ASSESSMENT OF THE EPBC OFFSET AREA AT WEST SALE AIRPORT

A report for the Australian Government's Department of Climate Change, Energy, the Environment and Water and Wellington Shire Council

Final

Prepared for:
Wellington Shire Council

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ETHOSNRM

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GLOSSARY

ACRONYM	FULL NAME
DAWE	Department of Agriculture, Water and the Environment
DEWHA	Department of the Environment, Water, Heritage and the Arts
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EPBC Act	Environment Protection & Biodiversity Conservation 1999
FFG Act	Flora and Fauna Guarantee Act 1988
GRGGW	Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland
PAMA	Public Authority Management Agreement

EXECUTIVE SUMMARY

Ethos NRM completed a site survey and review of the Offset Management Plan for a 13ha protected native grassland that includes a 3ha EPBC Offset at West Sale Airport in Spring 2022. This review was requested after the site was burnt in its entirety in 2021 rather than as a mosaic pattern specified in the Offset Management Plan.

The Spring 2022 survey confirmed that the EPBC listed ecological community Plains Grassland persists at the Offset site.

At the 3ha EPBC Offset native graminoid cover is 67%, weed cover is 15% and native herb cover is 5%.

At the adjacent 10ha Protected Area, native graminoid cover is 97%, weed cover is 5% and native herb cover is 4%.

Despite the 2021 burn, biomass is high across the grasslands probably because of unusually wet conditions since February 2021.

Burning of the 3ha EPBC Offset area in a mosaic pattern is impractical and may adversely affect the site (if fuel breaks have to be slashed). We suggest that mowing may be an acceptable alternative and that mowing in the winter of 2024 may help reduce biomass levels across the grasslands.

Two methods of assessing species diversity – a species inventory walk and an assessment of a 10x10m quadrat – are compared. We recommend including the Species Inventory Walks in monitoring in future.

While weed diversity is lower across the site - with some species such as African Boxthorn and Blackberry Nightshade now eliminated – weed cover of two perennial grasses (*Holcus lanatus* and *Anthoxanthum odoratum*) has increased significantly and must be addressed going forward.

A method of assessing weed cover at the quadrat level is prescribed in the management plan, but there is no method of assessing weed cover at the site level. Discrete areas where weed cover is dense have now been mapped across the 13 ha and will use this as a means of monitoring control going forward.

All recommendations made are summarised below with the document section added.

Recommendation 1: implement the new monitoring and management outlined in Table 10 (4.3).

Recommendation 2: continue Species Inventory Walks as described in (Zeeman *et al.*, 2015) across both the 3ha EPBC Offset and the 10ha Protected Area. **(4.3.1.1)**

Recommendation 3: continue to assess weed cover and diversity using the 10x10m Species Diversity quadrats and the Species Inventory walks. **(4.3.1.2)**

Recommendation 4: consider relocating the EPBC Offset (a suggested location is in Figure 9) to improve prospect of achieving <5% grass weed cover by 2028 and capture a higher diversity of native species. **(4.3.1.1)**

Recommendation 5: map all areas where weed cover is dense so that weed management can be targeted and establish three extra transects in the western part of the EPBC Offset. **(4.2.3)**

Recommendation 6: collect seed from species with a very localized distribution and sow across site to improve abundance. Collection to follow Florabank Guidelines. **(4.2.3)**

Recommendation 7: refine weed control to ensure all weed species with a score of 13.2 or higher as outlined in (White *et al.*, 2018) are addressed. **(4.2.4)**

Recommendation 8: grasslands at West Sale airport should be burnt in a mosaic at the property scale with a three to five year cycle per patch. **(4.3)**

Recommendation 9: undertake a mosaic mow across the 13ha in the winter of 2024 – with no more than 50% of the site mowed. Mow to a height of 10cm and remove all cut material from site, as advised in the OMP.

Recommendation 10: refine weed management in the 3ha EPBC Offset area, consider small scale scalping of very weedy areas followed by hand sowing of seed collected elsewhere from the airport grasslands.

Recommendation 11: continue to target all weed invasions within the 10ha Protected Area to maintain the relatively low weed cover there.

Recommendation 12: Ongoing control should focus on physical removal where possible. Herbicide control of weeds should be increased significantly post-fire: the exotic grasses will germinate in the autumn following a burn and are easily identified.

Plate 1 *Wahlenbergia multicaulis* at West Sale

1 BACKGROUND

West Sale Aerodrome is listed as a 'Key Site' in the Action Statement for Central Gippsland Plains Grassland (under the *Flora and Fauna Guarantee Act 1988* -FFG Act). The site is also listed as a 'Key Site' for the Grassland Component of Gippsland Red Gum Grassy Woodland and Associated Grassland' Ecological Community in the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) Listing Advice.

In 2018 Wellington Shire Council (WSC) received Federal approval from the Australian government's Department of Agriculture, Water & the Environment (DAWE; now the Department of Climate, Change, Energy, the Environment and Water - DCCEEW) to remove 0.485ha of the EPBC listed Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland (GRGGW) ecological community to allow for a runway extension at West Sale Airport to support Defence Force pilot training initiatives at the East Sale RAAF Base.

A condition of that approval was that WSC had to find and protect a suitable EPBC Offset Site. This Offset Site is located within airport grounds and is comprised of an area of 3ha of the GRGGW ecological community within a patch of approximately 13ha in size. State approval required the entire 13ha to be protected in perpetuity via a Section 69 Agreement under the Victorian *Conservation, Forests and Lands Act 1987*. An Offset Management Plan was prepared (Ethos NRM, 2018) to facilitate this Agreement and to meet state and federal requirements.

West Sale Airport is approximately 180 ha in size and has 32.8ha of GRGGW that meet the EPBC criteria for listing. The remainder of the grassland, outside of the 13ha protected by the Section 69 agreement, has a voluntary Public Authority Management Agreement (PAMA), under the FFG Act, which outlines management practices for four zones. The location of the GRGGW grasslands, the area protected by the various agreements and the EPBC Offset area is shown in Figure 1.

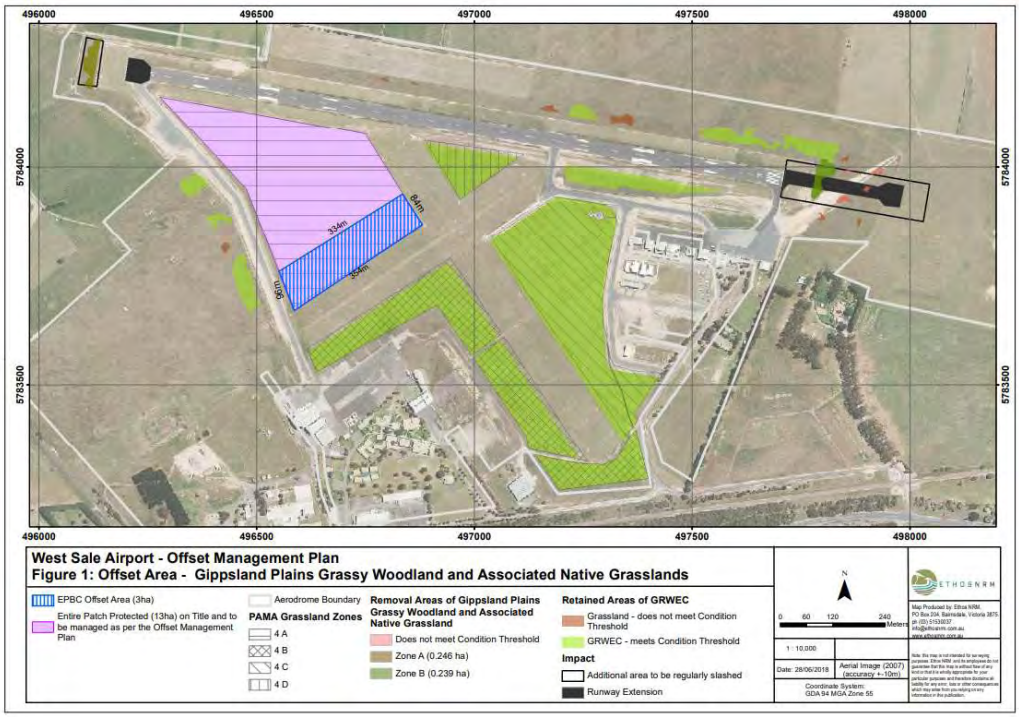


Figure 1. EPBC Offset area, protected patch and other PAMA Grassland Zones at West Sale Airport (map will be correctly labelled – screenshot only for final draft)

1.1 Offset Management Plan

The Offset Management Plan (Ethos NRM, 2018) recommended the conservation management required for the 10 years following the approval (i.e. 2018-2028) to address the following priority actions from the EPBC Policy Statement (DEWHA, 2010) and approved Conservation Advice (DEWHA, 2008) for the ecological community:

- Weed Invasion - prevention of the spread of invasive exotic weeds.
- Native Shrub Invasion - management of the spread of native shrubs into the ecological community.
- Pest Animals - control of all introduced pest animals.
- Inappropriate Fire Regimes - implementation of suitable fire management regimes and biomass reduction.
- Grazing, Trampling and Browsing – exclusion of grazing at the site.
- Habitat Loss - protection from future infrastructure and maintenance works through the establishment of a management agreement and security of the Offset site on the property title (in perpetuity).

1.1.1 Fire Management

Regarding a suitable fire management regime, the OMP recommended:

"The controlled application of fire can be used for biomass reduction in all or parts of the Offset site. Selected areas of this grassy woodland may be burnt to tackle weed issues or to assist in the lowering of soil nitrogen and phosphorous which would also assist in weed control works. However, no area is to be subject to a planned burn more frequently than every three years and no more than 50% of the Offset site will be deliberately burnt in any one year." (Ethos NRM, 2018).

The standard to be achieved was: "Aim to complete biomass reduction across the entire site by end of year 3. Complete biomass reduction at a 3-5 year interval from date of last burn. Use monitoring to inform application of the recommended mosaic approach to burning where no more than 50% of the site is burnt in any one year."

However, in 2021 the entire Offset site - rather than the 50% recommended - was burnt in a controlled burn by local CFA brigades and WSC.

This deviation from the burn pattern prescribed in the OMP triggered an administrative non-compliance with the Australian Government who issued a formal warning and a variation to the EPBC 2017/8016 approval (Appendix 8.1) requiring WSC to:

- have the Offset area assessed to determine if the EPBC listed grassland community was still present (and secure another Offset if it was not),
- review the monitoring programme and the management prescriptions in the OMP and
- make recommendations if changes were required.

Ethos NRM surveyed the Offset area in September 2022 and reviewed the OMP. This report presents the results of both the survey and the review and has been prepared for WSC to be submitted to the Australian Government's DCCEEW. The report specifically addresses the variation 3A attached to the approval (date 22 June 2022) and summarised in Table 1.

Table 1. Variations to conditions attached to approval EPBC 2017/8106 and how they are addressed in this report

Variation	Comments
3A. The approval holder must ensure that a survey of the EPBC Offset area in accordance with the method specified in the Offset Management Plan is undertaken by a suitably qualified fire ecologist and completed with 12 months of the date this variation decision is made.	EPBC Offset area surveyed in September and October 2022 (three months after the variation decision) in accordance with method specified (see Section 2.2) by Mick Bramwell and Trish Fox (see Appendix 2).
A report must be submitted within two months of the date on which the survey is completed.	This report submitted December 2022.
The report must contain the following information:	
a. Results of the survey	See Section 3 RESULTS
b. Methodology used to conduct the survey	See Section 2 FIELD SURVEY METHODOLOGY
c. As assessment of whether the monitoring program in the Offset Management Plan is appropriate and any recommended changes to the monitoring programme specified in the Offset Management Plan	See Section 4.2 Is the monitoring programme in the OMP appropriate? Recommended changes to the monitoring programme are discussed in **Section 4** and **Tables 10 and 13.**
d. As assessment of whether the EPBC Offset area meets the listing criteria for the ecological community	See **Section 4.1 Do the grasslands still meet EPBC listing criteria?**
e. An assessment of whether the management prescription in the OMP is appropriate for management the EPBC Offset area and any recommended changes to the management program in the OMP and its implementation	Recommended changes are discussed in **4.4** and we have included a summary of all recommended changes to management prescriptions in Table 16.
f. Recommendations of any corrective actions that should be undertaken in the two years (or a shorter period) following the Minister's approval of the report	Corrective actions suggested are an amendment to the OMP as suggested in our report, specifically removal of the requirement to burn the grassland Offset in a mosaic, an increase in weeding effort, and a change to the monitoring schedule as outlined above.
g. Recommended actions if the EPBC offset area no longer meets the listing criteria for the ecological community and the suitably qualified fire ecologist considers that, despite any corrective actions, it is unlikely that the EPBC offset area can meet the listing criteria for the ecological community within those two years.	Not applicable as offset area still meets the listing criteria.

2 FIELD SURVEY METHODOLOGY

To assess the direct and indirect effects of fire on the status of the ecological community, WSC were required to commission a suitably qualified fire ecologist to survey the EPBC Offset area within 12 months of 22 June 2022 (the date the variation to the approval was issued). Appendix 2 provides information about the Ethos NRM staff involved in the survey.

To meet the EPBC threshold for listing, the grassland form must meet all of three criteria:

- a minimum of 0.04 ha

AND

- 50% or more of the perennial ground layer vegetation cover comprises native species

AND

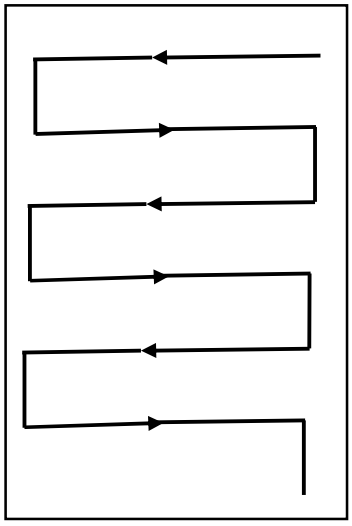
- Seven or more species of native plants are present, excluding trees and tall shrubs over 5 m (DEWHA , 2009).

The EPBC Policy Statement directs that unless exceptional circumstances apply, native plant species diversity must be assessed during spring (September to November) and after the site has not been disturbed (e.g. by fire, overgrazing, mowing) for at least two months prior to the springtime of sampling (DEWHA, 2010). This approach is recommended because many plant species in the ground layer only appear above ground and flower during spring or are sensitive to disturbance.

Ethos NRM (Mick Bramwell and Trish Fox) surveyed the grasslands in the 3ha EPBC Offset area on 13, 19, 20 and 21st September 2022 (1 year and seven months after the fire) and returned to monitor the 10ha protected area on October 13-16 using the methodology below. The EPBC Offset and adjacent 10ha protected grasslands were monitored separately to provide a clear picture of conditions at the 3ha Offset.

