is bordered by Royal Canberra Golf Club to the northwest, Banks Street and the Forestry Oval to the east, and Bentham Street to the south.

The proposed action area is therefore already subject to a high-level of indirect impacts from long-term and ongoing human occupation and associated activities. As such, the only potential indirect impacts to arise as a result of the proposed action are from construction. These potential indirect impacts are listed below.

- Increased noise, vibration, and dust during construction.
- Weed introduction and/or spread during construction.
- Incidental damage or removal of retained native vegetation and habitat during construction.

The proposed action reduces the likelihood of indirect impacts by enacting the management and mitigation measures detailed in the preliminary documentation that has been developed by Canberra Town Planning. In summary, these measures:

- control noise, vibration, and dust spill during construction;

- control weed introduction and/or spread during construction; and
- control incidental damage of retained native vegetation and habitat during construction.

In combination, the above measures are considered sufficient to reduce the risk of indirect impacts on avoided and/or adjacent vegetation and habitat to an acceptably low level.

## 9. Significance of the Impact on MNES

As per the ACT Government's ACTmapi<sup>14</sup>, there is 68.84 ha of Golden Sun Moth habitat within 2 km of the proposed action area (the 'locality') (Figure 7). When combined with the 0.55 ha of Golden Sun Moth habitat in the proposed action area, the locality is therefore estimated to support 69.39 ha of Golden Sun Moth habitat.

Within the wider region, the extent of Golden Sun Moth habitat has been determined as detailed in Appendix C. In summary, there is estimated to be:

- 1,831 ha of Golden Sun Moth habitat in the ACT;
- 9,917 ha of Golden Sun Moth habitat in the Murrumbateman IBRA Subregion; and
- 14,499 ha of Golden Sun Moth habitat in the Extent of Occurrence (EOO).

As such, the proposed impact to 0.22 ha of low-quality Golden Sun Moth habitat will remove:

- 40% of the 0.55 ha of Golden Sun Moth habitat in the proposed action area;
- 0.5% of the 69.39 ha of Golden Sun Moth habitat in the locality;
- 0.006% of the 9,917 ha of Golden Sun Moth habitat in the Murrumbateman IBRA Subregion; and
- 0.004% of the 14,499 ha of Golden Sun Moth habitat in the EOO.

Given that the Golden Sun Moth populations in the proposed action area are considered likely to be functionally isolated from one-another and from surrounding Golden Sun Moth populations, the impact to an isolated 0.22 ha patch of low-quality Golden Sun Moth habitat is unlikely to impact any other population or disrupt functional connectivity between populations.

When assessing the likely impacts of the proposed action on the long-term viability of the Golden Sun Moth in the proposed action area and wider locality, it is useful to also consider the likely future biodiversity values under the non-development scenario. Under the non-development scenario, it is very likely that the current land management regime would continue unchanged. This would likely mean that the proposed action area would continue to experience impacts from human activities, in particular unintentional damage to habitat and the assisted spread of noxious weeds. These activities, over time, would likely further degrade or entirely destroy the remaining patches of Golden Sun Moth habitat in the proposed action area.

Given the degraded state of the habitat, the small-scale nature of the impact, and the likely non-development scenario, the proposed action is unlikely to reduce the long-term viability of the Golden Sun Moth in the locality, ACT, IBRA Subregion, or EOO. Accordingly, the proposed action is considered

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<sup>14</sup> <https://app.actmapi.act.gov.au/actmapi2/index.html?viewer=ssvcrt>

unlikely to significantly impact the species. As there is considered to be no significant residual impact on Golden Sun Moth, no offset is required in accordance with the EPBC Act Environmental Offsets Policy<sup>15</sup>, and therefore none is proposed.

## 10. Significance of the Impact on the ‘Whole of Environment’

As the proposed action will occur on Commonwealth/National land, the significance of the proposed action on the ‘whole of environment’ must also be assessed. Guidelines for determining whether an impact is significant are provided by the Department of the Environment (Commonwealth of Australia 2013b<sup>16</sup>) and are addressed below.

- The environmental context.

The proposed action area is a historically disturbed site which currently houses a CSIRO research facility. There is evidence of experimental tree planting for scientific uses and other associated urban infrastructure. As a result, the majority of the proposed action area has been intensively landscaped and regularly mown over a long period of time. This has removed the remnant overstorey, midstorey, and shrubstorey, and heavily modified the groundlayer and encouraged the proliferation of exotic species.

As a result, the only notable ecological value are two small patches of low-quality Golden Sun Moth habitat (total area = 0.55 ha, Figure 5).

- The larger southern patch (area = 0.33 ha) contains a groundstorey dominated by Chilean Needle Grass, African Love Grass, and Couch Grass. This area will not be impacted by the proposed action.
- The smaller northern patch (area = 0.22 ha) contains a groundstorey of native grasses, comprising several Wallaby Grass species, Red-leg Grass, and Tall Speargrass, with a mixture of the exotic grasses found throughout. This area will be impacted by the proposed action.

The Golden Sun Moth populations in the proposed action area are considered likely to be functionally isolated from one-another and from surrounding Golden Sun Moth populations.

The original woody vegetation (canopy, midstorey, and shrubstorey) has been historically cleared across the entire proposed action area. However, much of the proposed action area currently supports planted overstorey vegetation, consisting of a variety of experimentally planted pines, eucalypts, and other species. This planted vegetation is likely to be of some habitat value to a variety of native fauna and is therefore likely to contribute to habitat connectivity throughout the immediate locality. However, as the proposed action area is surrounded by road infrastructure, urban development, and a golf course, the noted habitat connectivity is only likely to be of limited significance to highly mobile species such as birds.

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<sup>15</sup> Commonwealth of Australia (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. October 2012.

<sup>16</sup> Commonwealth of Australia (2013b). *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies - Significant Impact Guidelines 1.2. Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Department of the Environment.

As shown in Figure 3, the proposed action will retain the majority of the planted native and exotic trees and includes additional plantings and gardens. As such, the proposed action is considered unlikely to significantly impact habitat connective for native fauna and/or flora.

- The potential impacts likely to be generated by the action, including indirect consequences of the action.

As discussed above, the only notable ecological value within the proposed action area are the two small patches of low-quality Golden Sun Moth habitat (total area = 0.55 ha, Figure 5) that support a low-density and small population.

