Goulburn Mulwaree Council

Preliminary Biodiversity Development Assessment Report

Goulburn Sludge Lagoons Upgrade, Wheeo Road, Goulburn

Prepared by Brian Erik Faulkner, BAAS21005

Preliminary BDAR Report – March 2024

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Document control

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Summary

The proposed activity involves a planning proposal to rezone a parcel of land owned by Goulburn Mulwaree Council from RE1 Public Recreation to SP2 Infrastructure, in order to allow permissibility for a project to upgrade and expand the Goulburn WTP (Water Treatment Plant) Residuals Handling Facility. The facility includes a series of constructed ponds/sludge lagoons, used for collection and settling of suspended solids resulting from treatment of drinking water.

The WTP is located at the corner of Wheeo Road and River Street, as shown in Figure 1 (Project Location). The currrent associated Residuals Handling Facility is contained on two adjoining lots, these being Lot 2 DP 511739 and part of the adjoining Lot 1 DP 1030749.

The proposed is to expand the WTP Residuals Handling Facility by decommissioning existing sludge lagoons and replacing these with two larger sludge lagoons on Lot 1 DP 1030749. Part of the proposed development will occur on areas currently occupied by existing sludge lagoons, but expansion of the facility will also require clearing and development of previously uncleared land.

Goulburn's population increased from 22,890 in 2016 to 32,053 in 2021. The number of dwellings increased from 10,095 to 14,671 over the same period (Australian Bureau of Statistics, 2021). This growth is projected to continue significantly over coming decades.

Expansion and upgrade of the WTP and associated Residuals Handling Facility is critical to meeting increasing demands for safe drinking water.

Lot 1 DP 1030749 is currently zoned RE1 Public Recreation, and for the proposed activity to expand the Residuals Handling Facility to be permissible, the land will need to be rezoned to SP2 Infrastructure.

The subject land is identified as the entirely of Lot 1 DP 1030749 and part of Lot 2 DP 511739 as shown in Figure 2 (Site Map). The subject land is clearly demarcated and surrounded by a chain mesh security fence.

No parts of the subject land are marked on the Biodiversity Values Map.

The entirety of the subject land comprises approximately 2.536 hectares, of which approximately 1.784 hectares has been identified as featuring remnant native vegetation identified as *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest*.

PCT 3373 is a component of the NSW listed Critically Endangered Ecological Community *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.

Although the vegetation on the site is degraded and weed infested, it also meets criteria for identification as the Commonwealth listed Critically Endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community.

The bulk of the native vegetation on the site will need to be cleared for construction of the new sludge lagoons, and for the purposes of this BDAR it is assumed that the entirety of the subject land is to be cleared.

The proposed activity falls under Part 5 (Infrastructure and environmental impact assessment) of the NSW *Environmental Planning and Assessment Act 1979.*

It is a requirement of the NSW *Biodiversity Conservation Act 2016*, that proponents of Part 5 activities must apply the test of significance (under section 7.3) to assess biodiversity impacts. The test of significance is used to determine whether the proposed activity is likely to significantly affect threatened species or ecological communities, or their habitats.

If the activity is likely to have a significant impact the proponent must either apply the Biodiversity Offsets Scheme (BOS) or prepare a species impact statement (SIS).

As the proposed activity following rezoning has been assessed as being likely to constitute a significant impact on the local occurrence of a listed threatened entity, ie the Box Gum Grassy Woodland CEEC, Council has opted to enter into the BOS and prepare a BDAR as part of the environmental assessment for the proposed activity.

In addition to the listed CEEC present on the land, two threatened species have been confirmed to be present by survey. The land supports a small population of the Hoary Sunray *Leucochrysum albicans* subspecies *tricolor,* which is listed as Endangered under both NSW State and Commonwealth legislation. Survey also found Key's Matchstick Grasshopper *Keyacris scurra*, which is also listed as Endangered under both NSW State and Commonwealth legislation, to be present on the site.

A threatened species test of significance has determined that the proposed activity is not likely to have a significant impact on the Hoary Sunray, but that it is likely to have a significant impact on the local occurrence of the Key's Matchstick Grasshopper.

Impacts of the proposed activity have been assessed using the Streamlined assessment module – Small area of the BAM (Appendix C). The Streamlined Assessment module – Small area clearing threshold for this site is 2.0 hectares (Table 12 of BAM Appendix C).

The proposed activity will impact on approximately 1.8 hectares of native vegetation.

Following initial advice provided after preliminary ecological surveys and assessment of likely impacts of the proposed activity in 2021 and 2022, Goulburn Mulwaree Council has devoted a considerable amount of effort in identifying and evaluating numerous alternative options to developing the subject site in an effort to avoid impacts on the identified CEEC and threatened species present on the site as far as is reasonably and practicably possible. This evaluation process is described in detail in Appendix I of this report.

However, after exhaustive analysis, it has been determined that there are no realistic alternative sites that would be suitable. After evaluating 19 alternative potential sites, it has been concluded that the current proposal is the only feasible option for expanding the WTP Residuals Handling Facility.

Proposed minimisation and mitigation measures include:

- Removal of vegetation and earthworks will be scheduled to occur between March and May, to avoid fauna breeding seasons. It is particularly important that vegetation clearance should not occur in the spring months, ie September, October and November as this is the peak breeding time for birds. The winter months are also to be avoided to prevent impacts on torpid bats that may be overwintering in tree hollows.
- A tree removal protocol is to be implemented to avoid harm to fauna at the time of clearing/removal of native vegetation. Removal of trees will be supervised by an accredited ecologist licenced to handle fauna.
- Larger logs and logs with hollows will be salvaged and relocated to bushland reserves close by, in order to provide and enhance fauna habitat.
- On completion of works, bare earth and sludge lagoon banks will be sown down with a mix of locally occurring native grasses and forbs. This will include seeds of Hoary Sunray collected from within the site prior to clearing.
- Creation of two Box Gum Grassy Woodland Conservation areas on Council owned land.

Table E1 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
3373_PCT3373 Moderate	PCT3373 Goulburn Tableland Box-Gum Grassy Forest	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	1.8	84

Table E2 Impacts that require an offset – species credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
Key's Matchstick Grasshopper	*Keyacris scurra*	1.8	67
Hoary Sunray	*Leucochrysum albicans* subspecies *tricolor*	200	400

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Shortened forms

APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	critically endangered ecological community

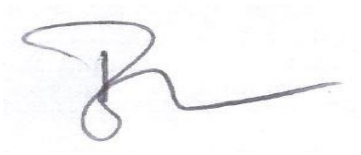
DBH	diameter at breast height over bark
EC	ecological community listed under the EPBC Act
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EEC	endangered ecological community
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
LLS Act	*Local Land Services Act 2013* (NSW)
MNES	matters of national environmental significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
PCT	plant community type
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
VEC	vulnerable ecological community
Vegetation SEPP	*State Environmental Planning Policy (Biodiversity & Conservation) 2021 – Chapter 2 Vegetation in non-rural areas.*

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

This BDAR is a preliminary document prepared for the purpose of a Planning Proposal. The credit assessment has not been finalised or submitted within BOAMS.

I certify that this report has otherwise been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: 

Date: 17th November, 2023

BAM Assessor Accreditation no: BAAS21005

This BDAR has been prepared to meet the requirements of BAM 2020 Streamlined Assessment Module – Small Area. Appendix A provides an assessment of compliance with the minimum information requirements outlined in BAM Appendix K.

ii. Details and experience of author/s and contributors

Authors and contributors

Name	BAM Assessor Accreditation no. (if relevant)	Position/Role	Tasks performed	Relevant qualifications
Brian Erik Faulkner	BAAS21005	Accredited Assessor and BDAR author Goulburn Mulwaree Council Environment & Biodiversity Assessment Officer	Planning and executing ecological surveys – BAM plots Targeted searches for threatened species Fauna habitat evaluation Mapping work and figure preparation BAM-C data entry and analysis BDAR preparation and certification	BSc (Honours) Zoology PhD (Biological Sciences) Continuously employed in Conservation and Land Management industry and related disciplines in the Goulburn Mulwaree Local Government Area since 2000.

iii. Conflict of interest

I declare that I have considered the circumstances and I wish to openly declare the following perceived and potential conflict of interest and the management strategies employed:

I am employed by Goulburn Mulwaree Council in the role of Environment and Biodiversity Assessment Officer. As I am an employee of the proponent and preparing a BDAR on the proponent's behalf there may be a perceived or potential conflict of interest.

This is being managed by Goulburn Mulwaree Council arranging for the BDAR to be independently peer-reviewed by NSW Department of Planning and Environment officers.

This declaration has been made in the interests of full disclosure to the decision-maker and to any other stakeholders who may have an interest in the proposed activity.

Signature: 

Date: _____17/11/2023

BAM Assessor Accreditation no: BAAS21005

Stage 1: Biodiversity assessment

1. Introduction

1.1 Proposed development

1.1.1 Development overview

The proposed activity involves a planning proposal to rezone a parcel of land owned by Goulburn Mulwaree Council from RE1 Public Recreation to SP2 Infrastructure.

The planning proposal is required in order to allow a permissibility pathway for a project to upgrade and expand the Goulburn WTP (Water Treatment Plant) Residuals Handling Facility.

The Residuals Handling Facility includes a series of constructed ponds/sludge lagoons, used for collection and settling of suspended solids resulting from treatment of drinking water.

The current WTP and associated Residuals Handling Facility is contained on two adjoining lots, these being Lot 2 DP 511739 and part of the adjoining Lot 1 DP 1030749.

The proposed activity is to expand the WTP Residuals Handling Facility by decommissioning existing sludge lagoons and replacing these by constructing two larger sludge lagoons on Lot 1 DP 1030749.

The proposed activity requires approval under Part 5, Division 5.1 of the EP&A Act (where the proponent has opted-in to the BOS).

1.1.2 Location

The proposed activity is located at the Goulburn WTP (Water Treatment Plant), which produces Goulburn’s drinking water.

The WTP is located at the intersection of Wheeo Road and River Street, Goulburn, NSW 2580. The project site comprises part of Lot 2 DP 511739 and the entirety of Lot 1 DP 1030749.

Refer to Figure 1 (Project Location) and Figure 2 (Site Map).

1.1.3 Proposed development and the subject land

The proposed development comprises rezoning of a parcel of land identified as Lot 1 DP 1030749, comprising approximately 1.745 hectares, currently zoned RE1 Public Recreation to SP2 Infrastructure. Current land zoning is shown in Figure 3 (Project Land Zones).

Following rezoning of Lot 1 DP 1030749, the proposal includes subsequently upgrading and expansion of the existing WTP Residuals Handling Facility on the site, which is currently partly located partly on Lot 1 DP 1030749 and partly on Lot 2 DP 511739.

The area to be impacted is hereafter referred to as the subject land and is shown in Figure 2 (Site Map).

The proposed upgrade of the WTP Residuals Handling Facility is anticipated to clear the entirety of Lot 1 DP 1030749.

Associated infrastructure works required to support operations of the proposal are minimal and will not differ significantly from what is currently in place.

No additional roads, stormwater facilities, drainage, asset protection zones (APZ) or fencelines are required. Stockpile and storage areas for materials such as roadbase, and parking of machinery and vehicles, are already present on the site.

The subject land

The location of the site is shown in Figure 1.

The extent of the subject land is shown in Figure 2.

The operational and construction footprint is shown in Figure 4.

The subject land comprises approximately 2.536 hectares.

Approximately 1.784 hectares of the subject land comprises native vegetation.

Approximately 0.752 hectares of the subject land has been previously cleared and comprises access tracks, stockpile/storage areas, sludge lagoons and ancillary structures (drains, pumping facilities and pipelines).

The subject land is located at an elevation of approximately 684 to 703 m asl and has a north-westerly aspect, with a gentle slope of approximately 9%.

The underlying geology comprises sedimentary/metasedimentary siltstones, shale and some quartzite. The soil comprises a silty clay loam, that is shallow and can be described as being generally nutrient poor on higher parts of the site.

There are no identified naturally occurring drainage lines, creeks or watercourses on the subject land. There is currently a series of constructed ponds, comprising two larger ponds

and 8 smaller ones, which are used as sludge lagoons. Sludge is produced as a by-product of treating raw water to produce potable water. Sludge is stored and concentrated in the sludge lagoons prior to removal from the site for disposal.

The subject land is bordered on the northern side by the Wheeo Road, and on the southern side by remnant grassy woodland. Land to the east is owned and managed by Trinity Catholic College Goulburn. The immediately adjoining land on this site comprises sports fields, with a fringe of trees largely comprising very large Radiata pines.

Land to the west of the subject site comprises degraded pasture land dominated by exotic pastures species, with a high component of weeds including African Love Grass *Eragrostis curvula*, Chilean Needle Grass *Nassella neesiana* and St John's Wort *Hypericum peforatum*.

There are no residences in close proximity to the subject site or proposed activity.

1.1.4 Other documentation

Documents referred to and relied upon in this assessment include:

Goulburn Mulwaree Council Goulburn WTP Residuals Handling – 2 Lagoon Option Site Arrangement, Reference 5665-C-SK1, prepared by HunterH2O

1.2 Biodiversity Offsets Scheme entry

The subject land comprises the entirety of Lot 1 DP 1030749 (approximately 1.719 hectares) and part of Lot 2 DP 511739 (approximately 0.817 hectares).

No parts of the subject land are marked on the Biodiversity Values Map. Refer to Figure 17 (Biodiversity Values Map).

The entirety of the subject land comprises approximately 2.536 hectares, of which approximately 1.784 hectares has been identified as featuring remnant native vegetation identified as *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest*.

PCT 3373 is a component of the NSW listed Critically Endangered Ecological Community *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.*

Although the vegetation on the site is degraded and weed infested, it also meets criteria for identification as the Commonwealth listed Critically Endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community.

The bulk of the native vegetation on the subject land will need to be cleared for construction of the new sludge lagoons, and for the purposes of this BDAR it is assumed that the entirety of the subject land is to be cleared.

The proposed activity falls under Part 5 (Infrastructure and environmental impact assessment) of the NSW *Environmental Planning and Assessment Act 1979.*

It is a requirement of the NSW *Biodiversity Conservation Act 2016*, that proponents of Part 5 activities must apply the test of significance (under section 7.3) to assess biodiversity impacts. The test of significance is used to determine whether the proposed activity is likely to significantly affect threatened species or ecological communities, or their habitats.

If the activity is likely to have a significant impact the proponent must either apply the Biodiversity Offsets Scheme (BOS) or prepare a species impact statement (SIS).

As the proposed activity following rezoning has been assessed as being likely to constitute a significant impact on the local occurrence of a listed threatened entity, ie the Box Gum Grassy Woodland CEEC, Council has opted to enter into the BOS and prepare a BDAR as part of the environmental assessment for the proposed activity.

In addition to the listed CEEC present on the land, two threatened species have been confirmed to be present by survey. The land supports a small population of the Hoary Sunray *Leucochrysum albicans* subspecies *tricolor,* which is listed as Endangered under both NSW State and Commonwealth legislation. Survey also found Key's Matchstick Grasshopper *Keyacris scurra*, which is also listed as Endangered under both NSW State and Commonwealth legislation, to be present on the site.

A threatened species test of significance has determined that the proposed activity is not likely to have a significant impact on the Hoary Sunray, but that it is likely to have a significant impact on the local occurrence of the Key's Matchstick Grasshopper.

Impacts of the proposed activity have been assessed using the Streamlined assessment module – Small area of the BAM (Appendix C). The Streamlined Assessment module – Small area clearing threshold for this site is 2.0 hectares (BAM Appendix C, Table 12. There is no minimum lot size associated with Lot 1 DP 1030749, so actual lot size of approximately 1.719 hectares has been used in determining the small area clearing threshold).

The proposed activity will impact on approximately 1.78 hectares of native vegetation (entirety of native vegetation on Lot 1 DP 1030749 and a small part of Lot 2 DP 511739).

1.3 Excluded impacts

1. The BAM does not assess biodiversity values for:

a. marine mammals

b. wandering seabirds

c. biodiversity that is endemic to Lord Howe Island

d. native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts under clause 6.1 of the BC Regulation (referred to as prescribed impacts in the BAM).

There are no biodiversity values not assessed under under requirements of BAM 2020 that apply to the subject land.

1.4 Matters of national environmental significance

The subject land has been confirmed by survey and data analysis to contain three MNES:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)
- Key's Matchstick Grasshopper *Keyacris scurra* (Endangered)
- Hoary Sunray *Leucochrysum albicans* subspecies *tricolor* (Endangered)

The proposed activity is likely to have a significant impact on the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered) and on the Key's Matchstick Grasshopper, and a referral is required to the Australian Government Environment Minister.

No other MNES have been found to be present on the subject land.

The BAM Calculator predicts presence of some fauna species (ecosystem credit species) that are listed as threatened under the EPBC Act, as shown in Table 1.

Table 1: MNES Fauna predicted to be present on the subject land by the BAM-C

Scientific Name	Common Name	EPBC Status
Anthochaera phrygia	Regent Honeyeater	CE
Callocephalon fimbriatum	Gang Gang Cockatoo	E
Calyptorhynchus lathamii	Glossy Black Cockatoo	V
Climacteris picumnus victoriae	Brown Treecreeper (South-eastern)	V
Daysurus maculatus	Spotted Tail Quoll	E
Hirundapus caudacutus	White Throated Needletail	V
Lathamus discolor	Swift Parrot	CE
Melanodryas cucullata cucullata	Hooded Robin (South-eastern)	E
Pteropus poliocephalus	Grey Headed Flying Fox	V
Stagonopleura guttata	Diamond Firetail	V

Spotted Tail Quolls are highly unlikely to be present on the site, due to small area and lack of suitable habitat, and a significant impact on this species is unlikely. Other MNES species may be present on occasion, but are highly mobile and wide ranging, and the impacts of the proposed activity are not likely to constitute a significant impact on any of these species.

1.5 Information sources

Key information sources used in the preparation of this BDAR include:

Legislation

- *Amending Agreement No.1 – Amending the Original Agreement relating to environmental assessment. Commonwealth of Australia and the State of NSW*. 2020;
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Goulburn Mulwaree Local Environmental Plan 2009*
- NSW *Biodiversity Assessment Method Order BAM 2020*
- NSW *Biodiversity Conservation Act 2016* (BC Act);

- NSW *Biodiversity Conservation Regulation 2017* (BC Reg);

Guidelines

- Biodiversity Assessment Method operation manual – Streamlined assessment module, Small Area. Department of Planning and Environment (2022).
- Biodiversity Assessment Method Operational Manual – Stage 1. State of NSW and Department of Planning, Industry & Environment (2020).
- Biodiversity Assessment Method Survey Guide – Koala (Phascolarctos cinereus). NSW
- Department of Planning and Environment (2022). Threatened reptiles, Biodiversity Assessment Method survey guide. Department of Planning and Environment (2022).
- Flora species with specific survey requirements. NSW Office of Environment & Heritage.
- Flora species with specific survey requirements. NSW Office of Environment & Heritage.
- Guide for mapping threatened species for inclusion in the NSW regulatory framework. Department of Planning, Industry & Environment (2020).
- Guide for mapping threatened species for inclusion in the NSW regulatory framework. Department of Planning, Industry & Environment (2020).
- Matters of National Environmental Significance – Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. Australian Government – Department of the Environment
- NSW survey guide – ‘Species credit’ threatened bats and their habitats (2018).
- NSW survey guide – ‘Species credit’ threatened bats and their habitats (2018).
- NSW Survey Guide for Threatened Frogs. Department of Planning, Industry & Environment (2020).
- Surveying threatened plants and their habitats. NSW survey guide for the Biodiversity Assessment Method (2020). Department of Planning, Industry & Environment (2020).
- Surveying threatened plants and their habitats. NSW survey guide for the Biodiversity Assessment Method (2020). Department of Planning, Industry & Environment (2020).
- Threatened biodiversity survey and assessment: Guidelines for developments and activities. NSW Department of Environment and Conservation (2004, in draft).

- Threatened reptiles, Biodiversity Assessment Method survey guide. Department of Planning and Environment (2022).

