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Transport Canberra and City Services

MONITORING OF GOLDEN SUN MOTH (SYNEMON PLANA) AND ITS HABITAT AT RESERVOIR HILL

(Lawson South Open Space)

FINAL

February 2021

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Prepared by
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on behalf of
Transport Canberra City Services Directorate

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Table of Contents

Figures

Tables

Appendices

Summary

The 2020 monitoring for Golden Sun Moth (GSM) populations and habitat conditions found that the population was stable across the site, with a small increase in the proportion of forage species within the native grassland areas. The approach taken was a continuation of previous monitoring on the site, maintaining a consistent methodology to allow direct comparison of the data from previous years.

The wetter and warmer growing season during latte winter and early spring 2020 saw vigorous growth in exotic grasses and broadleaf weeds, which has created a high biomass in the southern and eastern slopes of Reservoir Hill. While there has been an overall reduction in bare ground and some recovery in native species abundance, weed growth means that the grass height and thatch depth significantly exceeds the levels prescribed in the EMP. This is both crowding out native species, and potentially reducing the breeding success of GSM by obscuring females at ground level.

The recommended management guidelines (refer to **Appendix A**) are focused on addressing the high biomass and thatch levels in the southern portions of the site prior to the 2021 GSM breeding season, and also include recommendations for disrupting the growth and seed-set of weed species across the site.

The interpretive signage for the site was also reviewed and some additional changes have been recommended to meet Commonwealth approval conditions.

1.0 The Project

Transport Canberra City Services Directorate (TCCS) has engaged Umwelt Environmental and Social Consultants (Umwelt) to undertake monitoring of Golden Sun Moth (*Synemon plana*) populations at Reservoir Hill, Lawson, ACT (the site). Golden Sun Moth is listed as critically endangered under both the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and as endangered under the *Nature Conservation Act 2014*.

The ACT Land Development Agency was granted approval on 13 September 2012 to develop a new residential estate at Lawson South, Belconnen (EPBC Act referral 2010/5549). The Approval Conditions included a requirement to protect golden sun moth and the critically endangered Natural Temperate Grassland of the South Eastern Highlands ecological community.

A variation to EPBC approval conditions was approved on 4th April 2013 to amend Condition 5 which was to maintain or improve the GSM habitat on Reservoir Hill (refer to **Figure 1.1**) following the Environment Management Plan (EMP) (Rowell 2013). The requirements of Condition 5 of the approval include the completion of ongoing monitoring and management.

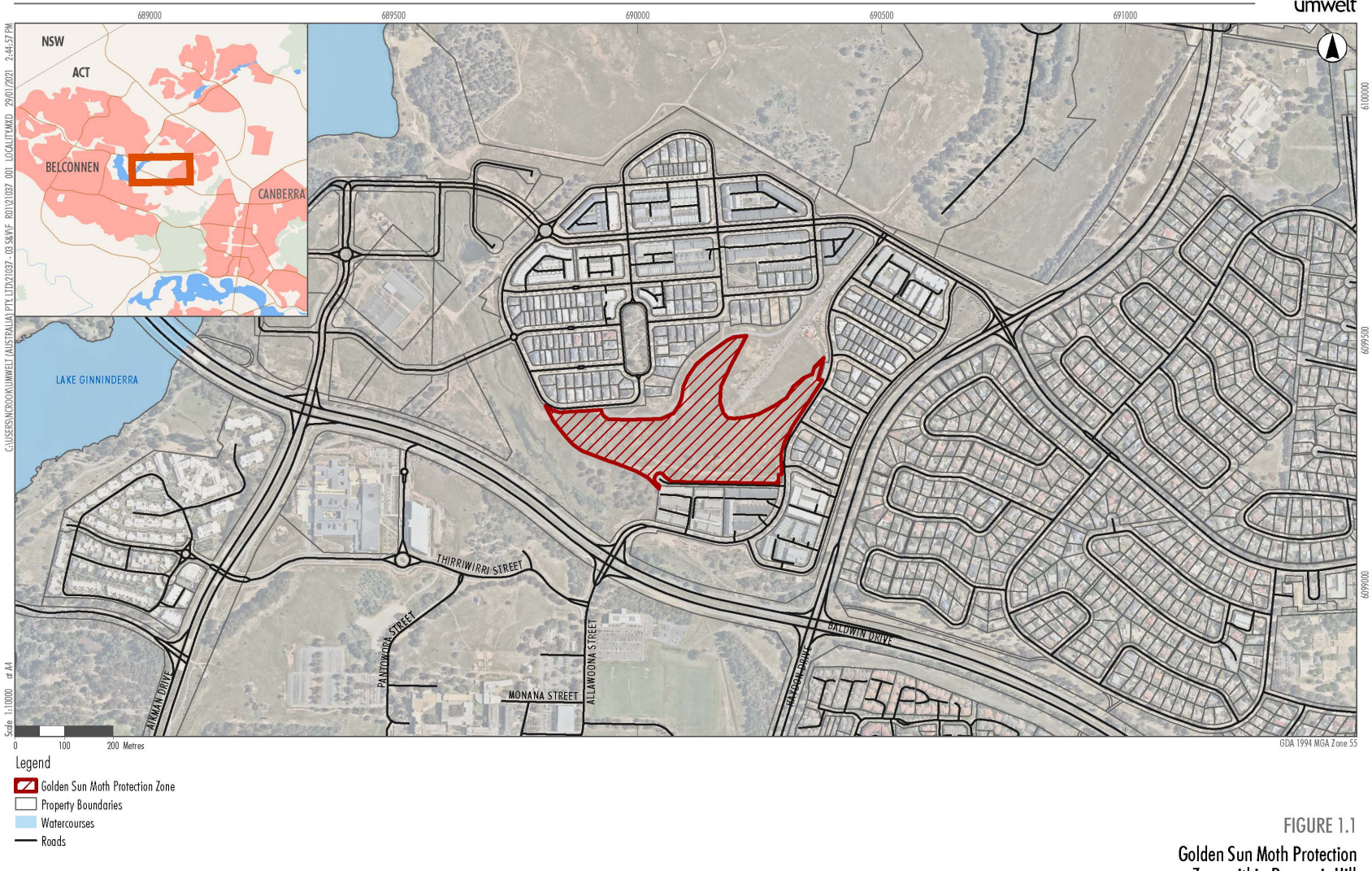

FIGURE 1.1
Golden Sun Moth Protection Zone within Reservoir Hill

Image Source: Nearmap (Jan 2020) Data source: ACTMapi (2020)