The proposed impact to 0.22 ha of this Golden Sun Moth habitat will remove:

- 40% of the 0.55 ha of Golden Sun Moth habitat in the proposed action area;
- 0.5% of the 69.39 ha of Golden Sun Moth habitat in the locality;
- 0.006% of the 9,917 ha of Golden Sun Moth habitat in the Murrumbateman IBRA Subregion; and
- 0.004% of the 14,499 ha of Golden Sun Moth habitat in the EOO.

Given that the Golden Sun Moth populations in the proposed action area are considered likely to be functionally isolated from one-another and from surrounding Golden Sun Moth populations, the impact to an isolated 0.22 ha patch of low-quality Golden Sun Moth habitat is unlikely to impact any other population or disrupt functional connectivity between populations.

With respect to the above, it is highly unlikely that the removal of 0.22 ha of low-quality Golden Sun Moth habitat will significantly impact the environment, either directly or indirectly.

- Whether mitigation measures will avoid or reduce these impacts.

The proposed action area is a historically disturbed site which currently houses a CSIRO research facility. There is evidence of experimental tree planting for scientific uses and other associated urban infrastructure. As a result, the majority of the proposed action area has been intensively landscaped and regularly mown over a long period of time. This has removed the remnant overstorey, midstorey, and shrubstorey, and heavily modified the groundlayer and encouraged the proliferation of exotic species. The selection of this site for the proposed action therefore largely avoids impacts on the environmental values of the locality.

As discussed previously, the only notable ecological value within the proposed action area are the two small patches of low-quality Golden Sun Moth habitat (total area = 0.55 ha, Figure 5). The proposed action will impact 0.22 ha (40%) of this habitat and avoid 0.33 ha (60%).

Combined with the measures summarised on Section 8.2, the proposed action substantially reduces the potential impacts on the environment.

With respect to the above, the proposed action is considered unlikely to significantly impact on the 'whole of environment'.

## 11. Conclusion

In conclusion, the following points are noted.

- The proposed action area is a historically disturbed site, the majority of which has been intensively landscaped and regularly mown over a long period of time. This has removed the remnant overstorey, midstorey, and shrubstorey, and heavily modified the groundlayer and encouraged the proliferation of exotic species.
- The only notable ecological values are two small patches of low-quality Golden Sun Moth habitat (total area = 0.55 ha).
  - The proposed action will avoid and retain the larger 0.33 ha southern patch of Golden Sun Moth habitat, which represents approximately 60% of that which occurs in the proposed action area.
  - The proposed action will permanently remove the smaller 0.22 ha of this Golden Sun Moth habitat, which represents approximately 40% of that which occurs in the proposed action area.
- Appropriate mitigation measures will be implemented to protect and manage the 0.33 ha patch of avoided Golden Sun Moth habitat during construction of the proposed action.
- Given the degraded state of the habitat, the small-scale nature of the impact, and the likely non-development scenario, the proposed action is unlikely to reduce the long-term viability of the Golden Sun Moth in the locality, ACT, IBRA Subregion, or EOO. Accordingly, the proposed action is considered unlikely to significantly impact the species or the 'whole of environment'.
- As there is considered to be no significant residual impact on Golden Sun Moth or the 'whole of environment', no offset is required in accordance with the EPBC Act Environmental Offsets Policy, and therefore none is proposed.

We trust that the information and advice provided herein is of assistance. If, however, you should have any questions relating to the matters discussed, please do not hesitate to contact us.