Databases

- A Directory of Important Wetlands in Australia, Third Edition, Environment Australia (2001). http://www.environment.gov.au/water/wetlands/publications/directory-important-wetlandsaustralia- third-edition.
- Aerial photography of the site: Department of Lands SIX Maps Viewer, Google Maps ©2023 and Nearmap.
- NSW BioNet (www.bionet.nsw.gov.au): Vegetation Classification tool, Threatened Biodiversity Data Collection (TBDC), and Atlas records.
- SEED | Sharing and Enabling Environmental Data (www.seed.nsw.gov.au): NSW Interim Biogeographic Regions of Australia (IBRA) regions and subregions, NSW Mitchell Landscapes (version 3.1), State Vegetation Type Map – SVTM_NSW_Extant_PCT, State Vegetation Type Map – SVTM_NSW_1750_PCT.
- Threatened biodiversity profiles. NSW Office of Environment & Heritage.

2. Methods

2.1 Site context methods

2.1.1 Landscape features

As part of the evaluation of the site and its suitability for the proposed activity, the subject land was assessed on a number of occasions over three consecutive years, including a preliminary site assessment conducted on 13/10/2021 and three subsequent targeted searches for threatened species predicted to be present.

Targeted searches were conducted on 28/10/2021, 24/11/2022 and 25/09/2023. Targeted searches involved walking transects across the site, combined with random meander. Site assessment included ground truthing of aerial imagery available from Nearmap, and confirming landscape features as mapped on the Goulburn Mulwaree internal mapping database.

2.1.2 Native vegetation cover

Land to the north, east and south-east of the subject land is mostly cleared and developed, featuring residential dwellings. Small pockets of remnant vegetation are present. Land to the west is mostly historically cleared agricultural land and is used for livestock grazing.

Land to the south and south-east of the subject land retains remnant native vegetation, which is mapped on the SEED STVM Extant PCT layer as comprising PCT 3373 Goulburn Tableland Box-Gum Grassy Forest. This includes the West Goulburn Bushland Reserve, which comprises approximately 20 hectares of high conservation value remnant woodland and forest.

While it has not been possible to physically inspect all areas mapped as PCT 3373, a combination of examination of high resolution Nearmap aerial imagery (19/07/2023), site assessment and local knowledge suggests that the SEED mapping is largely accurate. Based on this, it was estimated that the percentage native vegetation cover in the assessment area (including subject land and 1,500 m radius comprises approximately 20%.

2.2 Native vegetation, threatened ecological communities and vegetation integrity methods

2.2.1 Existing information

Vegetation on the subject land and within the 1,500 m surrounding assessment area is mapped on the SEED STVM Extant PCT layer as PCT 3373 Goulburn Tableland Box-Gum Grassy Forest. This PCT is a component of two ecological communities listed as being Critically Endangered:

NSW *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* – Critically Endangered Ecological Community

Commonwealth *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* – Critically Endangered.

2.2.2 Mapping native vegetation extent

Mapping of native vegetation extent on the subject land was based on a combination of examining high resolution Nearmap imagery and site assessment.

Site assessment including preliminary site assessment conducted on 13/10/2021 and walking parallel transects across the entire site on three subsequent separate occasions (28/10/2021, 24/11/2022 and 25/09/2023).

A complete flora list for the site was developed based on combined field notes compiled during these site assessments (Refer to Appendix E of this report).

2.2.3 Plot-based vegetation survey

One BAM-VIS plot survey was undertaken within the subject land by Brian Faulkner on 24/11/2022. At that time the vegetation on the site was confirmed to be in good condition and most easily identifiable, as required by the BAM.

The BAM plot was located in an area of the site that was considered to be representative of the remnant native vegetation on the subject land, and to avoid boundary areas and areas impacted by the existing sludge lagoons and associated access tracks.

Vegetation within the BAM plot was confirmed to be representative of and consistent with other parts of the subject land, on the day that the BAM plot was assessed, but also subsequently during a second site inspection on 25/09/2023.

The BAM survey plot, as specified by the BAM 2020 utilises:

A 20 m x 20 m plot to assess vegetation composition and structure, within a 20 m x 50 m plot used to collect data for evaluation of function attributes, and five 1 m x 1 m subplots used to assess litter cover.

Refer to Figure 5 (BAM VIS Plot Location).

2.2.4 Vegetation integrity survey

Vegetation integrity scores were calculated using field data obtained from the BAM plot and the formulae embedded in the BAM calculator. The calculation used standard condition benchmarks with the BAM calculator.

2.3 Threatened flora survey methods

2.3.1 Review of existing information

The BAM calculator (Part 5 Development – Small Area) was used to generate a list of relevant threatened species on the basis of IBRA subregion (Monaro), native vegetation cover class in the assessment area, patch size and PCT present.

A review was undertaken of habitat and constraints information held in the TBDC in relation to the list of relevant species, and geographic and habitat constraints set out in the BAM Calculator.

In addition, a search was undertaken using the NSW BioNet Atlas database for records of threatened species within a 10 x 10 km grid over the subject land.

2.3.2 Habitat constraints assessment

Site inspections were conducted by Brian Faulkner on 13/10/2021, 28/10/2021, 24/11/2022 and 25/09/2023. These included walking parallel transects across the site.

During these site assessments, flora habitat values and constraints were evaluated.

This included examining microhabitat values of potential drainage lines, low lying swampy areas, well drained sites, shady areas, exposed sunny ground etc.

Reference was also made to Goulburn Mulwaree Council mapping of landscape features such as drainage lines, creeks and rivers.

2.3.3 Field surveys

No targeted surveys are required for ecosystem credit species.

Under the BAM Streamlined Assessment Module – Small Area, only candidate species credit species that are SAII entities require targeted field survey and assessment.

Based on the output of the BAM calculator, no candidate species credit flora species required targeted survey. However targeted surveys were conducted for threatened flora species considered possibly present on the basis of BioNet records and the Commonwealth EPBC Act Protected Matters Search Tool.

2.4 Threatened fauna survey methods

2.4.1 Review of existing information

The BAM calculator (Part 5 Development – Small Area) was used to generate a list of relevant threatened fauna species on the basis of IBRA subregion (Monaro), native vegetation cover class in the assessment area, patch size and PCT present.

A review was undertaken of habitat and constraints information held in the TBDC in relation to the list of relevant species, and geographic and habitat constraints set out in the BAM Calculator.

In addition, a search was undertaken using the NSW BioNet Atlas database for records of threatened species within a 10 x 10 km grid over the subject land.

2.4.2 Habitat constraints assessment

Site inspections were conducted by Brian Faulkner on 13/10/2021, 28/10/2021, 24/11/2022 and 25/09/2023. These included walking parallel transects across the site.

During these site assessments, fauna habitat values and constraints were evaluated. This included examining trees for potential presence of nesting hollows, assessing fallen

logs/branches, searching for termite mounds, examining any loose surface rock present and also included evaluation of debris such as roofing metal and piles of bricks and other building waste. Presence/absence of key fauna foraging habitat such as *Allocasuarina* species, mistletoes and other native plants was also evaluated.

Reference was also made to Goulburn Mulwaree Council mapping of landscape features such as drainage lines, creeks and rivers.

2.4.3 Field surveys

No targeted surveys are required for ecosystem credit species.

Under the BAM Streamlined Assessment Module – Small Area, only candidate species credit species that are SAII entities require targeted field survey and assessment.

Based on the output of the BAM calculator, no candidate species credit fauna species required targeted survey. However targeted surveys were conducted for threatened flora species predicted to be present based on searches of the EMPBC Act Protected Matters Search Tool and NSW BioNet Atlas Records. These included incidental observations and searching for evidence of threatened fauna possibly present.

These included searching for evidence of tracks, scats, scratch marks on trees, nests, burrows, turning over rocks, bricks and other building debris, listening for calls and scanning the site for possible sightings of fauna.

2.5 Weather conditions

Table 2 Environmental conditions during threatened species surveys

Survey undertaken (e.g. method / targeted species)	**Date**	**Time**	**Temperature** (min. & max.)	**Wind** (light, mod…)	**Rainfall** (mm)	**Other conditions relevant to the species**
Walking parallel transect, targeted search for threatened flora, also opportunistic fauna survey	28/10/2021	0930–1100	18 to 20 ^{0}C	Light westerly breeze	No rain	Bright sunshine

Survey undertaken (e.g. method / targeted species)	**Date**	**Time**	**Temperature** (min. & max.)	**Wind** (light, mod…)	**Rainfall** (mm)	**Other conditions relevant to the species**
Walking parallel transect, targeted search for threatened flora, also opportunistic fauna survey	24/11/2022	1415-1645	20 to 22 ^{0}C	Light WNW breeze	No rain	Bright sunshine
Walking parallel transect, targeted search for threatened flora, also opportunistic fauna survey	25/09/2023	0745-0955	18 to 20 ^{0}C	Very light westerly breeze	No rain	Partly cloudy

2.6 Limitations

Flora surveys were conducted in spring at a time when most species are most easily identifiable. However, it is likely that not all species present on the site could have been identified as some species are seasonal in appearance, for example some plants are in active growth and flowering in autumn. For a truly comprehensive flora list to be compiled, monthly flora surveys would be required over an entire year. Despite this limitation, it is likely that the majority of flora species present on the subject land would have been detected over the three consecutive surveys conducted as part of this study.

All flora observed on the site during site assessments were recorded and a flora list is presented in Appendix E.

No candidate threatened fauna species required targeted survey, however surveys conducted on the subject land included opportunistic searching for presence of some threatened species. All fauna observed on the site during site assessments were recorded and a fauna list is presented in Appendix E.

During the targeted surveys the following threatened species were specifically targeted:

Table 3 Targeted Species Survey

Scientific Name	Common Name	Comment
Bossiaea oligosperma	Few Seeded Bossiaea	BioNet predicted
Diuris aequalis	Buttercup Doubletail	BioNet predicted EPBC PMST
Dodonaea procumbens	Trailing Hop-bush	EPBC PMST
Eucalyptus aggregata	Black Gum	EPBC PMST
Keyacris scurra	Key's Matchstick Grasshopper	BioNet predicted EPBC PMST
Lepidium aschersonii	Spiny Peppercress	EPBC PMST
Lepidium hyssopifolium	Basalt Peppercress	EPBC PMST
Leucochrysum albicans tricolor	Hoary sunray	BAM C, BioNet predicted EPBC PMST
Persoonia oxycoccoides	Cranberry Geebung	BioNet predicted
Pomaderris delicata	Delicate Pomaderris	BioNet predicted EPBC PMST
Prasophyllum petilum	Tarengo Leek Orchid	EPBC PMST
Rutidosis leptorhynchoides	Button Wrinklewort	BioNet predicted EPBC PMST
Senecio macrocarpus	Large-fruit Groundsel	EPBC PMST
Swainsona recta	Small Purple-pea	EPBC PMST
Thesium australe	Austral Toadflax	EPBC PMST

Surveyor licence:

Brian Faulkner, Scientific Licence 102470 (NSW *Biodiversity Conservation Act 2016*).

Fauna surveys involved opportunistic observation only, in conjunction with habitat assessment. No trapping or handling of any fauna was involved.

3. Site context

3.1 Assessment area

The assessment area comprises the subject land and land within a 1,500 m radius buffer area as shown in Figure 6 (Assessment Area).

3.2 Landscape features

Landscape features identified within the subject land and assessment area are shown on Figure 1 (Project Location) and Figure 2 (Site Map), respectively. A discussion of relevant landscape features is provided below.

3.2.1 IBRA bioregions and IBRA subregions

IBRA Bioregion: South East Highlands (SEH)

IBRA Subregion: Monaro (SEH16)

Mitchell Landscape: Gundary Plains

Refer to Figure 15 (SubIBRA & Mitchell Landscape of the Subject Land).

3.2.2 Rivers, streams, estuaries and wetlands

There are no creeks, streams or rivers located on the subject land.

An ephemeral drainage line is located on the adjoining property to the west, which drains northwards, as shown in Figure 7 (Water Courses, Creeks and Rivers). This drainage line ultimately leads to the Wollondilly River, which is located in the northern part of the assessment area and comprises the only significant water body in the local area. The Wollondilly River at its closest point to the subject land is approximately 1.3 km to the northeast. Aside from the Wollondilly River there are no significant wetlands, lakes, dams or other aquatic habitats in the assessment area. No DIWA listed wetlands are present in or near the assessment area.

The subject land contains constructed sludge lagoons that contain sediment laden water and residual flocculants, but these do not provide suitable habitat for aquatic life.

3.2.3 Habitat connectivity

The subject land contains remnant native forest/woodland vegetation that is contiguous with similar vegetation located to the south and east. A small amount of similar vegetation is also located on the adjoining property to the east, but this is also largely dominated by very large Radiata Pine trees. However, this area still provides significant potential habitat for arboreal fauna. Remnant trees and patches of native dominant grassland connect the subject land to the West Goulburn Bushland Reserve in Ridge Street. The reserve is located approximately 700 metres to the south south west of the subject land. Adjoining agricultural lands to the west of the West Goulburn Bushland Reserve feature substantial areas of grassy woodland, dominated by Yellow Box and Blakely's Red Gum trees.

There is also some habitat connectivity to the north east, to patched of remnant Grassy Woodland located at the Goulburn TAFE college and adjoining lands.

Habitat connectivity is shown in Figure 8 (Habitat Connectivity).

3.2.4 Karst, caves, crevices, cliffs, rocks or other geological features of significance

There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within the subject land. Some cliffs and rock outcrops are present located alongside the Wollondilly River, which is located on the northern edge of the assessment area. These cliffs and rocky outcrops are located approximately 1,200 metres from the subject land.

3.2.5 Areas of outstanding biodiversity value

There are no Areas of Outstanding Biodiversity Value located within the subject land, the assessment area, or in any other part of the Goulburn Mulwaree Local Government Area.

3.2.6 NSW (Mitchell) landscape

The subject land falls entirely within the Gundary Plains (72% cleared)

Small parts of the assessment area also fall within:

Rockley Plains (62% cleared)

Breadalbane Swamps and Lagoons (91% cleared)

Refer to Figure 16 (SubIBRA and Mitchell Landscapes of the Assessment Area).

3.2.7 Additional landscape features identified in SEARs

Not applicable to this assessment.

3.2.8 Soil hazard features

Not applicable to this assessment.

3.3 Native vegetation cover

Based on Nearmap aerial imagery (19/07/2023) and SEED SVTM Extant PCT mapping, it has been estimated that approximately 140 hectares of remnant native woodland and derived native grassland is present in the assessment area, equivalent to approximately 20% of the area.

Table 4 summarises the extent of native vegetation cover within the assessment area.

Figure 9 (Native Vegetation Cover) shows the approximate extent of native vegetation cover within the assessment area, based on SEED SVTM Extant PCT Mapping.

Table 4 Native vegetation cover in the assessment area

Assessment area (ha)	Approximately 710 hectares
Total area of native vegetation cover (ha)	Approximately 140 hectares
Percentage of native vegetation cover (%)	20%
Class (0-10, >10-30, >30-70 or >70%)	>10-30%

4. Native vegetation, threatened ecological communities and vegetation integrity

4.1 Native vegetation extent

The subject land comprises approximately 2.536 hectares, of which 1.784 hectares has been identified as comprising remnant dry sclerophyll woodland, dominated by Yellow Box *Eucalyptus melliodora*, Blakely's Red Gum *Eucalyptus blakelyi* and Apple Box *Eucalyptus bridgesiana*.

There is also a high component of non-native trees and shrubs present scattered throughout the site, including Radiata Pine *Pinus radiata*, Hawthorn *Crataegus monogyna*, Privet *Ligustrum* spp., Service Tree *Sorbus domestica* and Cherry Plum *Prunus cerasifera*.

The groundcover layer is largely native dominated, with a variety of grasses and forbs present. However, this too contains a relatively high component of introduced weedy species, including St John's Wort *Hypericum perforatum*, Serrated Tussock *Nassella trichotoma*, Catsear *Hypochoeris radicata* and Proliferous Pink *Petrorhagia nanteuilli*.

Refer to Figure 10 (Native Vegetation Extent in the Subject Land).

4.1.1 Changes to the mapped native vegetation extent

Site assessments conducted in 2021, 2022 and 2023 found that the extent of native vegetation matched Nearmap aerial imagery (latest imagery available at the time of preparing this report 19/07/2023). The extent of native vegetation present on the site is consistent with SIX Maps imagery dated 22/04/2014, indicating that there has been no significant changes since that time.

Refer to Figure 10 (Native Vegetation Extent in the Subject Land).

4.1.2 Areas that are not native vegetation

0.752 hectares of the site has been identified as not being native vegetation. Most of this area is occupied by existing sludge lagoons, and associated access tracks, stockpile storage areas and associated facilities. Part of the area identified as non-native vegetation features grassy vegetation, but it is almost entirely dominated by exotic species including species such as Phalaris *Phalaris aquatica*, Cock's Foot *Dactylis glomerata* and African Love Grass *Eragrostis curvula*. Refer to Figure 10 (Native Vegetation Extent in the Subject Land).

4.2 Plant community types

4.2.1 Overview

Vegetation within the subject land has been assessed as aligning with the BioNet Vegetation Classification PCT 3373 Goulburn Tableland Box-Gum Grassy Forest and its extent is shown in Figure 8 Plant community types. A detailed description of the PCT is provided in the following subsection.

Table 5 PCT identified within the Subject Land

PCT ID	PCT name	Subject land area (ha)
PCT 3373	Goulburn Tableland Box-Gum Grassy Forest	1.8
	Total area	**1.8**

4.2.2 PCT 3373 Goulburn Tableland Box-Gum Grassy Forest

4.2.2.1 PCT overview

Table 6 PCT 3373 Goulburn Tableland Box-Gum Grassy Forest

PCT ID	3373
PCT name	Goulburn Tableland Box-Gum Grassy Forest
Vegetation formation	Grassy Woodlands
Vegetation class	Southern Tableland Grassy Woodlands
Per cent cleared value (%)	92%
Extent within subject land (ha)	1.78

The plant community present on the site takes the form of an open grassy woodland.

Remnant canopy trees present on the subject are predominantly Yellow Box *Eucalyptus melliodora*, Apple Box *Eucalyptus bridgesiana* and Blakely's Red Gum *Eucalyptus blakelyi*. Other species present include occasional Brittle Gum *Eucalyptus mannifera*, Broad Leaf

Peppermint *Eucalyptus dives* and Argyle Apple *Eucalyptus cinerea*. There are a significant number of Radiata Pines *Pinus radiata* present on the site. These do not appear to have been deliberately planted and it is likely that they have invaded from the extensive plantings on the adjoining Trinity Catholic College Goulburn (located to the east). Some of the Radiata Pines are very large and represent the largest trees on the site. Locations of Radiata Pines on the subject land are shown in Figure 11 (Locations of Radiata Pines).

The majority of the Eucalypts on the subject land are generally small to medium sized, and few hollow bearing trees are present. In general, where hollows are present, they are less than 5 cm in diameter.

No very large trees with significant hollows are present. It is likely that the site was historically cleared and that the majority of the trees present are regrowth. The locations of hollow bearing trees are shown in Figure 12 (Locations of Hollow Bearing Trees).

The midstratum includes Early Black Wattle *Acacia decurrens*, Silver Wattle *Acacia dealbata*, Broad-leaf Hickory *Acacia falciformis* and Blackwood Wattle *Acacia melanoxylon*. No Black She Oak *Allocasuarina littoralis* was recorded on the land. Also present are numerous environmental woody weeds, such as Hawthorn *Crataegus monogyna*, Fire Thorn *Pyracantha angustifolia*, Cotoneaster *Cotoneaster* spp., Service Tree *Sorbus domestica* and Cherry Plum *Prunus cerasifera*.

The lower shrub layer contains a variety of shrubs typical of the community, including Daphne Heath *Brachyloma daphnoides*, Peach Heath *Lissanthe strigosa*, Bitter Cryptandra *Cryptandra amara*, Urn Heath *Melichrus urceolatus*, Grey Guinea Flower *Hibbertia obtusifolia* and Curved Riceflower *Pimelea curviflora*.

