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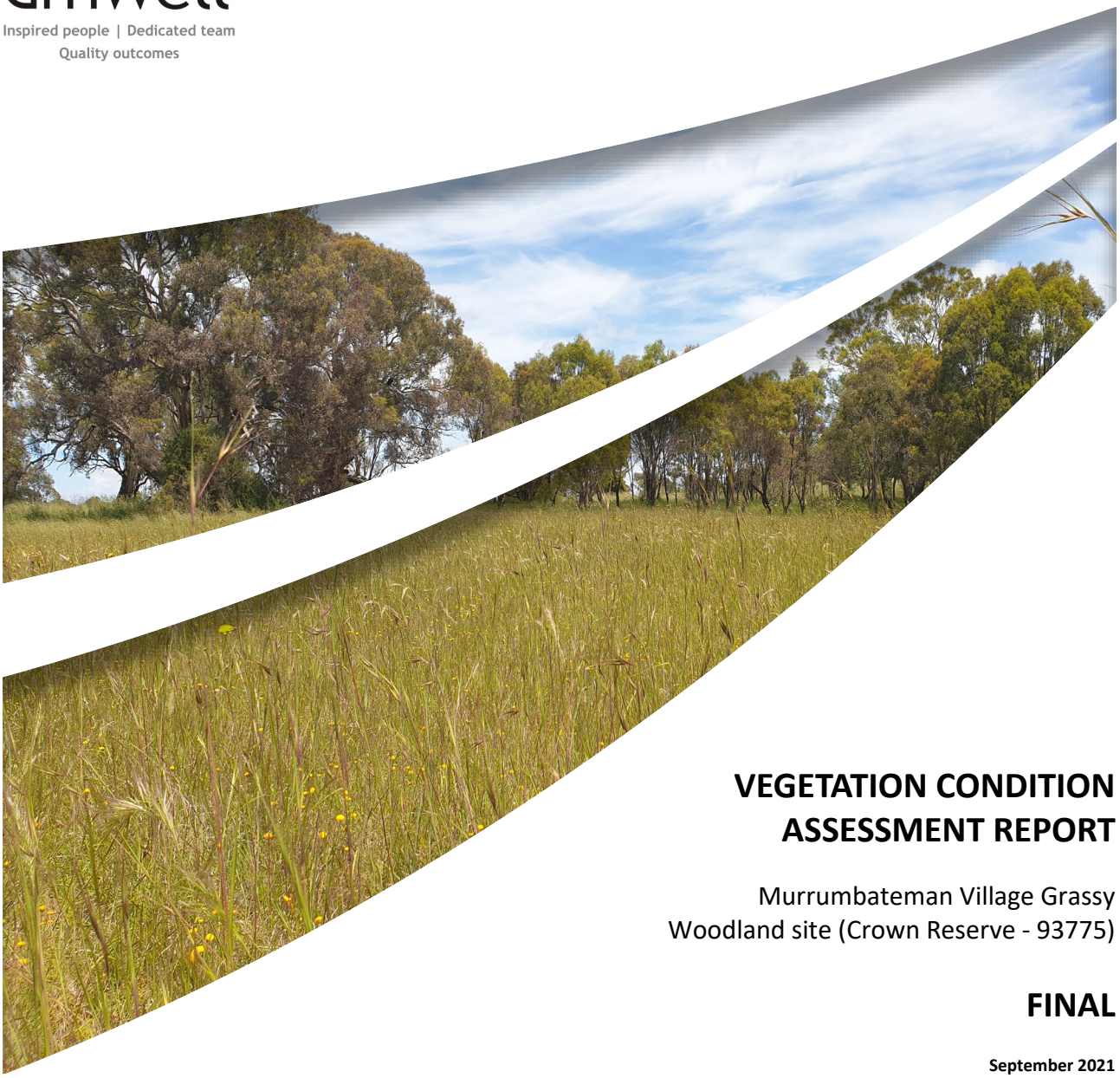

# VEGETATION CONDITION ASSESSMENT REPORT

Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)

## FINAL

**September 2021**

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## FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Murrumbateman Landcare Group

| | |
|---|---|
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| Date: | September 2021 |


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# Executive Summary

Umwelt (Australia) Pty Ltd (Umwelt) undertook a field biodiversity assessment in November 2020 at the Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775) located on the corner of West Street and Hercules Street in Murrumbateman, NSW.

The biodiversity assessment identified native woodland and derived grassland occurring as Plant Community Type (PCT) 1330 *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.* Areas of exotic grassland are also present around the peripheries of the site.

Four (4) hectares of Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion (PCT 1330) comprises a Critically Endangered Ecological Community (CEEC) meeting listing criteria and diagnostic thresholds under NSW and Commonwealth legislation at the whole site;

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* CEEC listed under the BC Act

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grasslands* CEEC listed under EPBC Act.

The NSW Critically Endangered Ecological Community BC Act listing is a candidate entity for serious and irreversible impact (SAII). This concept is fundamentally about protecting threatened entities that are most at risk of extinction from potential development (DPIE, 2019). It is estimated that less than 5% of this CEEC remains in good condition in its range, with most of this remaining in small isolated patches (DEH, 2006). This community has suffered compositional changes associated with different management practices and exposed to livestock grazing and rabbit damage (Prober and Thiele 2004; Keith 2004). High quality patches of this CEEC as identified at the site have very high biodiversity conservation value in terms of rarity and are important habitat for threatened flora and fauna species, as well as maintaining ecosystem function and providing ecosystem services in the landscape.

The Critically Endangered Ecological Community EPBC Act listing determines that the Murrumbateman Village Grassy Woodland is a Matter of National Environmental Significance (MNES) protected under national environmental law (DoE, 2013).

Very large remnant woodland trees present provide important habitat for woodland fauna. Such trees are a declining and important feature of woodland landscapes and have intrinsic values as irreplaceable landscape features due to the age of these trees. Based on confirmed BioNet records of golden sun moth, derived native grasslands in Vegetation Zone 2 and Vegetation Zone 3 are likely to support breeding habitat for these species.

The Murrumbateman Village Woodland has very high biodiversity conservation significance in terms of its rarity, importance for maintaining ecological function and providing habitat to a diversity of flora and fauna including threatened species in a highly fragmented landscape.

# 1.0 Introduction

Umwelt has been engaged by Murrumbateman Landcare Group to undertake a vegetation condition assessment of the Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775). The site is located at Lot 138 & Lot 139 DP 754900, on the corner of Hercules Street and West Street, Murrumbateman, NSW. The site is located in the South Eastern Highlands bioregion and the Murrumbateman sub-region as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995).

This vegetation condition assessment provides baseline field data on the condition and distribution of native vegetation at the site. It documents and highlights the biodiversity and conservation values at the site and establishes monitoring plots that can be used to manage and improve site values in the future.

The key aims of the project are to provide:

- a clear assessment of the site's conservation value using the Biodiversity Assessment Method (BAM) (Department of Planning, Industry and Environment (DPIE),2020) to assess vegetation integrity (VI) using plots that can be monitored over time
- clarity on the legislative status of the vegetation onsite at both the Commonwealth and state level. This comprises an assessment of native vegetation against the condition thresholds and diagnostic features to meet the criteria for any Threatened Ecological Communities (TECs) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- implications of the site's conservation status and biodiversity value in terms of constraints on any future development, ongoing site management, and recommendations for further studies/monitoring of biodiversity.

# 2.0 Methods

## 2.1 Desktop Assessment

A brief background review of existing information was undertaken to identify the existing environment potentially occurring on the site. This review included database searches, relevant ecological reports/documents pertaining to the site, property boundaries and GIS layers.

The following sources of information were consulted:

- BioNet - the Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC)
- The Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool (PMST)
- BioNet Vegetation Information System (VIS) Classification database
- Site specific documentation provided by Murrumbateman Landcare Group.

All applicable results and data were used to inform the ecological investigation.

## 2.2 Vegetation Assessment

### 2.2.1 Vegetation stratification and mapping

Regional broad-scale vegetation mapping was reviewed and updated to ensure consistency with best-practice techniques to delineate Plant Community Types (PCTs) across the site. Vegetation stratification and mapping involved the following key steps:

- review of satellite imagery to explore vegetation distribution patterns as dictated by a change in canopy texture, tone and colour, as well as topography
- review of the regional vegetation mapping sourced from South East Local Land Services Biometric vegetation map, 2014 (VIS_ID 4211) (Eco Logical Australia 2015)
- revision of vegetation community profiles and floristic delineations
- onsite ground-truthing of the vegetation map into PCTs and vegetation zones.

Field assessment to record the flora species occurring in the study area were conducted using random meanders as described by Cropper (1993) in order to capture the structural variation in vegetation communities, the variation in species diversity across the site, and to define changes in abiotic conditions (the occurrence of creek lines and past disturbances). The vegetation was delineated into PCT and stratified into vegetation zone based on condition, with focus on areas of the site supporting grassland with more than 50% native perennial cover.

Vegetation mapping was undertaken using site survey data and polygons digitised in a GIS (QGIS 3.4.15) at a scale of between 1:1,000 and 1:5,000 and not greater than 1:10,000. Coordinates of vegetation zone boundaries was recorded during site assessment with a GPS device. Mapping was undertaken with reference to aerial imagery and field data using ESRI ArcMap 10.3.