Yours sincerely,



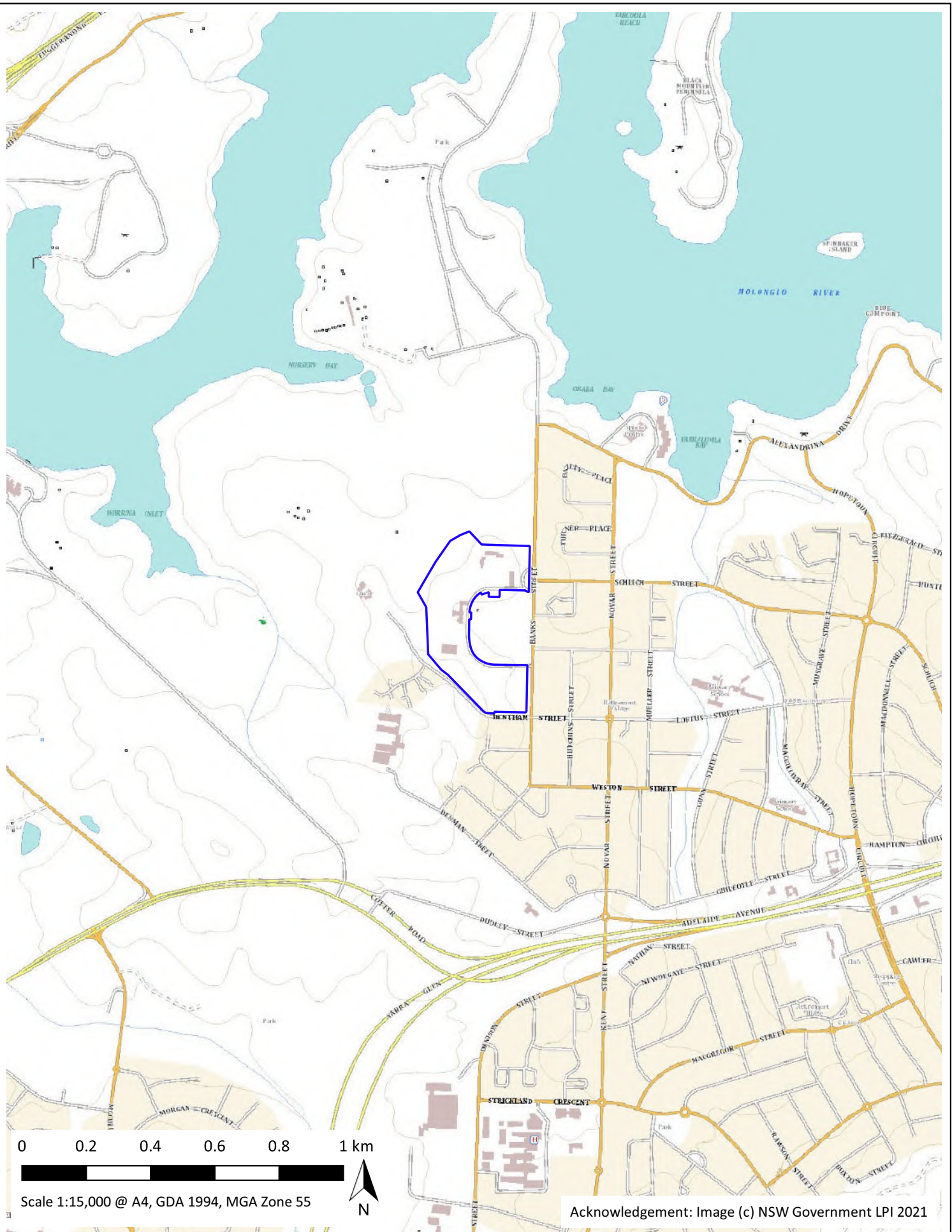
Robert Speirs

Director / Principal Ecologist



Dr Sam Reid

Senior Ecologist



Acknowledgement: Image (c) NSW Government LPI 2021

Figure 1. Locality Plan

Capital Ecology Project No: 3008  
 Drawn by: S. Reid  
 Date: 23 November 2021

Legend


 Proposed Action Area

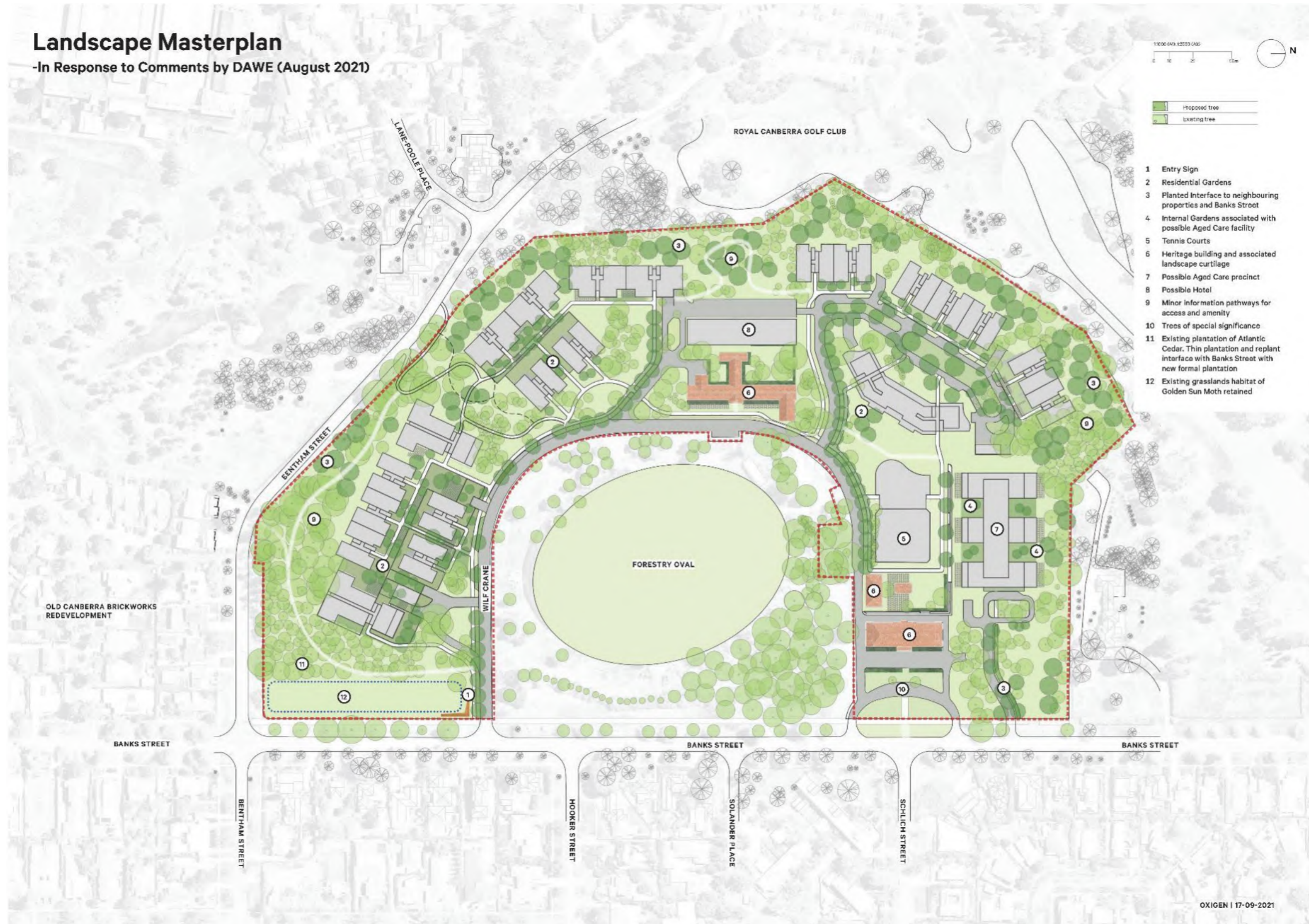


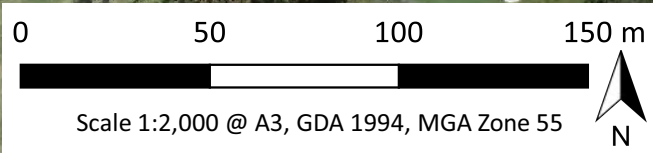




Figure 2. The Proposed Action Area on Aerial Imagery

Figure 3. The Proposed Action





**Legend**  
 Vegetation Mapping (Capital Ecology 2019)  
 Planted Overstorey Vegetation with Exotic Groundstorey  
 Planted Overstorey Vegetation with a Mixed Native and Exotic Groundstorey