2.1 Species inventory

On 13 September 2022, Ethos NRM completed a walking search of the 3ha Offset site in a systematic pattern tracked with GPS as a continuous transect (Figure 2), with waypoints marked every 5 mins (Zeeman *et al*., 2015). This walking search is considered an appropriate method for providing a reference point for future changes to the presence and absence of species (Zeeman *et al.*, 2015).



Observations of native and exotic species were recorded over a 3 m width with time to detection noted for each as this gives an indication of effort to find species (Zeeman *et al.*, 2015). As the Offset area is 3ha, the recommended time for survey of 60 minutes was observed with a further five minutes at the end of the survey for the discovery of any new species (Zeeman *et al.*, 2015)

This walking search was not a method prescribed in the OMP but was used to compare with the method recommended in the Management Plan: 10x10m species diversity quadrats (see below).

Figure 2. Systematic search pattern (Zeeman *et al*., 2015)

2.2 Transects

Transects are used to sample percentage cover of native and exotic flora species, for photopoint monitoring and for recording of pest animal evidence (scats/burrows).

2.2.1 Percentage cover

The OMP recommends two methods for assessing percentage cover:

- Monitoring native and exotic life form cover in ten 50 x 50cm quadrats along each transect
- Monitoring individual species cover in a 10 x 10m quadrat

The OMP advises that: "across the 13ha Protected Area, **at least** 9 (50m) transects will be established with 3 located within the 3ha EPBC Offset Site."

Figure 3 shows the transects monitored previously. Ethos NRM had been asked to assess the appropriateness of the monitoring protocol in the OMP and our initial response was that the distribution of transects may not have captured the changes in diversity and cover, in particular changes in high threat weeds, across the entire area.

After an initial field visit, Ethos NRM also considered that nine transects were insufficient and that, given the information required for the current assessment and review of the 3ha EPBC Offset, increased sampling over a greater area was required to provide sufficient detail to inform ongoing management.

In Spring 2022, Ethos NRM therefore established six 50m transects within the 3ha Offset area in September and a further nine transects in the 10 ha Protected Area in October (Figure 4). Along each transect a 50-m tape was extended, a 50x50cm quadrat was placed every 5m and the following data were collected consistent with the methodology in the OMP:

- % native graminoid cover;
- % high threat weed (exotic) vegetation cover (and portion % that is a high threat);
- % bare ground;
- % herbaceous cover;
- % cover lichen or moss.
- and other.

Figure 3. Location of monitoring transects previously established at West Sale

Figure 4. Revised location of the transects for monitoring across the EPBC Offset area and Protected Area in 2022.

2.2.2 All species percentage cover: 10 x 10m quadrats

As recommended in the OMP (Ethos NRM, 2018), a species diversity quadrat (10x10m in size) was also located between the 25m and 35m points along each of the transects established. All species present were recorded and coverage was assessed using a modified Braun-Blanquet cover-abundance scale (Table 2).

Table 2. Modified Braun-Blanquet Cover - Abundance Class (EthosNRM, 2018a)

Score	Cover	Abundance
0	0%	Species absent
+	<5%	Few Individuals
1	<5%	More than a few individuals
2	5-20%	Any number of individuals
3	20-50%	Any number of individuals
4	50-75%	Any number of individuals
5	75-100%	Any number of individuals

Transects were marked with GPS and with permanent metal markers so they can be re-surveyed as necessary over the remaining years of the OMP which will continue until 2028.

2.2.3 Photo Point monitoring

As specified in the OMP, photo points were located at the midpoint of each transect. A series of photos were taken from different directions including one of the 50cm² quadrats at the 25m point along the transect (taken directly down from 1.3m above the ground so that the quadrat fills the entire photo frame). The aim of photo points is to provide a visual record of any changes in vegetation condition.

2.2.4 Fauna survey

As specified in the OMP, signs of pest animals are to be monitored during vegetation surveys or at any time throughout the year. If significant pest animal populations are observed (particularly rabbits) the site will be searched systematically to identify the location of any warrens or other harbour. This information was added to the monitoring sheet (Appendix 3).

2.2.5 Biomass monitoring

Biomass was determined using the method outlined in the OMP: assessing the visibility of 18 golf balls dropped individually within a 1x1 meter quadrat (Schultz *et al.*, 2017). Usually, plots would be chosen randomly leaving 200m between each 1m^2 quadrat; however, this is challenging in an offset area that measures 84 x 354 x 96 x 334m. We chose to locate the sward structure quadrats at the 5m and 45m points of each of our six 50m transects, laying quadrats to the right of each facing 1-50m. The number of quadrats sampled is in accordance with recommendations by (Zeeman *et al.*, 2015) for an area of 2-10ha. In the 3ha EPBC Offset area, 12 quadrats were located along the transects and two chosen randomly and geo-referenced. In the protected area, two quadrats were monitored at the 5m and 45m points of the nine transects; a total of 18 quadrats. A photo was taken of the quadrat from 1.3 meters above the ground (Figure 5) and scored

high, medium or low (Table 3). To control for observer variability, three observers scored each photo separately, with the average number of golf balls observed for each quadrat recorded (there was good concurrence between observer scores).

High: biomass reduction required

Medium: monitor

Low : no action required

Figure 5. Examples of high, medium and low scoring quadrats

Table 3. Scoring system for the biomass monitoring

Biomass	Golf ball score	Action
High	0 -5	Requires biomass reduction
Medium	6-14	Monitor for thickening
Low	15-18	No action required

3 RESULTS

3.1 Species inventory walk

3.1.1 EPBC Offset area

A total of 29 native species and nine exotic species (Appendix 4) were recorded in the 3ha EPBC Offset area. It is likely that this under-estimated the number of species, both native and exotic, as some species – particularly native grasses such as *Rytidosperma* sp., *Dichelachne* sp. and *Microlaena stipoides* - were undetectable in September.

3.1.2 Protected area

A total of 32 native species and 15 exotic species were recorded in the 10ha protected area. Again, there were certain grass species that were not detectable in October so this may be an under-estimate.

Plate 2. Milkmaids (*Burchardia umbellata*)

Plate 3. Sow Thistle (*Sonchus asper*)

3.2 Life form/species percentage cover transects results

3.2.1 EPBC Offset area

From transect data (60 quadrats), a total of 20 native species and 13 exotic species were recorded in the 3ha EPBC Offset area. Percentage cover of the various life forms is shown in Figure 6 and species with the highest cover are listed in Table 4.

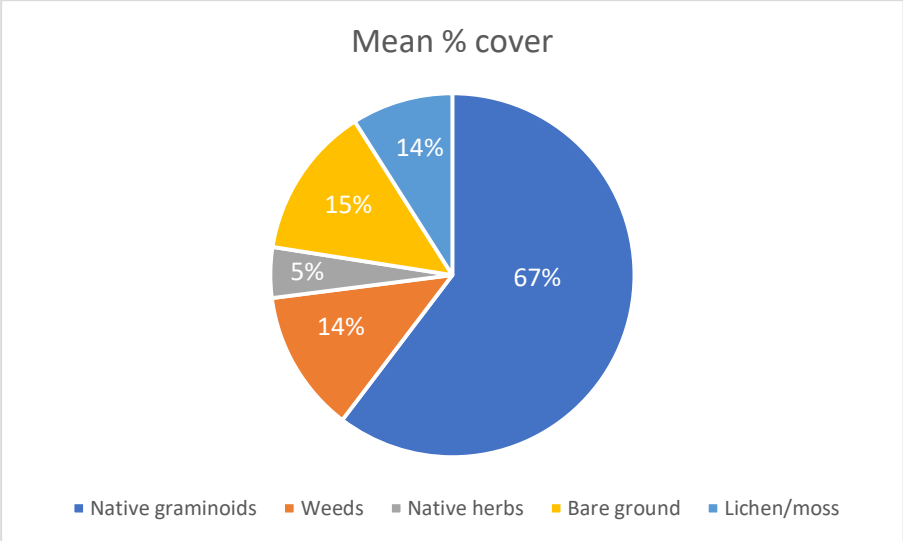


Figure 6. Mean percentage cover of the various categories surveyed in the 3ha Offset area

Table 4 lists all species with a modified Braun-Blanquet score of 1 or more and shows that the native grasses *Themeda triandra* and *Poa labillardieri* were the species with greatest cover in the 3ha EPBC Offset Area. The high threat perennials *Holcus lanatus*, *Anthoxanthum odoratum* and *Hypochaeris* spp. feature next in the list and should be the main target of weed effort (actual management is discussed further below).

Table 4. List of species scoring 1 or more on the modified Braun-Blanquet score in the 3ha EPBC Offset area.

Scientific name	Common name	Averaged modified Braun Blanquet score	Actual cover (%)
Themeda triandra	Kangaroo Grass	3	20-50
Poa labillardierei	Common Tussock-grass	3	20-50
Holcus lanatus*	Yorkshire Fog	2	5-20
Anthoxanthum odoratum*	Sweet Vernal Grass	1	<5
Hypochaeris radicata/glabra*	Flatweed	1	<5
Austrostipa rudis	Veined Spear-Grass	1	<5
Euchiton sp.	Cudweed	1	<5
Hypericum gramineum	Small St John's Wort	1	<5
Chloris truncata	Windmill Grass	1	<5

* = weed species

3.2.2 Protected area

From transect data (90 quadrats), a total of 30 native species and 16 exotic species were recorded in the 10ha protected area. Percentage cover of the various life forms is shown in Figure 7. Species with a score of 1 or above are listed in Table 5.

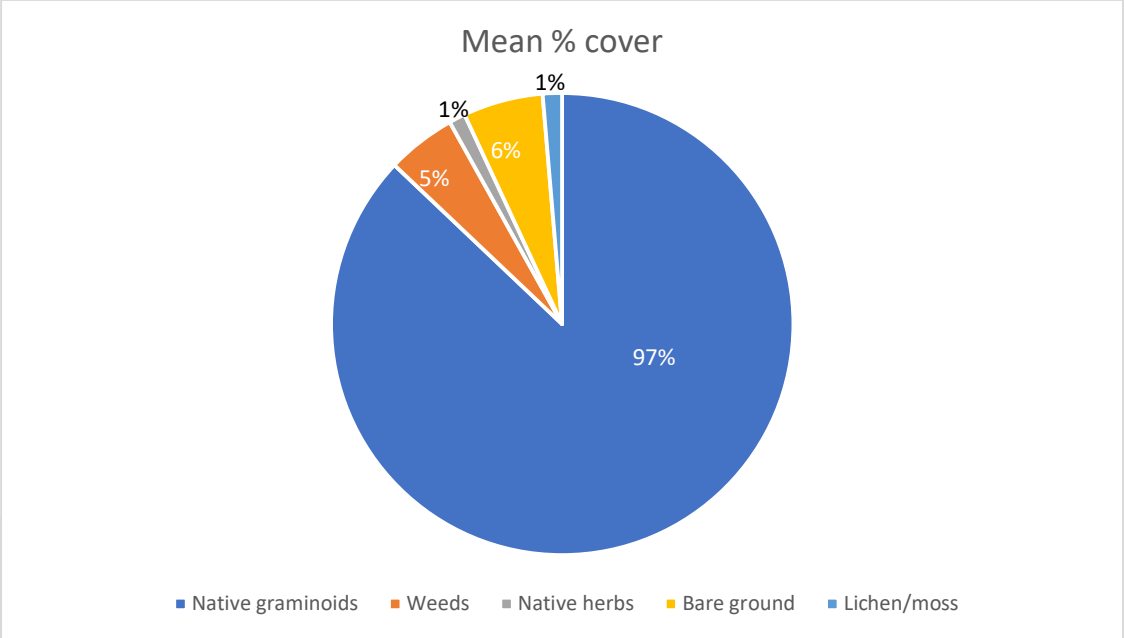


Figure 7. Mean percentage cover of the various categories surveyed in the 10ha protected area

Table 5. List of species scoring 1 or more on the modified Braun-Blanquet score in the 10ha protected area.

Scientific name	Common name	Averaged modified Braun Blanquet score	Actual cover (%)
Themeda triandra	Kangaroo Grass	4	50-75
Schoenus apogon	Common Bog-sedge	3	20-50
Poa labillardierei	Common Tussock-grass	1	<5
Lomandra filiformis	Wattle Mat-rush	1	<5
Holcus lanatus*	Yorkshire Fog	1	<5
Anthoxanthum odoratum*	Sweet Vernal Grass	1	<5
Hypochaeris radicata/glabra*	Flatweed	1	<5

* = weed species

3.2.3 Photo point monitoring

Photographs were taken as part of photo point monitoring and those from the 3ha EPBC Offset area are included in Appendix 5. All photographs will be included in the annual report to DEECA.

3.2.4 Fauna surveys

There was no evidence of rabbits or foxes anywhere on site. The exotic species Eurasian skylark (*Alauda arvensis*) is present and probably breeding on site but is not considered a threat to native biodiversity.

3.2.5 Biomass monitoring

In the 3ha EPBC Offset area, the average score from all 14 quadrats was 6 - monitor for thickening (Table 6). In the 10ha protected area, the average score was 4 - biomass reduction required (Table 7).

Table 6. Results from the 14 1x1m quadrats monitored by biomass in the 3ha EPBC Offset.

Quadrat location	Biomass	Score	Action
T1 at 5m	Medium	6	Requires biomass reduction
T1 at 45m	Medium	7	Monitor for thickening
T2 at 5m	High	4	Requires biomass reduction
T2 at 45m	Medium	10	Monitor for thickening
T3 at 5m	High	2	Requires biomass reduction
T3 at 45m	Low	15	No action required
T4 at 5m	Medium	5	Monitor for thickening
T4 at 45m	High	2	Requires biomass reduction
T5 at 5m	Medium	8	Monitor for thickening
T5 at 45m	Medium	7	Monitor for thickening
T6 at 5m	High	4	Requires biomass reduction
T6 at 45m	High	5	Requires biomass reduction
Q13	High	1	Requires biomass reduction
Q14	High	4	Requires biomass reduction
Average	Medium	6	Monitoring for thickening

Table 7. Results from the 18 1x1m quadrats monitored by biomass in the 10ha protected area

Quadrat location	Biomass	Score	Action
T1 at 5m	High	2	Requires biomass reduction
T1 at 45m	High	2	Requires biomass reduction
T2 at 5m	High	7	Requires biomass reduction
T2 at 45m	High	4	Requires biomass reduction
T3 at 5m	Medium	7	Requires biomass reduction
T3 at 45m	High	1	Requires biomass reduction
T4 at 5m	High	5	Requires biomass reduction
T4 at 45m	High	2	Requires biomass reduction
T5 at 5m	High	1	Requires biomass reduction
T5 at 45m	High	1	Requires biomass reduction
T6 at 5m	High	4	Requires biomass reduction
T6 at 45m	High	4	Requires biomass reduction
T7 at 5m	High	3	Requires biomass reduction
T7 at 45m	Medium	7	Monitor for thickening
T8 at 5m	High	5	Requires biomass reduction
T8 at 45m	High	2	Requires biomass reduction
T9 at 5m	Medium	7	Monitor for thickening
T9 at 45m	Medium	8	Monitor for thickening
Average	High	4	Requires biomass reduction

4 DISCUSSION

The following sections discuss the results of the field survey and OMP review to address specific questions as requested by DCCEEW.