2.0 Scope of this Report

This project gives effect to the monitoring and management planning requirements of the Conditions of Approval, and included:

- Monitoring of Golden Sun Moth population during Spring and Summer 2020/21 during their breeding emergence (November to December). The monitoring was conducted by qualified ecologists four times over two weeks.
- Monitoring of Golden Sun Moth habitat at three transects in December (2020) to identify if habitat has improved following management actions.
- Development of a yearly disturbance/management plan for the site (grazing, fire, slashing) to support ongoing improvement in habitat quality by 29 January 2021.
- Review of the wording of interpretive signage for the site to incorporate revised wording on Commonwealth GSM requirements.

This report provides both a report of ongoing monitoring and recommended approaches for future management of the site.

3.0 Methods

The monitoring of the Golden Sun Moth during 2020 involved the recording of individuals within the survey site and the recording of grass height, thatch depth and floristic composition. The locations of transects and the monitoring methods were based on the approaches in previous years to allow for a direct comparison of results.

3.1 Monitoring of Golden Sun Moth and its Habitat

3.1.1 Golden Sun Moth

The site was surveyed on four days of suitable weather (as far as possible) during the local flight period of the moth (10/11/20 – 15/12/20), as determined by GSM activity at reference sites. Initial checks of the site commenced in November, with spot checks taking place on a roughly weekly schedule during suitable days to determine if the population had started to emerge. The first moths were sighted on 27 November, and the transect surveys commenced from the next suitable day.

Good weather conditions for GSM emergence are generally between 1000 and 1400 hours in warm sunny weather with little wind, and more than two days since significant rainfall or an unusually cold night.

Transect counts were carried out as prescribed in the EMP, which involved walking (approximately) north-south transects 50 metres (m) apart across the whole site and recording the number of flying male moths seen in each 50 m segment of the transects. Concurrent searches were made for female moths and pupal cases. Results were compared with the results of previous monitoring.

The GSM monitoring transects are shown in **Figure 1.1**. The direction of travel was alternated between surveys to reduce the effect of time of day on survey results.

3.1.2 Habitat Monitoring

The vegetation was monitored as prescribed in the EMP and involved measurement of vegetation and other habitat parameters on the three fixed 100 metre step-point transects at the end of the moth flying season. The ground was searched for pupal cases during the vegetation transect survey. Transect results were compared with previous monitoring and the desirable range of habitat parameters in the EMP. The locations of the vegetation monitoring transects are shown in **Figure 1.1** and **Table 3.1**.

The predominant habitat feature present at each metre mark on a transect was recorded ('single hit' method). Plant species or other features which are uncommon on a site are not likely to be recorded using this method, but it adequately defines the structure of GSM habitat.

The features measured were placed in the following categories derived from ACT government guidelines in 2012:

- cryptogams
- bare ground
- rock
- litter (detached dead vegetation)

- potential larval food plants (native or exotic)
- other perennial native grasses
- other native species
- perennial exotic grass
- exotic annual grass
- exotic broadleaf

A photographic record of the transects was made as described in the Draft *ACT Golden Sun Moth Monitoring Plan* (Rowell & Evans 2014). This requires a close-up plan view at the zero point and a landscape view of the transect from the zero point with a measuring stick at the three-metre mark.

Detailed method for measuring average grass height and thatch depth (ESDD 2019):

A 1 m quadrat is placed every at each 10 m point along a 100 m transect. The average grass height is measured in each quarter of the 1 metre quadrat and those measures are averaged. To measure average grass height, measure the average leaf height of the grass in centimetres, the same amount of grass mass should be above and below the average height (illustrated below). This accounts for both tall and short leaves and areas of bare ground, providing a more accurate picture of herbage mass, habitat structure and grazing impacts.

Thatch depth in the same one square metre quadrats is measured by placing a ruler against the soil and recording the average depth of thatch (dead detached grass material) in 0.5 cm increments. Thatch is the detached, dead component of the grassy layer which is usually dead grass leaves and stems but can also include forbs. Thatch is often a smaller component in native swards (< 5% of total herbage mass) but can make up a substantial component of exotic and annual grass communities (ca 30%) due to rapid growth (e.g. Phalaris) or short life cycle (e.g. Wild Oats) in these communities.

Table 3.1 Vegetation Transect Coordinates (GDA 94)

	Transect 1	Transect 2	Transect 3
Start	690250 E 6099240 N	689978 E 6099308 N	690100 E 6099310 N
Finish	690297E 6099325 N	689882 E 6099314 N	690130 E 6099404 N