Acknowledgement: Image (c) ACT Government 2021 CC4.0

Figure 4. Vegetation Mapping in the Proposed Action Area



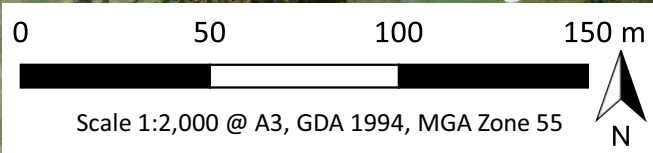


Figure 5. Golden Sun Moth habitat in the Proposed Action Area

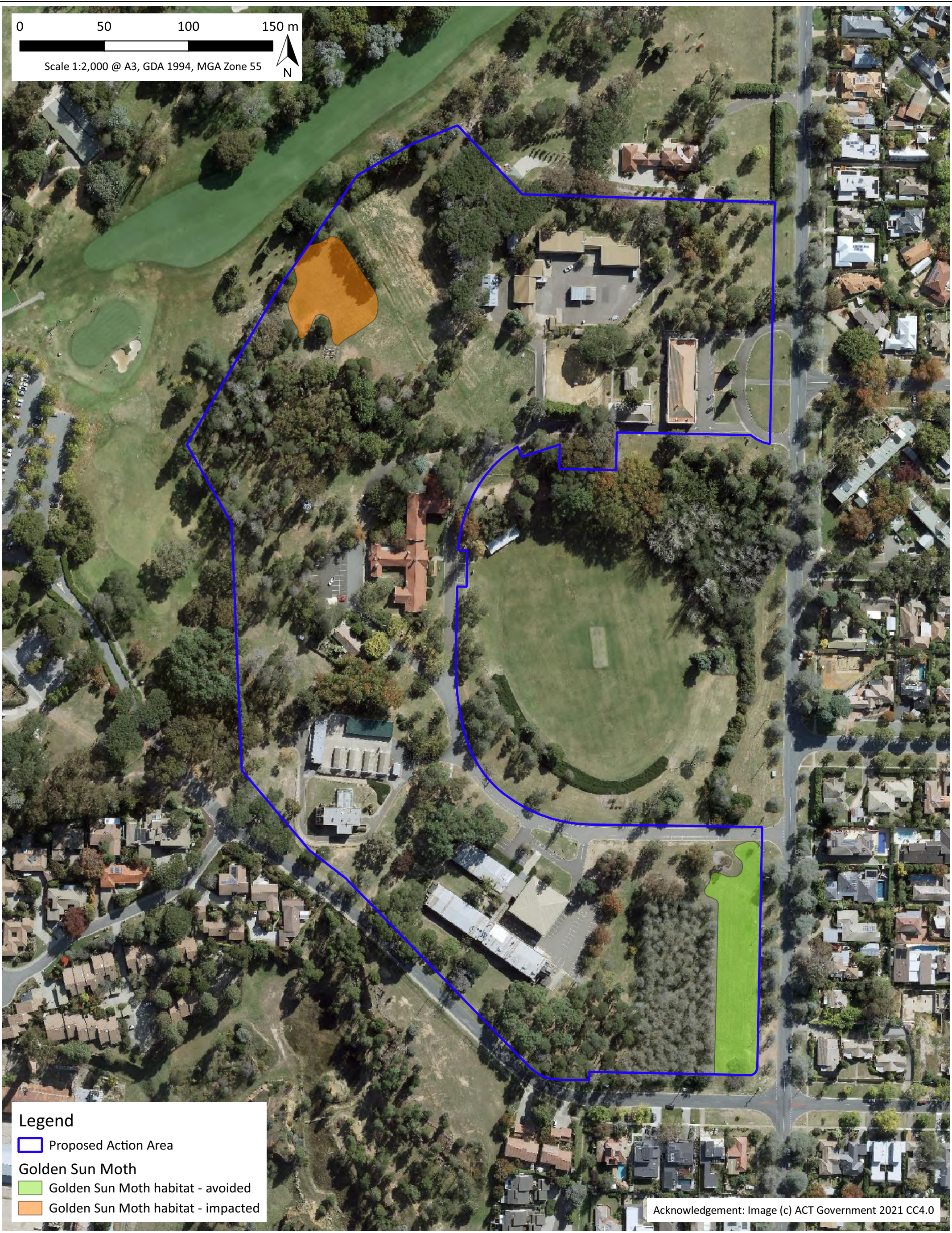
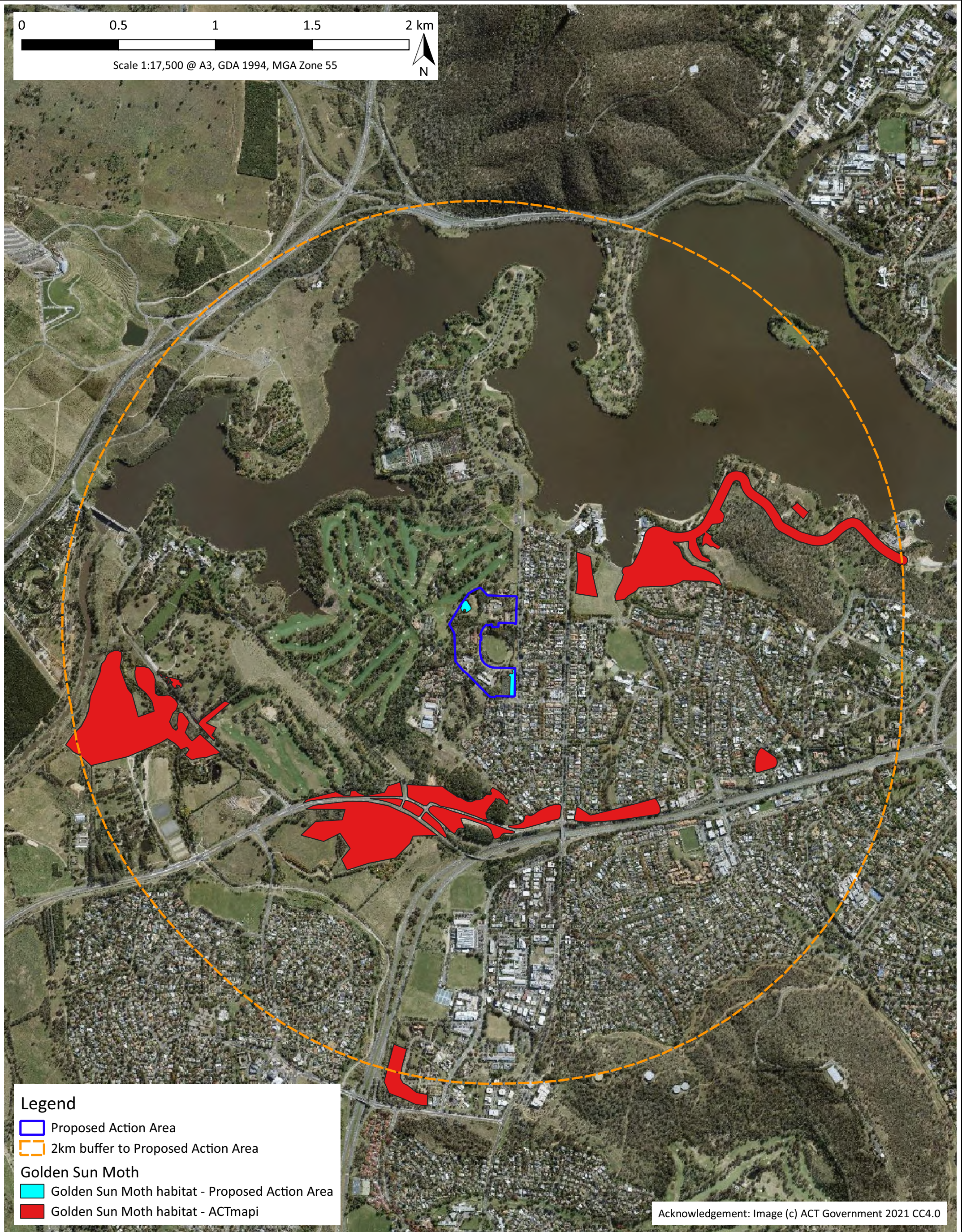
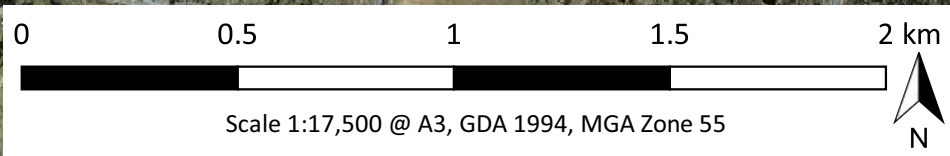