The groundcover layer features a diversity of native grasses and forbs.

Common grasses include Weeping Grass *Microlaena stipoides*, Brushtail Spear Grass *Austrostipa densiflora*, Corkscrew Grass *Austrostipa scabra*, Purple Wire Grass *Aristida ramosa*, Snow Grass *Poa sieberiana* and Kangaroo Grass *Themeda triandra*.

The most common forbs present are Common Everlasting *Chrysocephalum apiculatum*, Mueller's Fuzz Weed *Vittadinia muelleri*, Lemon Beauty Heads *Calocephalus citreus*, Scaly Buttons *Leptorhynchus squamatus*. There also patches of Hoary Sunray *Leucochrysum albicans* subspecies *tricolor*, especially in the vicinity of the boundary with the Wheeo Road.

A wide variety of weedy species are also present, especially St John's Wort *Hypericum perforatum*, Ribwort *Plantago lanceolata*, Proliferous Pink *Petrorhagia nanteuilii*, Flatweed *Hypochoeris radicata* and African Love Grass *Eragrostis curvula*.

Overall, the vegetation on the site can be described as being weed infested and degraded, but still retaining a wide diversity of native plant species representative of the PCT 3373 Goulburn Tableland Box-Gum Grassy Forest community.

Photo 1 PCT 3373 Goulburn Tableland Box-Gum Grassy Forest on the subject land

4.2.2.2 Condition states

One condition state of the PCT 3373 was identified on the subject land. Although there is some variability in the condition of the PCT across the site, there are no easily mapped discrete areas within the native remnant vegetation of sufficient size that would warrant assigning to different condition states or zones. A small strip running along the northern boundary adjacent to the Wheeo Road is maintained by occasional slashing, but the plant species present are similar in composition to the adjoining areas and include *Eucalyptus* saplings. If slashing were to be discontinued, this area would soon revert to the same status as other parts of the site.

4.2.2.3 Justification of PCT selection

The remnant native vegetation present on the subject land is mapped in the SEED STVM Extant PCT mapping layer as being PCT 3373 Goulburn Tableland Box – Gum Grassy Forest. The native vegetation present generally conforms to the description for the PCT provided in the BioNet Vegetation Classification Tool. Landscape position, elevation and mean annual rainfall specifications as described in the PCT description are perfect matches for this site.

Using the BioNet Vegetation Classification Tool, on the basis of IBRA, SubIBRA, dominant canopy trees and commonly occurring shrubs, grasses and forbs on the site, two PCTs received the highest number of matches:

- PCT 3373 Goulburn Tableland Box – Gum Grassy Forest
- PCT 3376 Southern Tableland Grassy Box Woodland

These PCT are very similar in terms of species composition, and both are mapped and known to be present in the Goulburn area, and in parts intergrade, so it can be hard sometimes to be sure which PCT is present, especially on a disturbed site.

However, there is a high degree of confidence that the PCT present on the subject land is PCT 3373, ie that the SEED mapping is accurate.

One of the key differences between the two communities is that PCT 3376 is described as having a shrub layer that is "*patchy to absent*", whereas for PCT 3373 the shrub layer is described as "*very sparse*".

The BioNet Vegetation Classification System also notes that: "*PCT 3376 grades into PCT 3373 which has a more diverse shrub layer…*"

The shrub layer present on the site is sparse, but certainly not "*patchy to absent*".

It is diverse and well represented on the site with a relative abundance of Daphne Heath *Brachyloma daphnoides*, Peach Heath *Lissanthe strigosa*, Bitter Cryptandra *Cryptandra amara*, Urn Heath *Melichrus urceolatus*, Grey Guinea Flower *Hibbertia obtusifolia* and Curved Riceflower *Pimelea curviflora*. On this basis, it is most likely that the PCT present on the site is PCT 3373.

4.2.2.4 Alignment with TECs

PCT 3373 Goulburn Tableland Box-Gum Grassy Forest is associated with the NSW Listed Critically Endangered Ecological Community 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.

This community is described in the NSW Government OEH profile as "an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box *Eucalyptus albens*, Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi*. Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs."

Comparison of data collected during site inspections and BAM survey with the Final Determination of the NSW Scientific Committee to list this ecological community as a Critically Endangered Ecological Community under Part 1 of Schedule 2 of the NSW BC Act confirms that the remnant vegetation present on the subject land meets criteria for identification as the TEC.

4.2.2.5 Alignment with EPBC Act listed ECs

PCT 3373 Goulburn Tableland Box-Gum Grassy Forest is associated with the Commonwealth EPBC Act listed Critically Endangered community White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

The Commonwealth Threatened Species Scientific Committee provides listing criteria for identification of the TEC, as set out under section 4 of the listing advice:

In order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey.

The patch has a predominantly native understorey.

The size and life-form of understorey species are such that viable populations can exist in very small areas (Prober & Thiele 1993). Therefore, in order to be the listed ecological community, an understorey patch, in the absence of overstorey trees, must have a high level of native floral species diversity, but only needs to be 0.1 hectares or greater in size.

The patch of the community present on the subject land comprises approximately 1.784 hectares (ie well in excess of 0.1 hectares).

A patch in which the perennial vegetation of the ground layer is dominated by native species, and which contains at least 12 native, non-grass understorey species (such as forbs, shrubs, ferns, grasses and sedges) is considered to have a sufficiently high level of native diversity to be the listed ecological community. At least one of the understorey species should be an important species (e.g. grazing-sensitive, regionally significant or uncommon species; such as Kangaroo Grass or orchids) in order to indicate a reasonable condition.

The BAM plot used to assess the native vegetation was found to contain 14 native forbs, 8 native grasses and 2 native shrubs. The native grasses included Kangaroo Grass.

The flora list for the subject land contains 35 native forbs, 12 native grasses (& grasslike), 16 native shrubs, 4 native vines and 1 native fern.

Areas with both an overstorey and understorey present are also considered of sufficiently good condition to be part of the listed ecological community if the understorey meets any of the conditions above, or if they have a predominantly native understorey, are two hectares or above in size, and have either natural regeneration of the overstorey species or 20 or more mature trees per hectare.

The area has both an overstorey and an understorey and meets all of the previously listed conditions, including having a predominantly native understorey.

While the extent of the community within the subject land is less than 2 hectares, it is contiguous with remnant vegetation located to the south and when considered together the area of remnant vegetation comprising the ecological community in the local area greatly exceeds 2 hectares.

The remnant vegetation contains regenerating saplings of the overstorey species and contains 20 or more mature trees per hectare.

Based on the preceding comments, it is clear that the remnant vegetation present on the site meets condition criteria as set under Section 4 of the listing advice for the Commonwealth EPBC Act listed Critically Endangered *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community.

4.3 Threatened ecological communities

TECs and where relevant, ECs identified within the subject land are listed in Table and their extent is shown on Figure 9 Threatened ecological communities and ECs.

Table 7 TECs within the subject land

TEC name	Profile ID (from TBDC)	BC Act status	EPBC Act status	Associated vegetation zones within the subject land	Area within subject land (ha)
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	10837	CEEC	-	PCT3373 Moderate	1.8
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	-	CE	PCT3373 Moderate	1.8

4.4 Vegetation zones

Remnant native vegetation across the subject land was found to be in one condition class. The area supports an open grassy woodland, with a canopy dominated largely by Yellow Box *Eucalyptus melliodora*, Blakely's Red Gum *Eucalyptus blakelyi* and Apple Box *Eucalptus bridgesiana*. The midstorey and undertorey strata are largely dominated by native species, but also contain a high component of exotic weedy species. Canopy trees are relatively small to medium sized and there are no very large remnant trees present. The largest trees present on the site are feral Radiata Pine (*Pinus radiata*). It is highly likely that the land was historically cleared of larger trees and that most of the trees present currently represent regrowth. The native vegetation on the site has been classed as one condition zone: "PCT3373 Moderate".

Patch size was determined using Nearmap aerial imagery (19/07/2023) and SEED SVTM Extant PCT mapping.

Refer to Table 5 (PCT identified within the Subject Land). Refer to Figure 10 (Native Vegetation Extent in the Subject Land).

Table 8 Vegetation zones and patch sizes

Vegetation zone ID	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	No. vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
PCT3373 Moderate	PCT 3373 Goulburn Tableland Box-Gum Grassy Forest	Moderate – (degraded due to presence of weed species and absence of large trees)	1.8	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	BAM Plot 1

4.5 Vegetation integrity (vegetation condition)

4.5.1 Vegetation integrity survey plots

One BAM VIS plot has been sampled within the remnant native vegetation present on the site, in accordance with BAM Table 3.

4.5.2 Scores

Table 9 Vegetation integrity scores

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
PCT3373 Moderate	76.6	74.8	75.5	75.7	Yes

4.5.3 Use of benchmark data

Standard condition benchmarks within the BAM – Calculator were used to assess the vegetation integrity attributes of the vegetation zone identified within the subject land.

5. Habitat suitability for threatened species

5.1 Identification of threatened species for assessment

5.1.1 Ecosystem credit species

Table 10 Predicted ecosystem credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Regent Honeyeater (foraging)	*Anthochaera regia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Gang Gang Cockatoo	*Callocephalon fimbriatum*	V	E	Yes	☐ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate
Glossy Black Cockatoo	*Calyptorhynchus lathami*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Reason 2: Habitat constraints	PCT3373 Moderate	High
Speckled Warbler	*Cthonicola sagittata*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Spotted Harrier	*Circus assimilis*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Varied Sitella	*Daphoenositta chrysoptera*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate
Spotted Tail Quoll	*Dasyurus maculatus*	V	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Reason 2: Habitat constraints	PCT3373 Moderate	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Black Falcon	*Falco subniger*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate
Little Lorikeet	*Glossopsitta pusilla*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
White-bellied Sea Eagle	*Haliaeetus leucogaster*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
White-throated Needletail	*Hirundapus caudacutus*	-	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Swift Parrot (foraging)	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate
Barking Owl (foraging)	*Ninox connivens*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Powerful Owl (foraging)	*Ninox strenua*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Scarlet Robin	*Petroica boodang*	V	-	No	☐ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate
Flame Robin	*Petroica phoenicea*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373	Moderate
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Diamond Firetail	*Stagonopleura guttata*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Little Whip Snake	*Suta flagellum*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High
Rosenberg's Goanna	*Varanus rosenbergi*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	PCT3373 Moderate	High

5.1.1.1 Predicted ecosystem credit species excluded from assessment

The following species were excluded from assessment on the basis of habitat constraints as show in the TBDC:

Glossy Black Cockatoo *Calyptorhynchus lathami* – foraging. The subject land does not contain *Allocasuarina* or *Casuarina* species.

Black-necked Stork *Ephippiorhynchus asiaticus*. The subject land does not contain any swamps or wetlands, and there are no swamps or wetlands within 300 metres of the subject land.

5.1.2 Species credit species

Table 11 Predicted flora species credit species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Hoary Sunray	*Leucochrysum albicans subspecies tricolor*	E	E	☒ BAM-C ☐ TBDC ☒ Previous survey ☒ Current survey	Yes	N/A	PCT3373 Moderate

5.1.2.3 Predicted flora species credit species excluded from assessment

No flora species credit species were predicted to be present in the BAM-C for this assessment.

5.1.2.3 Predicted flora species credit species added to assessment

Site assessment has confirmed that Hoary Sunray *Leucochrysum albicans* subspecies *tricolor* is present on the subject land and it has been included in the assessment for this project.

Table 12 Predicted fauna species credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	No	Reason 2: Habitat constraints	PCT3373 Moderate
Key's Matchstick Grasshopper	*Keyacris scurra*	E	E	No	☐ BAM-C ☐ TBDC ☐ Previous survey	Yes	N/A	PCT3373 Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
					☒ Current survey			
Swift Parrot	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	No	Reason 2: Habitat constraints	PCT3373 Moderate

5.1.2.3 Predicted fauna species credit species excluded from assessment

The following fauna species credit species have been removed from the BAM-C generated list on the basis of habitat constraints:

Regent Honeyeater *Anthochaera phrygia* (breeding) – the subject land is not part of an important mapped area for this species.

Swift Parrot Lathamus discolor (breeding) - the subject land is not part of an important mapped area for this species.

In addition, no evidence was found for presence of either species during site assessments in three consecutive years (2021, 2022 & 2023).

5.1.2.3 Predicted fauna species credit species added to assessment

Key's Matchstick Grasshopper *Keyacris scurra* has been added to the BAM-C generated list as it has been confirmed to be present on the subject land.

5.2 Presence of candidate species credit species

Table 13 Determining the presence of candidate flora species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Hoary Sunray	*Leucochrysum albicans* subspecies *tricolor*	E	E	Targeted threatened species survey	Yes	No

Table 14 Determining the presence of candidate fauna species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Key's Matchstick Grasshopper	*Keyacris scurra*	E	E	Targeted threatened species survey	Yes	No

5.3 Threatened species surveys

Table 15 Threatened species surveys for candidate flora species credit species on the subject land

Common name	Scientific name	Threatened flora species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (transects or grids)	**Timing of survey – within recommended period?** (BAM-C / TBDC)	**Effort** (hours & no. people)		
Hoary Sunray	*Leucochrysum albicans* subspecies *tricolor*	Transects & random meander	☒ Yes 28/10/2021 24/01/2022 25/09/2023	1 person, 5 hours total	Yes	No

TBDC specifies surveys should be conducted Jan/Feb/Mar/April & Sept/Oct/Nov/Dec.

This species is easily recognisable when in flower.

Table 16 Threatened species surveys for candidate fauna species credit species on the subject land

Common name	**Scientific name**	**Threatened fauna species surveys**			**Present**	**Further assessment required (BAM Subsections 5.2.5 and 5.2.6)**
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	**Timing of survey – within recommended period?** (BAM-C / TBDC)	**Effort** (hours & no. people)		
Key's Matchstick Grasshopper	*Keyacris scurra*	Random meander (refer to survey protocol developed by GMC & Roger Farrow).	☒ Yes 25/09/2023	1 person 2 hours	Yes	No

Survey protocol developed by GMC and Roger Farrow was used for this assessment, refer to Appendix H of this report.

5.4 Expert reports

No expert reports were used or relied upon for this assessment.

5.5 More appropriate local data (where relevant)

No local data has been used in this assessment.

5.6 Area or count, and location of suitable habitat for a species credit species (a species polygon)

Two species credit species have been confirmed to be present on the subject land by field survey (25/09/2023):

Key's Matchstick Grasshopper *Keyacris scurra*

Three individuals were detected during random meander survey, at widely spaced locations.

The ecological information provided in the TBDC suggests that the grasshopper is unlikely to be present under shaded areas and that survey should be conducted in open, exposed grassland areas, but degree of shade beneath woodland trees is likely to vary depending on season and time of day, and the grasshoppers, while wingless, are sufficiently mobile to move in response to changing shade conditions. It is likely that all areas of remnant native vegetation on the subject land potentially provide suitable habitat for this species.

The total area of remnant vegetation on the subject land is estimated to comprise approximately 1.8 hectares.

Hoary Sunray *Leucochrysum albicans* subspecies *tricolor*

Two patches of Hoary Sunray were found during the survey. It was estimated that approximately 200 individual plants were present on the subject land during field survey. However, the entirety of the remnant native vegetation on the site provides potential habitat for this species, and as with the Key's Matchstick Grasshopper, the species polygon on the subject land corresponds to the area mapped as PCT 3373 Goulburn Tableland Box-Gum Grassy Forest.

Species polygons for Key's Matchstick Grasshopper and Hoary Sunray showing extent of habitat and locations of sightings are shown in Figures 13 and 14.

Table 17 Results for present species (recorded within the subject land)

Common name	**Scientific name**	**Biodiversity risk weighting** (BAM-C & TBDC*)	**SAII entity**** (BAM-C & TBDC)	**Habitat constraints / microhabitats present on the subject land / vegetation zone**	**Abundance – No. individual plants present on subject land** (flora with unit of measure of count)	**Extent (ha) of suitable habitat present on site** (flora or fauna with unit of measure of area)	**TBDC species specific recommendations e.g. buffers, general comments** (where relevant)	**Habitat condition** (vegetation integrity score for each vegetation zone in the polygon – area species only)
Key's Matchstick Grasshopper	*Keyacris scurra*	High (2)	No	Native dominated grassland with a high abundance of forbs (especially Asteraceae).	-	1.8 hectares	Mowing should be avoided at times of year when grasshoppers are active	75.7
Hoary Sunray	*Leucochrysum albicans* subspecies *tricolor*	High (2)	No	Generally open sunny areas (shade intolerant)	Estimated approximately 200 individual plants present	1.8 hectares	-	75.7

Table 18 Results for EPBC Act listed species present (recorded within the subject land)

Common name	**Scientific name**	**Abundance – No. individual plants present on subject land** (flora with unit of measure as count)	**Extent (ha) of suitable habitat present on site** (flora or fauna with unit of measure as area)
Key's Matchstick Grasshopper	*Keyacris scurra*	-	1.8 hectares
Hoary Sunray	*Leucochrysum albicans* subspecies *tricolor*	Approximately 200	1.8 hectares

6. Identifying prescribed impacts

Table 19 Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒No	Not present on the subject land	N/A
Human-made structures	☐Yes / ☒No	No buildings or other significant structures are located in the subject land, ie the area to be impacted by the proposed activity.	N/A
Non-native vegetation	☒Yes / ☐No	Parts of the site have been identified as being dominated by non-native vegetation, primarily comprising exotic grasses and weedy pasture species.	These areas are not likely provided significant habitat for any threatened flora or fauna species.
Habitat connectivity	☒Yes / ☐No	There is some habitat connectivity across the site, linking remnant vegetation on land to the east, west and south with similar vegetation. However, while the proposed activity will reduce this connectivity, it will not entirely remove landscape connectivity.	Only one threatened fauna species has been confirmed to be present (*Keyacris scurra*). However, it is likely that highly mobile fauna including birds and microbats may use part of the habitat on occasion. These are not likely to be adversely impacted.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Waterbodies, water quality and hydrological processes	☐Yes / ☒No	No significant waterbodies or water courses are present. The sludge lagoons do not provide suitable habitat for flora or fauna.	N/A
Wind turbine strikes (wind farm development only)	☐Yes / ☒No	Not a wind farm.	N/A
Vehicle strikes	☒Yes / ☐No	Vehicles and heavy plant occasionally access the site to clean out the sludge lagoons and remove accumulated sediments/sludge.	It is not likely that any threatened entities are likely to be impacted by vehicles and plant on this site. There is no through traffic and all vehicles will be moving slowly (less than 10 km per hour maximum speed) while on site.

Stage 2: Impact assessment (biodiversity values and prescribed impacts)

7. Avoid and minimise impacts

7.1 Avoid and minimise direct and indirect impacts

7.1.1 Project location & relevant background information

The project is located at a site that has been long used for treatment of drinking water for Goulburn. Parts of the site are currently undeveloped and support remnant native vegetation, as described and assessed in this document.

Goulburn's population increased from 22,890 in 2016 to 32,053 in 2021. The number of dwellings increased from 10,095 to 14,671 over the same period (Australian Bureau of Statistics, 2021). This growth is projected to continue significantly over coming decades.

Expansion and upgrade of the WTP and associated Residuals Handling Facility is critical to meeting increasing demands for safe drinking water.

Under the *NSW Public Health Act 2010* Council is required as a water authority to provide drinking water which is fit for human consumption, with the relevant State Minister having the authority to intervene should drinking water be unfit for human consumption. Furthermore, under the Act, water suppliers must have a quality assurance program (Council's Drinking Water Management Plan) which identifies Council's roles and responsibilities regarding drinking water quality such as health based targets and aesthetic limits to ensure customers can safely and comfortably drink the water provided.

Council adopted a key strategic planning document for the future growth and development of the Local Government Area, namely the *Urban and Fringe Housing Strategy*. One of the intentions of the Strategy is to provide criteria for the consideration of Planning Proposals in future for land located on the fringe of the towns, specifically Goulburn and Marulan. Given the housing growth identified for Goulburn, it is anticipated that increased support from local infrastructure such as drinking water supply will also increase.