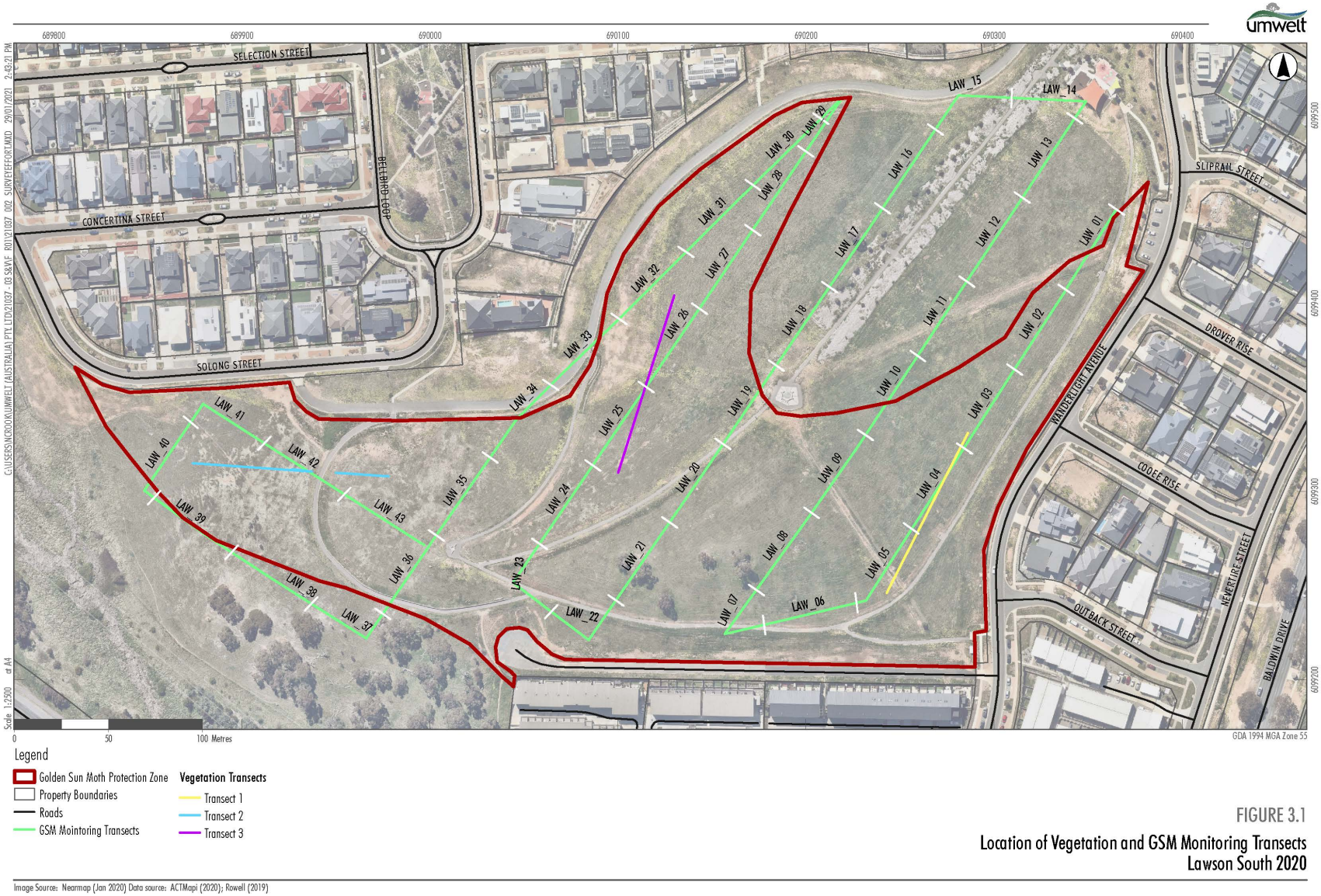

FIGURE 3.1

Location of Vegetation and GSM Monitoring Transects
Lawson South 2020

Image Source: Nearmap (Jan 2020) Data source: ACTMapi (2020); Rowell (2019)

4.0 Results

4.1 Golden Sun Moth Monitoring

4.1.1 Survey Conditions

The overall rainfall for 2020 was well above the median, with mild night-time temperatures compared to the long-term average of approximately 1 - 2 degrees. Spring featured above average rainfall and a continuation of warmer nights, whilst summer saw a continuation of warmer conditions and higher than average rainfall (**Figure 4.1**). The mean maximum temperatures for the October to December period were up to 2°C above the long-term average for those months (Bureau of Meteorology, 2020).