Figure 6. The Impact of the Proposed Action – Golden Sun Moth



**Legend**

-  Proposed Action Area
-  2km buffer to Proposed Action Area

**Golden Sun Moth**

-  Golden Sun Moth habitat - Proposed Action Area
-  Golden Sun Moth habitat - ACTmapi

Acknowledgement: Image (c) ACT Government 2021 CC4.0

Figure 7. Golden Sun Moth habitat in the Locality

## Appendix A. Data of Relevance to MNES in the Proposed Action Area

### Assessment against the listing criteria for the EPBC listed TEC – Natural Temperate Grassland of the South Eastern Highlands (NTG-SEH)

Description – As detailed in Commonwealth of Australia (2016<sup>17</sup>), the NTG-SEH TEC is characterised by grassy vegetation dominated by moderately tall (25–50cm) to tall (50–100cm), dense to open tussock grasses in the genera *Rytidosperma*, *Austrostipa*, *Bothriochloa*, *Poa* and *Themeda*. Up to 70% of all plant species may be forbs. The community may be treeless or contain up to 10% cover of trees, shrubs or sedges. Natural Temperate Grassland occurs within the biogeographical region of the South Eastern Highlands in valleys influenced by cold air drainage and in broad plains.

Presence in the proposed action area – Absent – The proposed action area would likely have supported areas of NTG-SEH TEC (Natural Temperate Grassland) pre-1750, however no remnants remain in the proposed action area in a condition that meets the listing criteria.

### Assessment against the listing criteria for the EPBC listed TEC – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Description – The White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC (PCT-ACT16) is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs (where shrub cover comprises less than 30% cover), and a dominance or prior dominance of White Box and/or Yellow Box and/or Blakely's Red Gum trees. This TEC occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through New South Wales and the Australian Capital Territory to Victoria.

Presence in the proposed action area – Absent – The proposed action area is likely have supported areas of Box-Gum Woodland pre-1750, however no traces of remnant woodland or moderately intact derived grassland remain. As a result, the proposed action area does not meet the listing criteria for Box-Gum Woodland as outlined in Commonwealth of Australia (2006<sup>18</sup>).

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<sup>17</sup> Commonwealth of Australia (2016). *Approved conservation advice for the Natural Temperate Grassland of the South Eastern Highlands (NTG-SEH) ecological community*.

<sup>18</sup> Commonwealth of Australia (2006). *Policy Statement 3.5: White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands. Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Department of Environment and Heritage.

### Golden Sun Moth targeted survey conditions

<b>Date:</b> 30/10/2019 (Survey 1)				<b>Observer/s:</b> SR
<b>Survey Site:</b> CSIRO Yarralumla				
<b>Time</b>	<b>Air Temp.</b>	<b>Wind</b>	<b>Cloud cover</b>	<b>Other weather information</b>
<b>Start:</b> 1315	27.0	15 NNW	7/8	Warm and relatively still
<b>Finish:</b> 1345	27.4	19 N	6/8	
<b>General site notes:</b> Males confirmed flying near Sutton and via ACT GSM email forum.				
<b>Date:</b> 11/11/2019 (Survey 2)				<b>Observer/s:</b> SR
<b>Survey Site:</b> CSIRO Yarralumla				
<b>Time</b>	<b>Air Temp.</b>	<b>Wind</b>	<b>Cloud cover</b>	<b>Other weather information</b>
<b>Start:</b> 1240	23.6	30 NW	0/8	
<b>Finish:</b> 1320	24.0	28 WNW	0/8	
<b>General site notes:</b> Male GSM recorded both flushed and spontaneously flying. Males confirmed flying near Sutton and via ACT GSM email forum.				
<b>Date:</b> 22/11/2019 (Survey 3)				<b>Observer/s:</b> SR
<b>Survey Site:</b> CSIRO Yarralumla				
<b>Time</b>	<b>Air Temp.</b>	<b>Wind</b>	<b>Cloud cover</b>	<b>Other weather information</b>
<b>Start:</b> 1220	32.0	32 NW	8/8	Entire sky covered in dust haze
<b>Finish:</b> 1300	33.3	35 NNW	8/8	
<b>General site notes:</b> Male GSM recorded spontaneously flying. Males confirmed flying near Gungahlin.				
<b>Date:</b> 29/11/2019 (Survey 4)				<b>Observer/s:</b> RS
<b>Survey Site:</b> CSIRO Yarralumla				
<b>Time</b>	<b>Air Temp.</b>	<b>Wind</b>	<b>Cloud cover</b>	<b>Other weather information</b>
<b>Start:</b> 1200	30.5	20 NW	0/8	Very dry conditions
<b>Finish:</b> 1240	29.5	20 NW	0/8	
<b>General site notes:</b> Males observed flying at Yarralumla Brickworks and near Queanbeyan Nature Reserve, NSW.				