### 2.2.2 Floristic and vegetation integrity survey

Plot-based floristic vegetation surveys and vegetation integrity transects (BAM plot surveys) were conducted in accordance with Section 5.2 and 5.3 of the BAM. A BAM plot survey was carried out for each vegetation zone occurring within the Crown Reserve. All BAM plots were completed by Umwelt Senior Botanist Jonathan Carr (BAAS18009) with assistance from Annaleise Caston from Murrumbateman Landcare Group on 6 November 2020.

The locations of individual BAM plots were determined by pacing a distance into the targeted vegetation zone which would allow for the establishment of a 20 metre by 20 metre plot and a 50 metre long transect. In some instances, BAM were specifically located within areas suitable for long term monitoring plots. Within the BAM plot the following data was collected:

- Species name: Scientific and common name
- Status: Species status: native, exotic or high threat exotic
- Growth form: Growth form classes: tree, shrub, grass and grass like, forb, fern and other
- Stratum in which each species occurs
- Cover: Percent foliage cover across the plot for each species rooted in or overhanging the plot (Section 5.3.4.13 of the BAM)
- Abundance: For species with less than or equal to five per cent cover an estimate of the number of individuals or shoots of each species was recorded (Table 2 of the BAM).

The 50 metre transect survey was used to collect attributes for assessing function, including:

- Number of large trees: With reference to the appropriate large tree benchmark for each PCT
- Tree regeneration: Presence or absence of living trees with less than five centimetres diameter at breast height (DBH) over bark
- Tree stem size class: 5-9, 10-19, 20-29, 30-49, 50-79 and greater than 80 centimetres DBH
- Length of fallen logs: Total length in metres of all woody material more than 10 centimetres in diameter and more than 50 centimetres in length
- Trees with hollows: Count of the number of trees with hollows that are visible from the ground.

Litter coverage (as a percentage) was also measured from within five, one square metre sub-plots located evenly along and either side of the 50-metre transect midline. Litter was considered as plant material detached from a plant including leaves, seeds, twigs, branchlets and branches with a diameter of less than 10 centimetres and in contact with the ground. The percentage litter cover from the five sub-plots was used to generate the average percentage litter cover for the entire plot.

**Table 2.1 Adequacy of Vegetation Integrity Assessment in the Project Area and Development Footprint**

| Vegetation zone | PCT ID and name | Broad condition class | Site area (ha)* | No. of plots in site | |
|---|---|---|---|---|---|
| | | | | Required | Completed (Plot ID) |
| 1 | 1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion | Moderate/Good (Native Woodland) | 1.78 | 1 | 1 (1330.1) |
| 2 | | Moderate/Good (Native Derived Grassland | 1.44 | 1 | 1 (1330.2) |
| 3 | | Low/Moderate (Native Derived Grassland) | 0.64 | 1 | 1 (1330.3) |
| TOTAL | | | 3.86 | 3 | 3 |

* *Area numbers rounded to two decimal places.*

Each plot consisted of a 20 metre by 50 metre area used to measure functional attributes, with a 20 metre by 20 metre nested plot measuring floristic diversity (species composition and structure) and abundance. Composition, structure and function attributes were ranked against benchmark data for the relevant PCT, and a vegetation integrity score for each vegetation zone was determined using the BAM calculator (BAM-C).


Legend

- Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)
- BAM Plot Location
- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion
- Exotic Vegetation
- Dam

FIGURE 2.1

PCT allocations and BAM plot locations present within Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)

Image Source: ESRI Basemap Data source: NSW DFSI (2021)

### 2.2.3 Threatened Ecological Community Delineation Techniques

PCTs identified in the site were assessed against NSW Scientific Committee Final Determinations and Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice for TECs listed under the EPBC Act and BC Act. The following approach was used:

- comparison with the specific location requirements of the TEC
- full-floristic quadrat assessment and meandering survey to determine floristic composition and structure of each ecological community
- comparison with published species lists, including lists of 'important species' as identified on the listing advice provided by the NSW Scientific Committee and/or Commonwealth Threatened Species Scientific Committee where relevant
- comparison with habitat descriptions, including edaphic characteristics and landscape position for listed TECs
- assessment using guidelines and recovery plans published by the Commonwealth DAWE and the NSW BCD
- comparison with other assessments of TECs known or predicted to occur in the region.

### 2.2.4 Limitations

The field survey aimed to sample the site at one point in time and a comprehensive inventory of species was not made. A period of several seasons or years is often needed to identify all the species present in an area, especially as some species are only apparent at certain times of the year e.g., orchids or migratory birds and require specific weather conditions for optimum detection e.g., breeding and flowering periods. The conclusions of this vegetation condition assessment are therefore based upon available data and are indicative of the environmental condition of the site at the time of the survey.

It should be recognised that site conditions, including the presence of threatened species, can change with time. To address this limitation, the assessment has aimed to identify the presence and suitability of the habitat for threatened species.

# 3.0 Results

## 3.1 Native Vegetation

### 3.1.1 Plant Community Types

Two plant communities were recorded within the site, one comprising native vegetation and one comprising exotic vegetation as described in **Table 3.1.**

**Table 3.1 PCTs and Vegetation zones within the site**

| Vegetation zone | PCT ID and name | Condition class | Site area (ha)* |
|---|---|---|---|
| 1 | 1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion | Moderate/Good (Native Woodland) | 1.78 |
| 2 | | Moderate/Good (Native Derived Grassland | 1.44 |
| 3 | | Low/Moderate (Native Derived Grassland) | 0.64 |
| - | Exotic vegetation | Poor (Exotic Grassland) | 0.39 |
| - | Dam | - | 0.02 |
| **Total Native Vegetation** | | | **3.86** |

Native vegetation can be classified into PCTs based on its floristic composition, geological substrate, landscape position and relevant regional vegetation classification.

A total of 3.86 hectares of native vegetation were identified within the site, comprising of one native PCT, 1330 – Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion, in three condition classes. A full description of PCT 1330 is presented in **Table 3.2**. Further description of each vegetation zone, and of areas of exotic vegetation are provided in **Section 3.1.2**. A comprehensive list of the plant species recorded is provided in Appendix A and reflects the local variation of woodland and derived grassland communities at the site. The distribution of vegetation zones within the site is illustrated in **Figure 3.1**.

A total of 0.39 hectares of exotic vegetation was recorded within the site. The most common exotic perennial grass species include *Nassella trichotoma, Aira spp.*, *Briza maxima*, *Bromus molliformis* and *Paspalum dilatatum*.

**Table 3.2 PCT 1330 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion**

<table>
<tr><th>PCT Name</th><th colspan="3">PCT 1330– Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion</th></tr>
<tr><td>Vegetation formation</td><td colspan="3">Grassy Woodlands</td></tr>
<tr><td>Vegetation Class</td><td colspan="3">Southern Tableland Grassy Woodlands</td></tr>
<tr><td>PCT Percent Cleared</td><td colspan="3">94%</td></tr>
<tr><td>Vegetation Description</td><td colspan="3">Woodland with a sparse shrub layer and dense grassy groundcover. Occurs on loamy soils on undulating terrain between 500 and 900 metres on the tablelands.</td></tr>
<tr><td rowspan="5">PCT Allocation</td><td colspan="3">This vegetation is most likely to be representative of PCT 1330 for the following reasons:</td></tr>
<tr><td>Vegetation Zone 1</td><td>Vegetation Zone 2</td><td>Vegetation Zone 3</td></tr>
<tr><td>The vegetation has a woodland structure with a canopy characterised by Eucalyptus blakelyi and Eucalyptus melliodora.</td><td>The vegetation has regenerating trees characterised by Eucalyptus blakelyi and Eucalyptus melliodora.</td><td>The vegetation has no canopy but is in proximity to Zone 1 and Zone 2 and is likely to have once had characteristic tree species. There is no indication of different soil or terrain contexts which may have resulted in dominance of other canopy species.</td></tr>
<tr><td colspan="2">The shrub layer is sparse with occasionally shrub species such as Cassinia sifton.</td><td>The vegetation has no shrub layer but is in proximity to Zone 1 and is likely to have once had characteristic shrub species.</td></tr>
<tr><td colspan="3">The groundcover is generally dense dominated by diagnostic native grasses and other forbs, including Themeda triandra, Austrostipa bigeniculata, Austrostipa densiflora, Bothriochloa macra, Microlaena stipoides, Leptorhynchos squamatus, Chrysocephalum apiculatum and Bulbine bulbosa.</td></tr>
<tr><td colspan="3">The landscape position matches undulating hills on loamy soils situated between 500-900 metres AHD.</td></tr>
</table>

### 3.1.2 Vegetation Zone Descriptions

Vegetation zones are defined as relatively homogenous areas of native vegetation that are the same PCT and same broad condition state. Native vegetation within the site was classified as PCT 1330 and then mapped into three vegetation zones, with distinct condition differences as a result of past disturbance and different land use practices, as follows:

- Vegetation Zone 1 (Moderate/Good condition – native woodland), described in **Table 3.3**
- Vegetation Zone 2 (Moderate/Good condition – derived native grassland), described in **Table 3.4**
- Vegetation Zone 3 (Low/Moderate condition – derived native grassland), described in **Table 3.5.**

Plot data from three vegetation integrity plots (one plot for each vegetation zone) were used to describe vegetation zones. It should be noted that Plot 3 was established in the most disturbed location in Vegetation Zone 3 to identify key threats and inform future management actions. As a result, the description of Vegetation 3 in **Table 3.5** is not wholly representative of the vegetation zone. Random meanders in Vegetation Zone 3 strongly indicate a dominant cover of native plant species, particularly native grasses *Themeda triandra* and *Austrostipa bigeniculata*.