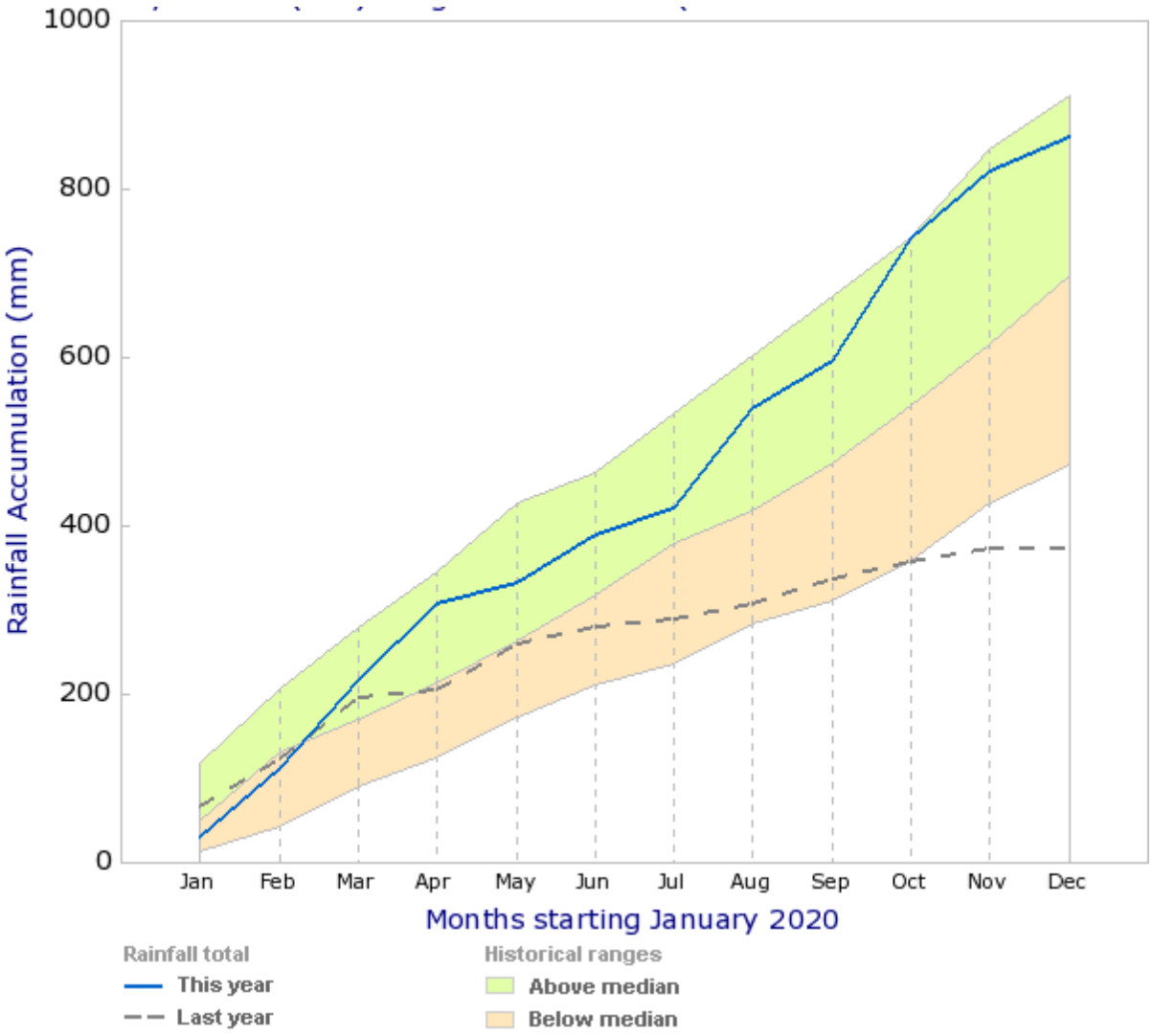

Figure 4.1 Monthly rainfall (mm) ranges (Australian National Botanic Gardens)

Once suitable weather conditions were present for the detection of flying adults, surveys of the site commenced. The starting point alternated between the eastern and western end. Surveys were conducted on 10 and 18 November 2020 but were suspended after the initial rounds did not detect any moths. Due to the absence of flying moths, surveys were suspended, and spot checks of the site were undertaken by Umwelt ecologists on suitable days, with the field survey re-commencing once flying moths were observed. The location of these preliminary detections was also recorded.

The final two rounds of site survey occurred on 1 and 15 December 2020. The time period between surveys was 1 - 14 days. Due to the short life span of adult GSM, this ensured that different cohorts of moths were counted in each survey, and also maintains a consistent spread of survey effort compared to previous years. All surveys were within the 2020 GSM flying season and the second and third surveys were during the peak flying period (as determined retrospectively by shared reports from other sites). Weather conditions during the surveys are summarised in **Table 4.1**.

4.1.2 GSM Survey Results

A total of 43 male GSMs were observed in 2020. No GSMs were seen in the first two surveys, and the last two surveys resulted in 8 and 14 observations. The remaining 21 moths were recorded incidentally while performing habitat surveys. As with previous surveys, no females or pupal cases were observed, and this is most likely due to a combination of tall growing grasses obscuring some sections of the site, and the generally sparse population of moths.

During the most recent two surveys in 2017 and 2019 no moths were recorded in the north-western portion of the site, whereas this year moths were recorded in this area, representing a small extension of the population across the site. This area has tall grasses dominated by weeds and may benefit from follow-up treatments to improve habitat quality.

Table 4.1 Weather Conditions During GSM Surveys at Lawson South, 2020

Survey	Date	Survey Time	Temperature (°C)	Weather
1	10 November 2020	11:18 – 12:25	21-22	Fine with light breeze (<11 km/h)
2	18 November 2020	11:33 – 12:58	20-21	Fine to scattered cloud cover (<30%) with light breeze (<11 km/h)
3	1 December 2020	10:25 – 11:47	22-25	Fine and still with some light (<11 km/h) breeze and few gusty winds
4	15 December 2020	11:47 – 1:05	23	Partly cloudy (>30% and <90% cover) with gusty winds

The observations of GSM were generally of either single moths or small groupings, and these were distributed widely across the site. GSM were detected in both the higher quality remnant patches of native grassland, as well as the areas on the eastern side of Reservoir Hill where there has been extensive weed growth, overshadowing native species.

Table 4.2 GSM Results at Lawson South, 2020

Survey	Date	Total Males	Total Females	Total
1	10 November 2020	0	0	0
2	18 November 2020	0	0	0
3	1 December 2020	8	0	8
4	15 December 2020	14	0	3
Incidental	10 December 2020	21	0	21
Total	-	-	-	**43**

Previous surveys detected GSM on the site during November, however none were detected during the most recent survey until