4.1 Do the grasslands still meet EPBC listing criteria?

The grasslands in the 3ha EPBC Offset area still meet the listing criteria for the ecological community as summarized in Table 8. A very weedy area in the south-west is discussed further below 4.3.1.3.

Table 8. Summary statistics for the 3ha EPBC Offset Area

Criterion	Survey results
Minimum of 0.04 ha	3ha
50% or more of the perennial ground layer vegetation cover comprises native species	67% native graminoid cover and 5% native herbaceous cover (average cover from quadrats)
Seven or more species of native plants are present, excluding trees and tall shrubs over 5 m	29 species of native plants present (no trees and tall shrubs)

Rainfall is a major driver of site productivity in grasslands (Moxham *et al.*, 2011) and the overall rise in mean percentage cover of native graminoids can probably be attributed to the 2021 burn followed by the atypically wet seasons throughout the remainder of 2021 and 2022. Data from the East Sale Airport Bureau of Meteorology station show the higher than average annual rainfall in 2021; that trend continued in 2022 with four months experiencing rainfall higher than the 30 year average (Figure 8).

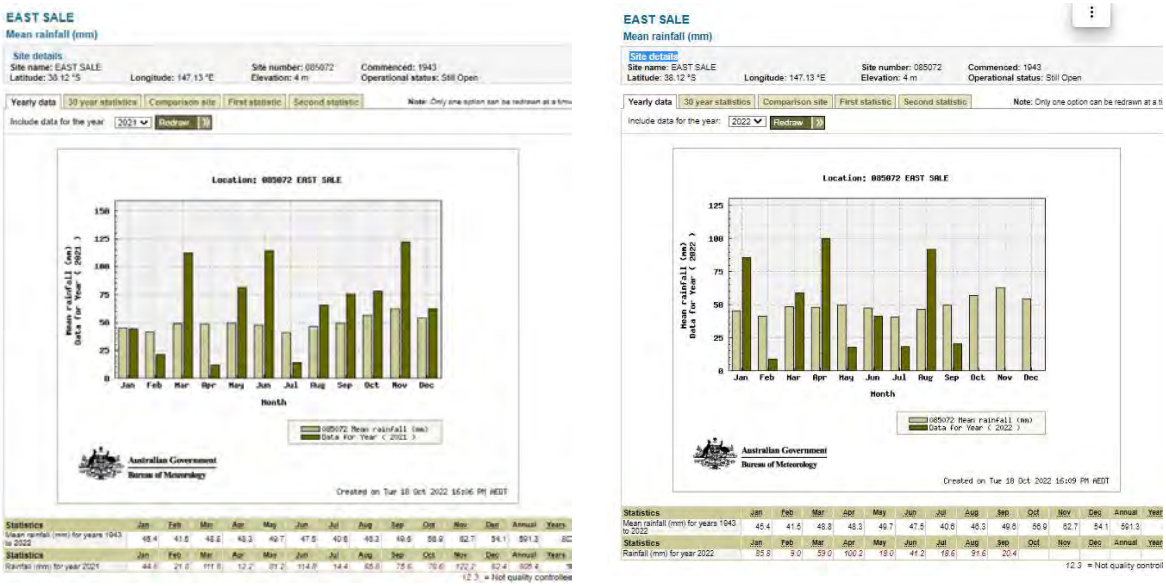


Figure 8. Screenshots from the Bureau of Meteorology website (bom.gov.au) showing rainfall in the 2021 year and to Sept 2022

However, the perennial exotic grasses *Holcus lanatus* and *Anthoxanthum odoratum* also appear to have flourished in these conditions. Again, comparisons over time are challenging but Table 9 presents the estimated percentage covers for these two species with Yorkshire Fog (*H. lanatus*) clearly increasing most, particularly in the 3ha EPBC Offset.

Table 9. Estimates of cover of the two perennial exotic grasses *H. lanatus* and *A. odoratum*

	2018 Appendix 2 of OMP[1]	2021 entire 13ha[2]	2022 3ha EPBC Offset[3]	2022 10ha protected area[3]
Holcus lanatus	<1%	<5	5-20	<5
Anthoxanthum odoratum	<1%	<5	<5	<5

[1] no indication of how this coverage was estimated was provided in the OMP; [2] from all spp quadrats (Indigenous Design Environmental Management, 2021); [3]Ethos NRM monitoring

4.2 Is the monitoring programme in the OMP appropriate?

The overarching objective of the OMP is to improve the condition of the site over ten years and maintain that condition in perpetuity, through implementation of on-ground actions.

The key management objectives of the OMP (3.4 of the OMP) are to:

- Protect and improve the current site quality.
- Maintain grassland cover and diversity.
- Reduce cover of high threat weeds and eradicate woody weeds (Appendix 2 of OMP).
- Undertake biomass management.
- Remove and/or control all grazing and browsing threats.
- Maintain and improve the cover of herbaceous species.
- Actively manage the Offset Site after the completion of Year 10 as specified in this Offset Plan, such that:
  - Vegetation quality and the cover does not decrease below the level attained at the completion of Year 10.
  - Weed cover does not increase beyond the target level for Year 10.

The monitoring program includes several parameters including:

- Native species cover and diversity
- Weed species cover and diversity
- Pest animal presence and impact
- Biomass accumulation.

Cover and diversity transects address the first three monitoring parameters, while a separate technique is applied for monitoring biomass.

Ethos NRM considers that the monitoring programme in the OMP is generally suitable with the following adjustments:

- Extra monitoring is undertaken as outline in Tables 10 and 11 specifically to ensure biomass levels are within tolerable limits.

- Species Inventory Walks as described in (Zeeman *et al.*, 2015) across both the 3ha EPBC Offset and the 10ha Protected Area (see Table 10 for recommended frequency) are added to the monitoring programme (4.3.1.1 and 4.3.1.2) to ensure native and exotic species diversity is fully captured.
- Maintain the increased number of transects as described in this report (an increase of 3 in the EPBC offset and three in the adjacent 10ha Protected Area over the number recommended in the OMP) **and** establish a further three in the EPBC Offset to monitor weed coverage closely.
- Photopoints in the locations suggested in the OMP could be reduced and new photopoints established in particularly weedy areas to provide meaningful results (4.3.2).

4.3 Changes to the monitoring schedule

There are two management plans that affect the site: the landowner agreement associated with the Section 69 title across the whole 13 ha (Ethos NRM, 2018) and the EPBC Offset Management Plan (Ethos NRM, 2018). At a general level these two documents are the same. However, the EPBC OMP gives more specific detail about the monitoring schedule including the following table which we have amended with our recommendations for monitoring and management going forward. As noted in Table 10, we have completed monitoring in Year 4 (red) and we recommend further monitoring in Years 5 (2023) and 7 (2025); presuming that the next ecological burn will occur in 2024 – this may change if biomass reduction with mowing is implemented.

Table 10. Monitoring and management at West Sale

✓ monitoring schedule in OMP	A: additional monitoring completed	R: extra monitoring recommended

	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028
Native species cover and diversity	✓		✓	A	R 3ha area only	✓	R			✓
Weed species cover and diversity	✓		✓	A	R 3ha area only	✓	R			✓
Pest animal presence and impact	✓		✓	A	R	✓	R			✓
Biomass accumulation	✓		✓ **(Ecological burn completed)**	A	R	✓ Next ecological burn/mow	R	✓		✓
Species inventory walk				A	R	R	R			✓
Mowing						R		✓ (pending results of monitoring)		

As stated, we consider that mosaic mowing of both the Offset and Protected Area in the winter of 2024 could help with biomass reduction. The next burn is due in 2024 and another mosaic mow could be conducted in 2026 if monitoring in 2025 suggests it is needed. The specific monitoring of biomass associated with the revised fire/mowing regime is outlined in Table 11.

Table 11. Potential monitoring around the revised fire/mowing regime

Biomass Monitor	Mow/burn
Nov 2023 (extra) Year 5;	Mow (autumn/early winter e.g. March 2024 rather than burn)
Nov 2024 Year 6 as per OMP	Possible burn autumn/early winter March 2025 if indicated by results
Nov 2025 (extra) Year 7	Probably no biomass reduction needed
Nov 2026 Year 8 as per OMP	Probably no biomass reduction needed; but mow if results indicate
No monitoring in 2027 Year 9	
Nov 2028 (OMP) FINAL YEAR OF MP	

Recommendation 1: implement the new monitoring and management outlined in Table 10.

4.3.1 Transects and quadrat monitoring for species diversity and cover

Diversity and cover were also assessed within the 3ha EPBC Offset and the 10ha protected area. Discrepancies in results allow us to refine our recommendations for monitoring going forward (Table 12).

Table 12. Comparison of species inventory v species quadrats methods for determining diversity.

	Species inventory walk		Species diversity quadrats	
	EPBC Offset Sept 2022	Protected Area Oct 2022	EPBC Offset Sept 2022	Protected Area Oct 2022
Number of native species	29	32	20	30
Number of exotic species	9	15	13	16

4.3.1.1 Native species diversity

As an assessment of native species diversity, the species inventory walk method produced a similar number of species for both the 3ha EPBC Offset Area (29) and the 10ha Protected Area (30).

However, native species diversity detected via quadrat surveys in the 3ha EPBC Offset Area (20) was much lower than that detected by the Species Inventory walk and compared with quadrats in the 10ha Protected Area (30).

Eight native species were detected solely in the inventory walks. Three native species were detected only in all species quadrats.

The number of native species detected using both methods was 43 across the 13ha. There were 49 native species recorded in 2018 but we do not believe there has been a decline in species diversity; six species found in 2018 but 'missing' from our surveys in September and October 2022 were noted when we returned to undertake weed control in November. Monitoring is recommended between September and November (Ethos NRM, 2018); this year, monitoring was scheduled for October so that Ethos NRM could fully understand the management requirements for grasslands as quickly as possible, and so that a report could be provided to Wellington Shire Council and the Australian Government before end of December 2022. November is probably the optimum time for monitoring.

In 2021, 40 native species were recorded across all 13ha assessed using 'a meandering method of recording' (Indigenous Design Environmental Management, 2021). This was markedly higher than the 26 native species recorded using the quadrat surveys along the transects in Figure 3 (Indigenous Design Environmental Management, 2021). This emphasizes the importance of the Species Inventory Walks.

Species diversity results from 2021 and 2022 both emphasize the importance of the Species Inventory Walks in addition to quadrat sampling. Species inventory walks require only 2 hours of extra work. We recommend continuing the Species Inventory Walks across the 3ha EPBC Offset Area and the remaining 10 ha of Protected Area in future. This will ensure native species diversity is fully captured going forward.

Recommendation 2: continue Species Inventory Walks as described in (Zeeman *et al.*, 2015) across both the 3ha EPBC Offset and the 10ha Protected Area (see Table 10 for recommended frequency).

4.3.1.2 Exotic species diversity

While the Species Inventory method produced similar numbers for weed species in both the 3ha EPBC Offset Area (9) and the 10ha Protected Area (12), more species were detected in both areas using the Species Diversity Quadrats, 13 and 16 species respectively. Weed species diversity is similar to the 13 species previously reported (Indigenous Design Environmental Management, 2021) but significantly lower than the 32 species recorded in the OMP; this may reflect both previous weed control and the effect of the 2021 burn.

We recommend continuing to assess exotic species cover using the Species Diversity Quadrats in both areas. We noted five weed species not previously recorded on the 13ha site: *Arctotheca calendula*, *Avena barbata* (one plant only), *Hypochaeris glabra*, *Juncus capitatus* and *Sonchus asper. Hypochaeris radicata* and *Sonchus olaraceous* were recorded previously so *H. glabra* and *S. asper* may have been combined and *H. radicata* appears twice in the OMP weed list in Appendix 2 (Ethos NRM, 2018) – this may have been a typing error.

It is of interest to note that neither method picked up the Lightwood (*Acacia implexa*) recruits which were noted on site moving between transects. These were mapped with GPS for future treatment (rain on the survey days meant treatment could not be undertaken). Blackberry was picked up in the Species Inventory Walk only and was also mapped with GPS for future control. Elimination of woody weeds is a target in the OMP and in our opinion is attainable given the low coverage of wattles and blackberry on site.

Recommendation 3: continue to assess weed cover and diversity using the 10x10m Species Diversity quadrats and the Species Inventory walks (see Table 10 for recommended frequency).

4.3.1.3 Native & Exotic Species Cover and Abundance

Although transects established by Ethos NRM in 2022 were in different areas to those established previously it is useful to compare overall results Table 13.

Table 13. Comparison of mean percentage covers of various categories surveyed in 2021 and 2022

	Mean % cover 2021 (see Fig 3 - entire site)	Mean percentage cover 2022 (see Fig 4 - 3ha EPBC Offset)	Mean percentage cover 2022 (Fig 4 - 10ha protected area)
Native graminoid	52	67	97
Exotics	16	14	5
High threat exotic cover	10	11	5
Herbaceous native cover	7	5	1
Lichen/moss	10	14	2
Bare Ground	13	15	6

Native graminoids (particularly Kangaroo grass as indicated by the All Species Diversity quadrat results in Table 5) are still the most prevalent life forms, which is not surprising given they respond well to fire and to rainfall. Native herbaceous cover appears to be declining, however and is only accounting for 1% cover in the protected area. We note that although species richness or alpha diversity has been measured at West Sale Airport over several years, there has been no measure of species abundance.

Some species such as *Caesia calliantha* and *Wahlenbergia communis* appear well distributed around the site but other such as *Dianella* sp. (left) and *Calcocephalus lacteus/citreus* appear to occur in localized patches only. Collecting seed and broadcasting it in open areas might be a relatively low-cost way of improving the abundance across the site. We recommend seed collection in autumn 2023 conducted in line with Florabank Guidelines (www.florabank.org.au)

There are clearly considerable differences between the 3ha Offset and the 10ha protected area; the latter is markedly less weedy (5%) than the former (14%).