Percent cover is calculated for each recorded species with different growth forms in a 400 square metre plot which can exceed 100 percent cover where plant individuals overlap in the structure of the understorey. High threat weeds are vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.

**Table 3.3 Vegetation Zone 1 – PCT 1330 (Moderate/High Condition – Native Woodland)**

| Condition | Vegetation Zone 1 Moderate/Good – Native Woodland | |
|---|---|---|
| Site Area | 1.78 ha |  |
| BC Act Status | Vegetation Zone 1 conforms to critically endangered ecological community *Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* under the BC Act. Assessment against the criteria and condition thresholds is present in **Section 3.2.1**. | |
| EPBC Act Status | Vegetation Zone 1 conforms to critically endangered ecological community *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* under the EPBC Act. Assessment against the criteria and condition thresholds is present in **Section 3.2.2**. | |
| General Description | Open grassy woodland area containing numerous young and regenerating trees dominated by *Eucalyptus blakelyi* and *Eucalyptus melliodora*. It has a very sparse midstorey and predominately native ground layer dominated by perennial native grasses. This vegetation zone is distributed south of the path within the site. | |
| **Vegetation structure** | | **Percent (%) cover in 400m$^2$ plot** |
| Canopy | This vegetation zone is characterised by an overstorey primarily dominated by *Eucalyptus melliodora*, with a minor component of *Eucalyptus blakelyi.* | 15.5 |
| Midstorey | This vegetation zone has a very sparse and scattered shrub layer comprising a single *Cassinia sifton.* | 0.1 |

| Condition | Vegetation Zone 1 Moderate/Good – Native Woodland | |
|---|---|---|
| Ground layer | This vegetation zone primarily comprises areas of leaf litter with large patches of native vegetation predominantly consisting of native grasses, *Themeda triandra*, and a mix of native forbs. | 45.1 |
| Weeds | This vegetation zone has various patches of weeds mostly dominated by the grasses *Aira spp.*, *Briza maxima*, and forbs, *Hypochaeris glabra*. | 23.5 |
| High threat weeds | Four high threat weed species were recorded. *Nassella trichotoma, Hypericum perforatum, Rosa rubiginosa* and *Paspalum dilatatum* | 0.4 |

**Table 3.4 Vegetation Zone 2 – PCT 1330 (Moderate/High Condition – Derived Native Grassland)**

| Condition | Vegetation Zone 2 Moderate/Good – Derived Native Grassland | |
|---|---|---|
| Site Area | 1.44 ha |  |
| BC Act Status | Vegetation Zone 2 conforms to critically endangered ecological community *Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* under the BC Act. Assessment against the criteria and condition thresholds is present in **Section 3.2.1**. | |
| EPBC Act Status | Vegetation Zone 2 conforms to critically endangered ecological community *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* under the EPBC Act. Assessment against the criteria and condition thresholds is present in **Section 3.2.2**. | |
| General Description | Open grassy woodland area containing numerous young trees and regenerating trees dominated by *Eucalyptus blakelyi* and *Eucalyptus melliodora*. This vegetation zone lacks mature trees. It has a very sparse midstorey and predominately native ground layer dominated by perennial native grasses. This vegetation zone is distributed south of the path within the Project Area. | |
| **Vegetation structure** | | **Percent (%) cover in 400m2 plot** |
| Canopy | This vegetation zone is characterised by an overstorey dominated by *Eucalyptus blakelyi* regrowth. | 0.2 |
| Midstorey | This vegetation zone has a very sparse midstorey layer. Shrubs are absent. | 0 |

| Condition | Vegetation Zone 2 Moderate/Good – Derived Native Grassland | |
|---|---|---|
| Ground layer | This vegetation zone primarily comprises areas of leaf litter with large patches of native vegetation predominantly consisting of native grasses, *Themeda triandra*, *Austrostipa densiflora*, and native forbs, *Bulbine bulbosa*, *Leptorhynchos squamatus.* | 104.4 |
| Weeds | This vegetation zone has low weed cover mainly consisting of grasses, *Briza maxima*, and forbs, *Hypochaeris glabra*. | 3.9 |
| High threat weeds | No high threat weeds were recorded | 0 |

**Table 3.5 Vegetation Zone 3 – PCT 1330 (Low/Moderate – Native Grassland)**

| Condition | Vegetation Zone 3 Low/Moderate – Derived Native Grassland | |
|---|---|---|
| Site Area | 0.64 ha |  |
| BC Act Status | Vegetation Zone 3 conforms to critically endangered ecological community *Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* under the BC Act. Assessment against the criteria and condition thresholds is present in **Section 3.2.1**. | |
| EPBC Act Status | Vegetation Zone 3 conforms to critically endangered ecological community *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* under the EPBC Act. Assessment against the criteria and condition thresholds is present in **Section 3.2.2**. | |
| General Description | Open grassy woodland area lacking both mature trees and regrowth. It lacks a midstorey, and has a ground layer dominated by native grasses, although patches dominated by exotic perennial grasses are present. This vegetation zone is distributed north of the path within the Project Area. | |
| **Vegetation structure** | | **Percent (%) cover in 400m2 plot** |
| Canopy | A canopy is absent in this vegetation zone. No *Eucalyptus* regrowth is present. | 0 |
| Midstorey | This vegetation zone has a very sparse midstorey layer. Shrubs are absent. | 0 |

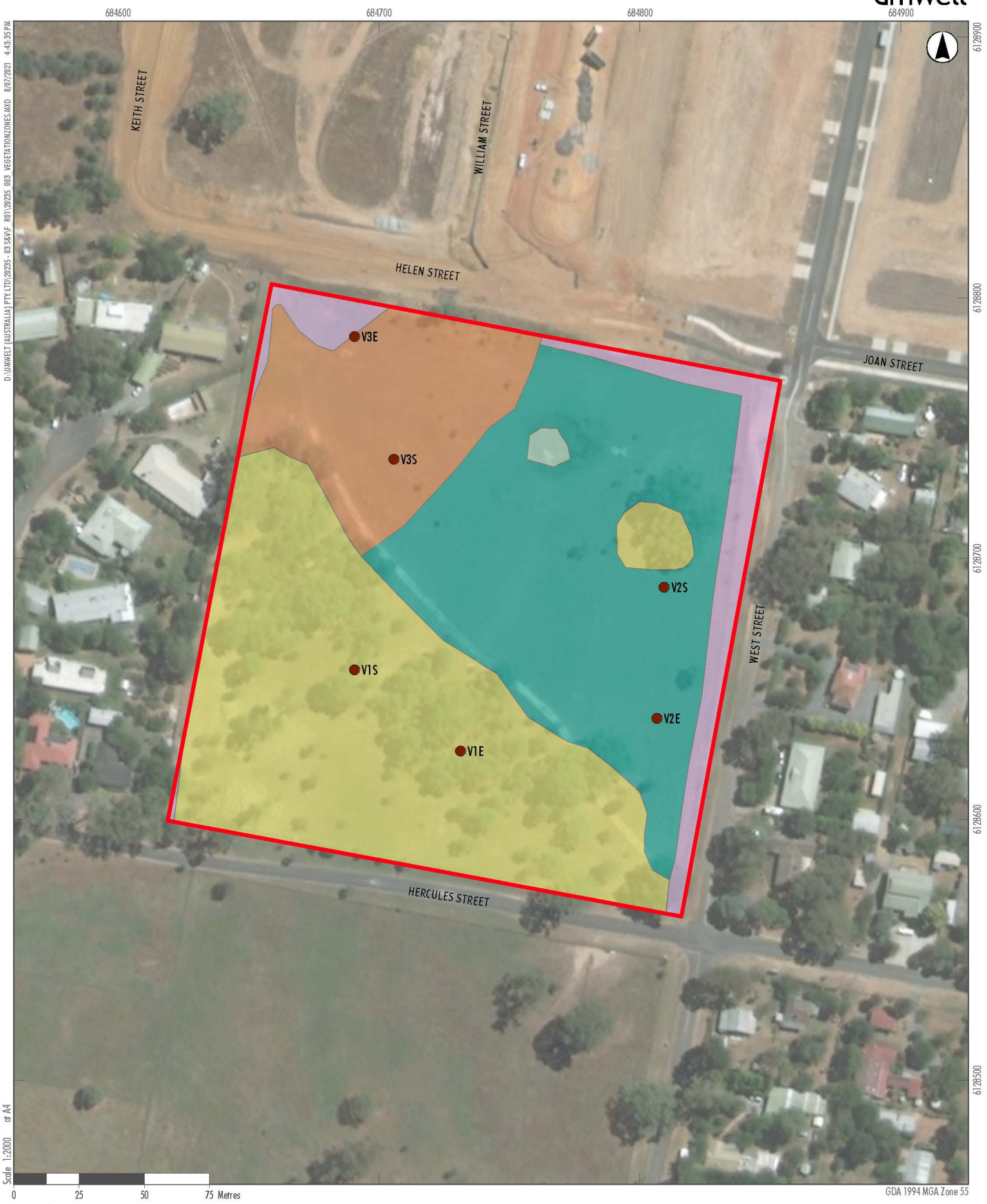
| Condition | Vegetation Zone 3 Low/Moderate – Derived Native Grassland | |
|---|---|---|
| Ground layer | This vegetation zone primarily comprises native grasses, *Themeda triandra*, and native forbs such as *Drosera peltata with* areas of leaf litter and scattered large patches of exotic perennial grasses. | 26.9 |
| Weeds | This vegetation zone has high weed cover mainly consisting of grasses, *Paspalum dilatatum*, *Nassella trichotoma*, *Briza sp.*, and forbs, *Hypochaeris spp.*, *Trifolium spp*. | 88.6 |
| High threat weeds | No high threat weeds were recorded | 40.2 |

### 3.1.3 Vegetation Integrity Score

The results of vegetation integrity scores produced by the BAM calculator (under the Stewardship module) is summarised as the observed mean of all plots for composition, structure and function each vegetation zone in **Table 3.6**.