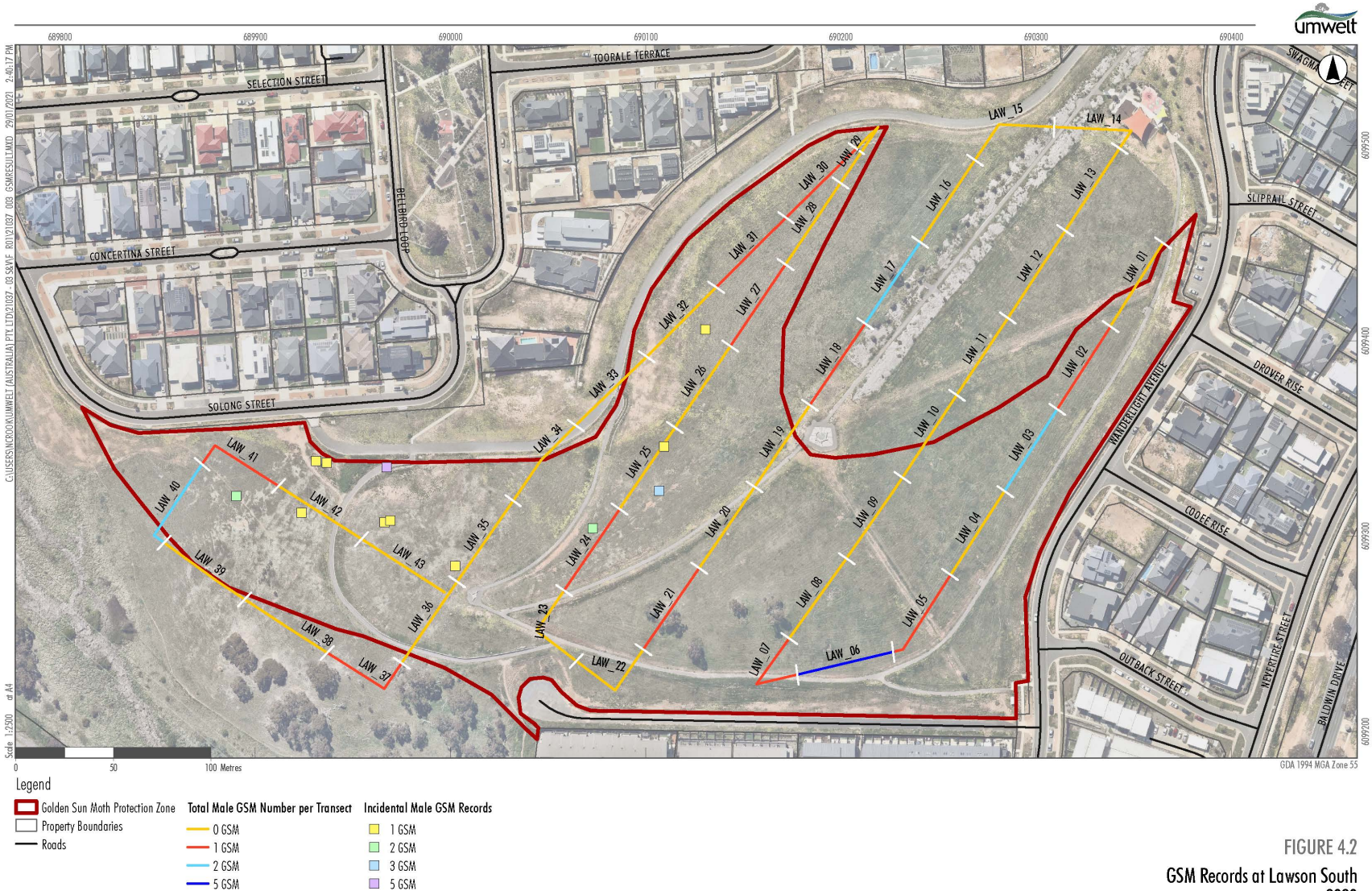

FIGURE 4.2

GSM Records at Lawson South 2020

Image Source: Nearmap (Jan 2020) Data source: ACTMapi (2020); Rowell (2019)

4.2 Golden Sun Moth Habitat Monitoring

4.2.1 GSM Habitat Condition

There was a significant increase in both the average grass length and thatch depth within Transect 1, which corresponds to field observations of extensive weed growth on the southern and eastern side of the site. The site was previously grazed by cattle, and then by kangaroos, but cattle grazing was discontinued in 2012 and kangaroo populations are at very low levels, with none observed on the site during the survey.

There has been an overall increase in the proportion of exotic grass across the site, and a smaller increase in the proportion of native grasses, with the improved growing conditions seeing grasses take up areas of bare ground. The southern and eastern portions of the site saw the largest increases in exotic grasses, with these dominated by fast growing annual species such as Wild Oats (*Avena fatua*), and Saffron Thistle (*Carthamus lantanus*). These species can rapidly respond to increased soil moisture, and if left unmanaged will set large amounts of seed and retained biomass that will crowd out slower-growing natives. Perennial weed species that favour wetter conditions, particularly Phalaris (*Phalaris aquatica*) have also established across some areas of the site. These exotic species have created a dense sward of tall grasses, as well as an increased thatch depth at ground level, and is consistent with the conditions observed elsewhere in the region. This is likely to disadvantage the lower growing native grasses, which have been slower to respond to the improved conditions.

The EMP prescribes mowing and baling of cut material between January and late September, with the aim of maintaining the grass height at less than 15cm, and thatch depth at less than 1 cm (Rowell 2013). Conditions on the site are shown in **Table 4.3** below and the areas sampled by Transect 1 are considerably higher than these levels, and corrective action to address both biomass and weed recruitment is outlined in the management action section below.

Despite the extensive weed growth, there was still an increase in the proportion of GSM forage species, particularly in Transect 1. This is most likely in response to a more favourable season, and highlights that the habitat has been responding to the improved season, and that removal of weeds is likely to allow for an acceleration of this improvement.

Table 4.3 Grass length and thatch depth on habitat transects

Transect	Average grass length (cm)			Average thatch depth (cm)		
	January 2019	January 2020	December 2020	January 2019	January 2020	December 2020
1	10.2	6.4	19.2	1.4	1.0	2.6
2	Not available	5.7	6.5	Not available	0.5	0.4
3	11.4	9.4	11.1	0.8	1.2	1.1

Table 4.4 Vegetation transect results at Lawson South.

Category	Desirable range EMP/ESDD 2019	Transect 1 (% cover)						Transect 2						Transect 3					
		Jan 13	Dec15	Jan 17	Feb18	Jan 20	Dec20	Jan 13	Dec15	Jan 17	Feb18	Jan 20	Dec20	Jan 13	Dec15	Jan 17	Feb18	Jan 20	Dec20
Cryptogams		0	0	0	1	0	0	14	18	14	12	15	14	0	6	3	4	3	2
Bare ground	5-15/5-25%	1	1	7	4	7	1	6	10	7	12	9	2	11	13	11	10	10	2
Rock		0	0	0	0	0	2	3	6	2	0	5	4	1	3	1	0	0	3
Litter/dead vegetation	5-15/<30%	25	17	20	11	31	2	5	12	6	7	9	3	16	24	16	36	35	21
Non-vegetation hits		**26**	**18**	**27**	**16**	**38**	**5**	**28**	**46**	**29**	**31**	**38**	**23**	**28**	**46**	**31**	**50**	**48**	**28**
Annual exotic grass		4	30	8	23	20	9	4	1	3	0	0	0	4	7	7	4	3	3
Perennial exotic grass		4	7	7	2	0	1	0	0	0	0	0	0	0	0	0	0	2	3
Exotic broadleaf		5	15	10	22	6	43	2	3	1	1	2	8	3	4	3	1	1	4
Total exotic hits	**<5%**	**13**	**52**	**25**	**47**	**26**	**53**	**6**	**4**	**4**	**1**	**2**	**8**	**7**	**11**	**10**	**5**	**6**	**10**
All perennial native grasses		59	29	47	37	36	41	65	50	64	66	59	66	65	43	59	45	55	60
Other native species		2	1	1	0	0	1	1	0	3	2	1	2	0	0	0	0	0	2
Total native hits		**61**	**30**	**48**	**37**	**36**	**42**	**66**	**50**	**67**	**68**	**60**	**68**	**65**	**43**	**59**	**45**	**55**	**62**
TOTAL HITS		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**98**	**100**	**100**	**100**	**100**	**100**	**100**