The OMP directive is to assess weed cover is to be assessed **across the entire site** and **at the quadrat level** but there is no prescribed methodology for how weed cover at the site level is to be assessed. Ethos NRM's on-site observations indicate that the previous transect monitoring is not adequately detecting weed infestations at the site, particularly along the boundaries and corners, and hence requires review and modification. Incidental observation of weed cover was estimated by Ethos NRM as 30% in the 3ha EPBC Offset area, and 10% in the 10ha protected area.

Ethos NRM proposes establishing three extra transects to allow for more accurate monitoring of native and exotic species diversity in southwest corner in an area of particularly high weed cover going forward (Figure 9). The OMP states that weed cover within the Offset area was 30% but provides no detail on how this was assessed (2.2.2 (Ethos NRM, 2018). The quadrats indicate that current weed cover is on average below this level, although above targets for year 3 of the OMP.

Ethos NRM has mapped where weed cover is dense (that is where weed cover exceeds native cover) across the 13ha and will use this map as a means of monitoring changes and effectiveness of weed control going forward (Fig. 9). As has been noted previously by DEECA, there are weedy hotspots on the site, and these are in need of urgent action. The OMP (Table 11) does allow for adaptive management to occur especially if high threat herbaceous weed cover exceeds 5% advising managers to 'undertake additional and targeted weed control works; review effectiveness of previous weed control methods and adapt or seek alternatives as required.'

To be confident that they can achieve the gain targets within the 3ha EPBC Offset area of <5% high threat herbaceous weed cover by the end of the agreement in 2028, Wellington Shire Council could consider reconfiguring the Offset within the existing grassland (Figure 9). Management of all threats will continue throughout 2022 and 2023 across the entire 13 ha in line with the Owner Agreement. Another advantage of reconfiguring the 3ha Offset would be that surveys would capture more of the native species diversity.

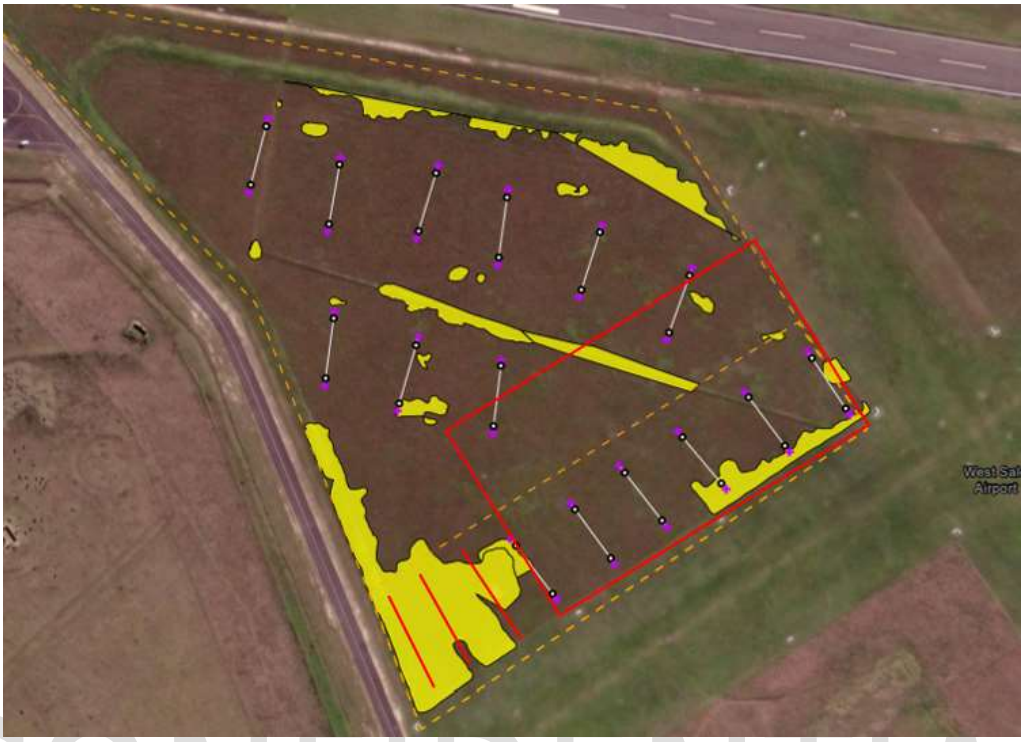


Figure 9. Aerial image with areas of dense weed cover mapped Sept-Nov 2022. The red rectangle is a proposed reconfiguration of the EPBC Offset area. The three red lines in the south-west corner are proposed extra transects to allow more accurate monitoring of weed load in this part of the Offset going forward if the Offset area cannot be reconfigured.

Recommendation 4: consider relocating the EPBC Offset (a suggested location is in Figure 9) to improve prospect of achieving <5% grass weed cover by 2028 and capture a higher diversity of native species. **(4.3.1.1)**

Recommendation 5: map all areas where weed cover is dense so that weed management can be targeted and establish three extra transects in the western part of the EPBC Offset. If Offset is reconfigured, there is no need for extra transects but weed management must continue.

Recommendation 6: collect seed from species with a very localized distribution and sow across site to improve abundance. Collection to follow Florabank Guidelines.

4.3.2 Photo points

Potentially, the photographs could be used to monitor for woody weed invasion but as this is a working airport, any visible woody weed would be quickly dealt with by Airport managers if contractors had missed them. We see little value in photo point monitoring at this site but note that photo points are now a mandatory method of monitoring for Offset sites. Photopoints in the locations suggested in the OMP could be reduced and new photopoints established in particularly weedy areas to provide meaningful results.

4.3.3 Summary of all recommended changes to monitoring programme

In summary, Ethos NRM considers the monitoring programme in the OMP is generally appropriate with scope for minor improvements and the following changes (Table 14).

Table 14. Monitoring requirements specified in the OMP and suggested changes.

OMP monitoring requirement	Suggested changes
Across the 13ha Protected Area, at least 9 (50m) transects will be established with 3 located within the 3ha EPBC Offset Site	At least a further three transects to be established within the 3ha EPBC Offset site to allow ongoing monitoring established in 2022 (with another three to be established in south-west area of 3ha Offset if Offset area cannot be reconfigured).
Wellington Shire Council will engage a suitably qualified expert to survey the grassland areas in year 1, 3, 6 and 10 and then every 5 years thereafter	Given the unusually wet conditions that have followed the 2021 fire which have resulted in a significant increase in biomass in general and weed cover in particular, Ethos NRM recommends further monitoring in year 5 (2023), 7 (2025) and 8 (2026) as outlined in Table 10 of this report.
Native species cover **A modified Braun-Blanquet cover-abundance scale will be used to assess species cover and diversity**	Ethos NRM recommends using a 0.5 for the 'few individuals' instead of a + to allow for analysis using Excel.
Native species diversity **The diversity of species will be monitored through the establishment of at least 9 all species quadrats across the 13ha Protected Area, with 3 located within the 3ha EPBC Offset Site.**	Ethos NRM recommends establishing at least a further three all species quadrats in the EPBC Offset site. Further, Ethos NRM recommends using Species Inventory Walks (See Sections 2.1 , 3.1 and 4.3.1.1) to fully capture species diversity across the 3ha EPBC Offset area and 10ha Protected Area
Photo Points	Ethos NRM sees little value in photo point monitoring at this site but note that photo points are now a mandatory method of monitoring for Offset sites. Photopoints in the locations suggested in the OMP could be reduced and new photopoints established in particularly weedy areas to provide meaningful results

4.4 Are the management prescriptions in the OMP appropriate for management of the EPBC Offset area?

Table 4 of the OMP outlines the management actions for both the EPBC Offset site and the surrounding Protected Area. These actions are designed to meet the management objectives as outlined in 4.2 of this report.

Below, we address whether prescriptions are appropriate and if any changes need to be made.

4.4.1 Exotic species threat

As mentioned above, 32 weed species were noted in the OMP; 20 of those were considered 'high threat'. However, during the 2022 survey Ethos NRM observed several weeds considered 'low threat' in the OMP are now acting as high threat weeds at the site. The Arthur Rylah Institute produced an objective 'expert system' for ranking environmental weed species with respect to management urgency. Each weed species was given a score and a risk rating outlined in Table 15.

Table 15. Risk ratings for ranges of Risk Ranking Scores (White *et al.*, 2018)

Risk Ranking Score Range	Risk rating
31.3 – 33.3	Very high
22.2 – 31.2	High
13.2 -22.1	Moderately high
11.1 – 13.1	Medium
0	Lower
Unscored	Potential

We recommend that weed control should focus on any species with a score of 13.2 or higher. Based on 2022 survey results these have been assessed and are indicated in Appendix 6. This would raise awareness of the importance, for example, of controlling *Hypochaeris* spp. at the site; currently these species are not listed as high threat but are widespread across the grassland and in certain areas form dense patches completely out-competing native species, as shown in the photograph (Plate 4). Cover was originally assessed at <1% (Ethos NRM, 2018) but our 2022 surveys show it as <5%. The OMP allows for this sort of adaptive management stating: "Seasonal conditions can vary greatly from year to year and influence the implementation and success of management actions. Where possible, allowances for seasonality have been captured in this Offset plan through flexibility in the timing of certain actions."

Categorising a further six species as high threat will improve the condition of the protected matter (Appendix 6).

Recommendation 7: refine weed control programme to focus on any weed with a score of 13.2 or higher as outlined in (White *et al.*, 2018)

Plate 4. Dense Flatweed cover

4.4.2 Biomass management

Central to the management of any grassland community in as an appropriate fire regime. Ecological burns are currently recommended at 3-5 year intervals. The need for burns is assessed through monitoring sward structure; this monitoring and the results are now presented.

Despite the relatively short time since the prescribed burn (February 2021), biomass is unusually high at the Offset area. The score of 6 is at extreme end of 'monitor for thickening'. The recommended fire regime in the OMP is 3-5 years and 'no more than 50% of the site is burnt in one year' in line with knowledge that fire intervals that are too short may not allow enough time for some species to regenerate and reproduce; fire

intervals that are too long may result in biomass accumulation that suppresses some species by reducing available light and the amount of bare ground between tussocks for native flora regeneration (Brawata, 2017).

We repeated biomass monitoring for the 10ha Protected Area and the average score was '4: requires biomass reduction.'

Although the biomass accumulation results indicate that the 10ha protected area should be burnt in 2023, and the 3ha EPBC Offset in 2023-4, this would result in an undesirable fire interval less than 3 years for the grassland. Hence alternative biomass management strategies are required for the site (discussed in 4.4.2.2).

Another aspect of the ecological burning regime is the pattern and proportion of area burnt in a year, with the OMP specifying that 'no more than 50% of the site is burnt in one year'. A mosaic burn within the 3ha EPBC Offset area and 10ha Protected Area poses several risks to conservation of the grassland patch:

- Machinery (e.g. slasher) to create physical fuel breaks may cause harmful compaction through the Offset site and adjacent protected area, as even in drier years the site is damp
- Use of a chemical barrier for fuel break is not desirable
- There is the potential to burn some parts of the site in consecutive years if burn escapes fuel breaks
- High level of complexity to plan and implement

A more practical and lower risk approach would be to apply the mosaic burning regime across all the grasslands at West Sale Airport, with each patch burnt on a five-year rotation. Existing cleared areas around the perimeter of grassland patches can be used as fuel breaks, without the need to dissect individual patches using machinery or chemicals. It is expected that there will be variation in burn intensity and cover within a patch, as it is recognized that grasslands do not burn uniformly and tend to burn in a mosaic pattern which is advantageous to promoting greater diversity of flora and fauna (Wong, N. & Morgan, J., 2007). In addition, alternative biomass management techniques could be applied to introduce more of a mosaic pattern within the Offset area (refer 4.4.2.2).

This is consistent with WSC current management of the site as outlined in the PAMA agreement which rotates burning of individual grassland patches. Figure 10 shows the recent burns at the airport on a five-year interval interrupted in 2022 because of the excessive rain. Changes may need to be formalized in the OMP.

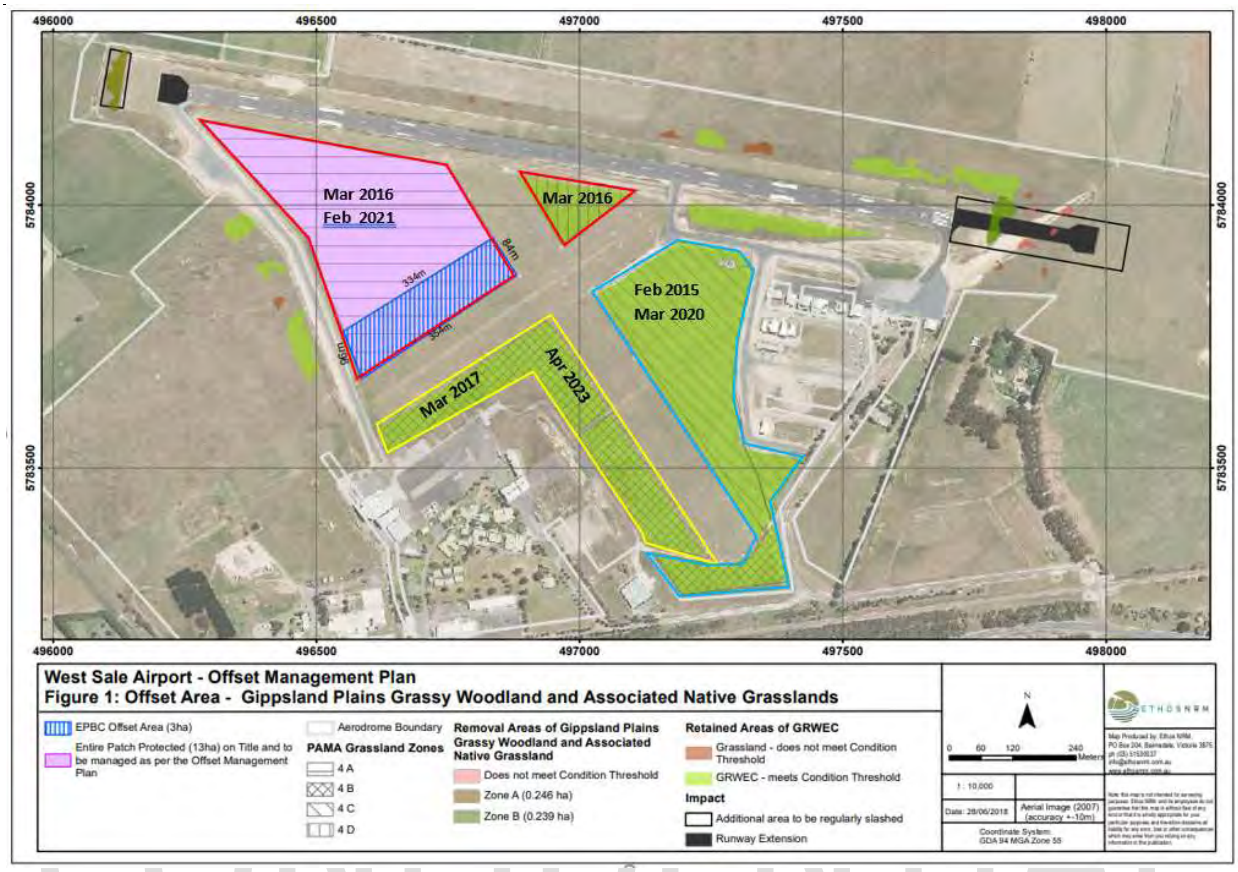


Figure 10. Fire history at the grasslands of West Sale Airport (map to be correctly labelled – screenshot for final draft only)

Management has to be practical and the requirement for the 3ha EPBC Offset area to be burnt in a mosaic should be lifted in light of the fact that the area is one of several grasslands at the airport currently managed with an appropriate fire regime.