**Table 3.6 Vegetation integrity scores for each vegetation zone**

| Veg Zone | PCT<br>*Condition Class* | Composition | Structure | Function | Current VI Score |
|---|---|---|---|---|---|
| 1 | PCT1330<br>*Moderate/High Condition Native Woodland* | 74.8 | 84.2 | 53.5 | **69.3** |
| 2 | PCT1330<br>*Moderate/High Condition Derived Native Grassland* | 74.6 | 63 | 30 | **51.5** |
| 3 | PCT1330<br>*Low/Moderate – Derived Native Grassland* | 51.6 | 51.1 | 15 | **31.4** |
| - | Exotic Vegetation<br>*(no VI plot completed)* | - | - | - | **-** |




Legend

- Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)
- BAM Plot Location
- Vegetation Zone 1
- Vegetation Zone 2
- Vegetation Zone 3
- Exotic Vegetation
- Dam

FIGURE 3.1

Vegetation Zones within Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)

Image Source: ESRI Basemap Data source: NSW DFSI (2021)

## 3.2 Threatened Ecological Communities

### 3.2.1 NSW BC Act Listed TECs

Each native vegetation zone was assessed against the key characteristics for the BC Act listed *Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* Critically Endangered Ecological Community (CEEC) in the White Box-Yellow Box-Blakely's Red Gum Woodland Guidelines (DECC, 2007) and the Final Determination (NSW TSSC, 2020) as shown in Table 3-7. The assessment determined that vegetation zones 1 and 2 conform to the CEEC on the basis that it is dominated by *Eucalyptus blakelyi* and *Eucalyptus melliodora* and has a native understorey. Vegetation zone 3 also conforms to the CEEC on that basis it is predominantly dominated by native understorey species characteristic of the CEEC, and would have at some time possessed *Eucalyptus blakelyi, Eucalyptus albens,* and *Eucalyptus melliodora.* Given the past disturbance history at the site, it is important to note that remnant derived native grassland (Zone 2 and 3) would (under appropriate management) respond to assisted natural regeneration where natural soil and associated seedbank are likely to be mostly or partially intact, such that the CEEC would be able to recover.

**Table 3.7 Assessment of key characteristics for BC Act listed White Box - Yellow Box – Blakely's Red Gum Woodland TEC**

| Key Characteristics | Response | Zone 1 | Zone 2 | Zone 3 |
|---|---|---|---|---|
| **Is the site on the tablelands or western slopes of NSW?** | The site is located on the NSW South Eastern Highlands bioregion. | Yes | Yes | Yes |
| **Does the site contain, or would the site have recently been likely to contain White Box, Yellow Box or Blakely's Red Gum?** | Zone 1 and 2 consists of Yellow Box, or Blakely's Red Gum.<br>Zone 3 is primarily native grassland, however, due to the position in the landscape and proximity to Zone 1 and 2, it's likely Zone 3 historically contained Yellow Box, or Blakely's Red Gum. | Yes | Yes | Yes |
| **Is the ground layer mainly grassy?** | Yes, all zones consist of a grassy ground layer with a high proportion of *Themeda triandra*. | Yes | Yes | Yes |
| **If the site has been degraded, is the potential for assisted natural regeneration of the tree layer or the understorey (e.g., by removing grazing, weeds, etc)?** | The site has been degraded primarily through grazing and has a small area with construction fill in Zone 3.<br>Evidence of regeneration is present on Zone 1 and 2 with young Yellow Box, or Blakely's Red Gum.<br>Zone 3 has no natural Eucalyptus regeneration.<br>All zones have potential to regenerate from the ground layer. | Yes | Yes | Yes |
| **BC Act listed Yellow Box – Blakely's Red Gum Woodland** | | **Yes** | **Yes** | **Yes** |

### 3.2.2 Commonwealth EPBC Act Listed TECs

Each native vegetation zone was assessed against criteria for *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (*DOE, 2006) listed as critically endangered under the EPBC Act. As shown in **Table 3-8**, Vegetation Zone 1 and Vegetation Zone 2 meet listing criteria for *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC*.* Although plot assessments in Vegetation Zone 3 identified >50% perennial exotic grass cover, the majority of the zone supported native grassland, and is considered part of the same continuous patch. Therefore, the whole patch comprising all vegetation zones is assessed against the criteria and meets the listing criteria.

**Table 3.8 Assessment against EPBC Act listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland**

| Criteria | Response | Zones | | | Whole patch* |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | |
| **Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box, or Blakely's Red Gum?** | Zone 1 contains woodland comprising Yellow Box, or Blakely's Red Gum.<br>Zone 2 contains derived grassland with *Eucalyptus blakelyi* regrowth.<br>Zone 3 contains exotic grassland with no *Eucalyptus spp.* regrowth. | Yes | Yes | Yes | Yes |
| **Does the patch have a predominantly native understorey?** | Zones 1, 2 and 3 have a predominately native understorey with at least 50% of native perennial vegetation cover. While the plot completed for Zone 3 has >50% exotic perennial groundcover, this was located in the most degraded location for long term monitoring purposes and is not representative | Yes | Yes | Yes | Yes |
| **Is the patch 0.1 ha or greater in size?** | All zones are part of the same patch which are greater than 0.1 ha. | Yes | Yes | Yes | Yes |
| **There are 12 or more native understorey species present (excluding grasses)?** | Zone 1 and 2 have more than the 12 native understorey species in a 20x 20 m plot.<br>Zone 3 has 11, less than the 12 native understorey species in a 20 x 20 m plot but is part of a single continuous patch of native vegetation which includes Zones 1 and 2. | Yes | Yes | Yes | Yes |
| **Is there at least one important species?** | All zones have at least one important species (*Themeda triandra*). | Yes | Yes | Yes | Yes |
| **Is the patch 2 ha greater in size, has an average of 20 or more mature trees per hectare, or has regeneration of the dominant over storey eucalypts?** | Zone 1 is greater than 2 ha in size and has an average of <20 or more mature trees per hectare but has evidence of overstorey regeneration.<br>Zone 3 is less than 2 ha but does not have any mature trees or evidence of overstorey regeneration. | - | - | - | Yes (Zone 1 and 2) |
| **EPBC Act listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland** | | **Yes** | | | |
| *Patch containing a continuous area of the ecological community with an understorey that is predominately native | | | | | |

## 3.3 Threatened Species

No threatened were identified on site during field surveys.

Ecologists were aware that golden sun moth (*Synemon plana*) (Endangered BC Act, Critically Endangered EPBC Act) is present at the Murrumbateman Grassy Woodland, as recorded by Landcare and BIONET, Atlas of Living Australia and Canberra Nature Map. Golden sun moth are dependent on native grasslands, and, due to their restricted flying range, are likely to be breeding in suitable vegetation within the Murrumbateman Village Grassy Woodland.

## 3.4 Habitat Features

The main habitat feature within the Crown Reserve is large mature trees. Whilst only one hollow-bearing tree was detected within the site, many exceptionally large trees were found on site and it appeared as if hollows were beginning to form. The hollow identified was a large hollow (approximately 30 centimetres), it must be noted, however, that the branch supporting this hollow has fallen from the tree, splitting the hollow. This has made the hollow less viable birds but may still be utilised by microbats and reptiles.

A total of 15 large trees (≥50 centimetres) were recorded within the Crown Reserve, seven of which were over 80 centimetres. The presence of small hollows (<5 centimetres) cannot be ruled-out. It is possible that trees with a diameter at breast height (DBH) of ≥80 centimetres could feature small hollows, but due to the size of the tree and angle of the hollow, they remained undetected. Large trees of this size are still important habitat feature, even without hollows, as they can provide roosting and foraging habitat for a wide variety of birds and microbats. The location of large trees over 80 centimetres DBH is presented with **Figure 3.2**.


Legend

- Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)
- Large Tree (DBH > 80cm) and contains a hollow
- Large Tree (DBH > 80cm)

FIGURE 3.2

Large Trees within Murrumbateman Village Grassy Woodland site (Crown Reserve - 93775)

Image Source: ESRI Basemap Data source: NSW DFSI (2021)

## 3.5 Implications for Future Development

### 3.5.1 NSW legislation

The Biodiversity Offsets Scheme (BOS) is the framework, established under the BC Act, for offsetting unavoidable impacts on biodiversity from development with biodiversity gains through landholder conservation agreements. Under the BOS, applications for development or clearing approvals must set out how impacts on biodiversity will be avoided and minimised, with the remaining residual impacts offset with the requirements of the scheme. Entry to the BOS is triggered by developments, projects and activities that meet certain thresholds for significant impacts on biodiversity, or on an opt-in basis.