The adoption of the *Urban and Fringe Housing Strategy* assists with infrastructure planning by identification of future growth potential and urban release areas. On this basis the Planning Proposal is consistent with this Strategy.

The project site was considered to be the most suitable for this project because:

- Proximity of lagoons to the existing water treatment plant

- The site is secure and can be supervised easily by staff
- The site is likely to already be affected by contaminants from the treatment process associated with the existing lagoons.
- The land is already owned by Council.
- The site is large enough for the lagoons/ponds required.
- The cost of expansion and operation will be lower.
- Sites with overland flows and proximity to water courses should be avoided due to potential water quality contamination in excessive rain events. The site selected is relatively elevated and not affected by overland flows/stormwater.
- The additional lagoons will provide some bushfire risk hazard reduction to the existing facility which is key infrastructure for Goulburn.
- The site is mostly surrounded by non-residential uses and therefore likely to have less impact on surrounding residential areas.

After preliminary ecological surveys and assessment of likely impacts of the proposed activity in 2021 and 2022, Goulburn Mulwaree Council was advised that the proposed project site supported a plant community identified at that time as *PCT 1330 Yellow Box – Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion*.

This community directly aligns with the NSW listed Critically Endangered Ecological Community *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.*

Although the vegetation on the site is degraded and weed infested, it was also determined that it meets criteria for identification as the Commonwealth listed Critically Endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community.

Council was advised that:

- The proposal would be likely to have a significant impact on the local occurrence of a listed NSW Listed CEEC and a Commonwealth MNES/TEC.
- It is key requirement of the NSW BC Act that proponents demonstrate that the hierarch of Avoid – Minimise – Mitigate has been applied when designing projects that may impact on biodiversity values.

- If the project were to proceed it would require preparation of a BDAR and subsequently the acquisition and retirement of BOS credits that would add substantially to the cost of the project.

Following this advice, Council temporarily postponed the project and put in place a process to identify and evaluate alternative options.

7.1.2 Project design

Council staff have devoted a considerable amount of effort in identifying and evaluating numerous alternative options to developing the subject site in an effort to avoid impacts on the identified CEEC and threatened species present on the site as far as is reasonably and practicably possible.

However, after exhaustive analysis, it has been determined that there are no realistic alternative sites that would be suitable. After evaluating 19 alternative potential sites, it has been concluded that the current proposal is the only feasible option for expanding the WTP Residuals Handling Facility.

Nineteen alternative possible locations for the proposed facility were identified and evaluated, as shown in Appendix I.

7.1.3 Project implementation

Implementation of the project will require removal of all remnant native vegetation on the subject land. The following measures are proposed to be implemented to assist with avoiding and minimising impacts on biodiversity:

- Removal of vegetation and earthworks will be scheduled to occur between March and May, to avoid fauna breeding seasons.
- It is particularly important that vegetation clearance should not occur in the spring months, ie September, October and November as this is the peak breeding time for many fauna species, especially birds.
- The winter months (June, July and August) are also to be avoided to prevent impacts on torpid bats that may be overwintering in tree hollows.
- Timing of tree and vegetation removal is to take into account weather conditions and seasonal considerations. Some adjustment to timeframes may be acceptable or necessary, depending on seasonal constraints.

- A tree and vegetation removal protocol is to be implemented to avoid harm to fauna at the time of clearing/removal of native vegetation. Removal of trees and native vegetation will be supervised by an accredited ecologist licenced to handle fauna.
- Larger logs and logs with hollows will be salvaged and relocated to bushland reserves close by, in order to provide and enhance fauna habitat in the local area.
- On completion of works, bare earth and sludge lagoon banks will be sown down with a mix of locally occurring native grasses and forbs. This is to include seeds of Hoary Sunray collected from within the site prior to clearing.

7.2 Avoid and minimise prescribed impacts

7.2.1 Project location

The project has been located in an area that is already partly utilised for water treatment. The proposal is to rezone part of the subject land in order to allow further development and expansion of the existing water treatment plant. The project location largely avoids prescribed impacts, as it does not contain significant geological features such as karst, caves, or cliffs. It does not contain any significant natural waterbodies or wetlands. There are no significant human made structures that would provide habitat for threatened fauna, such as mines, old buildings, sheds etc. The project does not involve any wind turbines or large infrastructure.

7.2.2 Project design

Clearing of non-native vegetation

A small area of non-native vegetation, largely dominated by exotic grasses and pasture weed species is to be removed. The majority of this vegetation is located in the vicinity of the Wheeo Road and the project design has avoided more sensitive areas of the broader area of land owned and managed by Council. The removal of non-native vegetation is not likely to constitute a significant impact on any threatened species.

Habitat connectivity

The proposed activity will involve reduction of habitat connectivity across the subject land. However, habitat connectivity in the broader landscape will not be significantly impacted as adjoining land to the south retains significant native vegetation in good condition.

Vehicle strikes

The project site is a restricted site. It will be accessed only occasionally by vehicles and heavy plant, primarily in order to clean out and remove accumulated sludge from the sludge lagoons. There is no through road access, and any vehicles or plant on site will be restricted to a maximum speed of 10 kilometres per hour or less. It is not likely that there will be any significant impacts on any threatened species from vehicle strikes.

7.3 Other measures considered

As described previously in this report, the primary measure considered to avoid impacts of the proposed activity was to find an alternative site for the project. However, following exhaustive analysis of 19 alternative sites it was concluded that this measure was not feasible.

7.4 Summary of measures to avoid and minimise impacts

Table 20 Avoidance and minimisation measures for direct, indirect and prescribed impacts

Action	Outcome (Describe the outcome of implementing the measure, with reference to specific entities identified in Sections 4 and 5)	Timing	Responsibility
Removal of vegetation scheduled to avoid fauna breeding and hibernation times	Avoidance of impacts to breeding fauna and overwintering fauna	No clearing to occur in spring or winter months	Project manager
Tree and vegetation clearing protocol to be developed and implemented	Avoid and minimise impacts on any native fauna that may be present when clearing is undertaken	During tree and vegetation clearing	Project ecologist

Action	Outcome (Describe the outcome of implementing the measure, with reference to specific entities identified in Sections 4 and 5)	Timing	Responsibility
Larger logs and any hollow logs to be salvaged and moved to nearby bushland reserves	Retention of habitat for fauna that utilise fallen timber and hollow logs	During and after tree and vegetation clearing	Project ecologist and GMS project staff
Collection of seeds from Hoary Sunray and other native grassland plants on site	Retention of local provenance genetics and conservation of local population of Hoary Sunray and other grassland species	Prior to clearing, at suitable times when seed is maturing	Project ecologist and GMS project staff
Reseeding of lagoon banks and cleared areas post works	Restoration of some local grassland species	On completion of works	Project ecologist and GMS project staff

8. Impact assessment

8.1 Direct impacts

8.1.1 Residual direct impacts

Table 21 Summary of residual direct impacts

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	**BC Act status**	**EPBC Act status**	**SAII entity**	**Project phase/timing of impact** (e.g. construction, operation, rehabilitation)	**Extent** (ha, number of individuals)
Removal of 1.8 hectares of PCT 3373 Goulburn Tableland Box-Gum Grassy Forest (aligns to CEEC White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland).	CEEC	CE	Yes	Construction	1.8 hectares
Removal of habitat for Key's Matchstick Grasshopper *Keyacris scurra*	E	E	No	Construction	1.8 hectares
Removal of habitat for Hoary Sunray *Leucochrysum albicans* subspecies *tricolor*	E	E	No	Construction	1.8 hectares, approximately 200 plants

8.1.2 Change in vegetation integrity score

Table 22 Impacts to vegetation integrity

Vegetation zone	PCT ID	Management zone	Area (ha)	Before development			After development			Change		
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
PCT3373 Moderate	3373	To be cleared	1.8	76.6	74.8	75.5	75	0	0	0	0	-75.7

8.2 Indirect impacts

Table 23 Summary of residual indirect impacts

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	**Impacted entities** (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	**Extent** (ha or zone reference)	**Frequency**	**Duration** (long-term/ short-term/ medium-term)	**Project phase/ timing of impact** (e.g. construction, operation, rehabilitation)	**Likelihood and consequences**
Inadvertent physical damage to adjacent vegetation	Trees and other native vegetation adjacent to the subject land, comprising PCT 3373	Refer to Figure 12	N/A	Short term	Construction	Very low likelihood, as the subject land is fenced and adjacent vegetation is protected by this.
Reduced viability of habitat due to edge effects	Patch of remnant native vegetation on adjoining land, comprising PCT 3373	Refer to Figure 12	N/A	N/A	Construction & operation	Clearing associated with the proposed activity will move the boundary between remnant native vegetation and cleared land, however overall there should not be a significant increase in edge effects.

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	**Impacted entities** (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	**Extent** (ha or zone reference)	**Frequency**	**Duration** (long-term/ short-term/ medium-term)	**Project phase/ timing of impact** (e.g. construction, operation, rehabilitation)	**Likelihood and consequences**
Reduced viability of habitat due to noise, dust or light spill	Patch of remnant native vegetation on adjoining land, comprising PCT 3373	Refer to Figure 12	N/A	Short term	Construction	During the construction phase there will be some impacts from noise and dust due to machinery. However, this will be a short-term impact and is not anticipated to have long term consequences
Spread of diseases or weeds	Patch of remnant native vegetation on adjoining land, comprising PCT 3373	Refer to Figure 12	May be ongoing	May be long term ongoing	Construction & operation	There is a small risk of pathogens and weeds being brought into the site on vehicles and machinery and then spreading into adjacent bushland. This will be managed by good hygiene protocols, monitoring and

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	**Impacted entities** (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	**Extent** (ha or zone reference)	**Frequency**	**Duration** (long-term/ short-term/ medium-term)	**Project phase/ timing of impact** (e.g. construction, operation, rehabilitation)	**Likelihood and consequences**
						ongoing site weed control programs.
Loss of food and shelter for fauna.	No further indirect impact	N/A	N/A	N/A	N/A	N/A
Loss of breeding habitat	No further indirect impact	N/A	N/A	N/A	N/A	N/A
Trampling of threatened flora species	Not relevant – restricted site and remnant vegetation not easily accessible	N/A	N/A	N/A	N/A	There will be no increase in access to remnant vegetation either during or after construction
Inhibition of nitrogen fixation and increased soil salinity	Not relevant. Remnant native vegetation is uphill from sludge lagoons and there will be no change in soil hydrology	N/A	N/A	N/A	N/A	N/A

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	**Impacted entities** (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	**Extent** (ha or zone reference)	**Frequency**	**Duration** (long-term/ short-term/ medium-term)	**Project phase/ timing of impact** (e.g. construction, operation, rehabilitation)	**Likelihood and consequences**
Fertilizer drift	Not relevant. No fertilizers will be applied to any parts of the site.	N/A	N/A	N/A	N/A	N/A
Rubbish dumping	Not relevant – restricted site and remnant vegetation not easily accessible	N/A	N/A	N/A	N/A	Very unlikely as the area is securely fenced with restricted access.
Wood collection	Not relevant – restricted site and remnant vegetation not easily accessible	N/A	N/A	N/A	N/A	Very unlikely as the area is securely fenced with restricted access.
Removal of rocks	Not relevant – restricted site and remnant vegetation not easily accessible	N/A	N/A	N/A	N/A	Very unlikely as the area is securely fenced with restricted access.
Increase in predators	Not relevant – the proposed activity is not likely to result in	N/A	N/A	N/A	N/A	

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	**Impacted entities** (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	**Extent** (ha or zone reference)	**Frequency**	**Duration** (long-term/ short-term/ medium-term)	**Project phase/ timing of impact** (e.g. construction, operation, rehabilitation)	**Likelihood and consequences**
	any increases in predators such as cats, dogs etc					
Increase in pest animal populations	Not relevant – the proposed activity is not likely to result in any increases in pest animal populations	N/A	N/A	N/A	N/A	Very unlikely to be any increase in pest animal populations.
Changed fire regime	Not relevant – not likely to be any changes in fire regimes	N/A	N/A	N/A	N/A	Very unlikely to be any change to existing fire regimes.
Disturbance to specialist breeding and foraging	No further indirect impacts	N/A	N/A	N/A	N/A	N/A

8.3 Prescribed impacts

8.3.1 Non-native vegetation

8.3.1.1 Nature

Parts of the subject land have been identified as containing non-native vegetation and these areas are dominated mostly by exotic grass species and pasture weeds.There are some shrubby species present, including Gorse *Ulex europaeus*, Blackberry *Rubus fruticosus* aggregate and African Box Thorn *Lycium ferocissimum*.

8.3.1.2 Extent

Approximately 0.8 hectares of the subject land has been identified as containing non-native vegetation.

8.3.1.3 Duration

The areas identified as non-native vegetation on the subject land are to be entirely cleared as part of the proposed decommissioning of the existing WTP residuals handing facility and construction of new sludge lagoons. It is anticipated that clearing will occur over a relatively short time frame (less than 3 months).

8.3.1.4 Consequences

The areas of non-native vegetation to be cleared are considered unlikely to provide significant habitat for any threatened species, and clearing is not likely to constitute a significant impact on biodiversity values of the area.

8.3.2 Habitat connectivity

8.3.2.1 Nature

The remnant native vegetation on the subject land (identified as PCT 3373) links similar remnant vegetation located on land to the east, west and south.

8.3.2.2 Extent

Approximately 1.8 hectares of native vegetation is to be removed. The area comprises a strip approximately 180 metres long by 100 metres wide.

8.3.2.3 Duration

The area identified as native vegetation on the subject land is to be entirely cleared as part of the proposed decommissioning of the existing WTP residuals handing facility and construction of new sludge lagoons. It is anticipated that clearing will occur over a relatively short time frame (less than 3 months).

8.3.2.4 Consequences

Only one threatened fauna species has been confirmed to be present (*Keyacris scurra*) in the native vegetation to be cleared. The clearing will have an impact on habitat connectivity for this species. It is likely that other protected and threatened fauna including birds and microbats may use part of the habitat on occasion. These are highly mobile species and not likely to be adversely significantly impacted.

8.3.3 Vehicle strikes

8.3.3.1 Nature

The site is occasionally accessed by vehicles and heavy plant, primarily to clean out and remove accumulated sludge from the sludge lagoons, and for site maintenance purposes. Vehicles are slow moving while on site and restricted to a maximum speed of 10 kilometres per hour.

8.3.3.2 Extent

The extent of vehicle access is limited and confined to what is needed to providing access to the sludge lagoons. There is no through road access and only a limited number of vehicles can access the site.

8.3.3.3 Duration

Access by vehicles and plant is intermittent and likely to be less than one day per week. Vehicles only access the site during daylight hours and only when sludge lagoon clearing or other maintenance activities are required.

8.3.3.4 Consequences

While there is the possibility of vehicle strikes on fauna, this is considered to be very unlikely. Most fauna species likely to be present are highly mobile and will be able to evade vehicles as these are not travelling at speed.

8.3.4 Vehicle strikes

Table 24 Residual prescribed impacts – vehicle strikes

Threatened fauna or protected fauna that are part of a TEC that are at risk of vehicle strike (identified in Section 6)	**SAII entity**	**Likelihood**	**Estimated vehicle strike rates**	**Consequences**
Protected fauna that are part of Box-Gum Grassy Woodland TEC	No	Very low.	Very low to non-existent	Not likely to be a significant issue.

8.4 Mitigating residual impacts – management measures and implementation

Mitigating residual impacts – management measures and implementation

- Mitigation measures are proposed to minimise and compensate for impacts of the proposed activity in accordance with best practice and include:
- Removal of vegetation and earthworks will be scheduled to occur between March and May, to avoid fauna breeding seasons. It is particularly important that vegetation clearance should not occur in the spring months, ie September, October and November as this is the peak breeding time for birds. The winter months are also to be avoided to prevent impacts on torpid bats that may be overwintering in tree hollows.
- A tree and vegetation removal protocol is to be implemented to avoid harm to fauna at the time of clearing/removal of native vegetation. Further details are provided in 8.4.1 below.
- Removal of trees and other vegetation will be supervised by an accredited ecologist licenced to handle fauna.
- Larger logs and logs with hollows will be salvaged and relocated to bushland reserves close by in order to provide and enhance fauna habitat. If larger rocks are uncovered during earthworks, these too will be salvaged for creation of fauna habitat.

- On completion of works, bare earth will be sown down with a mix of locally occurring native grasses and and grassland forbs. This will include seeds of Hoary Sunray *Leucochrysum albicans* subspecies *tricolor* collected from within the site prior to clearing.
- Two adjoining sites in Council ownership and containing remnant *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest* are to be managed for conservation purposes. A management plan is to be developed for each site that will provide guidance on measures to be implemented to improve Vegetation Integrity Scores and hence biodiversity values of each site, compensating for the loss of biodiversity and impacts on the CEEC resulting from the proposed upgrade of the Water Treatment Plant.

➢ Proposed BGGW (Box Gum Grassy Woodland) Management Site 1 contains approximately 1 hectare of derived native grassland with parts of the site having a canopy of exotic conifers (*Pinus* and *Cupressus* species). This site is located on the opposite side of the Wheeo Road to the proposed project site but is less than 100 metres distance away as shown in Figure 1. The exotic conifers on this site will be removed and parts of the site will be replanted with small suitable native tree and shrub species representative of PCT 3373. Due to infrastructure constraints the majority of this site will be managed as grassland by carefully timed, strategic mowing.

➢ Proposed BGGW Management Site 2 contains approximately 5 hectares of *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest* in similar condition to that present in the proposed project impact area. This site is directly adjoining the proposed project area, as shown in Figure 4. The vegetation comprises a Eucalypt woodland with a canopy dominated by Yellow Box *Eucalyptus melliodora*, Apple Box *Eucalyptus bridgesiana* and Blakely's Red Gum *Eucalyptus blakelyi*. There is a well-defined midstorey, shrub layer and native dominated groundcover. However, this area is weed infested and has a significant infestation of Radiata Pines (*Pinus radiata*) present, some of which are very large and are clearly competing with native plants. This site historically has largely been unmanaged and weed infestations have not been well controlled. The proposal is to remove the feral Pines (using best practice guidelines for wilding conifer control in natural bushland areas) and develop and implement a weed management plan to reduce impacts of feral plants on the plant community.

- The combination of the management and protection of the two proposed Box Gum Grassy Woodland conservation areas will result in protection of a combined area of approximately 6 hectares of the local occurrence of *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest*. The anticipated improvements in Vegetation Integrity Scores and hence biodiversity values of these areas will significantly compensate for the loss of 1.78 hectares of the plant community required for the upgrade of the Water Treatment Plant.
- Details of the two proposed Box Gum Grassy Woodland Conservation Areas are provided in Appendix J.

8.4.1 Tree & Other Vegetation Removal Protocol

- An accredited ecologist licenced to handle fauna will be engaged to supervise vegetation clearing activities required for the project.
- Two weeks prior to any clearing occurring, the project ecologist will undertake preclearing assessments of the site and identify any hollow bearing trees, other significant habitat trees and any other significant fauna habitat present on the site.
- Significant habitat trees will be clearly identified by pink flagging tape.
- Removal of vegetation and earthworks will be scheduled to occur between March and May, to avoid fauna breeding and dormancy seasons.
- The project ecologist will be present on site to supervise clearing activities that involve significant habitat trees and any other significant fauna habitat.
- As far as is reasonably practicable, non-significant vegetation is to be cleared first, leaving habitat trees and other significant fauna features to be cleared last.
- A clear zone is to be established around the base of trees to be removed prior to removal, allowing free access for personnel and machinery.
- Identified significant habitat trees will be bumped using machinery to encourage any roosting fauna to self-evacuate. Bumping is to be repeated at 1 minute intervals for approximately 5 minutes per tree.
- Any hollow sections of trees or branches that are found to be hollow are to be left on the ground for 24 hours before salvage, to provide additional opportunity for fauna to self-evacuate.
- Hollow logs and branches are to be relocated to adjoining bushland or other nearby Council bushland reserves to provide and enhance fauna habitat.