(Note: a 0.1ha of the 3ha EPBC Offset was burnt again in 2022; full details are included in Appendix 7).

Recommendation 7: the requirement for the 3ha EPBC Offset area to be burnt in a mosaic should be lifted and grasslands at West Sale airport should be burnt in a mosaic at the property scale with a three to five year cycle per patch. This change and any other to be reflected by a formal alteration to the OMP requiring State and Federal approval.

4.4.2.1 Options analysis

We consider now the options if there is no agreement to remove the requirement to burn the 3ha Offset area in a mosaic.

Fire control measures must be able to:

- reliably burn only a defined portion of the 3 ha Offset area in a given year,
- protect a recently burnt area during burns in successive years,
- ensure no more than 50% of the site is burnt in any given year,
- ensure all areas are burnt every 3-5 years.

How could this be achieved? The advantages and disadvantages of the various firebreak options are summarized in Table 16.

Table 16. Firebreaks: advantages and disadvantages

Control type	Description	Effectiveness	Issues
Mineral earth	Removal of all vegetation and organic matter	Most effective	Requires permanent removal of vegetation. Not desirable in grassland especially at 3ha scale. Cannot be done without damaging both 3h Offset and adjacent 10ha Protected Area
Mowing	Mow to a height of 10cm in autumn/winter and remove all cut material from site, as advised in the OMP. Focus on weedy areas of high biomass.	Moderately effective as will change fuel loads	May permanently alter vegetation along and adjacent to fuel break. Use by vehicles increases risk of weed and pathogen incursion and causes compaction. Will require vehicle-based patrol with water or retardant to ensure fire is contained.
Chemical retardant (e.g. Phos-check)	Application of chemical to reduce fuel flammability	Moderately effective if used with a physical break and vehicle-based patrol	Retardants contain fertilisers, e.g. Phosphorus, which are not desirable for use in grasslands.
Water	Application of water to reduce fuel flammability	Only effective under very specific environmental conditions. Unlikely to be effective without physical fuel removal and vehicle-based patrol	Least disturbance to grassland on its own, but not very effective. The use of water alone as a fire control line, without a 'fuel-reduced' break, does not generally provide a large enough fuel moisture differential in a grassland, and provides low certainty of containing a fire within its bounds. The environmental conditions under which this may be successful are very narrow and difficult to plan for. Hence there is also a real risk that a burn regime of 3-5 years in each 'block' will not be achieved.

4.4.2.2 The potential benefits of mowing

The OMP refers to both mowing and slashing at West Sale Airport, noting: "Mowing or slashing of areas (adjoining the sealed runway and the grass runways) at the Aerodrome is undertaken to ensure the site meets aviation safety standards. Areas which are currently mown recorded a higher weed cover and few native kinds of native grass or herbaceous species. It is likely that the regime of ongoing slashing and soil compaction has benefited the introduced grasses such as Couch, Rat-tail Fescue, Toowoomba Canary-grass and Paspalum."

For the purposes of this report, Ethos NRM clarifies that slashing is usually done with a tractor which leaves cut material behind. This heavy machinery is not appropriate for the offseted grassland areas as it will compact soils, and cuttings cannot be left behind as they will enrich the soil. Mowing is use of a lighter machine (a Gianni Ferrari collector mower, for example) with a catcher that allows all cut material to be removed from the site.

WSC has expressed concern about compaction of the soils as seed harvesting on site has resulted in wheel ruts that persisted for years (A. Wolstenholme pers. comm) but if a mower rather than a tractor was used and cuttings were collected this would be acceptable. A recent study in temperate grassland reserves has shown that **mowing** had largely positive or neutral effects on species diversity, vegetation structure and individual species, with few negative effects, and this was under a regime of annual mowing to 10cm high with cut biomass retained on site (Smith, 2018). Mowing positively affected six individual native species and no exotic species and negatively affected one native species and two exotic species. The authors recommend heterogeneous mowing to ensure persistence of mowing-sensitive native species such as *Asperula conferta*.

Another advantage of mowing would be an increase in the heterogeneity of the site: different levels of biomass would favour a patchier burn when the next ecological management burn is undertaken (proposed for 2024). We suggest that 50% of the permanent transects across the 13ha should be mowed (as part of the target of a maximum of 50% of the entire site) to allow fine-scale monitoring of the impacts of mowing.

We noted with interest that along the western boundary of the 13ha grassland, slashing is done regularly as part of maintenance of a bitumen runway. This slashed area is in parts of higher quality than the adjacent grassland which is never slashed. We noted at least two orchid species (*Microtis* sp and *Thelymitra pauciflora*) which had flowered in this regularly slashed area. The same cannot be said for the slashed areas adjacent to the grassed runways which appear extremely weedy.

Recommendation 9: undertake a mosaic mow across the 13ha in the winter of 2024 – with no more than 50% of the site mowed (to include 50% of the transects established in 2022). Mow to a height of 10cm and remove all cut material from site, as advised in the OMP.

Appendix 2 of the OMP lists the percentage covers of all weed species recorded at the time of plan issue (2018). We note some interesting changes: *Agrostis capillaris* was at 15% cover but we did not detect any plants at all in Sep/Oct 2022. Toowoomba Canary Grass and Blackberry were at <5% but are negligible now.

However, Yorkshire Fog and Sweet Vernal Grass were estimated at <1% and we assessed both to be at about 10% and 5% across the 13ha.

Given the significantly higher weed cover in the 3ha EPBC Offset (14%) versus the cover in the Protected Area (5%) as shown in Figure 9, we also suggest that the weed management within the EPBC Offset Area needs to be adjusted: small scale scalping of some areas on the edges may be required to reduce nutrient/weed seed load. If resources allow, seed from elsewhere in the grassland could be sown in these areas.

Recommendation 10: refine weed management in the 3ha EPBC Offset area, consider small scale scalping of very weedy areas followed by hand sowing of seed collected elsewhere from the airport grasslands.

Recommendation 11: continue to target all weed invasions within the 10ha Protected Area to maintain the relatively low weed cover there.

4.5 Chemical weed control: pros and cons

Weeding effort has now been occurring at the 13ha grasslands for several years but it appears that while some species have been completely controlled, others have flourished post-fire and with high rainfall. Dealing with this weed load going forward needs careful consideration. Control using herbicides is logistically difficult

because the exotics are often closely intertwined with natives: off-target damage is always a risk and missing weeds is inevitable. The Arthur Rylah Institute's review of the effectiveness of weed control, across 40 high-quality grassland remnants on the Victorian Volcanic Plains, showed that although weed control reduces weed cover, weeds quickly return once control ends and that native species shows no immediate response to weed control. They speculated that as litter, bare ground and the biological soil crust are all adversely affected by weed control, that may be impacting on native species capacity for recruitment. They recommend additional actions such as fire are required to favour natives (DELWP, 2021). As detailed above, we recommended mowing the grasslands in a mosaic pattern with no more than 50% of the site mowed in the autumn/winter of 2024. Chemical weed control will occur using spot spraying where there is high confidence level that native species will not be affected.

Recommendation 12: Ongoing control should focus on physical removal where possible. Herbicide control of weeds should be increased significantly post-fire: the exotic grasses will germinate in the autumn following a burn and are easily identified.

4.6 Summary of all recommended changes to management prescriptions

In summary, Ethos NRM considers the management prescriptions in the OMP are appropriate but recommends the following changes (Table 17). Other adaptative management alterations are discussed above.

Table 17. Management prescriptions specified in the OMP and suggested changes.

OMP management prescription	Suggested changes
Monitor and control herbaceous weeds to reduce cover of all high threat weeds.	Refine weed control programme to focus on any weed with a score of 13.2 or higher as outlined in 4.4.1 and Appendix 6. This effectively increase the number of high threat weeds by seven.
Biomass reduction	The requirement for the 3ha EPBC Offset area to be burnt in a mosaic should be lifted and grasslands at West Sale airport should be burnt in a mosaic at the property scale with a three to five year cycle per patch. If the requirement cannot be lifted, the use of mowing to create a mosaic is the preferred option.

5 REVIEW OF ONGOING MANAGEMENT COMMITMENTS

Finally, we consider the ongoing management commitments set out in the OMP (Ethos NRM, 2018) with a brief assessment of whether those commitments are or can be met. The recommendations in this report are in alignment with the overall objectives of the Offset site and will ensure that the 10 year management commitments will be achieved.

Table 18. Management commitments and an assessment of whether they can be met

10 year management commitments	Achievable? If not what is recommended.
Eliminate all high threat weeds to <5% cover	Weed management regime must be adjusted in conjunction with the biomass reduction management as detailed above.
Ensure no vehicle movement over the Offset area and install markers around the perimeter of the Offset area	Achieved. However, low pressure mowers should be allowed to access site to assist with biomass management.
Maintain fencing around boundary of the property in good condition according to the standards detailed in information sheet 12. Standards for Management – Fencing. Conduct yearly monitoring to ensure all fencing meets the required standard	Achieved
Eliminate all woody weeds	Achievable. African Boxthorn no longer on site. Some Blackberry persists but is <1%; although this could be considered eliminated, Airport managers report plants appear each year. 'New' woody weeds such as *Prunus* and *Kunzea* have been eliminated
Elimination of all high threat herbaceous and grassy weeds <5% cover by Year 3	Not met. It is challenging to map weed cover accurately at the site level but clear that the two perennial grasses Yorkshire Fog and Sweet Vernal Grass have flourished in the many wet months that have followed the 2021 fire. Considerable input would be required to meet the <5% target by 2028. Reconfiguring the EPBC Offset area as suggested above will ensure this target is achievable.
Control pest animals	Achieved. There are no sign of rabbit warrens or fox dens on the site. Monitoring is ongoing. European Skylark was observed on site and is probably breeding but this is not considered a threat to the biodiversity value.
Biomass management **Ecological burning or slashing – autumn or winter at a 3-5 year interval.** **Complete first burn before end of year 3**	Burn completed in 2021 but whole site rather than 50% burnt. As discussed above, mosaic burning of this 13 ha grassland 3ha EPBC Offset is impractical. Whole of site mosaic burning every 3-5 years is recommended across the airport. A regime of mosaic mowing is recommended to manage biomass and weeds in between burns

Plate 5. Blue-grass Lily (*Caesia calliantha*) at West Sale Airport grasslands

6 REPORTING

Ethos NRM is currently undertaking weed control across the 13ha grasslands and will include all details in the annual report to DEECA due September 2023.

REFERENCES

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APPENDICES

Appendix 1. Variation to conditions

Australian Government
Department of Agriculture, Water and the Environment

VARIATION OF CONDITIONS ATTACHED TO APPROVAL WEST SALE AIRPORT RUNWAY EXTENSION, VICTORIA (EPBC 2017/8106)

This decision to vary conditions of approval is made under section 143(1)(a) of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	Wellington Shire Council ABN: 18 420 243 468
Approved action	To extend the existing sealed runway at the West Sale Airport, Victoria by up to 400 metres and associated works [See EPBC Act referral 2017/8106]

Variation

Variation of conditions attached to approval	The variation is: Add new conditions 3A, 3B, 3C, 7B and 7C and 11 specified in the table below Revoke condition 6 and replace with conditions 6A and 6B specified below Revoke condition 7 and replace with condition 7A specified below Revoke condition 8 and replace with condition 8A, 8B, and 8C specified below. Revoke condition 10 and replace with conditions 10A and 10B specified below. Add new definitions of 'plan(s)', 'EPBC offset area', 'Environmental Offsets Policy', 'legally secured', 'suitably qualified fire ecologist', 'business day', 'compliance records', 'compliance reports', 'incidents', 'independent audit', monitoring data', plan(s)', 'protected matters', 'sensitive ecological data', 'shapefile', 'suitably qualified person', and 'website specified in the table below
Date of effect	This variation has effect on the date the instrument is signed

Person authorised to make decision

Name and position	Assistant Secretary Environment Compliance Branch
Signature	
Date of decision	D / M / 2022

Date of decision	Conditions attached to approval
Original dated 11/10/2018	1. For the protection of the **ecological community**, the approval holder must not **clear** more than 0.485 hectares of the **ecological community** from the **project area**.
Original dated 11/10/2018	2. Prior to **commencement** of the action, the **offset attributes** and **shapefiles**, as described in the **Section 69 Landowner Agreement**, must be provided to the **Department**.
Original dated 11/10/2018	3. The **Offset Management Plan** must be implemented for the duration of the approval.
As varied on the date this instrument was signed	3A. To assess the direct and indirect effects of fire on the status of the **ecological community**, the approval holder must ensure that a survey of the **EPBC offset area** in accordance with the method specified in the **Offset Management Plan** is undertaken by a **suitably qualified fire ecologist** and completed within twelve months of the date that this variation decision is made. A report with the following information must be submitted, within two months of the date on which the survey is completed, to the **Department** for the **Minister**'s approval: a) Results of the survey; b) Methodology used to conduct the survey; c) An assessment of whether the monitoring program in the **Offset Management Plan** is appropriate and any recommended changes to the monitoring program specified in the **Offset Management Plan**; d) An assessment of whether the **EPBC offset area** meets the listing criteria for the **ecological community**; e) An assessment of whether the management prescription in the **Offset Management Plan** is appropriate for managing the **EPBC offset area** and any recommended changes to the management program in the **Offset Management Plan** and its implementation; f) Recommendations of any corrective actions that should be undertaken in the two years (or a shorter period) following the **Minister's** approval of the report; g) Recommended actions if the **EPBC offset area** no longer meets the listing criteria for the **ecological community** and the **suitably qualified fire ecologist** considers that, despite any corrective actions, it is unlikely that the **EPBC offset area** can meet the listing criteria for the **ecological community** within those two years. If the **Minister** approves the survey report, the approval holder must implement all recommendations of the approved survey report and any requirements made in writing by the **Minister** which are based on the findings of the survey report.
As varied on the date this instrument was signed	3B. If the **Minister** determines that the **EPBC offset area** no longer meets the listing criteria for the **ecological community**, the approval holder must, within six months of the **Minister's** determination, propose environmental offsets by submitting an Offset Strategy consistent with the **Department's Environmental Offsets Policy** to the satisfaction of the **Minister**. Any additional offset(s) proposed in the approved Offset Strategy must be **legally secured** within twelve months of the **Minister's** approval of the Offset Strategy. The approval holder must submit a revised **Offset Management Plan** to the **Minister** for approval before the offset(s) proposed in the approved