The BOS applies to:

- developments assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (otherwise known as local development) that triggers the BOS clearing or Biodiversity Values Map threshold, or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the BC Act
- state significant development (SSD) and state significant infrastructure (SSI) projects, unless the Secretary of the DPIE and the environment agency head determine that the project is not likely to have a significant impact
- biodiversity certification proposals
- clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold and does not require development consent
- clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013* (LLS Act).

Activities assessed and determined under Part 5 of the EP&A Act (generally, proposals by government entities), are not required to be assessed under the BOS however, relevant self-determining authorities may do so.

Biodiversity assessments under the BOS must be supported by a BAM assessment and the preparation of Biodiversity Development Assessment Report (BDAR). The BAM is a highly prescribed survey and assessment methodology that:

- provides a consistent method for the assessment of biodiversity values from a proposed development or activity
- guidance on how a proponent can avoid and minimise potential biodiversity impacts
- the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity.

The BAM assesses direct, indirect, and prescribed impacts of a proposed development on biodiversity values. Biodiversity credits are required to offset direct impacts (including clearing for asset protection zones); biodiversity credits may also be required to offset indirect and prescribed impacts, depending on the scale and nature of such impacts, at the request of relevant government agencies. The cost of sourcing biodiversity offset credits can be expensive and this cost should be factored into any cost-benefit analysis of proposed development.

Depending on the extent of clearing of native vegetation that would occur, development on the site may trigger the BOS, thus the need for a BAM assessment and BDAR.

The concept of serious and irreversible impacts (SAII) is a central component of the BOS. It is fundamentally about protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities. The BC Act and the LLS Act imposes various obligations on decision-makers in relation to impacts on biodiversity values that are at risk of a serious and irreversible impact. These obligations generally require a decision-maker to determine whether or not any of the residual impacts of a proposed development, activity, biodiversity certification or vegetation clearing on biodiversity values (that is, the impacts that would remain after any proposed avoid or mitigate measures have been taken) are serious and irreversible.

Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is an entity which has been identified by DPIE as one that is at risk of serious and irreversible impact. As such, a BDAR would need to include an assessment on SAII in accordance with Section 9.1 of the BAM. If an assessment found that a development would likely pose an SAII, the decision maker may be required to refuse to grant approval / development consent depending upon the planning pathway. Specifically:

- the decision maker for Part 4 developments, and approvals for clearing under the LLS Act or State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 are required to refuse approval/development consent
- the decision maker for Part 5 activities, SSI and SSD, and biodiversity certification is required to take likely SAII into consideration and determine whether additional and appropriate measures would minimise impacts.

The environmental impact of development proposals that do not exceed the BOS thresholds and will not otherwise have a significant impact on biodiversity values as assessed by the test of significance will continue to be assessed under section 4.15 of the EP&A Act.

### 3.5.2 Commonwealth legislation

The EPBC Act is the Commonwealth Government's primary piece of environmental Biodiversity assessment legislation and is administered by the DAWE. It is designed to protect national environmental assets, known as Matters of National Environmental Significance (MNES), which include threatened species of flora and fauna, endangered ecological communities and migratory species, as well as other protected matters. Among other things, it defines the categories of threat for threatened flora and fauna, identifies key threatening processes and provides for the preparation of recovery plans for threatened flora, fauna and communities.

Actions that adversely affect MNES may be deemed to be a controlled action under the EPBC Act. The significance of the proposed action on MNES can be determined through a self-assessment using *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (Department of the Environment, Water, Heritage and the Arts, 2013). Impacts assessed as having a significant impact should be referred to DAWE under the EPBC Act for assessment as to the whether the proposal is a controlled action.

All native vegetation on site conforms to the diagnostic criteria and condition thresholds for the *EPBC Act* listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.* If development is likely to take place within the site a referral to the relevant federal minister for development is likely to be warranted.

# 4.0 Conclusion

Umwelt has carried out a vegetation assessment within the Murrumbateman Village Grassy Woodland site (Crown Reserve – 93775) in order to provide a baseline dataset on the condition and distribution of native vegetation within the site. Field surveys were carried out over two day and involved mapping and classifying vegetation into plant community types and condition class, and an assessment of habitat value for threatened and protected flora and fauna species.

Vegetation Zone 1 is of high conservation value as it represents White Box-Yellow Box-Blakely's Red Gum Grassy Woodland in good condition. Vegetation Zone 1 supports mature trees, a hollow, regrowth, and a high abundance of native forbs and grasses. It meets the benchmark threshold for listing as *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the BC Act and *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the EPBC Act.

Vegetation Zone 2 supports derived native grassland in good condition. Vegetation Zone 2 supports *Eucalyptus* regrowth that could help it transition from Derived Native Grassland into Box Gum Grassy Woodland. It meets the benchmark threshold for listing as *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the BC Act and *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the EPBC Act.

Vegetation Zone 3 supports derived native grassland with patches of perennial exotic grasses and is in low to moderate condition. It is eligible for listing as *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the BC Act as it is part of a larger continuous patch of native vegetation, and is derived from White Box, Yellow Box or Blakely's Red Gum. Lacking *Eucalyptus* regrowth. While the sampled location within this vegetation zone is marginal with respect to condition thresholds, the broader zone and vegetation patch meet diagnostic criteria and condition thresholds for inclusion in *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the EPBC Act.

Based on confirmed BioNet records of golden sun moth, derived native grasslands in Vegetation Zone 2 and Vegetation Zone 3 are likely to support breeding habitat for these species. Large remnant woodland trees in Vegetation Zone 1, are likely to provide important habitat refugia and contribute to landscape connectivity for woodland fauna. Such trees are a declining and important feature of woodland landscapes and have intrinsic values as irreplaceable landscape features due to the age of these trees.

When considered as a single continuous patch, all areas of native vegetation in Murrumbateman Village Grassy Woodland meets the minimum criteria for listing under both NSW and Commonwealth legislation. The impacts of future development on the site would need to be assessed in accordance with the provisions of the BC Act and EPBC Act. The *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* is of high conservation value given its status under both Act, and therefore poses a high level of constraint on the site.

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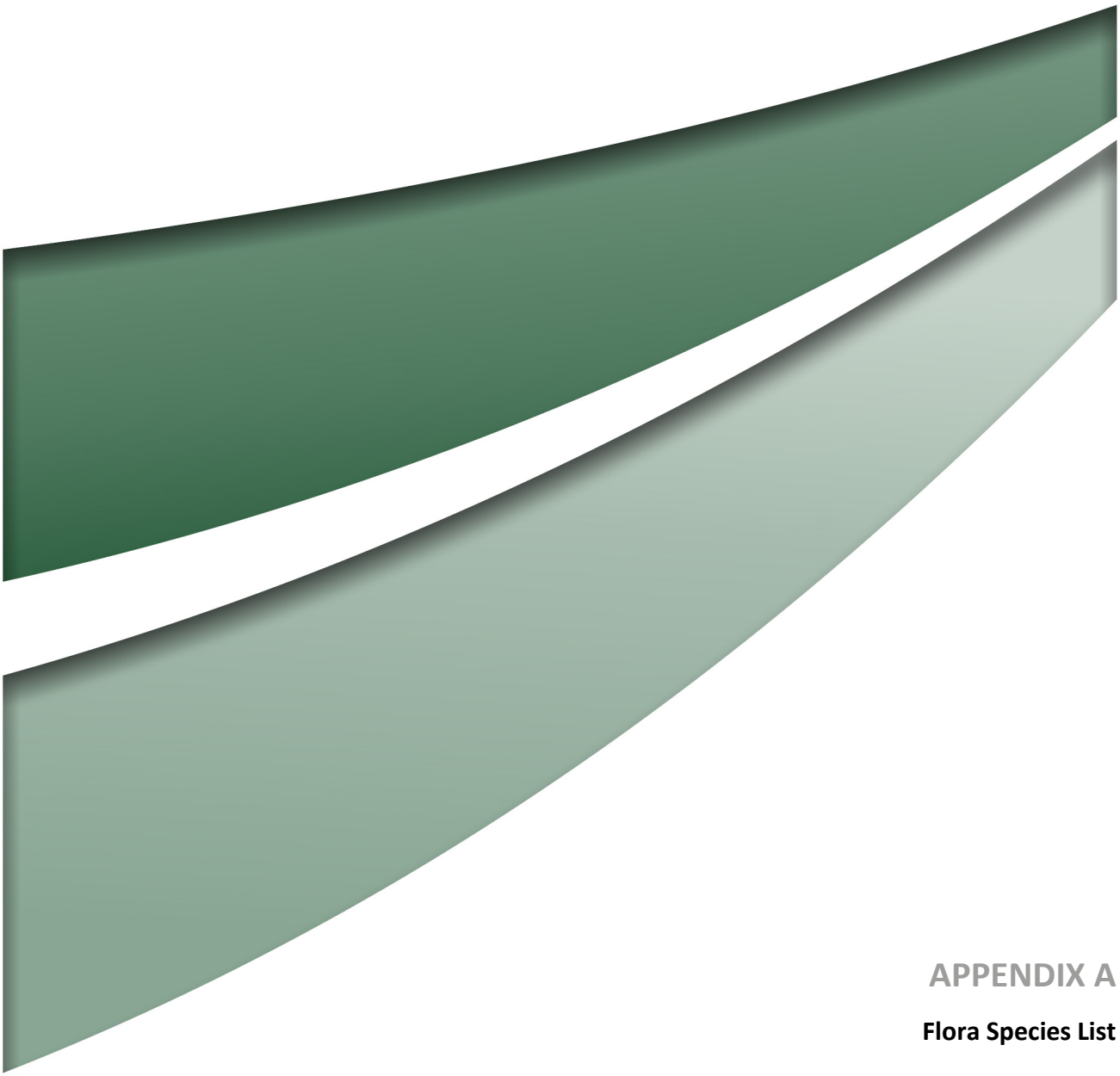


# APPENDIX A

**Flora Species List**

## Flora Species List

The following list shown was developed from surveys of the site by Umwelt. It includes all species of vascular plants observed during the survey on the 6 November 2020. It is acknowledged that the list is not comprehensive, as not all species are readily detected at any one time of the year. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

- sp. specimens that are identified to genus level only.