**Recorded flora species**

Common name	Scientific name	EPBC Act / NC Act status
<b>Exotic</b>		
Wild Oat	<i>Avena</i> sp.	-
Spear Thistle	<i>Cirsium vulgare</i>	-
Grey Cotoneaster	<i>Cotoneaster franchetii</i>	-
Couch grass	<i>Cynodon dactylon</i>	-
Cock's Foot	<i>Dactylis glomerata</i>	-
Paterson's Curse	<i>Echium plantagineum</i>	-
Panic Veldgrass	<i>Ehrharta erecta</i>	-
Goose Grass	<i>Eleusine tristachya</i>	-
African Lovegrass	<i>Eragrostis curvula</i>	-
English Ivy	<i>Hedera helix</i>	-
St John's Wort	<i>Hypericum perforatum</i>	-
Flatweed	<i>Hypochaeris radicata</i>	-
Prickly Lettuce	<i>Lactuca serriola</i>	-
Broad-leaf Privet	<i>Ligustrum lucidum</i>	-
Red-flowered Mallow	<i>Modiola caroliniana</i>	-
Chilean Needle Grass	<i>Nassella neesiana</i>	-
Serrated Tussock	<i>Nassella trichotoma</i>	-
Common Prickly Pear	<i>Opuntia stricta</i>	-
Shamrock	<i>Oxalis articulata</i>	-
Brazilian Whitlow	<i>Paronychia brasiliiana</i>	-
Paspalum Grass	<i>Paspalum dilatatum</i>	-
Radiata Pine	<i>Pinus radiata</i>	-
Pine	<i>Pinus</i> sp.	-
Plantain / Lamb's Tongue	<i>Plantago lanceolata</i>	-
White Poplar	<i>Populus alba</i>	-
Plum	<i>Prunus</i> sp.	-
Orange Firethorn	<i>Pyracantha angustifolia</i>	-
Holly Oak	<i>Quercus ilex</i>	-
English Oak	<i>Quercus robur</i>	-
Briar Rose	<i>Rosa rubiginosa</i>	-
Blackberry	<i>Rubus fruticosus</i>	-
Wild Sage	<i>Salvia verbenaca</i>	-
Clover	<i>Trifolium</i> sp.	-
Elm	<i>Ulmus</i> sp.	-
<b>Native</b>		
Cootamundra Wattle	<i>Acacia bailyana</i>	Protected
Black Wattle	<i>Acacia mearnsii</i>	Protected
River She-oak	<i>Allocasuarina cunninghamiana</i>	Protected

Common name	Scientific name	EPBC Act / NC Act status
Tall Speargrass	<i>Austrostipa bigeniculata</i>	Protected
Red-leg Grass	<i>Bothriochloa macra</i>	Protected
Kurrajong	<i>Brachychiton populneus</i>	Protected
Native Blackthorn	<i>Bursaria lasiophylla</i>	Protected
Wild Rosemary	<i>Cassinia quinquefaria</i>	Protected
Rock Fern	<i>Cheilanthes sieberi</i>	Protected
Common Everlasting	<i>Chrysocephalum apiculatum</i>	Protected
Australian Bindweed	<i>Convolvulus erubescens</i>	Protected
Slender Tick-trefoil	<i>Desmodium varians</i>	Protected
Flax Lily	<i>Dianella sp.</i>	Protected
Climbing Saltbush	<i>Einadia nutans</i>	Protected
White Box	<i>Eucalyptus albens</i>	Protected
Blakely's Red Gum	<i>Eucalyptus blakelyi</i>	Protected
Spotted Gum	<i>Eucalyptus maculata</i>	Protected
Red Box	<i>Eucalyptus polyanthemos</i>	Protected
Mugga Ironbark	<i>Eucalyptus sideroxylon</i>	Protected
Ribbon Gum	<i>Eucalyptus viminalis</i>	Protected
Native Sarsaparilla	<i>Hardenbergia violacea</i>	Protected
Hairy Panic	<i>Panicum effusum</i>	Protected
Black Pine	<i>Pinus nigra</i>	Protected
Snowgrass	<i>Poa sieberiana</i>	Protected
Swamp Dock	<i>Rumex brownii</i>	Protected
Wallaby Grass	<i>Rytidosperma sp.</i>	Protected
Cotton Fireweed	<i>Senecio quadridentatus</i>	Protected
Kangaroo Grass	<i>Themeda triandra</i>	Protected
Narrow-leaved New Holland Daisy	<i>Vittadinia muelleri</i>	Protected
Native Bluebell	<i>Wahlenbergia communis</i>	Protected

**Recorded fauna species**

Class	Common name	Scientific name	EPBC Act / NC Act status
Aves	Indian Myna	<i>Acridotheres tristis</i>	-
Aves	Australian King-Parrot	<i>Alisterus scapularis</i>	Protected
Aves	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	Protected
Aves	Little Corella	<i>Cacatua sanguinea</i>	Protected
Aves	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Protected
Aves	Galah	<i>Eolophus roseicapilla</i>	Protected
Aves	Magpie-lark	<i>Grallina cyanoleuca</i>	Protected
Aves	Australian Magpie	<i>Gymnorhina tibicen</i>	Protected
Aves	Noisy Miner	<i>Manorina melanocephala</i>	Protected
Aves	Crested Pigeon	<i>Ocyphaps lophotes</i>	Protected
Aves	Great Cormorant	<i>Phalacrocorax carbo</i>	Protected
Aves	Crimson Rosella	<i>Platycercus elegans</i>	Protected
Aves	Eastern Rosella	<i>Platycercus eximius</i>	Protected
Aves	Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>	Protected
Aves	Pied Currawong	<i>Strepera graculina</i>	Protected
Mammalia	Eastern Grey Kangaroo	<i>Macropus giganteus</i>	Protected
Reptilia	Delicate Skink	<i>Lampropholis delicata</i>	Protected