Date of decision	Conditions attached to approval
	Offset Strategy is/are **legally secured**, detailing the management of any additional environmental offset. If the **Minister** determines that the **EPBC offset area** meets the listing criteria for the **ecological community**, the approval holder must, within six months of the **Minister's** determination, submit to the **Department** for the **Minister**'s approval a revised Offset Management Plan to address the recommendations of the survey report for the **EPBC offset area**. If the **Minister** approves the revised Offset Management Plan the approval holder must implement the approved **Offset Management Plan**.
As varied on the date this instrument was signed	3C. If an Offset Strategy is required under condition 3B, the Offset Strategy must: a. Identify a suitable environmental offset (or offsets) for the impacts of the action on the **ecological community**; a) Include summary information on the impacted areas and detailed baseline information on the proposed offset(s) and commit to achievable ecological benefits, and timeframes for their achievement, for the proposed offset(s); b) Describe the monitoring program(s) to be implemented that will determine progress towards, attainment of and maintenance of the ecological benefits for the **ecological community** at the proposed offset(s); c) Specify how and at what frequency offset(s) management results, monitoring program findings and assessments of ecological benefits will be reported to the **Department** and the public; and d) Detail how the offset(s) will be protected, and ecological benefits maintained, in perpetuity.
Original dated 11/10/2018	4. For the protection of the **ecological community**, the approval holder must: a) Prior to **commencement**, clearly delineate the **no-go zones** to prevent entry by machinery, people or vehicles. The delineated **no-go zones** must be maintained and remain in place until the project is complete. b) For the duration of the project, until the expiry date of the approval, implement the entirety of the **Construction Environmental Management Plan**.
Original dated 11/10/2018	5. Within 10 days after the **commencement** of the action, the approval holder must advise the **Department** in writing of the actual date of **commencement**.
As varied on the date this instrument was signed	6. REVOKED.
As varied on the date this instrument was signed	6A. The approval holder must maintain accurate and complete **compliance records**.
As varied on the date this instrument was signed	6B. If the **Department** makes a request in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request. Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department**'s website or through the general media.
As varied on the date this	7. REVOKED.

Date of decision	Conditions attached to approval
instrument was signed	
As varied on the date this instrument was signed	7A. The approval holder must prepare a **compliance report** for each 12 month period following the date of **commencement of the action**, or otherwise in accordance with an annual date that has been agreed to in writing by the **Minister**. The approval holder must: a. publish each **compliance report** on the **website** within 60 **business days** following the relevant 12 month period b. notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within 5 **business days** of the date of publication c. keep all **compliance reports** publicly available on the **website** until this approval expires d. exclude or redact **sensitive ecological data** from **compliance reports** published on the **website** e. where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within 5 **business days** of publication. **Note**: **Compliance reports** may be published on the **Department**'s website.
As varied on the date this instrument was signed	7B. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than 2 **business days** after becoming aware of the **incident** or non-compliance. The notification must specify: a. any condition which is or may be in breach b. a short description of the **incident** and/or non-compliance c. the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.
As varied on the date this instrument was signed	7C. The approval holder must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying: a. any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future b. the potential impacts of the **incident** or non-compliance c. the method and timing of any remedial action that will be undertaken by the approval holder.
As varied on the date this instrument was signed	8. REVOKED.

Date of decision	Conditions attached to approval
As varied on the date this instrument was signed	8A. The approval holder must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the **Minister**.
As varied on the date this instrument was signed	8B. For each **independent audit**, the approval holder must: a. provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department** b. only commence the **independent audit** once the audit criteria have been approved in writing by the **Department** c. submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.
As varied on the date this instrument was signed	8C. The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.
Original dated 11/10/2018	9. If, at any time after five years from the date of this approval, the approval holder has not **commenced** the action, then the approval holder must not **commence** the action without the written agreement of the **Minister**.
As varied on the date this instrument was signed	10. REVOKED.
As varied on the date this instrument was signed	10A. The approval holder must: a. submit **plans** electronically to the **Department** for approval by the **Minister** b. publish each **plan** on the **website** within 20 **business days** of the date the **plan** is approved by the **Minister**, unless otherwise agreed to in writing by the **Minister** c. exclude or redact **sensitive ecological data** from **plans** published on the **website** or provided to a member of the public d. keep **plans** published on the **website** until the end date of this approval.
As varied on the date this instrument was signed	10B. The approval holder must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **plan**, is prepared in accordance with the **Department's** *Guidelines for biological survey and mapped data* (2018) and submitted electronically to the **Department** in accordance with the requirements of the **plan.**
As varied on the date this instrument was signed	11. The approval holder may, at any time, apply to the **Minister** for a variation to a **plan** approved by the **Minister** under conditions 3 or 4, or as subsequently revised in accordance with these conditions, by submitting an application in accordance with the requirements of section 143A of the **EPBC Act**. If the **Minister** approves a revised **plan** then, from the date specified, the approval holder must implement that **plan** in place of the previous **plan**.

Date of decision	Definitions attached to approval
As varied on the date this instrument was signed	**Business day** means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.
Original dated 11/10/2018	**Clear** - is the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of native vegetation, but does not include measures for weed and pest management.
Original dated 11/10/2018	**Commencement** (also **commence**, **commenced**) - includes any preparatory works required to be undertaken including clearing vegetation, the erection of any onsite temporary structures and the use of heavy duty equipment for the purpose of breaking the ground for construction.
As varied on the date this instrument was signed	**Compliance records** means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.
As varied on the date this instrument was signed	**Compliance reports** means written reports: i. providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and the **plans** ii. consistent with the **Department**'s *Annual Compliance Report Guidelines* (2014) iii. include a **shapefile** of any clearance of any **protected matters**, or their habitat, undertaken within the relevant 12 month period **iv.** annexing a schedule of all **plans** prepared and in existence in relation to the conditions during the relevant 12 month period.
Original dated 11/10/2018	**Construction Environmental Management Plan** - means *Attachment 8: Construction Environmental Management Plan*, of the finalised Preliminary Documentation, inclusive of *Chapter 2.5: Operational Requirements*.
Original dated 11/10/2018	**Department** - means the Australian Government Department administering the **EPBC Act**.
Original dated 11/10/2018	**Ecological community** - means the Gippsland Red Gum (*Eucalpytus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland, a listed threatened ecological community under the **EPBC Act** and as defined in *Commonwealth Listing Advice* on the *Gippsland Red Gum* (Eucalyptus tereticornis *subsp*. Mediana) *Grassy Woodland and Associated Native Grassland.*
As varied on the date this instrument was signed	**Environmental Offsets Policy** - refers to the **Department's** *EPBC Act Environmental Offsets Policy 2012*.
Original dated 11/10/2018	**EPBC Act** - the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).
As varied on the date this instrument was signed	**EPBC offset area** - means the area represented in the map at Figure 1 of Annexure C by the polygon hatched by blue lines designated 'EPBC Offset Area (3ha)'.
As varied on the date this instrument was signed	**Incident** means any event which has the potential to, or does, impact on one or more **protected matter(s)** other than as authorised by this approval.
As varied on the date this instrument was signed	**Independent audit** means an audit conducted by an independent and **suitably qualified person** as detailed in the *Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines* (2019)

Date of decision	Definitions attached to approval
As varied on the date this instrument was signed	**Legally secured** - means to secure a legal agreement under relevant Victorian legislation, in relation to a site, to provide enduring protection for the site against development incompatible with conservation.
As varied on the date this instrument was signed	**Monitoring data** means the data required to be recorded under the conditions of this approval.
Original dated 11/10/2018	**Minister** - means the Commonwealth Minister administering the **EPBC Act** and includes a delegate of the **Minister**.
Original dated 11/10/2018	**No-go zone** - as identified by the black cross hatching in the map at Annex C.
Original dated 11/10/2018	**Offset attributes** - means an '.xis' file capturing relevant attributes of the offset area as marked in Annex B and described in the approved **Section 69 Landowner Agreement**, including: i. **EPBC Act** reference number; ii. physical address of the offset area; iii. coordinates of the boundary points in decimal degrees; iv. **EPBC Act** listed threatened species that the offset compensates for; v. any additional protected matters that are benefiting from the offset; and vi. size of the offset in hectares;
Original dated 11/10/2018	**Offset Management Plan** - means Version 2 of the *WEST SALE AIRPORT – Runway Extension EPBC Offset Management Plan* (July 2018), provided to the Department on 20 July 2018.
As varied on the date this instrument was signed	**Plan(s)** means any of the documents required to be prepared, approved by the Minister, implemented by the approval holder and/or published on the website in accordance with these conditions.
Original dated 11/10/2018	**Project area** - as identified by the black line labelled 'Runway Extension area of impact' in the map at Annex A.
As varied on the date this instrument was signed	**Protected matter** means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect.
Original dated 11/10/2018	**Section 69 Landowner Agreement** - refers to the approved Section 69 Landowner Agreement titled *Landowner Agreement CW_CFL-3055_01 between the Secretary to the Department of Environment, Land, Water and Planning and Wellington Shire Council [17 September 2018].*
As varied on the date this instrument was signed	**Sensitive ecological data** means data as defined in the Australian Government Department of the Environment (2016) *Sensitive Ecological Data – Access and Management Policy V1.0.*
Original dated 11/10/2018	**Shapefiles** - means an Esri compatible file containing '.shp', '.shx' and '.dbf' files and any other relevant file extensions capturing attributes including at least the **EPBC Act** reference number and **EPBC Act** protected matters present at the relevant site.
As varied on the date this instrument was signed	**Suitably qualified fire ecologist** - means a person who has relevant professional qualifications, training, skills and/or 5+ years' experience related to ecology, including fire ecology, of native grasslands and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.
As varied on the date this instrument was signed	**Suitably qualified person** means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment,

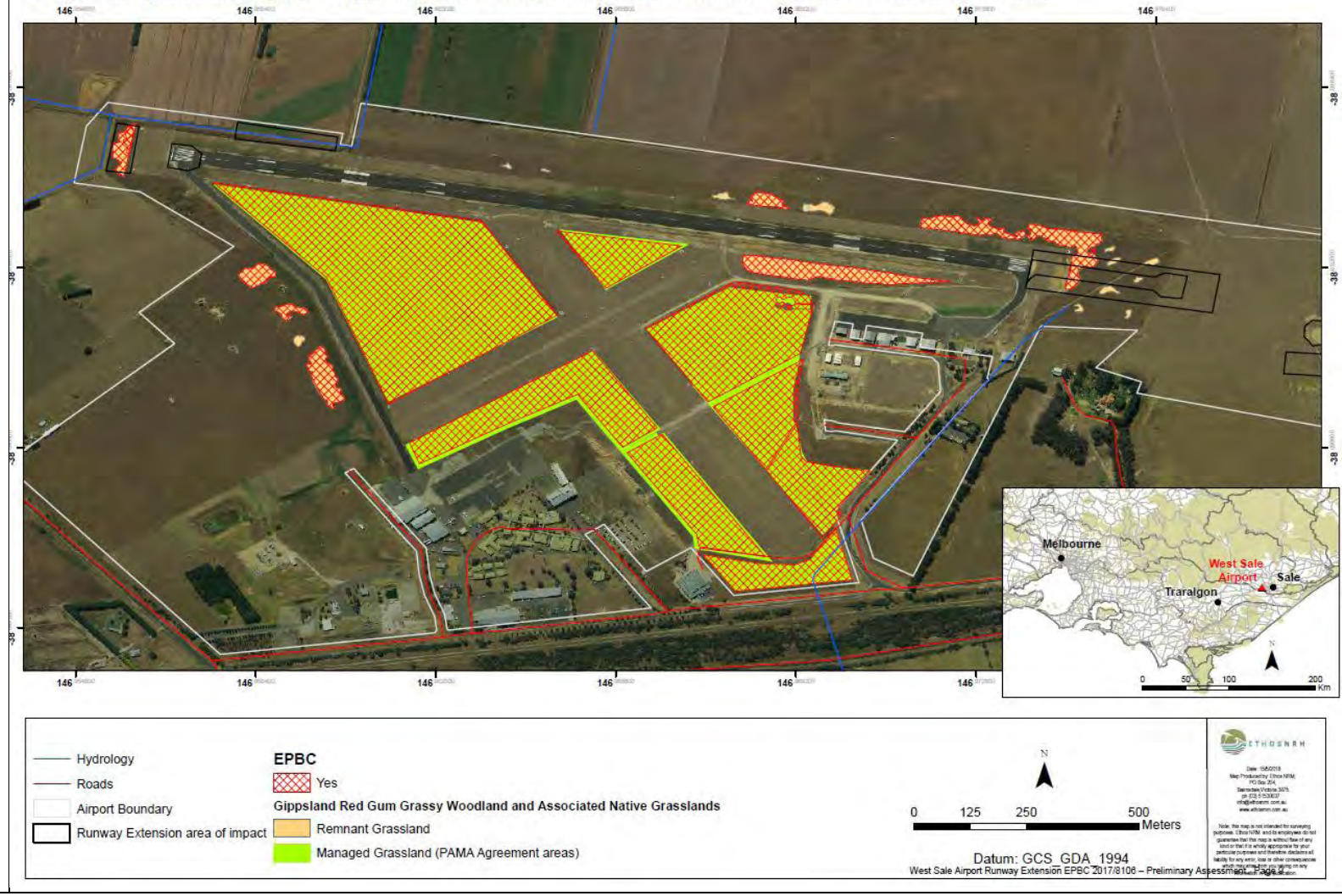
Date of decision	Definitions attached to approval
	advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.
As varied on the date this instrument was signed	**Website** means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.