The following abbreviations or symbols are used in the list:

- asterisk (*) denotes species non-native species
- subsp. subspecies
- var. variety.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002) and Wheeler et al. (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2018), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

## Appendix 1 Vegetation Zone 1 floristic data

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Anthericaceae | *Tricoryne elatior* | Yellow Autumn-lily | 0.1 | 100 | - | Forb (FG) | No |
| Apiaceae | *Eryngium ovinum* | Blue Devil | 0.1 | 1 | - | Forb (FG) | No |
| Asphodelaceae | *Bulbine bulbosa* | Bulbine Lily | 5 | 1,000 | - | Forb (FG) | No |
| Asteraceae | *Cassinia sifton* | Sifton Bush | 0.1 | 1 | - | Shrub (SG) | No |
| Asteraceae | *Centaurea sp.* | Thistle | 0.1 | 50 | * | N/A | No |
| Asteraceae | *Cirsium vulgare* | Spear Thistle | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Euchiton sphaericus* | Star Cudweed | 0.1 | 30 | - | Forb (FG) | No |
| Asteraceae | *Hypochaeris glabra* | Smooth Catsear | 15 | 2,000 | * | N/A | No |
| Asteraceae | *Hypochaeris radicata* | Catsear | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Lactuca serriola* | Prickly Lettuce | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Leptorhynchos squamatus* | Scaly Buttons | 0.1 | 1 | - | Forb (FG) | No |
| Asteraceae | *Solenogyne dominii* | - | 0.1 | 200 | - | Forb (FG) | No |
| Asteraceae | *Triptilodiscus pygmaeus* | Common Sunray | 0.1 | 100 | - | Forb (FG) | No |
| Brassicaceae | *Sisymbrium sp.* | - | 0.1 | 1 | * | N/A | No |
| Campanulaceae | *Wahlenbergia communis* | Tufted Bluebell | 0.5 | 300 | - | Forb (FG) | No |
| Campanulaceae | *Wahlenbergia luteola* | Bluebell | 0.2 | 100 | - | Forb (FG) | No |
| Campanulaceae | *Wahlenbergia sp.* | Bluebell | 0.3 | 300 | - | Forb (FG) | No |
| Clusiaceae | *Hypericum perforatum* | St. Johns Wort | 0.1 | 5 | * | N/A | HTE |
| Cyperaceae | *Carex inversa* | Knob Sedge | 0.1 | 500 | - | Grass & grasslike (GG) | No |
| Fabaceae (Faboideae) | *Desmodium varians* | Slender Tick-trefoil | 0.2 | 300 | - | Other (OG) | No |
| Fabaceae (Faboideae) | *Medicago spp.* | A Medic | 0.1 | 100 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium arvense* | Haresfoot Clover | 0.1 | 20 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium sp. 1* | A Clover | 0.1 | 100 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium sp. 2* | A Clover | 0.1 | 5 | * | N/A | No |

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Geraniaceae | *Geranium solanderi* | Native Geranium | 0.2 | 100 | - | Forb (FG) | No |
| Goodeniaceae | *Goodenia pinnatifida* | Scrambled Eggs | 2 | 1,000 | - | Forb (FG) | No |
| Lomandraceae | *Lomandra filiformis* | Wattle Matt-rush | 0.1 | 10 | - | Grass & grasslike (GG) | No |
| Myrtaceae | *Eucalyptus blakelyi* | Blakely's Red Gum | 2 | 5 | - | Tree (TG) | No |
| Myrtaceae | *Eucalyptus melliodora* | Yellow Box | 13.5 | 18 | - | Tree (TG) | No |
| Oxalidaceae | *Oxalis sp.* | - | 0.1 | 200 | - | Forb (FG) | No |
| Phormiaceae | *Dianella longifolia* | Blueberry Lily | 0.2 | 4 | - | Forb (FG) | No |
| Plantaginaceae | *Plantago lanceolata* | Lamb's Tongue | 0.1 | 200 | * | N/A | No |
| Poaceae | *Aira sp.* | A Hairgrass | 2 | 1,000 | * | N/A | No |
| Poaceae | *Austrostipa bigeniculata* | Yanganbil | 1 | 500 | - | Grass & grasslike (GG) | No |
| Poaceae | *Bothriochloa macra* | Red Grass | 0.2 | 20 | - | Grass & grasslike (GG) | No |
| Poaceae | *Briza maxima* | Quaking Grass | 1 | 1,000 | * | N/A | No |
| Poaceae | *Bromus molliformis* | Soft Brome | 0.1 | 30 | * | N/A | No |
| Poaceae | *Bromus sp.* | A Brome | 0.1 | 5 | * | Grass & grasslike (GG) | No |
| Poaceae | *Elymus scaber* | Common Wheatgrass | 0.1 | 300 | - | Grass & grasslike (GG) | No |
| Poaceae | *Lolium perenne* | Perennial Ryegrass | 0.5 | 300 | * | N/A | No |
| Poaceae | *Nassella trichotoma* | Serrated Tussock | 0.1 | 5 | * | N/A | HTE |
| Poaceae | *Paspalum dilatatum* | Paspalum | 0.1 | 10 | * | N/A | HTE |
| Poaceae | *Phalaris aquatica* | Phalaris | 3 | 300 | * | N/A | No |
| Poaceae | *Rytidosperma sp. 1* | - | 0.3 | 200 | - | Grass & grasslike (GG) | No |
| Poaceae | *Rytidosperma sp. 2* | - | 3 | 1,000 | - | Grass & grasslike (GG) | No |

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Poaceae | *Rytidosperma sp. 3* | - | 0.1 | 5 | - | Grass & grasslike (GG) | No |
| Poaceae | *Themeda triandra* | - | 30 | 200 | - | Grass & grasslike (GG) | No |
| Poaceae | *Vulpia sp.* | Rat's-tail Fescue | 0.5 | 1,000 | * | N/A | No |
| Polygonaceae | *Rumex brownii* | Swamp Dock | 0.1 | 1 | - | Forb (FG) | No |
| Rosaceae | *Acaena ovina* | Acaena | 0.2 | 100 | - | Forb (FG) | No |
| Rosaceae | *Rosa rubiginosa* | Sweet Briar | 0.1 | 1 | * | N/A | HTE |
| Rosaceae | *Rubus fruticosus sp. agg.* | Blackberry complex | 0.1 | 1 | * | N/A | No |
| Rubiaceae | *Asperula conferta* | Common Woodruff | 0.2 | 200 | - | Forb (FG) | No |
| Rubiaceae | *Asperula scoparia* | Prickly Woodruff | 0.1 | 200 | - | Forb (FG) | No |
| Rubiaceae | *Galium sp.* | - | 0.1 | 1 | * | Forb (FG) | No |
| Scrophulariaceae | *Linaria pelisseriana* | Pelisser's Toadflax | 0.1 | 1 | * | N/A | No |

## Appendix 2 Vegetation Zone 2 floristic data

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Anthericaceae | *Arthropodium minus* | Small Vanilla Lily | 0.1 | 50 | - | Forb (FG) | No |
| Anthericaceae | *Thysanotus tuberosus* | Common Fringe-lily | 0.1 | 4 | - | Forb (FG) | No |
| Anthericaceae | *Tricoryne elatior* | Yellow Autumn-lily | 0.1 | 300 | - | Forb (FG) | No |
| Apiaceae | *Eryngium ovinum* | Blue Devil | 0.2 | 10 | - | Forb (FG) | No |
| Asphodelaceae | *Bulbine bulbosa* | Bulbine Lily | 10 | 2,000 | - | Forb (FG) | No |
| Asteraceae | *Centaurea sp.* | Thistle | 0.1 | 100 | * | N/A | No |
| Asteraceae | *Chrysocephalum apiculatum* | Common Everlasting | 3 | 1,000 | - | Forb (FG) | No |
| Asteraceae | *Cymbonotus lawsonianus* | Bear's Ear | 0.3 | 200 | - | Forb (FG) | No |
| Asteraceae | *Euchiton sp.* | A Cudweed | 0.1 | 10 | - | Forb (FG) | No |
| Asteraceae | *Hypochaeris glabra* | Smooth Catsear | 0.1 | 200 | * | N/A | No |
| Asteraceae | *Hypochaeris radicata* | Catsear | 0.1 | 50 | * | N/A | No |
| Asteraceae | *Leptorhynchos squamatus* | Scaly Buttons | 50 | 2,000 | - | Forb (FG) | No |
| Asteraceae | *Sonchus oleraceus* | Common Sowthistle | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Tolpis barbata* | Yellow Hawkweed | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Triptilodiscus pygmaeus* | Common Sunray | 1 | 300 | - | Forb (FG) | No |
| Boraginaceae | *Cynoglossum sp.* | - | 0.1 | 20 | - | Forb (FG) | No |
| Campanulaceae | *Wahlenbergia communis* | Tufted Bluebell | 0.1 | 100 | - | Forb (FG) | No |
| Campanulaceae | *Wahlenbergia sp.* | Bluebell | 0.2 | 500 | - | Forb (FG) | No |
| Colchicaceae | *Wurmbea dioica* | Early Nancy | 0.5 | 300 | - | Forb (FG) | No |
| Crassulaceae | *Crassula sieberiana* | Australian Stonecrop | 0.1 | 300 | - | Forb (FG) | No |
| Cyperaceae | *Carex inversa* | Knob Sedge | 0.1 | 5 | - | Grass & grasslike (GG) | No |