## Appendix B. Mitigation measures to protect and manage avoided Golden Sun Moth habitat

Mitigation Measure	Description	Predicted Effectiveness
Exclusion fencing during construction.	Appropriate exclusion fencing will be established prior to commencement of construction and maintained throughout the life of the construction phase. This fencing will ensure that impacts from construction occurring on the adjoining land do not extend into the avoided Golden Sun Moth habitat.	High
Continuation of existing biomass management regime.	It is proposed not to change the existing management of the avoided Golden Sun Moth habitat, rather it will be managed in the same manner that it has been for many years. Notably, the grass in the patch will continue to be regularly mown to maintain the grass sward so that it is suitable for Golden Sun Moth habitat (i.e. height generally maintained between 10 cm and 25 cm) and generally consistent with that on the adjoining road verges. This mowing will either continue to be undertaken by ACT Government contractors or will be undertaken by personnel engaged by the proponent/landowner.	High
Monitoring of fencing and biomass.	<p>The exclusion fence and the grass biomass in the patch will be monitored regularly (i.e. monthly) to ensure that:</p> <ol style="list-style-type: none"> <li>the fence continues to be effective in protecting the patch of avoided Golden Sun Moth habitat from impacts from construction; and</li> <li>the grass biomass remains suitable for Golden Sun Moth habitat (i.e. height generally maintained between 10 cm and 25 cm).</li> </ol> <p>The findings of this monitoring will be provided to the proponent/landowner who will take any actions necessary to ensure that a. and b. are achieved.</p>	High

## Appendix C. Estimating Golden Sun Moth Extent of Occurrence (EOO) and occupied habitat

The following information has been informed by the following databases and documents.

- NSW Wildlife Atlas (BioNet) Golden Sun Moth records, downloaded on 30 August 2021.
- ACT Government's ACTmapi *Significant Species, Vegetation Communities & Registered Trees*<sup>19</sup> Golden Sun Moth habitat spatial data, accessed on 30 August 2021.
- NSW Government Saving Our Species (SOS) Golden Sun Moth species profile<sup>20</sup> and project report<sup>21</sup>.
- NSW Government Office of Environment & Heritage Golden Sun Moth profile<sup>22</sup>.
- *ACT native grassland conservation strategy and action plans* (ACT Government 2017<sup>23</sup>).
- *Significant impact guidelines for the critically endangered golden sun moth (Synemon plana)* (Commonwealth of Australia 2009b<sup>24</sup>).
- *Background paper to Significant impact guidelines for the critically endangered golden sun moth (Synemon plana)* (Commonwealth of Australia 2009a<sup>25</sup>).
- *Approved Conservation Advice for Synemon plana (golden sun moth)* (Commonwealth of Australia 2013b<sup>26</sup>).

The NSW Wildlife Atlas contains 922 Golden Sun Moth records. For the purposes of this assessment, the single record located near Tumut has been excluded as it is separated by over 60 km from the main body of Golden Sun Moth records and is therefore treated as an outlier. The remaining 921 Golden Sun Moth records span from 1993 to 2020 and represent at least 5,049 individuals (Figure B1).

As stated in ACT Government (2017) '*Based on the known former distribution of lowland Temperate Grassland in the ACT and areas surveyed for S. plana, it is unlikely any significant populations of the species remain undiscovered.*' As such, the spatial data from ACTmapi is likely to be an accurate reflection of the currently occupied Golden Sun Moth habitat in the ACT.

The NSW Wildlife Atlas (BioNet) Golden Sun Moth records and ACTmapi Golden Sun Moth habitat mapping have been combined to estimate the Golden Sun Moth Extent of Occurrence (EOO) (Figure B1). The EOO was calculated according to International Union for Conservation of Nature (IUCN)

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<sup>19</sup> <http://app.actmapi.act.gov.au/actmapi/index.html?viewer=ssvcr>

<sup>20</sup> <https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10791>

<sup>21</sup> <https://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=839&ReportProfileID=10791>

<sup>22</sup> <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10791>

<sup>23</sup> ACT Government (2017). *ACT native grassland conservation strategy and action plans*. Environment, Planning and Sustainable Development, Canberra.

<sup>24</sup> Commonwealth of Australia (2009a). *Significant impact guidelines for the critically endangered golden sun moth (Synemon plana). Nationally threatened species and ecological communities EPBC Act policy statement 3.12*. Department of the Environment, Water, Heritage and the Arts.

<sup>25</sup> Commonwealth of Australia (2009b). *Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)*. Department of the Environment, Water, Heritage and the Arts.

<sup>26</sup> Commonwealth of Australia (2013b). *Approved Conservation Advice for Synemon plana (golden sun moth)*. Approved by the delegate of the Minister on 17 December 2013.

Standards and Petitions Subcommittee (2017)<sup>27</sup> and represents ‘the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon’. Based on this, the EOO for Golden Sun Moth is estimated to be 414,022 ha (Figure B1, Table B1). The EOO in Figure B1 agrees well with previous estimates that the species in the ACT/NSW occurs in a narrow band that is 100 km long and 30 km wide, extending from the Queanbeyan district in the south-east to the Boorowa area in the north-west (Commonwealth of Australia 2009a, ACT Government 2017).

It is difficult to accurately determine the extent of habitat currently occupied by the Golden Sun Moth in the EOO. This is because most populations are small, the species is very patchily distributed across its range, and only certain areas have been appropriately surveyed. However, as mentioned previously, the spatial data from ACTmapi is likely to be an accurate reflection of the currently occupied Golden Sun Moth habitat in the ACT. Therefore, this high-resolution data can be used to determine the proportion of the EOO in the ACT that is currently occupied by Golden Sun Moth. This finding can then be extrapolated to estimate the area of currently occupied habitat in the EOO as a whole.

As detailed in Table B1, the ACT accounts for 52,293 ha (12.63%) of the EOO. Within this area, there is 1,831 ha of Golden Sun Moth habitat (Figure B1). Therefore, 3.50% of the 52,293 ha of EOO in the ACT supports occupied Golden Sun Moth habitat. Using this value, the following estimates are made.