Australian Government

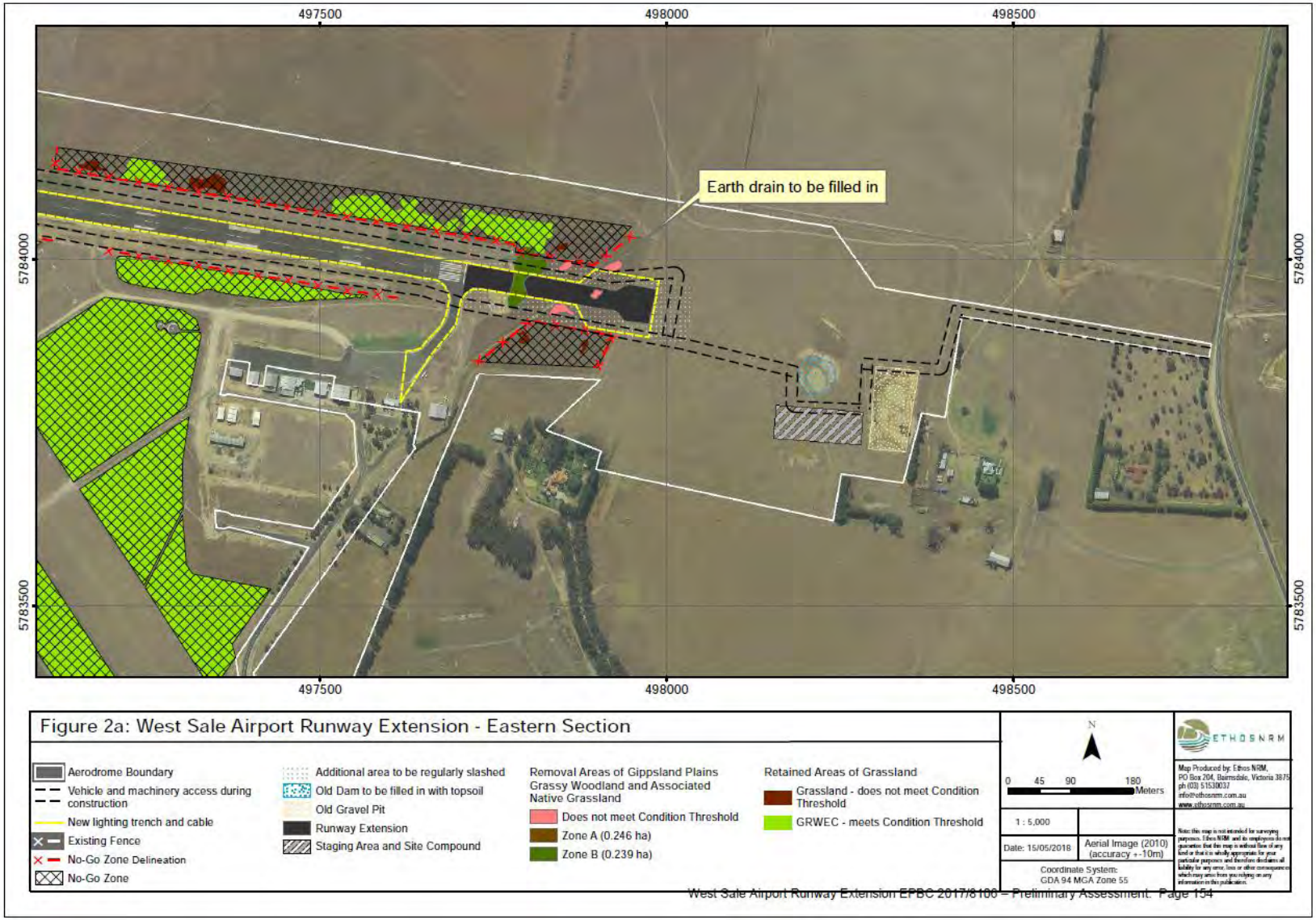
Department of Agriculture, Water and the Environment

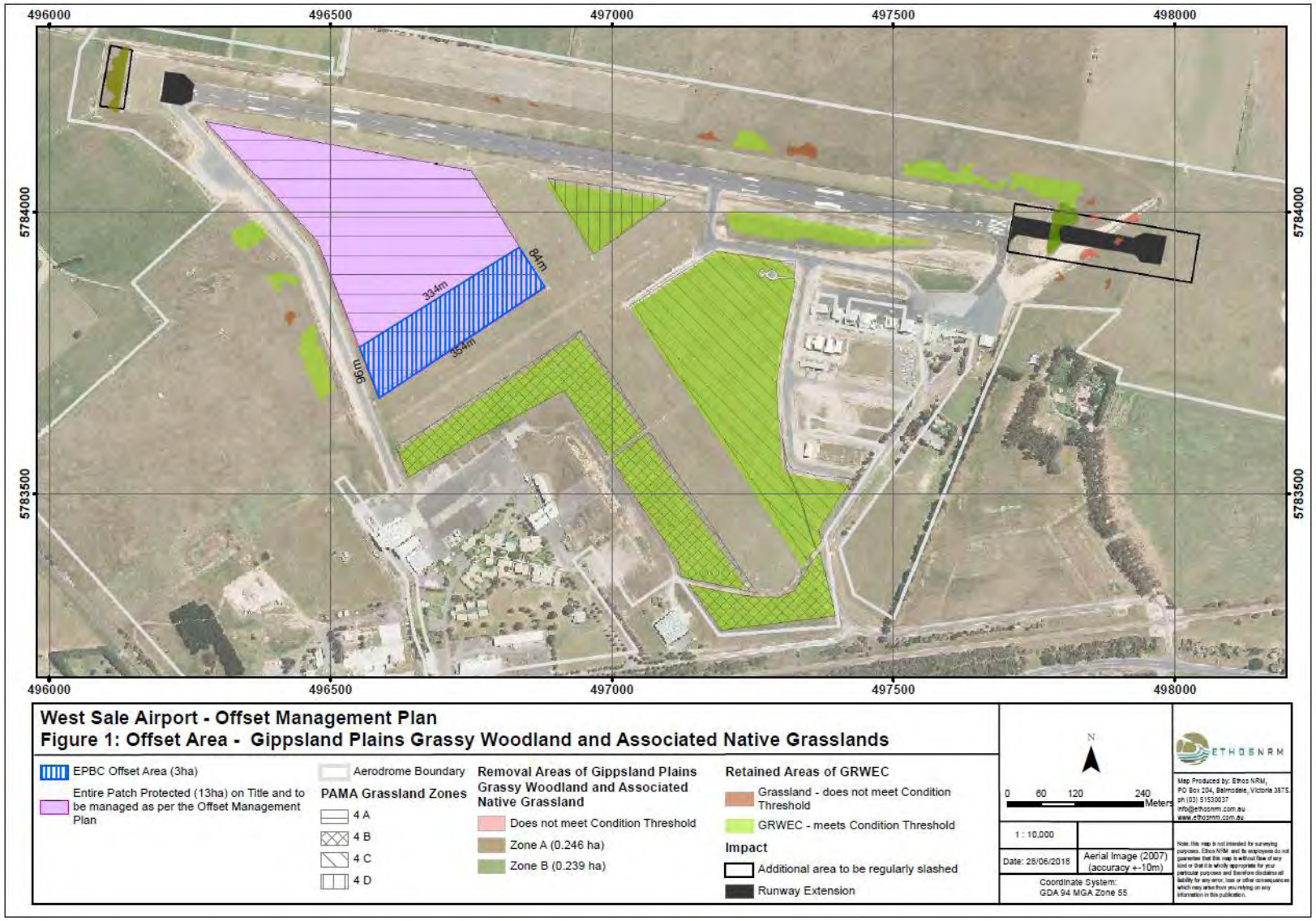
Date of decision	Annexure A
Original dated 11/10/2018	

Figure 1. West Sale Airport - Location and Grassland Areas
EPBC Ecological Community - Gippsland Red Gum Grassy Woodland and Associated Native Grassland



Date of decision	**Annexure B**
Original dated 11/10/2018	



Date of decision	**Annexure C**
Original dated 11/10/2018	

West Sale Airport Runway Extension EPBC 2017/8106 – Preliminary Assessment: Page 155

Appendix 2. Ethos NRM staff leading the assessment of the protected grasslands at West Sale Airport

Mr Michael Bramwell has decades of experience in management of temperate grasslands in the Gippsland area and use of fire as an ecological management. He has co-authored several research reports highly relevant to West Sale Airport grasslands, including:

• Moxham, C., Bramwell M., Trumbull-Ward A., Dorrough J. and Turner V. (2011) Monitoring the impact of planned burning on the Bairnsdale railway line reserve. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Melbourne.

• Fire exclusion and soil texture interact to influence temperate grassland flora in south-eastern Australia. (2016) Moxham C., Dorrough, J., Bramwell, M. and Farmilo, B. J. Australian Journal of Botany, 64: 417-426

• Intense fires promote uncommon post-fire ephemerals in Currawang *Acacia doratoxylon* dry scrubs of Little River Gorge, East Gippsland. 2006. Prober, S.M., Thiele, K.R. and Bramwell, M. Victorian Naturalist. Vol 123 (6) 320-331.

Dr Trish Fox is an ecologist with over 20 years' experience in scientific and community led restoration of natural environments. She completed a Ph.D. in regional variation in the understorey of *Eucalyptus salmonophloia* woodlands in the wheatbelt of Western Australia and was facilitator of the Gippsland Plains Conservation Management Network, focusing on protection, management and restoration of the EPBC listed Gippsland Red Gum Grassy Woodland community for ten years.

Appendix 3. Recording sheet for quadrat monitoring at West Sale Airport

SIX 50m TRANSECTS TO BE ESTABLISHED IN 3HA OFFSET AREA. 50cm^2 QUADRAT EVERY 5m to **LEFT** OF TRANSECT AND FOLLOWING MONITORED

Date……Surveyor……..

OFFSET TRANSECT 1 (50m)	**0m**	**5m GB PhPt**	**10m**	**15m**	**20m**	**25m PPt**	**30m**	**35m**	**40m**	**45m GB PhPt**
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
% native graminoid cover										
% exotic weed cover										
% of which is high threat										
% native herbaceous cover										
% bare ground										
% lichen & moss										
Other (specify)										

The all species quadrat is 10x10m and located between the 25m & 35m points positioned on the left when looking from the 0 to 50m (see separate monitoring sheet)

Photo pts will be located at the midpoint of each transect. A series of photos will be taken from different directions (N, E,W, & S) including one of the 50cm^2 quadrats at the 25m point along the transect (taken directly down from 1.3m above the ground so that the quadrat fills the entire photo frame).

EVIDENCE OF EXOTIC FAUNA ALONG EXTENT OF TRANSECT (1M EITHER SIDE) NO YES – SPECIFY

GB = golf ball quadrat location for biomass monitoring

Appendix 4. SPECIES INVENTORY WALK RESULTS

Species inventory walk in the 3ha EPBC Offset Area, completed 13 Sept 2022.

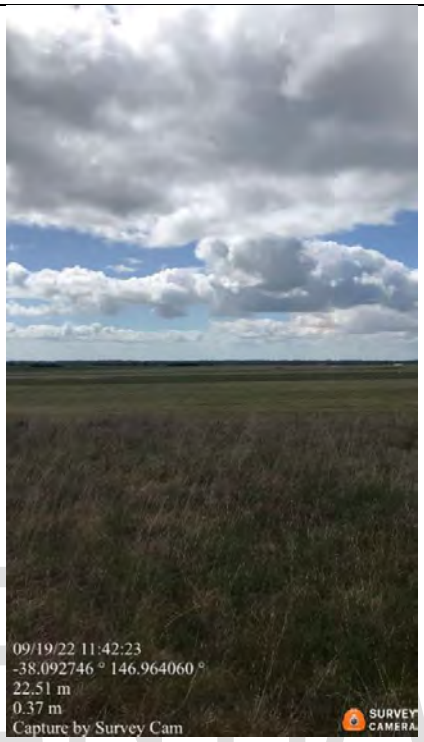
Summary: 29 native species and six exotic* species recorded		Time to detection (minutes)
Scientific name	**Common name**	
Themeda triandra	Kangaroo Grass	0:00.01
Poa sieberiana var. sieberiana	Grey Tussock-grass	0:00.02
*Holcus lanatus**	Yorkshire Fog	0:00.05
*Romulea rosea**	Onion Grass	0:00.10
*Hypochoeris radicata**	Flatweed	0:01:00
*Anthoxanthum odoratum**	Sweet Vernal Grass	0:03.00
Austrostipa rudis	Veined Spear-Grass	0:03.30
Eragrostis trachycarpa	Rough-grained Lovegrass[1]	0:04.45
Euchiton sphaericus	Annual Cudweed	0:04.40
Schoenus apogon	Common Bog-Sedge	0:04.59
Oxalis perennans	Grassland Wood-sorrel	0:05.00
Poa labillardierei	Common Tussock-grass	0:01.15
Chloris truncata	Windmill Grass	0:01.00
*Phalaris aquatica**	Phalaris	0:06:00
Hypericum gramineum	Small St John's Wort	0:06.44
*Cynodon dactylon**	Couch	0:06.48
Senecio quadridentatus	Cotton Fireweed	0:06.00
Lomandra filiformis	Wattle Mat-rush	0:08.00
Euchiton involucratus	Star Cudweed	0:08.25
Juncus sp.	Rush	0:10.00
Caesia calliantha	Blue Grass-lily	0:11.00
Phalaris arundinacea	Phalaris	0:16:00
Wahlenbergia multicaulis	Many-stemmed Bluebell	0:14.22
Asperula conferta	Common Woodruff	0:15:10
Hemarthria uncinata var uncinata	Mat Grass	0:18.00
Plantago gaudichaudii	Narrow Plantain	0:19.00
*Plantago lanceolata**	Ribwort	0:19.30
Thelymitra pauciflora	Slender Sun-orchid	0:20.00
Rytidosperma sp.	Wallaby Grass	0:20.45
Gonocarpus tetragynus	Common Raspwort	0:24:00
Solenogyne domini	Smooth Solenogyne	0:27.00
*Rumex dumosus**	Wiry Dock	0:27:00
*Pennisetum clandestinum**	Kikuyu	0:29.00
Arthropodium strictum	Chocolate Lily	0:29.00
Drosera hookeri	Sundew	0:32.00
Burchardia umbellata	Milkmaids	0:35.00
Bulbine bulbosa	Bulbine Lily	0:38.00
Dichelachne rara	Common Plume-grass	0:41.00
Dianella brevicaulis	Small-flower Flax-Lily	0:42.00
Acaena x ovina	Sheep's Burr	0:43.30