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Cyperaceae | *Schoenus apogon* | Fluke Bogrush | 0.1 | 200 | - | Grass & grasslike (GG) | No |
| Droseraceae | *Drosera peltata* | A Sundew | 2 | 2,000 | - | Forb (FG) | No |
| Fabaceae (Faboideae) | *Desmodium varians* | Slender Tick-trefoil | 0.1 | 50 | - | Other (OG) | No |
| Fabaceae (Faboideae) | *Glycine tabacina* | Variable Glycine | 0.1 | 5 | - | Other (OG) | No |
| Fabaceae (Faboideae) | *Medicago sp.* | A Medic | 0.5 | 1,000 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium angustifolium* | Narrow-leaved Clover | 0.1 | 20 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium arvense* | Haresfoot Clover | 0.2 | 500 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium sp.* | A Clover | 0.2 | 200 | * | N/A | No |
| Geraniaceae | *Geranium neglectum* | - | 0.5 | 200 | - | Forb (FG) | No |
| Geraniaceae | *Geranium solanderi* | Native Geranium | 0.5 | 1,000 | - | Forb (FG) | No |
| Goodeniaceae | *Goodenia pinnatifida* | Scrambled Eggs | 0.2 | 200 | - | Forb (FG) | No |
| Juncaceae | *Luzula densiflora* | Woodrush | 0.1 | 50 | - | Grass & grasslike (GG) | No |
| Juncaceae | *Luzula sp.* | - | 0.1 | 500 | - | Grass & grasslike (GG) | No |
| Lomandraceae | *Lomandra filiformis* | Wattle Matt-rush | 0.1 | 50 | - | Grass & grasslike (GG) | No |
| Myrtaceae | *Eucalyptus blakelyi* | Blakely's Red Gum | 0.2 | 5 | - | Tree (TG) | No |
| Orchidaceae | *Microtis sp.* | - | 0.2 | 1000 | - | Forb (FG) | No |
| Orchidaceae | *Thelymitra sp.* | - | 0.1 | 500 | - | Forb (FG) | No |
| Oxalidaceae | *Oxalis sp.* | - | 0.1 | 50 | - | Forb (FG) | No |
| Poaceae | *Aira sp.* | A Hairgrass | 0.5 | 1,000 | * | N/A | No |
| Poaceae | *Austrostipa densiflora* | Foxtail Speargrass | 30 | 2000 | - | Grass & grasslike (GG) | No |
| Poaceae | *Avena fatua* | Wild Oats | 0.1 | 50 | * | N/A | No |
| Poaceae | *Briza maxima* | Quaking Grass | 0.5 | 1,000 | * | N/A | No |
| Poaceae | *Briza minor* | Shivery Grass | 0.2 | 500 | * | N/A | No |

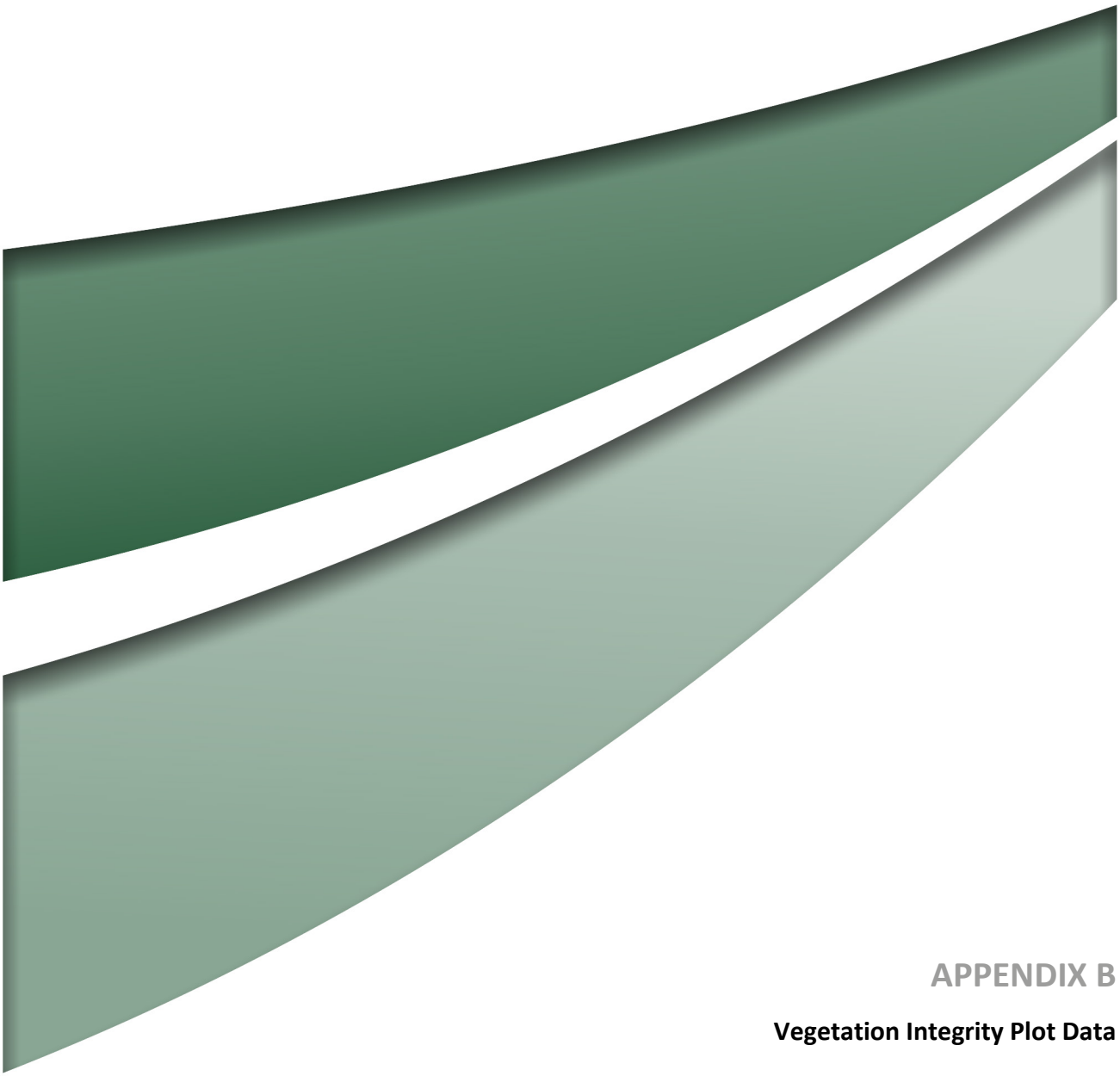
| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Poaceae | *Elymus scaber* | Common Wheatgrass | 0.1 | 50 | - | Grass & grasslike (GG) | No |
| Poaceae | *Rytidosperma sp.* | - | 1 | 300 | - | Grass & grasslike (GG) | No |
| Poaceae | *Themeda triandra* | - | 95 | 2,000 | - | Grass & grasslike (GG) | No |
| Poaceae | *Vulpia sp.* | Rat's-tail Fescue | 1 | 500 | * | N/A | No |
| Polygonaceae | *Persicaria prostrata* | Creeping Knotweed | 0.1 | 10 | - | Forb (FG) | No |
| Polygonaceae | *Rumex brownii* | Swamp Dock | 0.1 | 10 | - | Forb (FG) | No |
| Pteridaceae | *Cheilanthes sieberi* | Rock Fern | 0.1 | 20 | - | Fern (EG) | No |
| Rubiaceae | *Asperula conferta* | Common Woodruff | 0.1 | 500 | - | Forb (FG) | No |
| Rubiaceae | *Asperula scoparia* | Prickly Woodruff | 0.1 | 30 | - | Forb (FG) | No |
| Rubiaceae | *Galium gaudichaudii* | Rough Bedstraw | 0.1 | 500 | - | Forb (FG) | No |
| Scrophulariaceae | *Linaria pelisseriana* | Pelisser's Toadflax | 0.1 | 20 | * | N/A | No |