- Any injured native fauna are to be rescued and transferred to the care of accredited wildlife rescue personnel such as WIRES or Wildcare. Fauna requiring urgent veterinary treatment are to be taken to Southern Tablelands Veterinary Hospital as soon as is practicably possible.
- Bats must only be handled by trained personnel who have current Lyssavirus (Rabies) vaccination status.
- Venomous snakes must only be handled by trained personnel who are accredited venomous snake handlers.

8.5 Adaptive management strategy for uncertain impacts (where relevant)

No significant uncertain impacts are considered likely to result from the proposed rezoning and subsequent development activity. An adaptive management strategy is not required for this project.

9. Serious and irreversible impacts

9.1 Assessment for serious and irreversible impacts on biodiversity values

Table 25 Entities at risk of an SAII

Common name	Scientific name	Reason for inclusion in assessment
Box-Gum Grassy Woodland	*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*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal

9.1.1 Additional impact assessment provisions for TECs at risk of an SAII

9.1.1.1 Box-Gum Grassy Woodland

1. Actions to avoid and minimise direct and indirect impacts

Refer to Chapter 7.1 of this BDAR.

2. Current status (excluding impacts of the proposal)

Table 26 Current status – Box-Gum Grassy Woodland

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Current total geographic extent (ha) of the TEC in NSW	250,729 hectares	*NSW TSSC Conservation Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. (Tozer, M & Simpson C. 2020)	It is likely that this a significant underestimate of the true extent of the community. Low confidence due to inaccuracies in mapping and ongoing clearing, much of it unauthorised and undocumented.
Estimated reduction in geographic extent of the TEC since 1970	93%	As above	As above
Extent of reduction in ecological function, describing the degree of environmental degradation or disruption to biotic processes (Principle 2) SAII Principle 2 is selected in the TBDC: *<50 individuals or < 250 individuals where threats are known.* The Summary of Conservation Assessment – NSW TSSC (Tozer & Simpson, 2020) proposal for listing as Critically Endangered states: *The main reasons for this Ecological Community being eligible are that it has undergone a very large historical reduction in geographic distribution (since approximately 1750) and has*			

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
experienced disruption of biotic processes of relative severity >90% over more than 90% of its distribution since 1750.			
Evidence of restricted geographic distribution (Principle 3) based on the TEC's geographic range in NSW – *NOT APPLICABLE*			
Extent of occurrence (ha)			
Area of occupancy (ha)			
Number of threat-defined locations			

3. Impact assessment

Table 27 Impact assessment – *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Impact on the geographic extent of the TEC (Principles 1 and 3)			
Area of TEC to be impacted by the proposal (ha)	1.8 hectares	N/A	N/A
Area of TEC to be impacted by the proposal as a % of the current geographic extent in NSW (%)	0.0007%	N/A	N/A
Direct/indirect impacts likely as a result of the proposal to contribute to loss of flora/fauna species characteristic of the TEC	No direct or indirect impacts of the proposal are likely to contribute to loss of flora/fauna species characteristic of the TEC.	N/A	N/A
Impacts likely to contribute to further environmental degradation or disruption of biotic processes (Principle 2)			
Remaining extent of isolated areas of TEC (ha)	Approximately 140 hectares	GIS and latest available aerial imagery	

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Average distance between remaining remnants – remnant is retained (m)	Contiguous	GIS and latest available Nearmap aerial imagery. SEED Mapping of associated PCT.	Reasonable confidence within accuracy limits of available imagery and mapping data.
Average distance between remaining remnants – remnant is removed (m)	Contiguous	GIS and latest available Nearmap aerial imagery	Reasonable confidence within accuracy limits of available imagery and mapping data.
Estimated maximum dispersal distance of species associated with the TEC (km)	Most species are able to disperse over distances of greater than 0.1 km. The proposed activity is not likely to impact on dispersal and movement between remaining areas of the TEC.	Author's knowledge of the TEC and species assemblage present I the local area.	Species confirmed present mostly are available to disperse over distances > 100 metres. Key's Matchstick Grasshopper may be impacted if clearing creates barriers, but this is not likely to apply to this project.
Area to perimeter ratio of remaining remnants (ratio)	Minimal to almost no change	GIS and latest available Nearmap aerial imagery	Reasonable confidence within accuracy limits of available imagery and mapping data.

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Vegetation integrity analysis			
Vegetation Zone 1 (Composition score)	76.6	N/A	N/A
Vegetation Zone 1 (Structure score)	74.8	N/A	N/A
Vegetation Zone 1 (Function score)	75.7	N/A	N/A

10. Impact summary

10.1 Determine an offset requirement for impacts

10.1.1 Impacts on native vegetation and TECs or ECs (ecosystem credits)

Table 28 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
PCT3373 Moderate	PCT 3373 Goulburn Tableland Box-Gum Grassy Forest	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	1.8	75.7	0	-75.7	2.5	84
							Total credits	84

10.1.2 Impacts on threatened species and their habitat (species credits)

Table 29 Impacts that require an offset – species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Key's Matchstick Grasshopper	*Keyacris scurra*	Endangered	Endangered	1.8 hectares	2	67
Hoary Sunray	*Leucochrysum albicans tricolor*	Endangered	Endangered	200	2	400
					Total credits	467

10.1.3 Indirect and prescribed impacts

Table 30 Summary of proposed offsets for residual indirect and prescribed impacts

Residual indirect or prescribed impact (Identified in Tables 16 & 17)	**Proposed offset** (additional biodiversity credit requirement and/or other conservation measures)
Indirect impacts on retained trees and other vegetation on adjoining land	There is a low risk of impact and no further offsets are proposed.
Indirect impacts on habitat associated with retained trees and other vegetation on adjoining land	There is a low risk of impact and no further offsets are proposed.
Vehicle strikes	There is a low risk of impact and no further offsets are proposed.

10.2 Impacts that do not need further assessment

Impacts that do not need further assessment for ecosystem credits

Table 31: Impacts that do not need further assessment for ecosystem credits

Impact	**Location within subject land**	**Justification why no further assessment is required**
Decommissioning of existing sludge lagoons	Refer to Figure 10	The sludge lagoons do not provide suitable habitat for flora or fauna
Removal of non-native vegetation	Refer to Figure 10	Not native vegetation and of minimal habitat value

11. Biodiversity credit report

Refer also to Appendix F BAM Credit reports.

11.1 Ecosystem credits

Table 32 Ecosystem credit class and matching credit profile

Ecosystem credit	Attributes shared with matching credits						
	PCT name	**PCT vegetation class**	**PCT vegetation formation**	**Associated TEC or EC**	**Offset trading group** (BAM Section 10.2, Tables 4 & 5)	**Hollow bearing trees present?**	**IBRA subregion** (in which proposal is located)
3373	Goulburn Tableland Box-Gum Grassy Forest	Southern Tableland Grassy Woodlands	Grassy Woodlands	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland,	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, Western Slopes, South East Corner and Riverina Bioregions This includes PCT's:	Yes	Monaro

Ecosystem credit	Attributes shared with matching credits						
	PCT name	**PCT vegetation class**	**PCT vegetation formation**	**Associated TEC or EC**	**Offset trading group** (BAM Section 10.2, Tables 4 & 5)	**Hollow bearing trees present?**	**IBRA subregion** (in which proposal is located)
				Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150		

11.2 Species credits

Table 33 Species credit class and matching credit profile

Species credit	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
Key's Matchstick Grasshopper	Keyacris scurra	Fauna	Endangered	Endangered (BAM C shows as Not listed).	Any in NSW
Hoary Sunray	Leucochrysum albicans subspecies tricolor	Flora	Endangered	Endangered	Any in NSW

12. References

Tozer, M. and Simpson, C. (2020). *Conservation Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. NSW Threatened Species Scientific Committee.