Note: 2 m of transect two overlapped new areas of pavement in 2020

Table 4.5 Density of native larval food plants on habitat transects

Native larval food plants	Desirable % range (EMP)	Transect 1						Transect 2						Transect 3					
		Jan 13	Dec15	Jan 17	Feb 18	Jan 20	Dec20	Jan 13	Dec15	Jan 17	Feb 18	Jan 20	Dec20	Jan 13	Dec15	Jan 17	Feb 18	Jan 20	Dec20
Austrostipa+ Rytidosperma	55-65	32	14	17	12	26	42	61	32	41	44	34	34	66	32	56	45	47	58
Rytidosperma		6				2	19	59				22	3	23				11	14
Austrostipa		26				24	23	2				12	31	43				36	44

4.3 Interpretive Signs

Interpretive signage has been erected at several points around the site to provide information on the life cycle of GSM. Previous reports noted that members of the public had read the signs and become interested in GSM, actively looking for them.

Under the conditions of approval, the signage must be installed in at least five locations along the boundary of GSM habitat. Signage must provide information on both the biology of the species and the importance of the habitats retained on the site. Signage is being updated and must meet Commonwealth conditions of approval. Conditions of approval require that the signage must:

- Contain information on the ecological values being retained and the threats to these values; and
- Be maintained so that the information remains accessible, with signs to be replaced or updated as required.

The previous survey report included a review of the wording on the signage, and recommended changes to the descriptions based on the most recent knowledge of the species. These have been incorporated into the revised signage for the site, and it is recommended that additional wording clarifying ecological values and describing threats to the species be incorporated to meet the Commonwealth requirements.

Recommended changes to the wording of the revised draft signage include:

Suggested wording changes include:

- Include a sidebar text box that reads "*The Golden Sun Moth is a beautiful and unique species that is dependent on undisturbed native grasslands for survival. In addition to their intrinsic value as a species, they are a strong indicator that these grasslands have not been disturbed or fertilised in the past. Its habitat is threatened by urban development, weed invasion, changes to nutrient levels*"
- Amend text at the bottom of the sign to read "*Reservoir Hill contains areas of low, open, unshaded native grasslands that are important habitat for populations of the critically endangered Golden Sun Moth. The reserve is being actively managed to conserve and enhance these values through weed control, supporting the growth of their food plants and removal of excess biomass."*