## Appendix 3 Vegetation Zone 3 floristic data

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Anthericaceae | *Tricoryne elatior* | Yellow Autumn-lily | 0.1 | 500 | - | Forb (FG) | No |
| Asteraceae | *Arctotheca calendula* | Capeweed | 0.5 | 100 | * | N/A | No |
| Asteraceae | *Cirsium vulgare* | Spear Thistle | 0.1 | 100 | * | N/A | No |
| Asteraceae | *Conyza sp.* | A Fleabane | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Cymbonotus lawsonianus* | Bear's Ear | 0.1 | 10 | - | Forb (FG) | No |
| Asteraceae | *Euchiton sphaericus* | Star Cudweed | 0.1 | 5 | - | Forb (FG) | No |
| Asteraceae | *Gamochaeta sp.* | - | 0.1 | 500 | * | N/A | No |
| Asteraceae | *Hypochaeris glabra* | Smooth Catsear | 0.1 | 30 | * | N/A | No |
| Asteraceae | *Hypochaeris radicata* | Catsear | 1 | 500 | * | N/A | No |
| Asteraceae | *Lactuca serriola* | Prickly Lettuce | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Sonchus asper* | Prickly Sowthistle | 0.1 | 5 | * | N/A | No |
| Asteraceae | *Sonchus oleraceus* | Common Sowthistle | 0.2 | 100 | * | N/A | No |
| Asteraceae | *Tragopogon sp.* | - | 0.1 | 30 | * | N/A | No |
| Boraginaceae | *Echium plantagineum* | Patterson's Curse | 0.5 | 50 | * | N/A | No |
| Campanulaceae | *Wahlenbergia communis* | Tufted Bluebell | 0.1 | 100 | - | Forb (FG) | No |
| Campanulaceae | *Wahlenbergia luteola* | Bluebell | 0.1 | 30 | - | Forb (FG) | No |
| Caryophyllaceae | *Cerastium vulgare* | Mouse-ear Chickweed | 0.1 | 100 | * | N/A | No |
| Clusiaceae | *Hypericum perforatum* | St. Johns Wort | 0.1 | 25 | * | N/A | HTE |
| Cyperaceae | *Schoenus apogon* | Fluke Bogrush | 0.1 | 200 | - | Grass & grasslike (GG) | No |
| Droseraceae | *Drosera peltata* | A Sundew | 0.1 | 1,000 | - | Forb (FG) | No |
| Fabaceae (Faboideae) | *Medicago sp.* | A Medic | 0.1 | 300 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium angustifolium* | Narrow-leaved Clover | 0.1 | 5 | * | N/A | No |

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Fabaceae (Faboideae) | *Trifolium arvense* | Haresfoot Clover | 0.1 | 50 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium sp. 1* | A Clover | 0.1 | 5 | * | N/A | No |
| Fabaceae (Faboideae) | *Trifolium sp. 2* | A Clover | 0.1 | 200 | * | N/A | No |
| Gentianaceae | *Centaurium erythraea* | Common Centaury | 0.1 | 5 | * | N/A | No |
| Haloragaceae | *Haloragis heterophylla* | Variable Raspwort | 0.5 | 500 | - | Forb (FG) | No |
| Juncaceae | *Luzula sp.* | - | 0.1 | 500 | - | Grass & grasslike (GG) | No |
| Malaceae | *Crataegus monogyna* | Hawthorn | 0.1 | 5 | * | N/A | HTE |
| Myrsinaceae | *Lysimachia arvensis* | Scarlet Pimpernel | 0.3 | 500 | * | N/A | No |
| Oxalidaceae | *Oxalis sp.* | - | 0.1 | 300 | - | Forb (FG) | No |
| Plantaginaceae | *Plantago lanceolata* | Lamb's Tongues | 0.3 | 500 | * | N/A | No |
| Poaceae | *Aira sp.* | A Hairgrass | 0.5 | 2,000 | * | N/A | No |
| Poaceae | *Austrostipa bigeniculata* | Yanganbil | 0.1 | 5 | - | Grass & grasslike (GG) | No |
| Poaceae | *Avena fatua* | Wild Oats | 70 | 2,000 | * | N/A | No |
| Poaceae | *Briza maxima* | Quaking Grass | 5 | 2,000 | * | N/A | No |
| Poaceae | *Briza minor* | Shivery Grass | 1 | 1,000 | * | N/A | No |
| Poaceae | *Bromus molliformis* | Soft Brome | 2 | 2,000 | * | N/A | No |
| Poaceae | *Cynodon dactylon* | Common Couch | 0.1 | 100 | - | N/A | No |
| Poaceae | *Nassella trichotoma* | Serrated Tussock | 30 | 2,000 | * | N/A | HTE |
| Poaceae | *Paspalum dilatatum* | Paspalum | 50 | 2,000 | * | N/A | HTE |
| Poaceae | *Poa sp.* | - | 0.1 | 30 | * | Grass & grasslike (GG) | No |
| Poaceae | *Themeda triandra* | - | 50 | 2,000 | - | Grass & grasslike (GG) | No |
| Poaceae | *Vulpia sp.* | Rat's-tail Fescue | 0.1 | 20 | * | N/A | No |
| Polygonaceae | *Rumex brownii* | Swamp Dock | 0.1 | 5 | - | Forb (FG) | No |

| Family | Scientific Name | Common Name | % Cover | Abundance | Exotic | Growth Form | High Threat? |
|---|---|---|---|---|---|---|---|
| Pteridaceae | *Cheilanthes sieberi* | Rock Fern | 0.1 | 100 | - | Fern (EG) | No |
| Rosaceae | *Acaena ovina* | Acaena | 0.1 | 10 | - | Forb (FG) | No |
| Rosaceae | *Rosa rubiginosa* | Sweet Briar | 0.1 | 25 | * | N/A | HTE |
| Rosaceae | *Rubus fruticosus agg.* | Blackberry complex | 0.1 | 10 | * | N/A | HTE |
| Rubiaceae | *Sherardia arvensis* | Field Madder | 0.2 | 200 | * | N/A | No |
| Scrophulariaceae | *Parentucellia latifolia* | Red Bartsia | 0.1 | 5 | * | N/A | No |



# APPENDIX B

**Vegetation Integrity Plot Data**

## Table B.1 Vegetation Integrity plot data

| Plots | Composition* | | | | | | Structure* | | | | | | Function+ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TR | SH | GR | FB | FN | OT | TR | SH | GR | FB | FN | OT | RN | Stem Classes (cm) | | | | | LT | HBT | LTT (%) | FLL (m) | HTW |
| | | | | | | | | | | | | | | <5 | 5-9 | 10-19 | 20-29 | 30-49 | 50-79 | | | | |
| **1330.1.1** | 2 | 2 | 6 | 1 | 0 | 0 | 15.0 | 0.3 | 20.3 | 0.3 | 0.0 | 0.0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 39.0 | 0.0 | 5.2 |
| **1330.1.2** | 3 | 1 | 6 | 1 | 0 | 0 | 20.0 | 0.1 | 26.7 | 0.3 | 0.0 | 0.0 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 51.0 | 18.0 | 2.2 |
| **1330.1.3** | 1 | 0 | 2 | 1 | 0 | 0 | 15.0 | 0.0 | 20.1 | 0.3 | 0.0 | 0.0 | 1 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 38.0 | 15.0 | 10 |
| **1330.1.4** | 2 | 0 | 9 | 6 | 0 | 0 | 33.0 | 0.0 | 19.9 | 1.7 | 0.0 | 0.0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 61.6 | 0.0 | 1.4 |
| **1330.2.1** | 0 | 0 | 5 | 2 | 0 | 1 | 0.0 | 0.0 | 57.1 | 0.7 | 0.0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34.0 | 0.0 | 15.7 |
| **1330.2.2** | 0 | 1 | 7 | 2 | 0 | 0 | 0.0 | 0.1 | 62.8 | 0.4 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14.6 | 0.0 | 3.2 |
| **1330.2.3** | 0 | 1 | 7 | 2 | 0 | 0 | 0.0 | 0.2 | 52.3 | 4.4 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24.0 | 0.0 | 1.1 |
| **1330.2.4** | 0 | 1 | 9 | 5 | 0 | 0 | 0.0 | 1.0 | 103.9 | 6.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49.0 | 0.0 | 0.3 |
| **1330.3.1** | 0 | 0 | 3 | 2 | 0 | 0 | 0.0 | 0.0 | 61.1 | 0.3 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29.0 | 0.0 | 0.8 |
| **1330.3.2** | 0 | 1 | 5 | 1 | 0 | 0 | 0.0 | 0.1 | 56.3 | 0.2 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24.0 | 0.0 | 5.4 |
| **1330.3.3** | 0 | 0 | 2 | 4 | 0 | 0 | 0.0 | 0.0 | 76 | 2.3 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.0 | 0.0 | 4.4 |
| **1330.4.1** | 0 | 0 | 3 | 1 | 0 | 0 | 0.0 | 0.0 | 11.5 | 0.3 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19.0 | 0.0 | 20.4 |
| **1330.4.2** | 0 | 0 | 3 | 0 | 0 | 0 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21.0 | 0.0 | 35 |
| **1330.4.3** | 0 | 0 | 1 | 1 | 0 | 0 | 0.0 | 0.0 | 3.0 | 0.1 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19.2 | 0.0 | 32.2 |
| **1330.4.4** | 0 | 0 | 3 | 2 | 0 | 0 | 0.0 | 0.0 | 5.5 | 0.3 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17.0 | 0.0 | 0.2 |

*TR=Tree, SH=Shrub, GR=Grass and grass like, FB=Forb, FN=Fern, OT=Other

+RN=Regen, LT=Large Trees, HBT=Hollow bearing trees, LTT=Litter, FLL=Fallen Logs, HTW=High Threat Weeds

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