13. Figures

Figure 1 Project Location

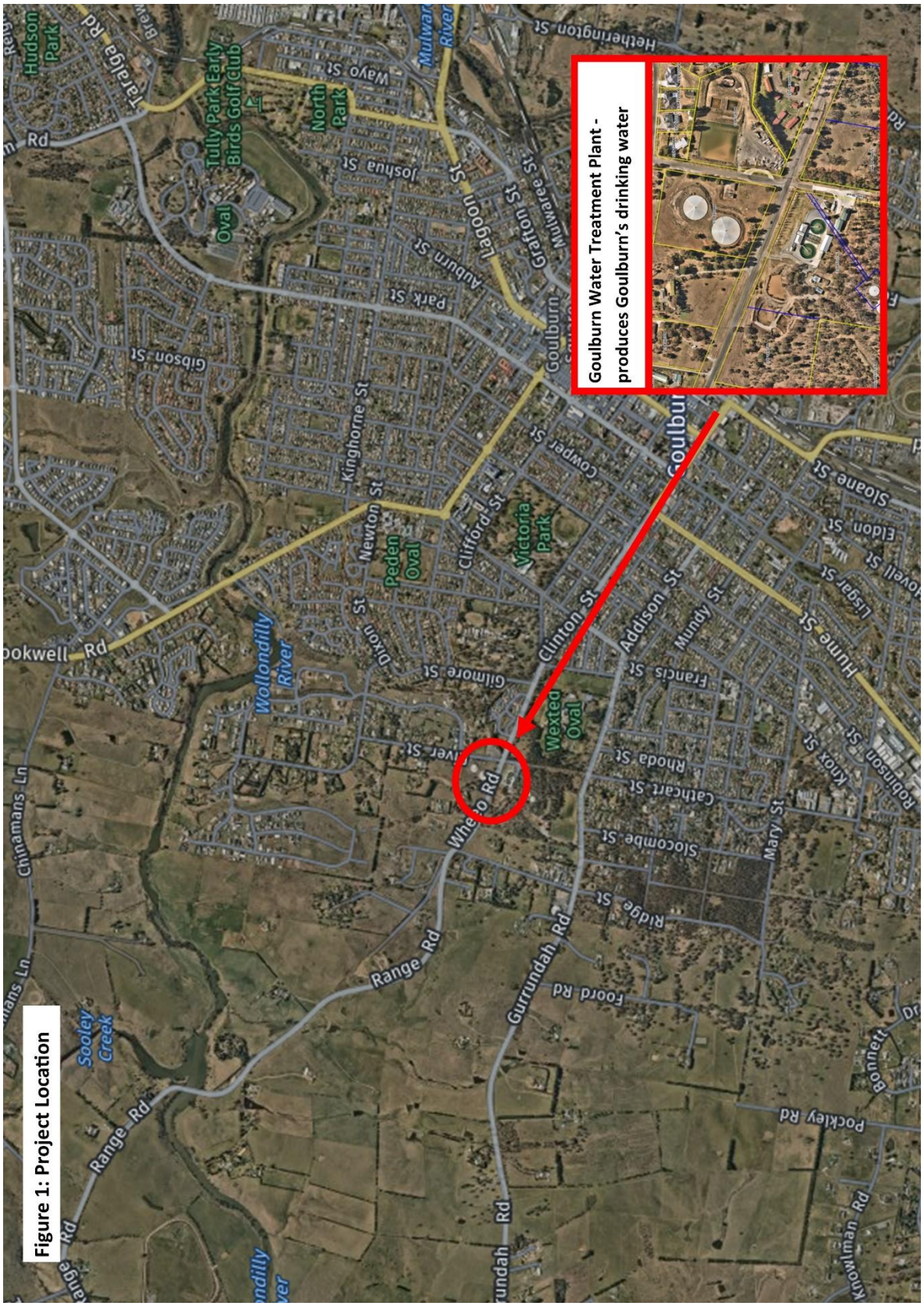


Figure 2 Site Map

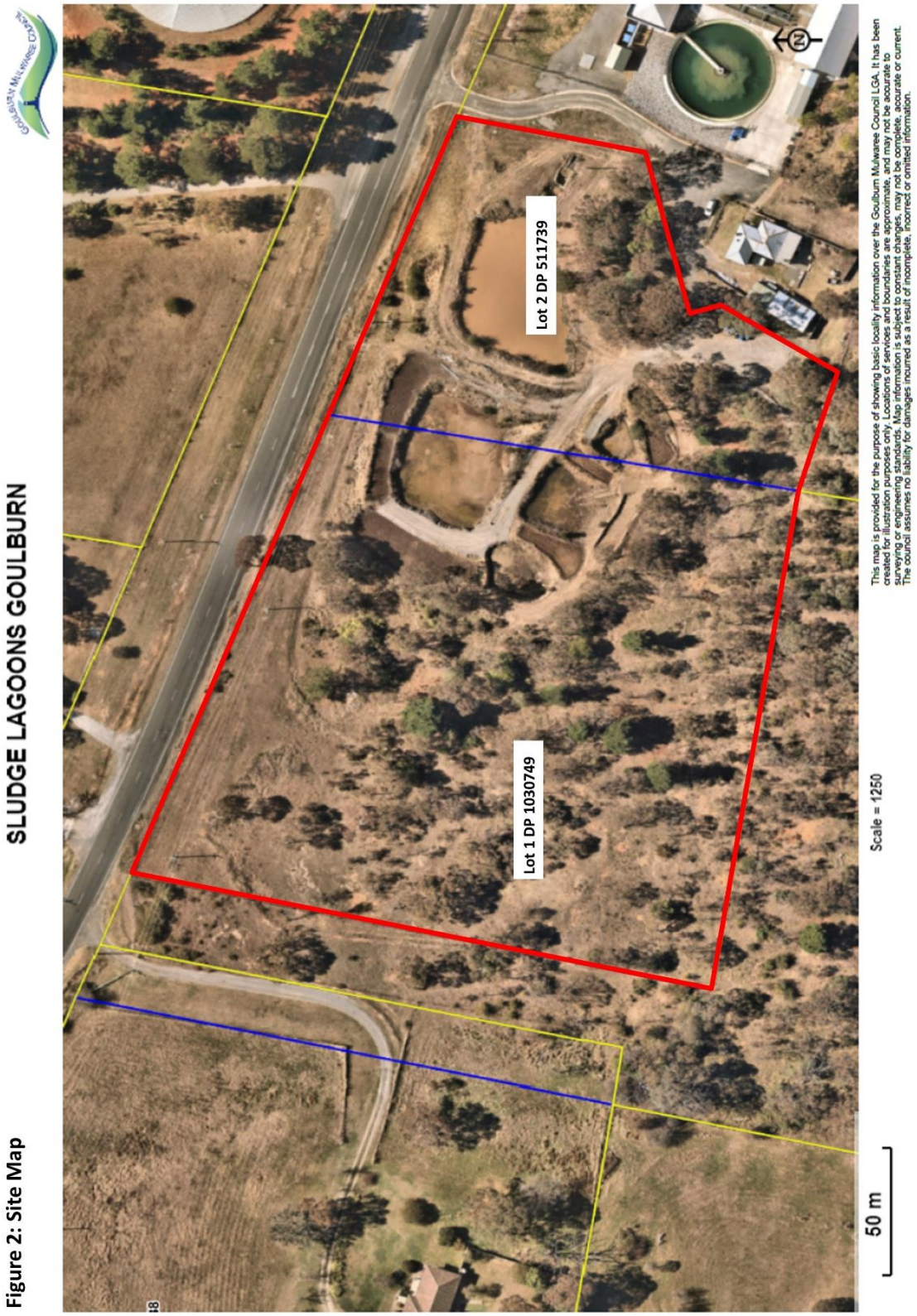


Figure 2: Site Map

Figure 3 Project Site Land Zones

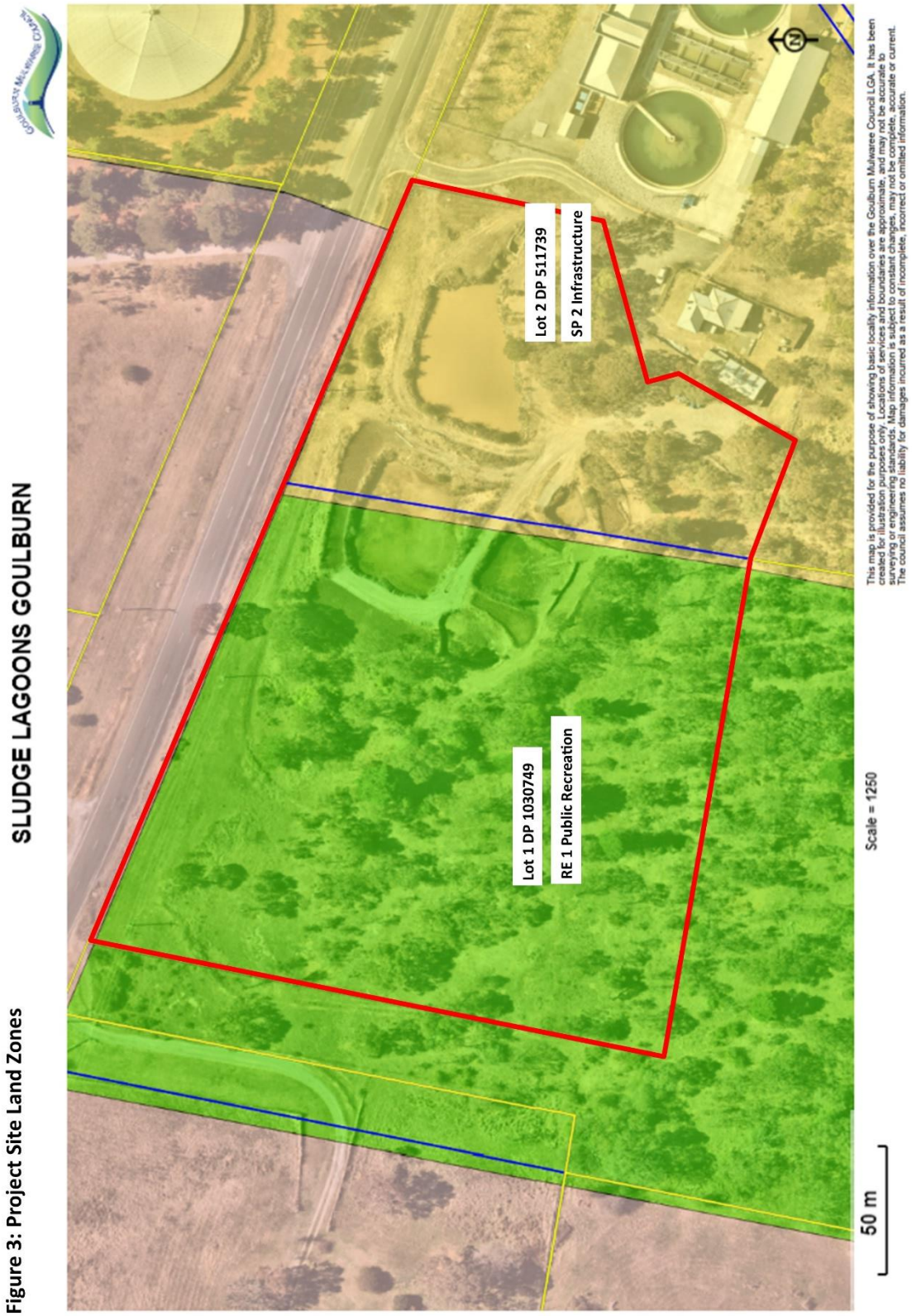


Figure 3: Project Site Land Zones

Figure 4 Operational and Construction Footprint

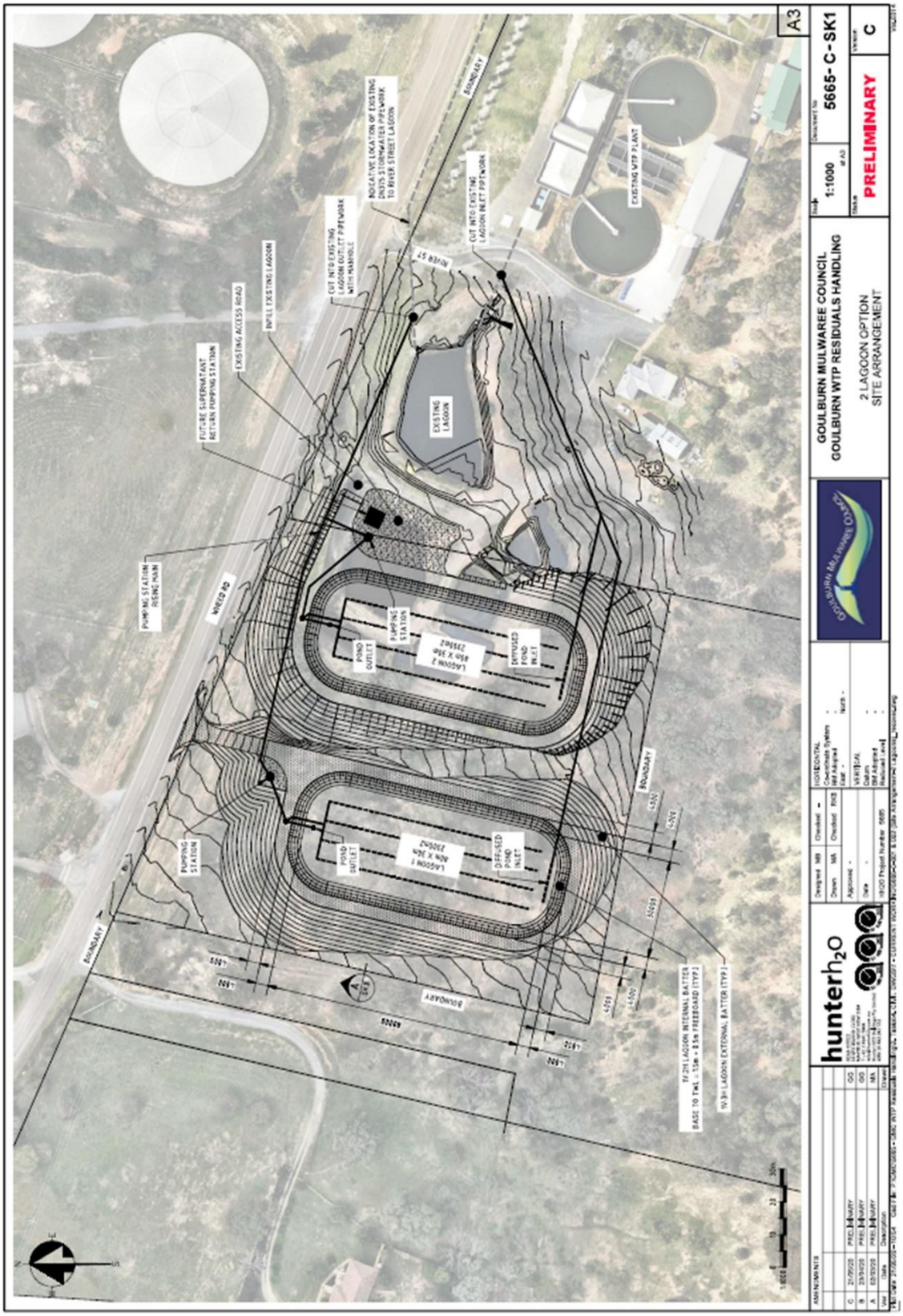


Figure 4: Operational and Construction Footprint

Figure 5 BAM VIS Plot Location

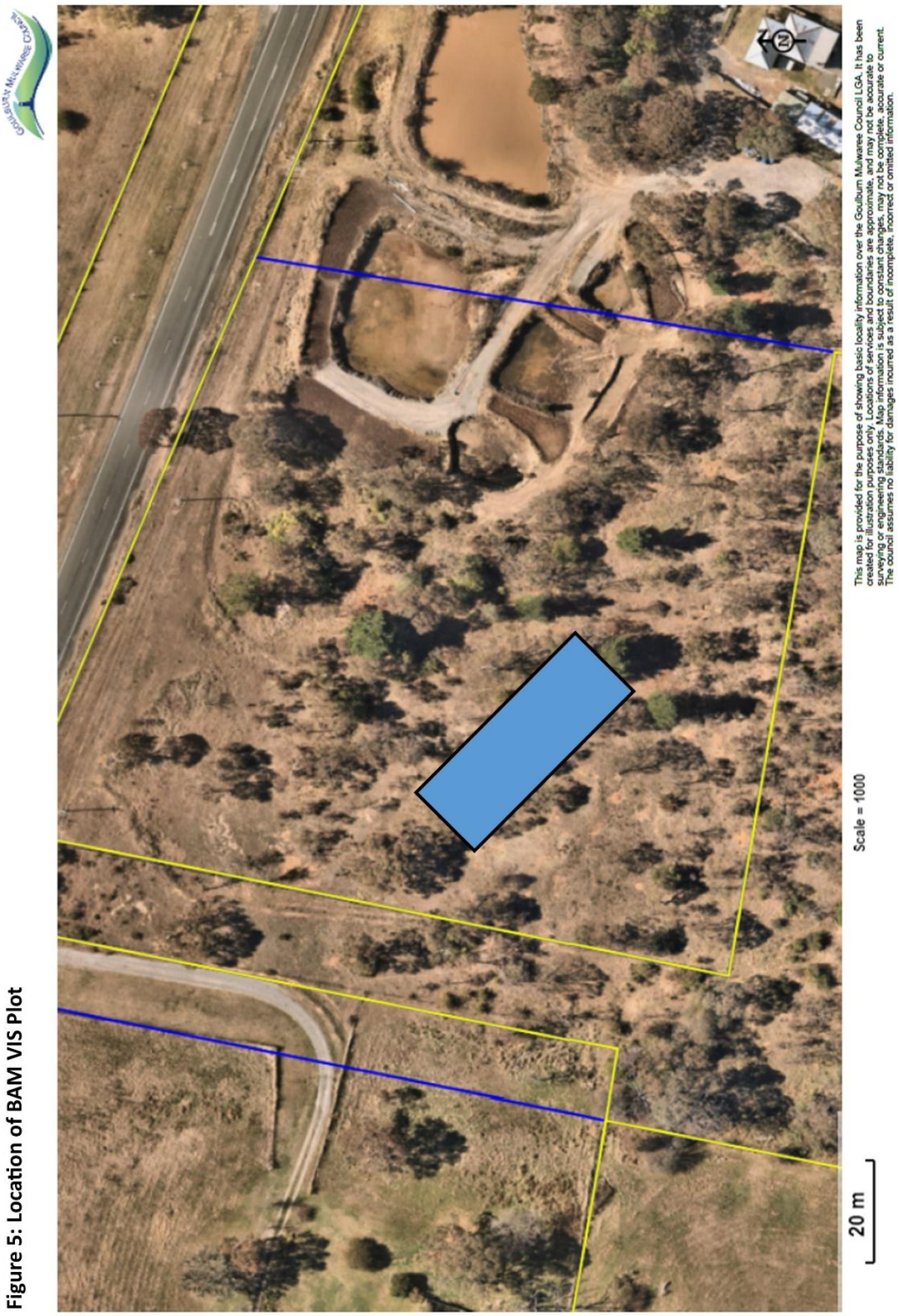


Figure 5: Location of BAM VIS Plot

Figure 6 Assessment Area

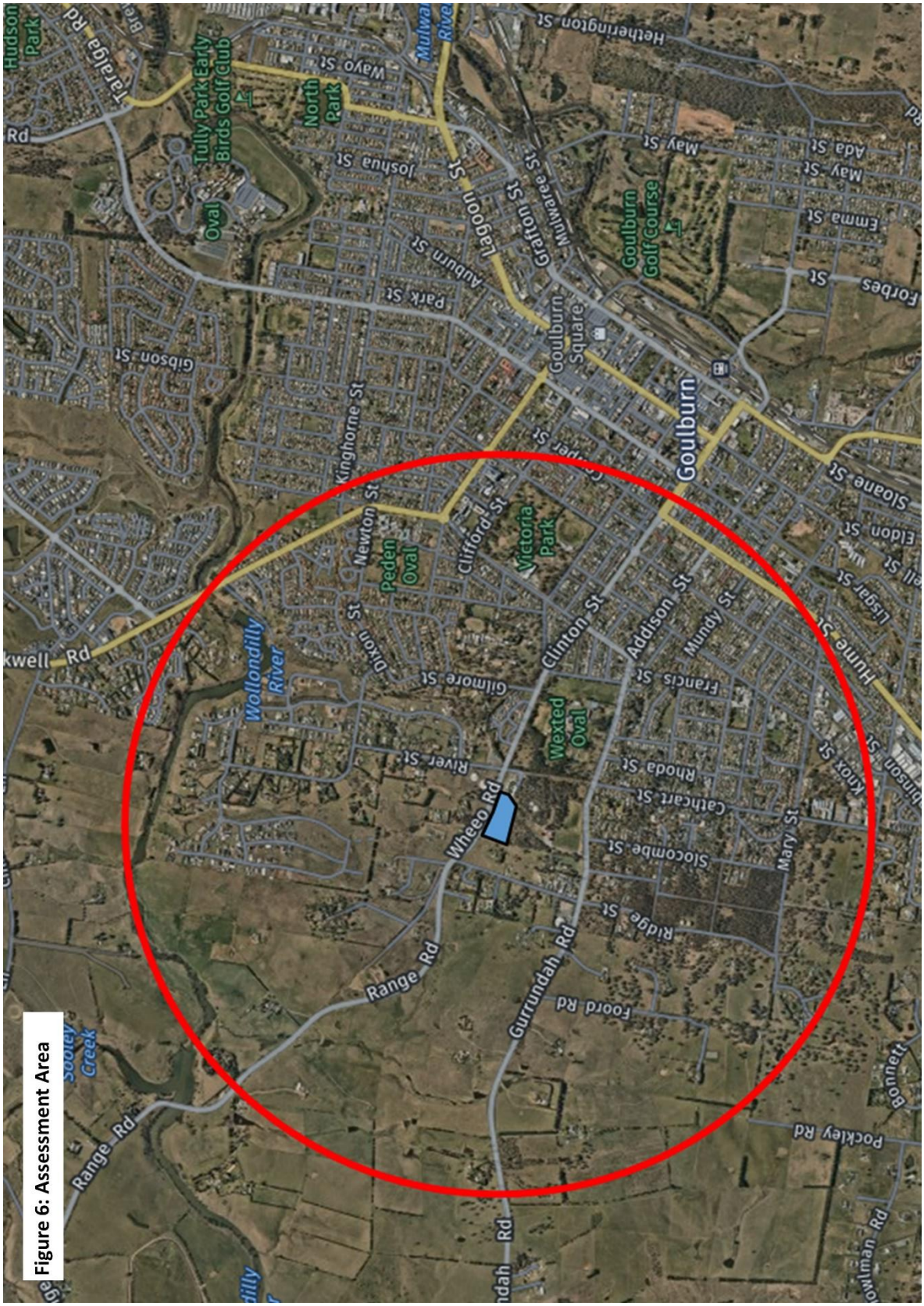


Figure 7 Water Courses, Creeks and Rivers

Figure 7: Water Courses, Creeks and Rivers

Figure 8 Habitat Connectivity

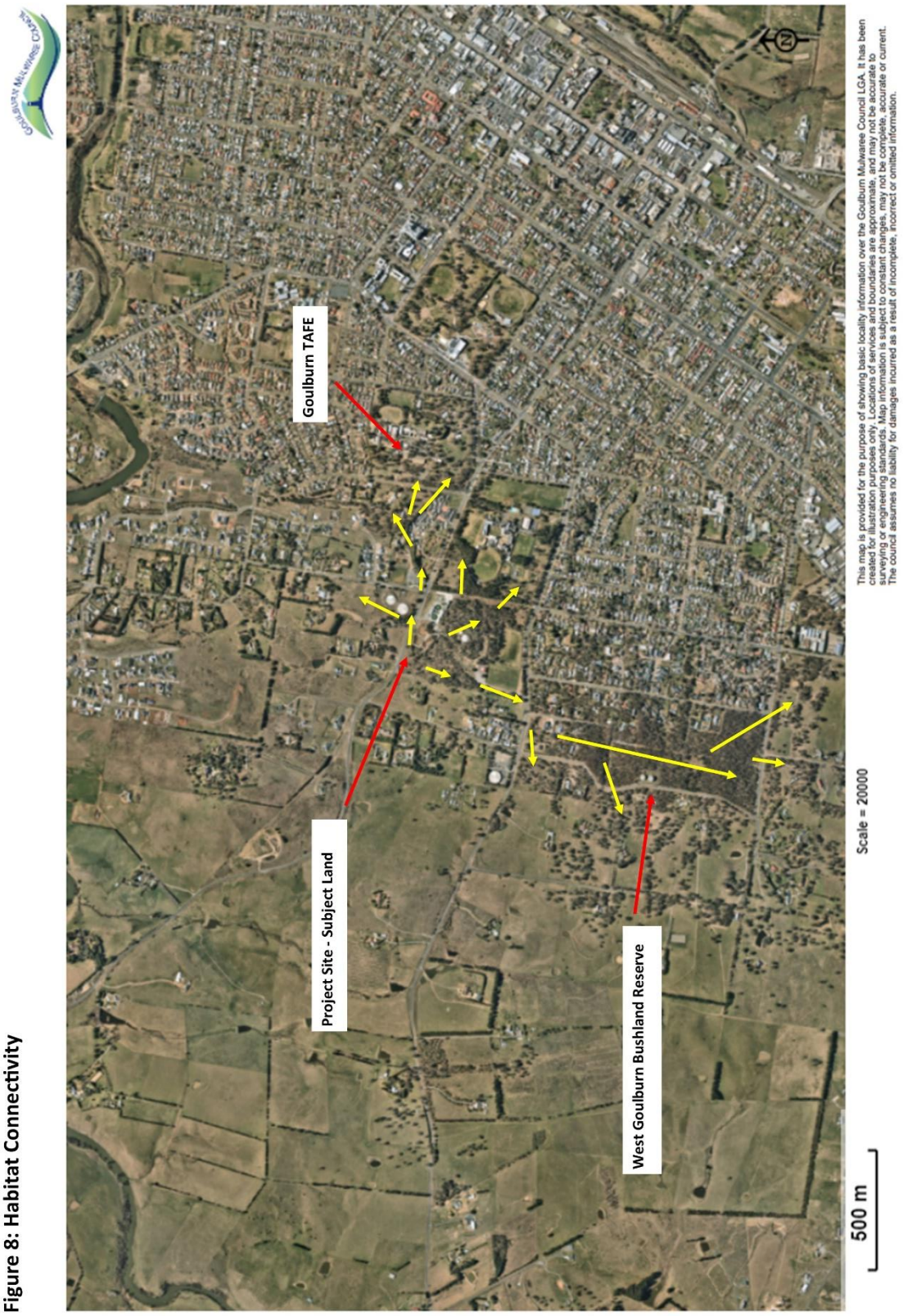


Figure 8: Habitat Connectivity

Figure 9 Native Vegetation Cover within the Assessment Area

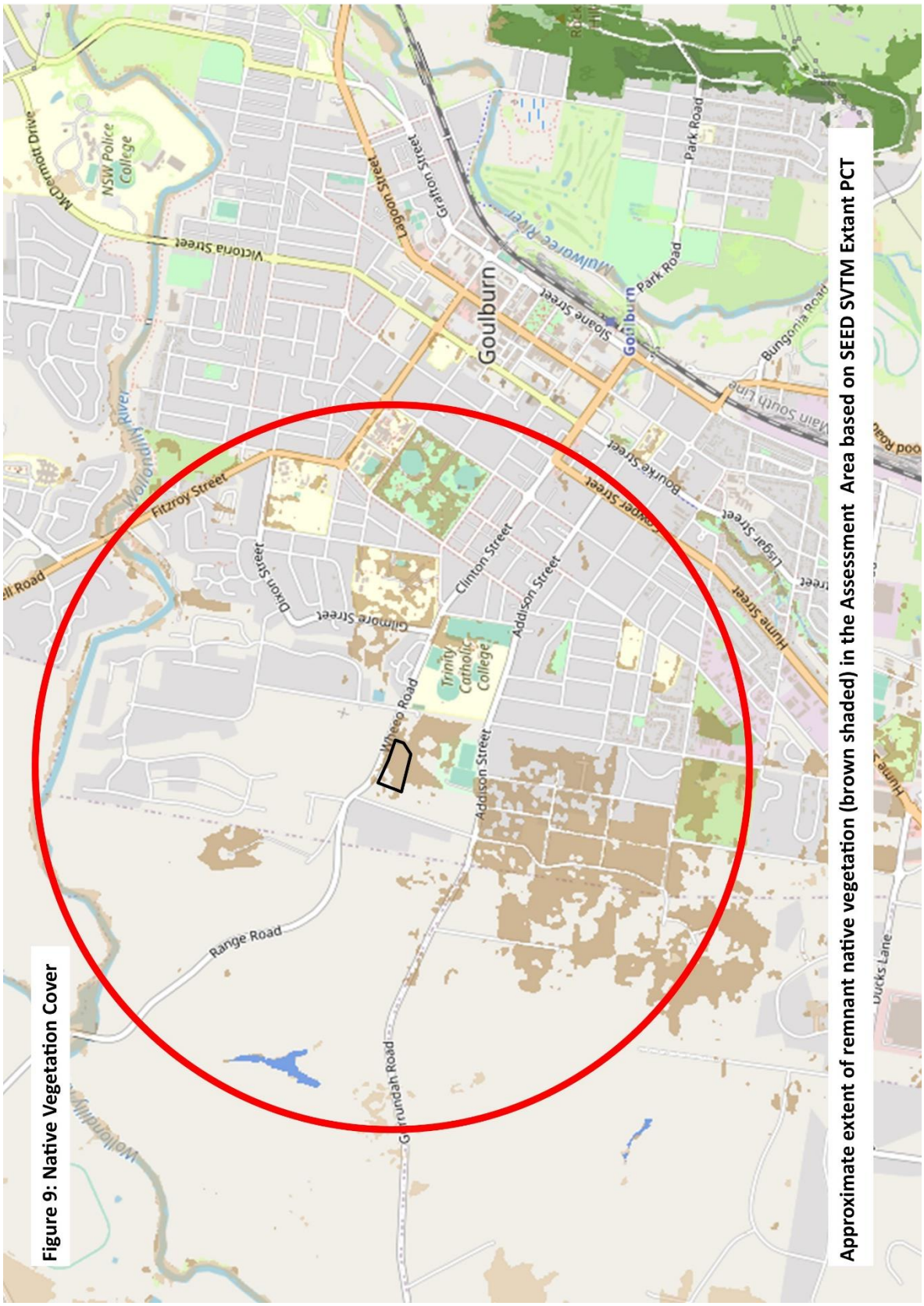


Figure 10 Native Vegetation Extent within the Subject Land

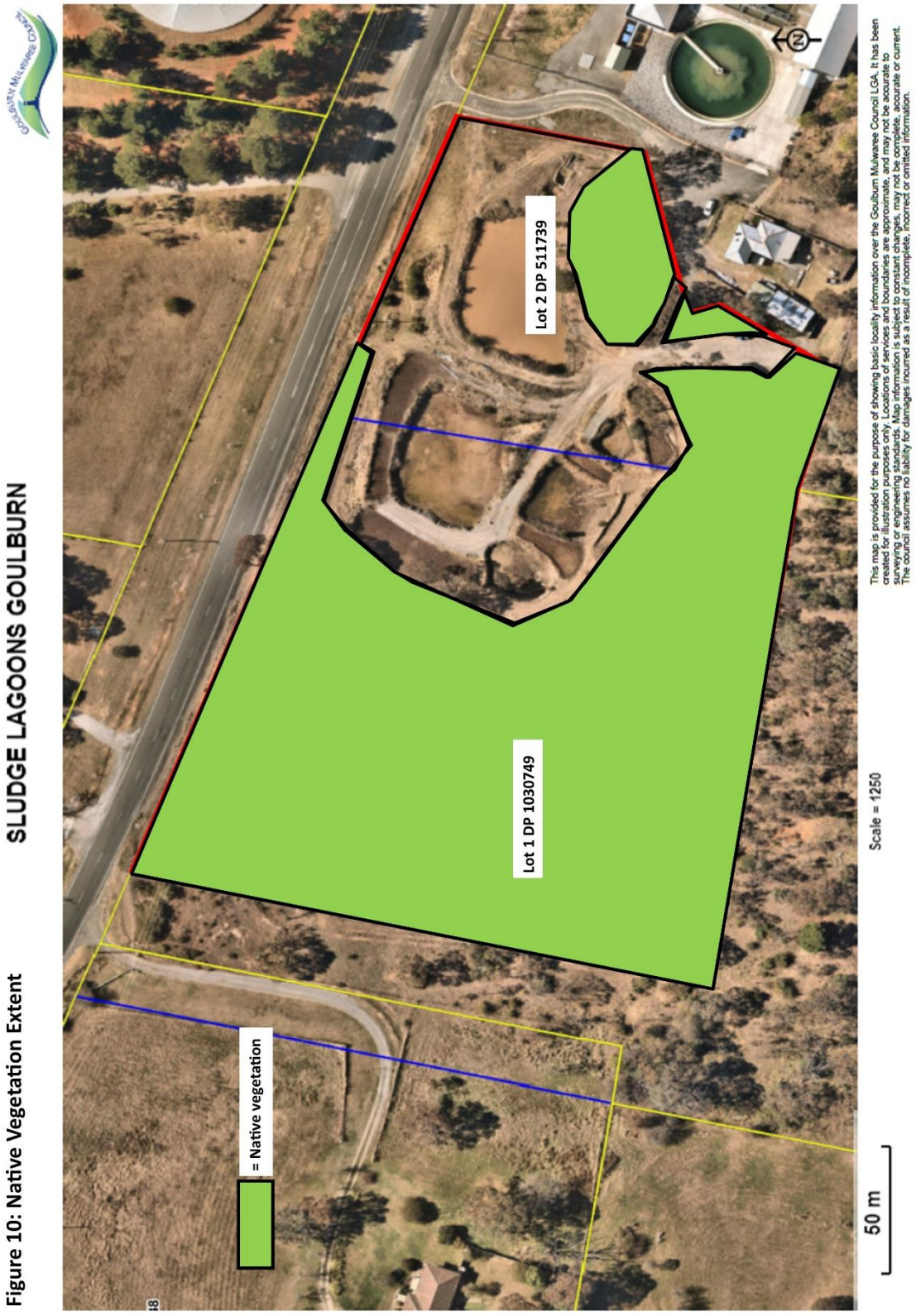