Species inventory walk results from 10ha Protected Area completed 10 Oct 2022

SPECIES INVENTORY WALK Summary: 32 native species and 15 exotic* species recorded		Time to detection (minutes)
Species name	**Common name**	
Poa labillardieri	Common Tussock-Grass	0:00.00
*Anthoxanthum odoratum**	Sweet Vernal Grass	0:00.00
*Plantago lanceolata**	Ribwort	0:00.00
Lomandra filiformis	Wattle Mat-rush	0:00.25
*Lysimachia arvensis**	Scarlet Pimpernel	0:00.25
*Briza minor**	Lesser Quaking-Grass	0:00:25
Bulbine bulbosa	Bulbine Lily	0:00.25
*Sonchus olaeraceous**	Milk Thistle	0:00.25
Austrostipa rudis	Veined Spear-Grass	0:00.25
Poa clellandi? (specimen collected	Matted Tussock-grass	0:00.25
Senecio quadridentatus	Cottony Fireweed	0:00.25
*Hypochaeris radicata**	Flatweed/Cat's Ear	0:00.30
Asperula conferta	Common Woodruff	0:01.00
Schoenus apogon	Common Bog-Sedge	0:01.00
Oxalis perennans	Grassland Wood-sorrel	0:01.00
Themeda triandra	Kangaroo Grass	0:01.00
*Sonchus asper**	Rough Sowthistle	0:02.00
*Romulea rosea**	Onion Weed	0:02.00
Acaena ovina	Sheep's Burr	0:02.15
Chloris truncata	Windmill Grass	0:02.30
Eragrostis trachycarpa	Rough-grained Lovegrass[1]	0:04.00
*Holcus lanatus**	Yorkshire Fog	0:04.40
Calcocephalus lacteus	Milky Beauty-heads	0:05.15
*Hypochaeris glabra**	Smooth Cat's Ear	0:05.54
*Briza maxima**	Large Quaking-Grass	0:06.05
Caesia calliantha	Blue Grass-Lily	0:07.00
*Centaurium erythraea**	Common Centaury	0:09.12
Euchiton sp	Cudweed	0:09.26
Hypericum gramineum	Small St John's Wort	0:10.40
Burchardia umbellata	Milkmaids	00:11.05
Laphangium luteoalbum	Jersey Cudweed	0:12.00
*Weed sp?**	Geo-referenced for future check	0:13.00
Wahlenbergia multicaulis	Many-stemmed Bluebell	00:14.00
Thelymitra pauciflora	Slender Sun-orchid	00:14.00
Arthropdium strictum	Chocolate Lily	00:15.40
Poa sieberiana	Grey Tussock-grass	00:19.00
*Phalaris aquatica**	Toowoomba Canary Grass	00:21.00
Calocephalus citreus	Lemon Beauty-heads	00:22.00
Dianella brevicaulis	Small-flower Flat-Lily	00:22.30
Bossiaea prostrata	Creeping Bossiaea	00:25.15
Lachnagrostis sp	Common Blown-Grass	00:25.55
*Rubus fruticosus**	Blackberry	00:28.48
Wahlenbergia gracilis	Sprawling Bluebell	00:29.12
Carex breviculmis	Common Grass-Sedge	00:31.40
Arthropodium milleflorum	Vanilla Lily	00:35.08
Geranium solanderi	Austral Crane's-bill	00:39.44
Leptorhynchus squamatus	Scaly Buttons	00:54.00

Appendix 5. Photo point monitoring

T1 at 25m north



T1 at 25m east

T1 at 25m south

We experienced some issues with the Survey Camera app and this file corrupted. We have since taken other photos with the Nav Camera app which has worked smoothly but do not have an image for this compass point

T2 at 25m north

T2 at 25m east

T2 at 25m south

T2 at 25m west

T3 at 25m north

T3 at 25m east

T3 at 25m south

T3 at 25m west

T4 at 25m north

T4 at 25m east

T4 at 25m south

T4 at 25m west

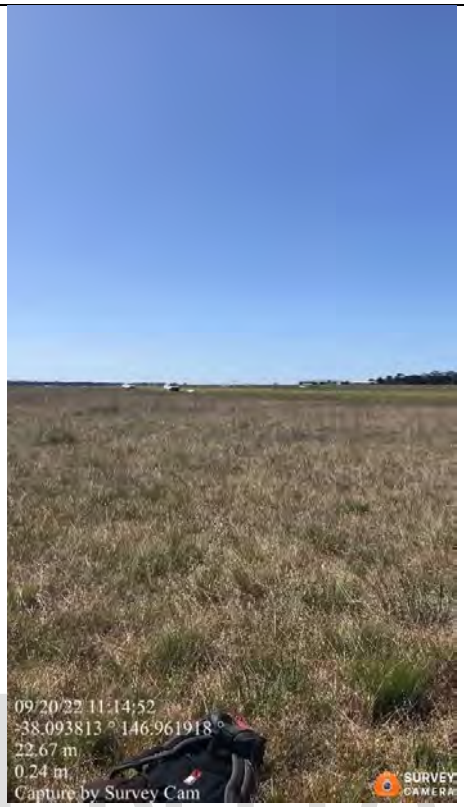
T5 at 25m north

T5 at 25m east

T5 at 25m south

T5 at 25m west

T6 at 25m north



T6 at 25m east

T6 at 25m south

T6 at 25m west

T1 50x50cm quadrat at 25m

T2 50 x 50 cm quadrat at 25 m

T3 50x50cm quadrat at 25m

T4 50x50cm quadrat at 25m

T5 50x50cm quadrat at 25m

T6 50x50cm quadrat at 25m

Appendix 6. Review of OMP's Appendix 2: Weed Species recorded across the 13ha grassland.

All weeds noted in 2018 listed (those not recorded in 2022 are struck through), new species are included (bold) and species with a threat score of >13.2 are highlighted in red

Botanical name	Common name	High Threat	% cover	CALP Listed Weed	Target	3 Year Target Cover	10 Year Target Cover	Suitable control methods	Timing
Arcotheca calendula	**Capeweed**	**Y**	**<1**		**Eliminate all plants immediately**	**< 1**	**< 1**	**Cut & Paint, Hand Pull**	**spring, summer, autumn**
Avena barbata	**Bearded Oat**	**Y**	**<1**		**Eliminate all plants immediately**	**< 1**	**< 1**	**Cut & Paint, Hand Pull**	**spring, summer, autumn**
~~*Cirsium vulgare*~~	~~Spear Thistle~~	~~Y~~	~~< 1~~	~~C~~	~~Eliminate all plants immediately~~	~~< 1~~	~~< 1~~	~~Foliar Spray, Hand Pull.~~	~~spring, summer~~
~~*Hypericum perforatum*~~	~~St John's Wort~~	~~Y~~	~~< 1~~	~~C~~	~~Eliminate all plants immediately~~	~~< 1~~	~~< 1~~	~~Cut & Paint, Foliar Spray, Hand Pull~~	~~early spring~~
~~*Lycium ferocissimum*~~	~~African Box Thorn~~	~~Y~~	~~< 1~~	~~C~~	~~Eliminate all plants immediately~~	~~< 1~~	~~< 1~~	~~Cut & Paint, Hand Pull~~	~~spring, summer, autumn~~
Rubus fruticosus spp. agg.	Blackberry	Y	< 5 (<1)	C	Eliminate all plants immediately	< 1	< 1	Cut & Paint, Hand Pull	spring, summer, autumn
Agrostis capillaris	Brown-top Bent-grass	Y	< 15 (<1)		Reduce to 3 and 10 year target covers	< 5	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Aira spp.	Hair Grass	Y	< 2 (<1)		Reduce to 3 and 10 year target covers	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Cynodon dactylon var. dactylon	Couch	Y	< 5 (<1)		Reduce to 3 and 10 year target covers	< 2	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Pennisetum clandestinum	Kikuyu	Y	< 2 (<1)		Reduce to 3 and 10 year target covers	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Phalaris aquatica	Toowoomba Canary Grass	Y	< 5 (<1)		Reduce to 3 and 10 year target covers	< 2	< 1	Knapsack foliar Spray, Hand Pull	spring, summer

Botanical name	Common name	High Threat	% cover	CALP Listed Weed	Target	3 Year Target Cover	10 Year Target Cover	Suitable control methods	Timing
Sporobolus indicus var. africanus	Rat-tail Grass	Y	< 5 (<1)		Reduce to 3 and 10 year target covers	< 2	< 1	Knapsack foliar Spray, Hand Pull	summer
Anthoxanthum odoratum	Sweet Vernal Grass	Y	< 1 (<5)		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	early spring
Bromus catharticus	Prairie Grass	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Conyza spp.	Fleabane	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Dactylis glomerata	Cocksfoot	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Festuca arundinacea Now *Lolium arundinaceum*	Tall Fescue	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Holcus lanatus	Yorkshire Fog Grass	Y	< 1 (<10)		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Juncus capitatus	**Captitate Rush**	**Y**	**<1**		**Actively control all plants ensuring no increase in % cover**	**< 1**	**< 1**	**Knapsack foliar Spray, Hand Pull**	**spring, summer**
Paspalum dilatatum	Paspalum	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Rumex dumosus	Dock	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
~~*Solanum nigrum*~~	~~Blackberry Nightshade~~	~~Y~~	~~< 1~~		~~Actively control all plants ensuring no increase in % cover~~	~~< 1~~	~~< 1~~	~~Knapsack foliar Spray, Hand Pull~~	~~spring~~
Sonchus asper	**Milk Thistle**	**Y**	**<1**		**Actively control all plants ensuring no increase in % cover**	**< 1**	**< 1**	**Knapsack foliar Spray, Hand Pull**	**spring, summer**
Sonchus oleraceus	Sow Thistle	Y	< 1		Actively control all plants ensuring no increase in % cover	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Briza maxima	Large Quaking-grass		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer

Botanical name	Common name	High Threat	% cover	CALP Listed Weed	Target	3 Year Target Cover	10 Year Target Cover	Suitable control methods	Timing
Briza minor	Lesser Quaking-grass		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Centaurium erythraea	Common Centaury		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Hypochaeris glabra	**Flatweed**		**< 1**		**Treat only if % cover increases**	**< 1**	**< 1**	**Knapsack foliar Spray, Hand Pull**	**spring, summer**
Hypochaeris radicata	Cat's Ear		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Lysimachia arvensis	Pimpernel		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Plantago coronopus	Buck's-horn Plantain		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Plantago lanceolata	Ribwort		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
Romulea rosea	Onion Weed		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	autumn
Rumex acetosella spp. Agg.	Sheep Sorrel		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer
~~*Trifolium arvense*~~	~~Hare's Foot Clover~~	-	~~< 1~~	-	~~Treat only if % cover increases~~	~~< 1~~	~~< 1~~	~~Knapsack foliar Spray, Hand Pull~~	~~spring, summer~~
~~*Trifolium repens var. repens*~~	~~White Clover~~	-	~~< 1~~	-	~~Treat only if % cover increases~~	~~< 1~~	~~< 1~~	~~Knapsack foliar Spray, Hand Pull~~	~~spring, summer~~
Vulpia bromoides	Squirrel-tail Fescue		< 1		Treat only if % cover increases	< 1	< 1	Knapsack foliar Spray, Hand Pull	spring, summer

Appendix 7. Memo to WSC re 2022 burn

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MEMO

To: **Andrew Wolstenholme / Wellington Shire Council**

From: **Dr Trish Fox / Ethos NRM**

Date: **13 October 2022**

RE: **Preliminary survey report for EPBC offset EPBC 2017/8106**

Wellington Shire Council has been working in relation to non-compliance of condition 3 of the EPBC 2017/8106 approval following a controlled burn across the entire site in February 2021.

Natural resource management consultants Ethos NRM Pty Ltd have been appointed to assist with meeting the revised conditions attached to the approval.

To meet condition 3A, Ethos NRM has surveyed the EPBC offset area and, in line with conditions, will submit a full report by mid December 2022. In brief, Ethos NRM reports that the EPBC offset area still meets the listing criteria for the ecological community with 29 native species and seven exotic species. Average cover across surveyed quadrats was: 67% native graminoids, 5% native herbs and 14% exotic weeds.

Ethos NRM also noted that an area of 0.1ha within the 3ha offset area had been burnt recently. Wellington Shire Council was made aware of this last Friday (7th of October at 4pm) and have been waiting on this memo to outline results of further monitoring and remedial action. The unplanned burn was the result of an accidental fire associated with pyrotechnics used during an Airshow at West Sale Airport on the weekend of 23rd and 24th of April 2022. Fire spread from a display area on the nearby grass runway and was quickly extinguished by Airshow and Country Fire Authority personnel who were in attendance. Co-ordinates from the centre of this area at -038.09366°/+146.96293°.

The area has been mapped and is shown on the image below.

A closer survey of this 0.1ha has shown that there are 13 native species and 12 exotic species. Coverage of native species is currently 27% (although this will increase substantially as the native grasses develop) but weed cover is at 26%.

In line with the conditions, specifically Condition 7B and 7C, we are writing to make you aware of this incident, and to provide corrective actions, impacts and the method and timing of the corrective actions.

The following corrective actions have been or will be undertaken to mitigate these impacts:

- Ethos NRM has targeted weed control on the 0.1ha area and this week physically removed 65kg of weeds from the area: work focused on removal of the exotic grasses Yorkshire Fog *Holcus lanatus* and Sweet Vernal Grass *Anthoxanthum odoratum* as these are currently flowering. Removal will significantly reduce the weed seed load. Yorkshire Fog was removed by hand and Sweet Vernal Grass flower spikes were cut to ground. Other species removed during this work included *Briza maxima* and *B. minima* (again both currently flowering), *Romulea rosea*, *Conyza* sp., *Plantago coronopus* and *Hypochaeris radicata*. All weed material was removed from the site. Further weed control is planned in this area and we are confident that weed load can be significantly reduced and that the native species present will expand. Several native species in the 0.1ha area are currently in flower *including Poa labillardieri, Bulbine bulbosa, Arthropodium strictum*, *Burchardia umbellata, Geranium solanderi,* and *Wurmbea dioica*. Physical removal of the material will reduce nutrient input in the area which will further benefit native species.

- In addition, Ethos NRM brush-cut Sweet Vernal Grass in a 0.05ha area around the recently burnt area to further reduce the weed seed input from the adjoining grass runway. Weed control is to continue across the 3ha offset area and the adjacent 10ha Protected Area throughout 2022/2023 in line with

the management plan. The grass runway adjacent to the 0.1ha burnt area is mowed regularly and weed seed input from there will be low.

- If there is another Airshow event, Wellington Shire Council will ensure that the area near the EPBC offset is out of bounds for any activities via a clause in the promoter's contract. (The event is not owned or managed by Wellington Shire Council, the event is hosted at their West Sale Aerodrome).

- Wellington Shire Council will also install markers at the edge of the offset area by the end of December 2022 to physically delineate it.

Before and after photographs of the weed control in this 0.1ha area:

Before and after photographs demonstrating the selective removal of the exotic perennial grass Yorkshire Fog (*Holcus lanatus*) around the native lilies *Bulbine bulbosa* and *Arthropodium strictum undertaken over the last 4 days*

Before and after photographs of two of the four 1x1m quadrats established in the 0.01ha area to allow ongoing monitoring of weed load.