- The EOO supports an estimated 14,498.67 ha of occupied Golden Sun Moth habitat, based on the assumption that 3.50% of the EOO supports Golden Sun Moth habitat. This finding agrees well with a previous estimate of 150 km<sup>2</sup> (15,000 ha) (ACT Government 2017).
- The Murrumbateman IBRA subregion supports an estimated 9,916.59 ha of occupied Golden Sun Moth habitat, based on the assumption that 3.50% of the EOO in the Murrumbateman IBRA subregion supports Golden Sun Moth habitat.

**Table B1. Golden Sun Moth Extent of Occurrence (EOO) and estimated occupied habitat.**

ID	Specific Matter	Area (ha)	Percent	Description
A	Golden Sun Moth EOO.	414,022	-	
B	ACT and EOO intersection.	52,293	12.63% (B/A)*100	The ACT accounts for 52,293 ha (12.63%) of the EOO.
C	Murrumbateman IBRA subregion and EOO intersection.	283,216	68.41% (C/A)*100	The Murrumbateman IBRA subregion accounts for 283,216 ha (68.41%) of the EOO.
D	ACTmapi Golden Sun Moth habitat in the ACT.	1,831	3.50% (D/B)*100	There is 1,831 ha of Golden Sun Moth habitat in the ACT. Therefore, 3.50% of the 52,293 ha of the EOO in the ACT supports Golden Sun Moth habitat.
E	Estimated extent of currently occupied Golden Sun Moth habitat in the EOO.	14,496.67 (A*0.035)	-	NSW supports an estimated 14,496.67 ha of occupied Golden Sun Moth habitat, based on the assumption that 3.50% of the EOO supports Golden Sun Moth habitat.

<sup>27</sup> IUCN Standards and Petitions Subcommittee (2017). *Guidelines for Using the IUCN Red List Categories and Criteria. Version 13*. Prepared by the Standards and Petitions Subcommittee. Available at: <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>

ID	Specific Matter	Area (ha)	Percent	Description
F	Estimated extent of currently occupied Golden Sun Moth habitat in the Murrumbateman IBRA subregion.	9,916.59 (C*0.035)	-	The Murrumbateman IBRA subregion supports an estimated 9,916.59 ha of occupied Golden Sun Moth habitat, based on the assumption that 3.50% of the EOO in the Murrumbateman IBRA subregion supports Golden Sun Moth habitat.

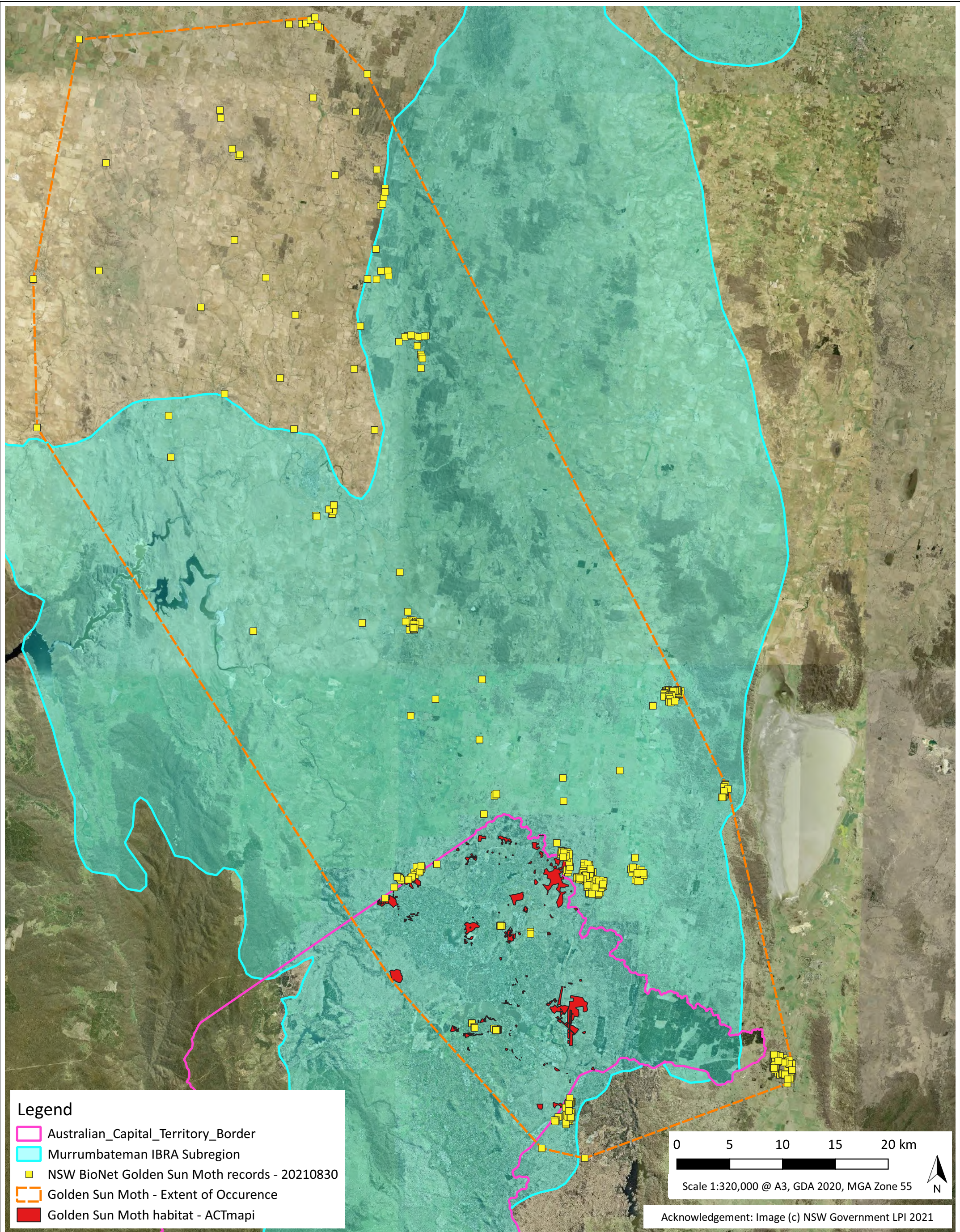


Figure B1. Golden Sun Moth Extent of Occurrence and Estimated Occupied Habitat