Figure 10: Native Vegetation Extent

Figure 11 Locations of Radiata Pine Trees

Figure 12 Locations of Hollow Bearing Trees

Figure 13 Species Polygon for *Keyacris scurra*

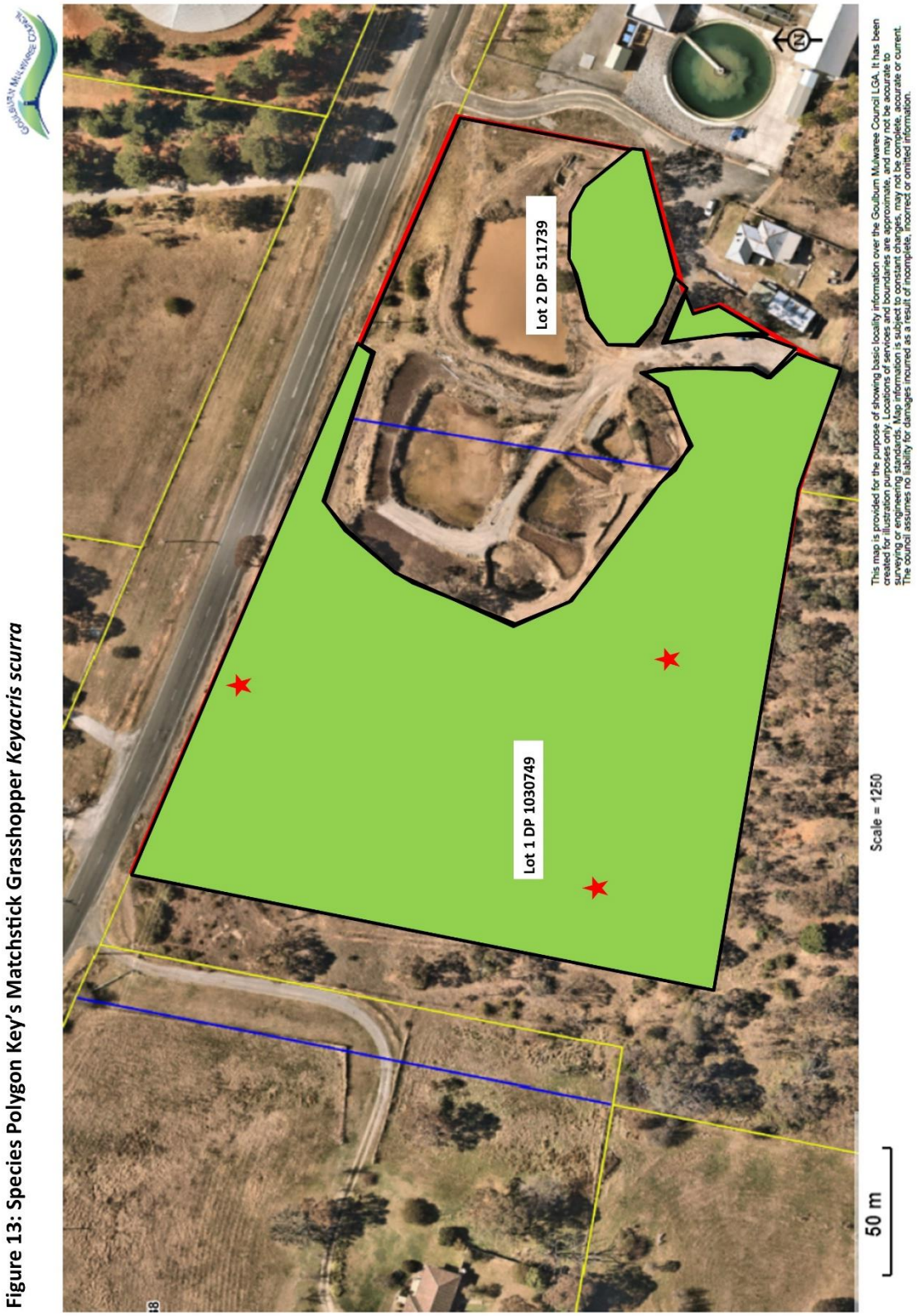


Figure 13: Species Polygon Key's Matchstick Grasshopper *Keyacris scurra*

Figure 14 Species Polygon for *Leucochrysum albicans* subspecies *tricolor*

Figure 14: Species Polygon Hoary Sunray *Leucochrysum albicans* subspecies *tricolor*

Figure 15 IBRA, SubIBRA & Mitchell Landscape of the Subject Land

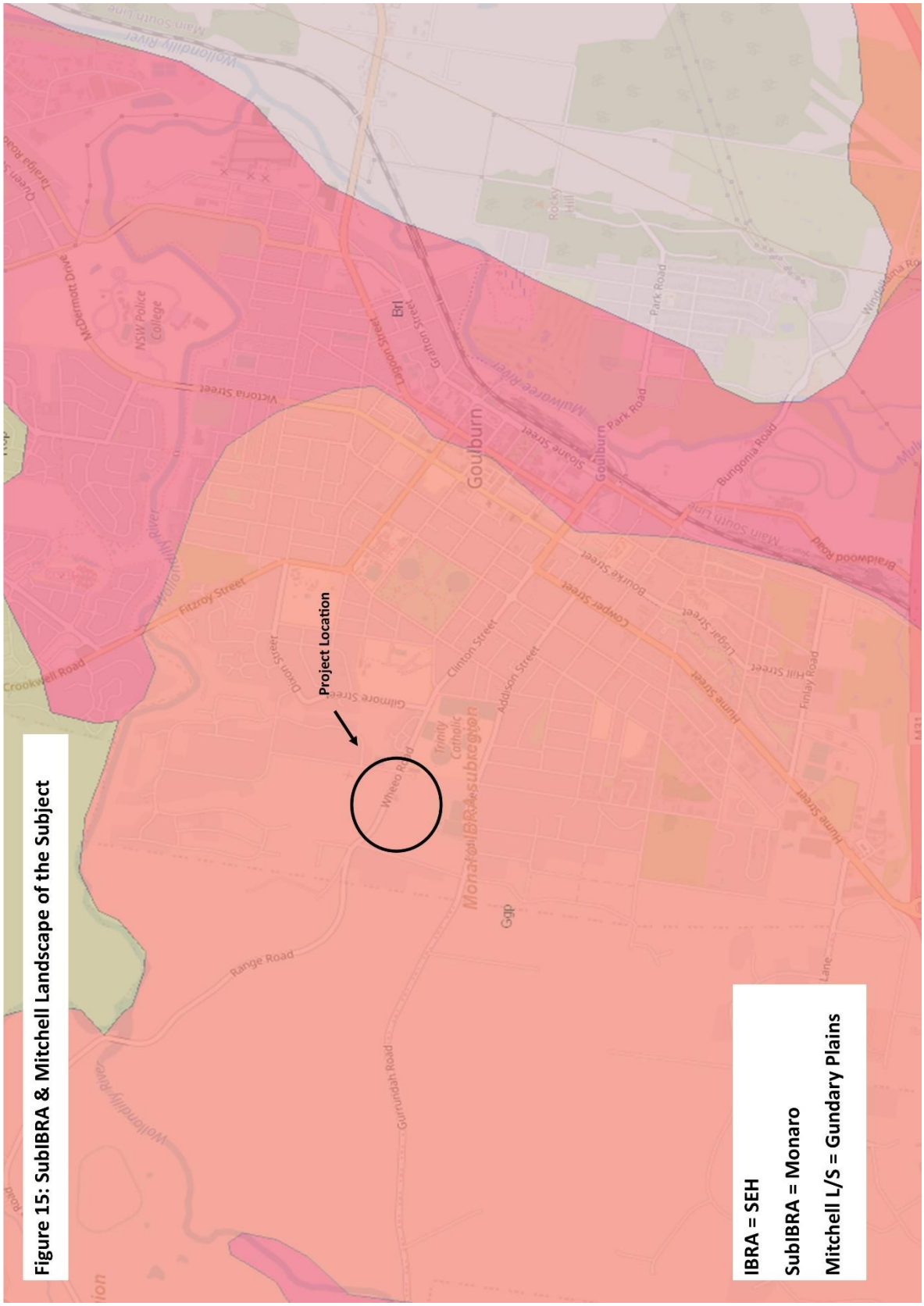


Figure 15: SubIBRA & Mitchell Landscape of the Subject

Figure 16 IBRA, SubIBRA & Mitchell Landscapes of the Assessment Area

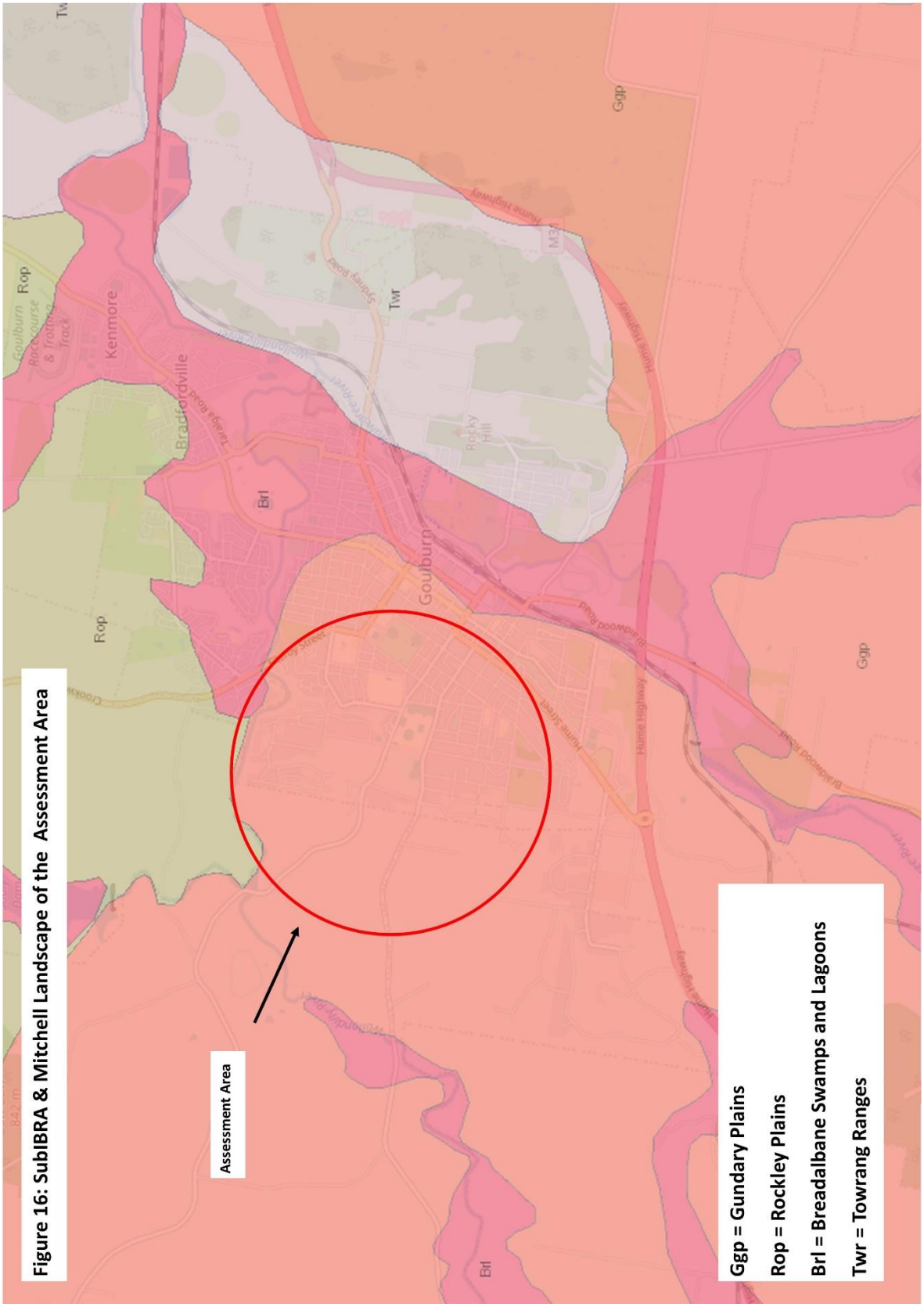


Figure 17 Biodiversity Values Map

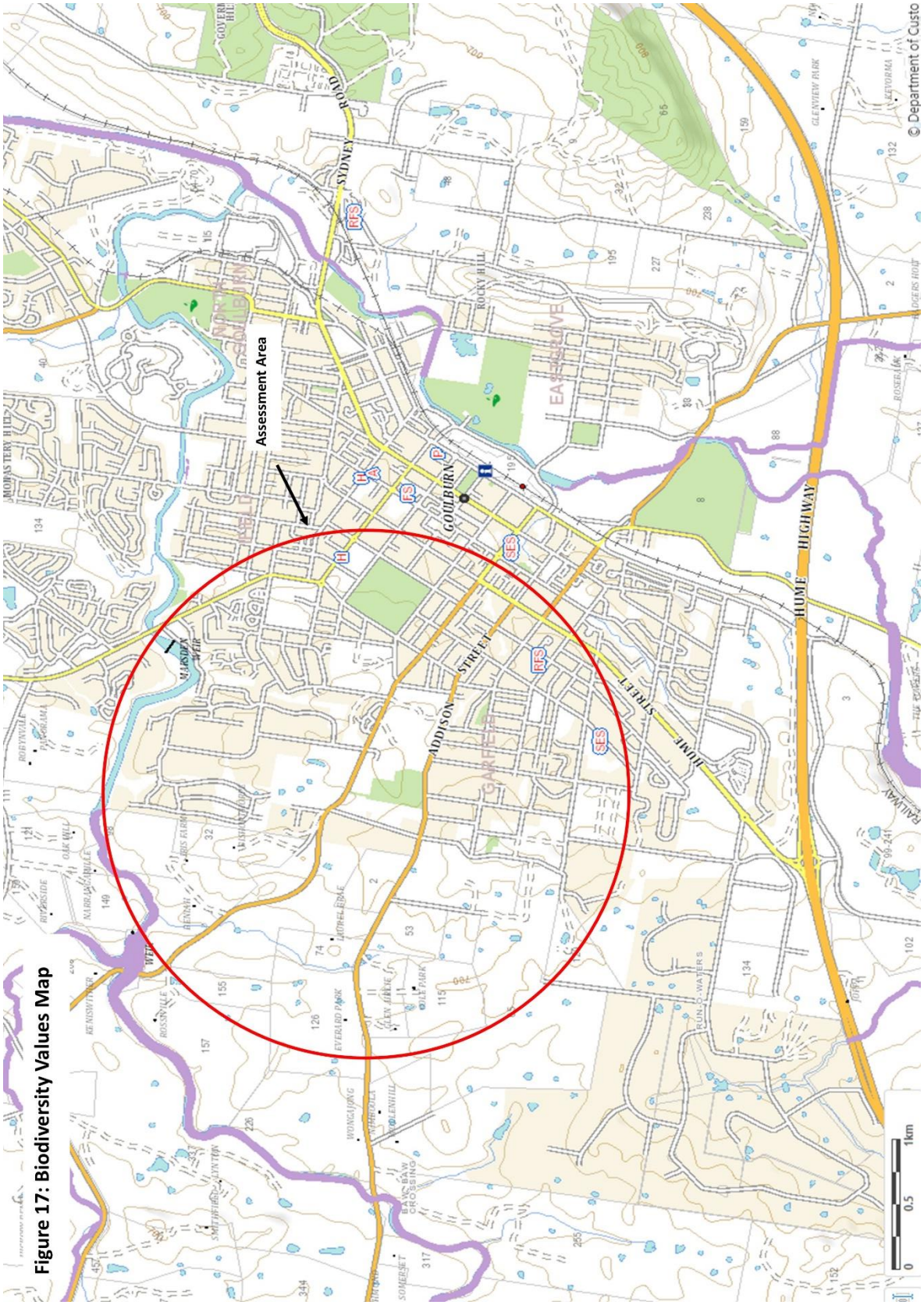


Figure 17: Biodiversity Values Map

Appendix A: BDAR requirements compliance

Table 34 specifies each component of the BDAR minimum information requirements in accordance with BAM Appendix K.