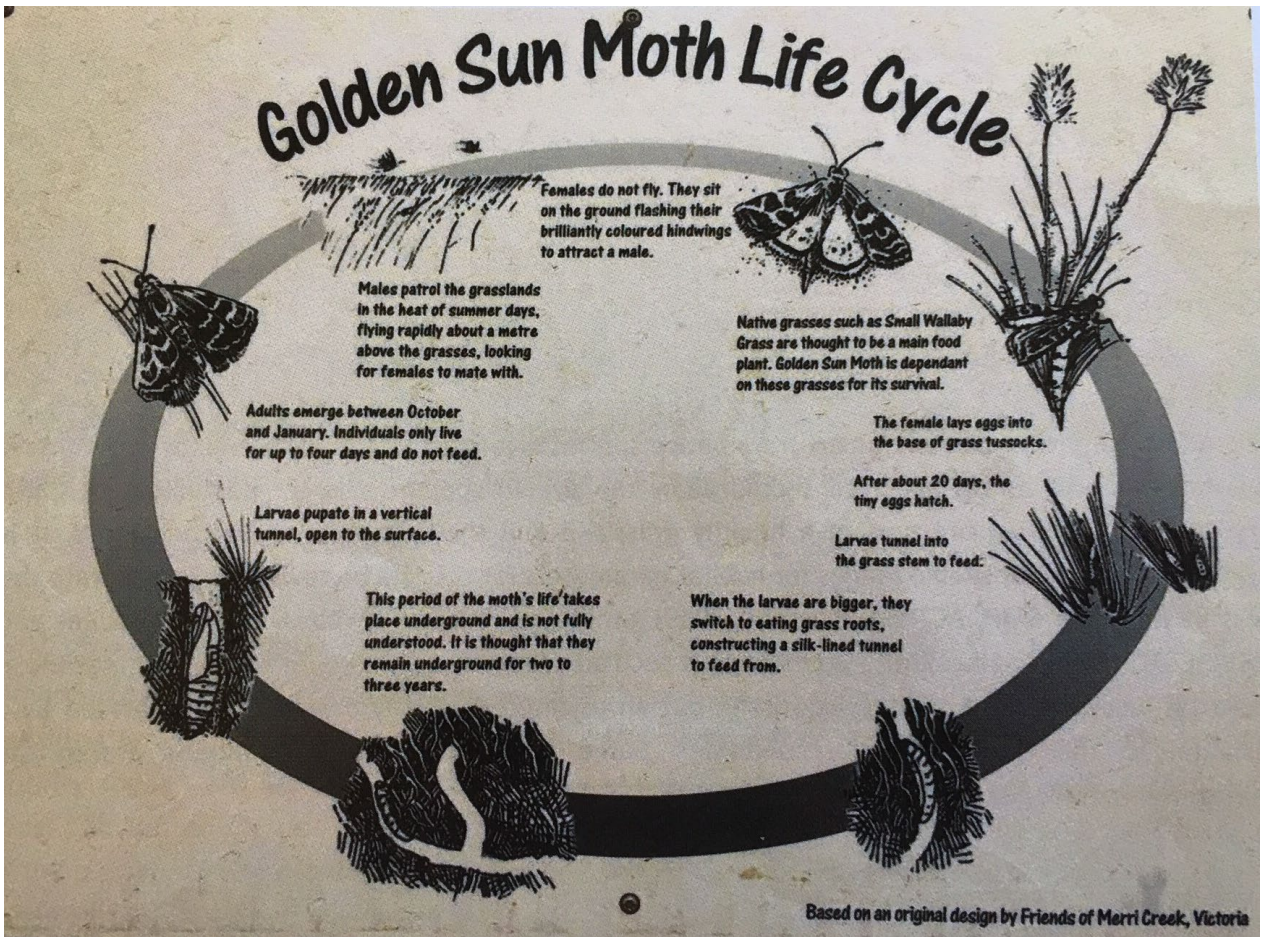

Figure 4.2 Existing Interpretive Sign

5.0 Discussion

5.1 GSM Population and Habitat Conditions

The population of GSM across the site remains stable but sparse, and this is consistent with the findings of previous reports that there is a generally lower percentage of native food grasses than the ideal range for the species. This year saw an overall increase in the proportion of food grasses across all transects, and a significant increase in one transect in response to more favourable conditions. The management objective for the site is to continue this trend by preventing exotic and/or tall growing native grasses from shading these species out.

The most pressing issue remains the high proportion of weeds in the southern and eastern portions of the site, and wild oats in particular have taken advantage of the favourable season and are likely to have set significant amounts of seed. Aggressive control of these tall-growing species will reduce competition with the desirable native feed grasses and will also increase the likelihood of breeding success of GSM by allowing males to find females more easily during their mating flights.

5.2 Weed Management

The combination of warmer, wetter conditions during 2020 resulted in significant growth in exotic weed species, including in areas where remnant populations of GSM were detected. The eastern portion of the site has seen extensive growth of both Wild Oats, Phalaris and Saffron Thistle, with these now forming a dense sward that dominating slower growing native species.

The most common weed species within the high-biomass areas of the site have a strong response to early spring rains. As a result, there is the potential to treat these areas with herbicide to selectively exclude exotic species prior to the emergence and growth of most native grass species, and well before GSM are likely to emerge.

Other potential treatments to manage these species include mowing/slashing, particularly prior to the flowering of Saffron Thistle in November/early December. Goats have also been used successfully to remove the plants and prevent seed set, and these could be used in combination with spot spraying/slashing to control weeds. (Department of Agriculture, Water and the Environment, 2016).

The EMP for the site recommended regular spot-spraying of herbicides to be undertaken outside the GSM flying period. This will be effective in the northern and western portions of the site, particularly where Saffron Thistle is forming distinct clumps, as the seed is dropped close to the parent plants, making areas for treatment easy to identify. As noted below in the biomass management section, weed control will both improve the species mix on the site, and will also increase the likely breeding success for GSM.

5.3 Biomass management

The visual nature of the mating cues for GSM means that this tall growth is detrimental to breeding success, as it reduces the likelihood that flying males will see a female at ground level. The survey noted areas on the eastern and southern side of the site where a combination of a south-eastern slope and wetter than average conditions have resulted in the establishment of a dense sward of mostly exotic grasses. This biomass has now cured and is both shading out low-growing native species. It also represents a potential fire risk, particularly should an ignition occur at the base of the hill and burn uphill towards the walking trails and lookouts.

Simply slashing the cured grasses is unlikely to be effective, as this will distribute a dense mulch of hay across the site which will be laden with exotic grass seeds. Either slashing and removal of the cut hay as per the prescriptions within the EMP or burning are the recommend treatments, and both treatments will facilitate follow-up weed control by creating a uniform, low grass height that exotic weeds will emerge from, allowing them to be specifically treated with a wipe-on herbicide via a cloth boom.

The previous assessments of the site did not recommend burning as a biomass management treatment, however extensive areas of the ACT were previously managed using indigenous fire management, particularly by the Ngunnawal people. A combination of a late autumn/early winter burn to reduce biomass and then follow-up consultation to establish trials of indigenous burning patters may be an effective approach to both reducing the prevalence of exotic species and stimulating native grass regeneration (Williams et al 2015 p.211).

This would typically involve low-intensity, frequent patch burning across the landscape to create a mosaic of regeneration that favoured grassland species. There has been some work underway to incorporate indigenous fire management prescriptions into prescribed burning practices within ACT grassland reserves, however no specific fire management plan is in place for the site.

The ACT Strategic Bushfire Management Plan notes that the opportunity to undertake prescribed burns is likely to become progressively smaller due to climate change, with hotter drier conditions and stronger winds promoting rapid, intense fire development. A combination of slashing, grazing, and targeted herbicide application is recommended in the management guidelines below, however this should not preclude investigating indigenous fire management as a long-term approach for the site.

6.0 References

Rowell A (2013) *Environmental management Plan for Golden Sun Moth habitat on Reservoir Hill, Lawson South*. Repot prepared for INDESCO and ACT LDA

Rowell A (2020) *Monitoring of Golden Sun Moth Synemon plana and its habitat at Reservoir Hill (Lawson South Open Space)* Report prepared for ACT Government

Williams NSG, Marshall A, Morgan JW (2015) *Land of Sweeping Plains – Managing and Restoring the Native Grasslands of South-Eastern Australia* CSIRO Publishing, Victoria

Weeds in Australia – Carthamus lantaus (2016) Department of Agriculture, Water and the Environment (website accessed at: http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=9434#)

APPENDIX A

Management Guidelines for GSM Habitat at Reservoir Hill

Management Guidelines for GSM Habitat at Reservoir Hill

The overall objective of annual management actions will be to improve the quantity and quality of native habitats across the site, with an emphasis on enhancing potential habitat for Golden Sun Moth and Native Temperate Grassland. The most pressing management issue on the site is to suppress the vigorous growth of exotic grasses that established across parts of the site during 2020, reducing grass height down to the range prescribed in the EMP.

As part of this the management actions will aim to:

- Remove excess biomass on the eastern and southern portions of the site caused by exotic grasses prior to the 2021/2022 Golden Sun Moth breeding season.
- Controlling weeds through removal/suppression of mature plants and prevention of flowering/seed set.
- Maintaining overall weed suppression across other areas of the site through targeted control.
- Assessing opportunities to re-establish indigenous fire regimes to maintain and enhance native habitat.

Table A1.1 Annual Work Schedule for Reservoir Hill, South Lawson

Task Description	Timing	Areas to be covered
Removal of excess biomass. • Slashing/baling of grasses and thistles • Slash to be removed from site	Autumn – Winter 2021	Eastern slope of Reservoir Hill Treatment area to cover all areas of tall exotic grasses where the sward exceeds 0.5 m
Monitoring emergence of exotic grasses • Periodic checks for emergence and establishment • Provide estimated timing for herbicide application	Mid-winter 2021	Eastern slope of Reservoir Hill Treatment area to cover all areas of tall exotic grasses where the sward exceeds 0.5 m
Treatment of emergent exotic weeds • Herbicide boom to treat tall growing weeds once above 0.3 cm • Managed grazing as an alternative treatment.	Late winter – early Spring 2021 Trigger point is emergence of exotic grasses and active growth suitable for treatment	Eastern slope of Reservoir Hill Treatment area to cover all areas of tall exotic grasses where the sward exceeds 0.5 m
Spot-treatment of weeds • Focus on Saffron thistle clusters, as seed set will be localised to the adult plants • Treatment via spot spraying or slashing of weed clusters. • Goat grazing is also a potential treatment option, and is likely to be effective for clusters just prior to flowering (Oct-Nov)	Spring 2021	All areas of the site, particularly clusters of Saffron Thistle on the western side of Reservoir Hill.

Task Description	Timing	Areas to be covered
Consultation on cultural fire regimes • Identify traditional owners with knowledge of fire regimes • Consultation on trail treatments to enhance native grassland regeneration	Autumn – Winter 2021	All areas of the site

Burning treatments are not included in this plan, however consultation should be undertaken with indigenous fire managers to investigate whether cultural burning prescriptions can be applied to the site, particularly or the lower productivity areas on the western facing slopes, where there is a higher proportion of native grassland species present.

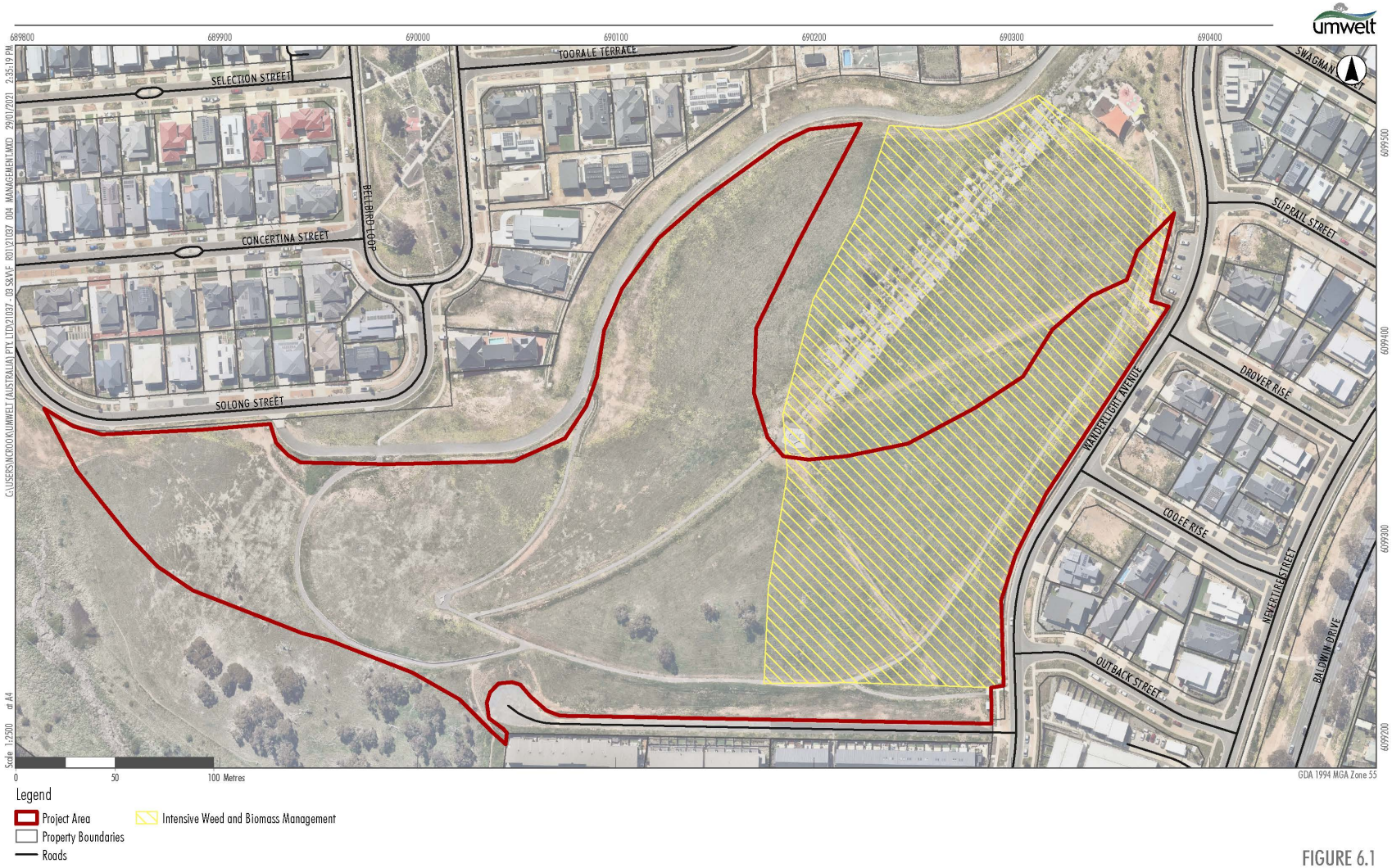

FIGURE 6.1

Reservoir Hill Land Management Zones

Image Source: Nearmap (Jan 2020) Data source: ACTMapi (2020); Rowell (2019)

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