Table 34: Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	1.1.1
		☒ identification of subject land boundary, including:	1.1.2 & 1.1.3
		☒ operational footprint	
		☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	
		☒ general description of the subject land	1.1.3
		☒ sources of information used in the assessment, including reports and spatial data	1.5
		☐ identification and justification for entering the BOS	1.2

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		Maps and tables	
		☒ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 2 Figure 4

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Landscape	Sections 3.1 and 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	–
		☒ general description of subject land topographic and hydrological setting, geology and soils	1.1.3
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	2.1.2 Figure 9
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	3.2.1 Figure 15 Figure 16
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	3.2.2 Figure 7
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	3.2.2 Figure 7
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	3.2.3

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
			Figure 8
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	3.2.4
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	3.2.5
		☒ any additional landscape features identified in any SEARs for the proposal	3.2.7
		☒ NSW (Mitchell) landscape on which the subject land occurs	3.2.6 Figure 15
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	2.1 Figures 5 & 6 Figures 11 - 14
		Maps and tables	
		☒ Site Map	Figure 2

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3	
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land ☒ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	Figure 1 Figure 2 Figures 6 & 9
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	–
			Figure 15 & 16

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands ☒ connectivity of different areas of habitat ☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☒ areas of outstanding biodiversity value occurring on the subject land and assessment area ☒ any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the subject land occurs	Figure 7 Figure 8 Figures 15 & 16
		Data	
		☒ All report maps as separate jpeg files	Can be supplied
		Individual digital shape files of:	Can be supplied
		☒ subject land boundary	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	–
		☒ cadastral boundary of subject land	–
		☒ areas of native vegetation cover	–
		☒ landscape features	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Native vegetation	Chapter 4, Appendix D and Appendix E	**Information**	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	4.1 Figures 2 Figures 10 - 14
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	4.1.2
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	2.2.2
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	2.2.3
		☒ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		For each PCT within the subject land, describe:	–
		☒ PCT name and ID	4.1 Figure 10
		☒ vegetation class	4.1.2
		☒ extent (ha) within subject land	2.2.2
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	4.2.2.3 Figure 9
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	4.2.2.3
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	4.3 Table 7 & 10
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	4.1.2
		Describe the vegetation integrity assessment of the subject land, including:	–
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	4.4 & Figure 10

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	4.4, 4.5 Table 8 Figure 10
		☒ area (ha) of each vegetation zone	Table 8
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	4.4 Table 8 Figure 10
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	4.5.1
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	4.5.3
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	–
		☒ identify the PCT or vegetation class for which local benchmark data will be applied	4.5.2 & 4.5.3

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ identify published sources of local benchmark data (if benchmarks obtained from published sources) ☒ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	
		☒ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	n/a
		☒ provide written confirmation from the decision-maker that they support the use of local benchmark data	n/a
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 10
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 8
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 10

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 6
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	10 & Table 7
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 10 & Table 5
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	–
		☒ composition condition score	Table 9
		☒ structure condition score	
		☒ function condition score	
		☒ presence of hollow bearing trees	
		Data	
		☒ All report maps as separate jpeg files	Can be supplied
		☒ Plot field data (MS Excel format)	Can be supplied

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ Plot field datasheets	Appendix D
		Digital shape files of:	Can be supplied
		☒ PCT boundaries within subject land	–
		☒ TEC boundaries within subject land	–
		☒ vegetation zone boundaries within subject land	–
		☒ floristic vegetation survey and vegetation integrity plot locations	–
Threatened species	Chapter 5	**Information**	
		Identify ecosystem credit species likely to occur on the subject land, including:	–
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	Table 10
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	5.1.1 Table 10

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ justification for addition of any ecosystem credit species to the list	5.1.1
		Identify species credit species likely to occur on the subject land, including:	–
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	Table 11 Table 12
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	5.1.2
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	5.1.2
		☒ justification for addition of any species credit species to the list	5.1.2
		From the list of candidate species credit species, identify:	–
		☒ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	n/a

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) ☒ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.)) ☒ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	
		Present the outcomes of species credit species assessments from:	–
		☒ threatened species survey (as described in BAM Section 5.2.4)	Table 15 Table 16
		☒ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	n/a
		Where survey has been undertaken include detailed information on:	–
		☒ survey method and effort (as described in BAM Section 5.3)	5.3

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	5.3 Appendix H
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	5.3 Appendix H
		☒ survey personnel and relevant experience	Declarations xiv
		☒ describe any limitations to surveys and how these were addressed/overcome	5.3
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	n/a
		☐ justification of the use of an expert report ☐ identify the expert, provide evidence of their expert credentials and departmental approval of expert status ☐ all requirements of Box 3 have been addressed in the expert report	n/a
		Where use of local data is proposed (BAM Subsection 1.4.2):	n/a

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☐ identify relevant species ☐ identify data to be amended ☐ identify source of information for local data, e.g. published literature, additional survey data, etc. ☐ justify use of local data in preference to VIS Classification or TBDC data	n/a
		☐ provide written confirmation from the decision-maker that they support the use of local data	n/a
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	–
		☒ the unit of measure for each species is documented	Table 17 Table 18
		for species assessed by area:	–
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	Figure 11 Figure 14

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	5.6
		for species assessed by counts of individuals:	–
		☒ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	5.6
		☒ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	5.6
		☒ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	Figure 11
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	Table 17
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	
		☒ the ecosystem credit species removed from the list	Table 30

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☐ the sensitivity to gain class of each species	Table 30
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	Table 11 Table 12
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	Table 12
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	n/a
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	5.6 & Table 17
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	Figure 13 Figure 14
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	Can be supplied

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ Survey locations including GPS coordinates of any plots, transects, grids	
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	Can be supplied
		☒ Species polygon map in jpeg format	Can be supplied
		☐ Expert reports and any supporting data used to support conclusions of the expert report	n/a
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)	Table 19
		☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2)	
		☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3)	
		☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	
		☐ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	n/a
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	Table 19 Table 24

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Table 24
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	6 Table 19
		Where the proposed development is for a wind farm:	n/a
		☐ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	n/a
		☐ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	n/a
		☐ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	n/a

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		Where the proposal may result in vehicle strike:	–
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	Table 19
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figure 2
		☒ Map showing location of potential vehicle strike locations	Figure 2
		☐ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	n/a
		Data	
		☐ Digital shape files of prescribed impact feature locations	n/a
		☐ Prescribed impact features map in jpeg format	n/a

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Avoid and minimise impacts	Chapter 7	**Information**	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	7.1.2 7.1.3 7.2.2
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	7.1.1 & 7.2.1
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	7.1.1 & 7.1.2 7.2.1 Appendix G
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	n/a

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	7.1.1 & 7.1.2 7.2.1 Appendix G
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	7.1.1 & 7.1.2 7.2.1 Appendix G
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	Appendix G
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 20
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Appendix G
		☐ Maps demonstrating indirect impact zones where applicable	n/a
		Data	

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		Digital shape files of:	Can be supplied
		☒ alternative and final proposal footprint	–
		☒ direct and indirect impact zones	–
		☒ Maps in jpeg format	Can be supplied
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	• **Information**	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Table 21 Table 22
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	–
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	Table 23
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	8.2

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ reporting any limitations or assumptions, etc. made during the assessment	8.2
		☐ identification of the threatened entities and their habitat likely to be affected	Table 21
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	–
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	–
		☐ karst, caves, crevices, cliffs, rocks and other features of geological significance	n/a
		☐ human-made structures	n/a
		☒ non-native vegetation	8.3.1
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	8.3.2
		☐ movement of threatened species that maintains their life cycle	n/a
		☐ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	n/a

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☐ assessment of the impacts of wind turbine strikes on protected animals	n/a
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	8.3.3
		☒ evaluate the consequences of prescribed impacts	8.2, 8.3
		☒ describe impacts that are uncertain	2.6 Table 27
		☒ document limitations to data, assumptions and predictions	2.6, 8.2 Table 27
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 28
		Data	
		N/A	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility ☒ identify measures for which there is risk of failure ☒ evaluate the risk and consequence of any residual impacts	8.4 Table 20
		☐ document any adaptive management strategy proposed	n/a
		Identification of measures for mitigating impacts related to:	–
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) ☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) ☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	8.4 Table 20

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☐ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	8.4
		Maps and tables	
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 20
		Data	
		N/A	–
Impact summary	Chapter 9	**Information**	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	–
		☒ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	Table 25 & Table 26
		☒ for each TEC, report the extent of the TEC in NSW	Table 26

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	Table 27
		☐ for each threatened species, report the population size in NSW	n/a
		☐ documenting assumptions made and/or limitations to information	n/a
		☐ documenting all sources of data, information, references used or consulted	
		☐ clearly justifying why any criteria could not be addressed	
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	Table 28
		☒ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	n/a
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	Figure 10
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the subject land	Figure 10
		☐ Map showing location of threatened species at risk of an SAII within the subject land	n/a
		Map showing location of:	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ impacts requiring offset	Figure 10
		☒ impacts not requiring offset	Figure 10
		☒ areas not requiring assessment	Figure 10
		Data	
		Digital shape files of:	Can be supplied
		☐ extent of TECs at risk of an SAII within the subject land	–
		☐ location of threatened species at risk of an SAII within the subject land	–
		☐ boundary of impacts requiring offset	–
		☐ boundary of impacts not requiring offset	–
		☐ boundary of areas not requiring assessment	–
		☒ Maps in jpeg format	Can be supplied

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	–
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM Subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	Table 28
		☒ biodiversity risk weighting for each	Table 28
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	Table 29
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	Table 32
		☒ Table of threatened species requiring offset and the number of species credits required	Table 33

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		Data	
		☐ Submitted proposal in the BAM Calculator	Not yet submitted as this is a preliminary BDAR
Biodiversity credit report	Chapter 10	**Information**	
		☒ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	Table 32 & 33
		☒ BAM credit report in pdf format	Appendix F
		Maps and tables	
		☒ Table of credit class and matching credit profile	Table 32
		Data	
		☒ BAM credit report in pdf format	Appendix F

Appendix B: Threatened Species Test of Significance

THREATENED SPECIES TEST OF SIGNIFICANCE FOR IMPACTS OF GOULBURN WATER TREATMENT PLANT RESIDUALS HANDLING FACILITY UPGRADE ON 'BOX GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLAND'

The land to be developed has been identified as containing *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.* The community is listed as a Critically Endangered Ecological Community under the NSW *Biodiversity Conservation Act 2016* and as Critically Endangered under the Commonwealth *Environment and Biodiversity Conservation Act 1999.* In this assessment the plant community on the land is referred to as "BGGW" (Box Gum Grassy Woodland).

1. The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a.in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

GMC comment: not applicable (not a threatened species).

b.in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i.is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The subject land comprises approximately 2.536 hectares, of which 1.784 hectares have been identified as containing BGGW. The proposed activity involves removal of all of this community from the subject land. This is clearly a significant impact on the occurrence of the community on the subject land.

Adjoining lots contain areas contiguous areas dominated by this ecological community and the proposed activity will not directly impact on these. The area of currently intact, contiguous BGGW on the subject land and immediately adjoining lots is estimated to comprise approximately 11 hectares.

However, the proposed activity will remove approximately 16% of the existing contiguous remnant patch of BGGW and this is likely to constitute an adverse effect on the extent of the ecological community such that is local occurrence will be at increased risk of extinction.

ii.is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The proposed activity will not substantially and adversely modify the composition of the ecological community. While it will significantly reduce the extent of the local occurrence of the community, it is not likely to modify the composition of the community.

c.in relation to the habitat of a threatened species or ecological community:

i.the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposed activity will involve the removal of a significant amount of the local occurrence of habitat of the ecological community present. As noted previously, the proposed activity will remove an estimated 16% of habitat from an existing contiguous patch of remnant BGGW.

ii.whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The proposed activity will not involve significant fragmentation or isolation of the habitat from other areas of habitat. The proposed activity will not reduce landscape connectivity. The area to be cleared is bounded to the north by the Wheeo Road, and this already constitutes a barrier that reduces landscape connectivity. The proposed activity will not reduce landscape connectivity to areas to the south, east or west of the subject site.

iii.the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat to be removed is important on a local scale. In addition to the presence of the BGGW ecological community, the site has been confirmed to contain small populations of the Endangered Hoary Sunray *Leucochrysum albicans* subspecies *tricolor* and Key's Matchstick Grasshopper *Keyacris scurra*.

d.whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

GMC comment: not applicable, the proposed activity will not have an adverse effect on any declared area of outstanding biodiversity value.

e.whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Listed key threatening that would apply to the ecological community on this site include:

Clearing of native vegetation.
Loss of hollow bearing trees
Removal of dead wood and dead trees
Invasion of native plant communities by exotic perennial grasses
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Clearing of native vegetation

The proposed activity will involve the clearing of native vegetation in order to construct two large sludge lagoons. These areas will not be revegetated. On completion of the proposed activity, there is likely to be re-establishment of native vegetation in the surrounding constructed banks and adjoining land, but this is likely to comprise groundcover species only.

Loss of hollow bearing trees

The proposed activity involves the removal of 9 hollow bearing trees. While these are relatively small trees, with small hollows, their removal does involve a key threatening process and will reduce habitat values of the local area.

Removal of dead wood and dead trees

The proposed activity will involve the removal of significant amounts of dead wood (logs and other woody debris) and some dead trees. The proposed activity will increase the impact of this key threatening process.

Invasion of native plant communities by exotic perennial grasses

The remnant native vegetation in the local area is already being invaded by exotic perennial grasses, but the proposed activity is not likely to significantly increase this.

Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

The remnant native vegetation in the local area is already being invaded by escaped garden plants, but the proposed activity is not likely to significantly increase this.

CONCLUSION

The proposed activity is likely to result in a significant impact on the local occurrence of the BGGW Critically Endangered Ecological Community present on the site and surrounding lands.

THREATENED SPECIES TEST OF SIGNIFICANCE FOR IMPACTS OF GOULBURN WATER TREATMENT PLANT RESIDUALS HANDLING FACILITY UPGRADE ON HOARY SUNRAY *LEUCOCHRYSUM ALBICANS* SUBSPECIES *TRICOLOR.*

The Hoary Sunray is a small perennial daisy typically found in grassy woodlands in the NSW Southern Tablelands. The plants have a tufted growth habit with silvery grey, rathe narrow leaves. From spring to late summer, the plants produce abundant flower heads, which feature conspicuous white papery bracts surrounding a bright yellow centre. The outer bracts are typically tinged purplish red on the undersides. The flower heads open up in bright sunshine, with the bracts closing over at night and in overcast rainy conditions.

Hoary Sunrays prefer open, sunny sites and may readily colonise disturbed ground. They are more likely to persist on poorer soils as they cannot compete with dense growth of weedy grasses such as *Phalaris aquatica*, *Dactylis glomerata*, *Eragrostis curvula*, *Nassella neesiana*, *Holcus lanatus* and *Bromus* spp. Where weedy growth is abundant, Hoary Sunray benefits from regular slashing to reduce shading and competition from weed species.

The Hoary Sunray is listed as Endangered under both NSW State and Commonwealth legislation.

1. The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a.in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposed development will remove habitat for the Hoary Sunray and is likely to remove at least some of the plants present on the site. However, the majority of the plants on the subject land are present in a thin mown strip along the northern boundary of the site, which is kept mown as it comprises a power easement. Hoary Sunray plants are also present in the adjoining road reserve. The Hoary Sunray readily colonies disturbed ground, so it is likely that on completion of the works areas of disturbed soil around the newly constructed sludge lagoons will see recruitment of new plants. The plant is relatively common on road verges in parts of the Goulburn Mulwaree LGA. The proposed activity is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

b.in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i.is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable, not an ecological community.

ii.is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable, not an ecological community.

c.in relation to the habitat of a threatened species or ecological community:

i.the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposed activity will involve the removal of existing habitat for the Hoary Sunray. However, the current distribution of the plants on the site is such that the extent of currently occupied habitat is relatively minor. A large part of the existing BGGW potential habitat is not suitable for Hoary Sunray as it is heavily shaded by a range of woody environmental weeds, including *Pinus radiata*, *Crataegus monogyna*, *Rubus fruticosus* aggregate, *Pyracantha angustifolia*, *Cotoneaster* spp. and others.

ii.whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The proposed activity will not involve significant fragmentation or isolation of habitat on the site for Hoary Sunray from other areas of habitat.

iii.the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat adjacent to the Wheeo road reserve is important and this will be preserved as far as is practicable. To a degree this area is protected from earthworks due to presence of overhead powerlines and proximity to the road. A small amount of other Hoary Sunray habitat will be removed within the subject land, near the southern boundary, but overall it is considered that the proposed activity will not substantially remove, modify, fragment or isolate Hoary Sunray habitat.

d.whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

GMC comment: not applicable, the proposed activity will not have an adverse effect on any declared area of outstanding biodiversity value.

e.whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Listed key threatening processes that would apply to the Hoary Sunray on this site include:

Clearing of native vegetation.

Invasion of native plant communities by exotic perennial grasses

Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Clearing of native vegetation

The proposed activity will involve the clearing of a relatively small amount of native vegetation that contains Hoary Sunray plants. On completion of the proposed activity, there is likely to be re-establishment of Hoary Sunray plants equivalent to or greater in number to what is currently present on the site. This key threatening process is unlikely to have a significant impact on Hoary Sunray in the context of the proposed activity.

Invasion of native plant communities by exotic perennial grasses

The groundcover layer has already been invaded in parts by exotic perennial grasses. However, the proposed activity is not likely to increase this process. On-going maintenance will manage the existing weed infestations and prevent these from further increase. This key threatening process is unlikely to have a significant impact in the context of the proposed activity.

Loss and degradation of native plant and animal habitat by invasion of escaped garden plants

A substantial amount of the subject land has already been invaded and colonised by escaped garden plants, rendering it unsuitable for Hoary Sunray. Construction of the new sludge lagoons is not likely to increase this key threatening process.

CONCLUSION

The proposed activity is not likely to result in a significant adverse impact on the local occurrence of the Hoary Sunray.

THREATENED SPECIES TEST OF SIGNIFICANCE FOR IMPACTS OF GOULBURN WATER TREATMENT PLANT RESIDUALS HANDLING FACILITY UPGRADE ON KEY'S MATCHSTICK GRASSHOPPER *KEYACRIS SCURRA*

Key's Matchstick Grasshopper is a small, flightless grasshopper that is largely confined to relatively undisturbed grassland areas dominated by native grass species and forbs. It may be found in grassy woodlands also and is most likely to be found in areas with a high component of Kangaroo Grass *Themeda triandra* and Asteraceae species.

The lifecycle is annual, with only one generation per year. Eggs are laid in pods in the soil in late spring and early summer, hatching from January to March. This insect has limited dispersal abilities and is susceptible to habitat clearance and fragmentation. The Key's Matchstick Grasshopper is listed as Endangered under both NSW State and Commowealth legislation.

Key's Matchstick Grasshopper records for the Goulburn Mulwaree Council area are recent and most records are for 2022 and 2023. At this stage it is not clear how abundant the grasshopper is locally, or the full extent of its range within the LGA.

1. The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a.in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposed activity involves the removal of up to 1.784 hectares of BGGW habitat. The Key's Matchstick Grasshopper is highly susceptible to disturbance. Part of the lifecycle is spent underground, but even the adult stage lacks mobility and the insects are unlikely to be able to readily escape the path of an excavator or other earthmoving equipment. The insect is known to have a low fecundity rate and the population is not likely to experience rapid recruitment even under favourable conditions.

It is therefore likely that the proposed clearing of native vegetation and construction of sludge lagoons may have an adverse effect on the life cycle of the species such that a viable local population of the species is placed at risk of extinction.

b.in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i.is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable, not an ecological community.

ii.is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable, not an ecological community.

c.in relation to the habitat of a threatened species or ecological community:

i.the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposed activity involves the removal of up to 1.784 hectares of BGGW habitat within the subject land, which provides habitat for the Key's Matchstick Grasshopper. This has been estimated to comprise 16% of the habitat in the local area (which is contained in an area bounded by sealed asphalt roads). As this species is flightless and has limited ability to move between sites, this is likely have a significant impact on the available extent of the habitat for this species in the local area.

ii.whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The proposed activity will involve reduction in the area of available habitat but is not likely to involve fragmentation or isolation of the habitat from other areas of habitat. The proposed activity will not reduce landscape connectivity for Key's Matchstick Grasshopper.

iii.the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The proposed activity will substantially remove a significant amount of locally occurring habitat for the Key's Matchstick Grasshopper.

d.whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

GMC comment: not applicable, the proposed activity will not have an adverse effect on any declared area of outstanding biodiversity value.

e.whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Listed key threatening processes that would apply to the Key's Matchstick Grasshopper on this site include:

Clearing of native vegetation.

Invasion of native plant communities by exotic perennial grasses

Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Clearing of native vegetation

The proposed activity will involve the clearing of up to 1.784 hectares of native BGGW vegetation. On completion of the proposed activity, there is likely to be some re-establishment of native vegetation in the disturbed areas that may result in new habitat for the Key's Matchstick Grasshopper, but as noted this species has low fecundity and limited ability to readily recolonise disturbed ground. This key threatening process is likely to have a significant impact in the context of the proposed activity.

Invasion of native plant communities by exotic perennial grasses

The groundcover layer has already been invaded in parts by exotic perennial grasses. However the proposed activity is not likely to increase this process. This key threatening process is unlikely to have a significant impact in the context of the proposed activity.

Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Parts of the site have already been invaded by escaped garden plants and the proposed activity will not increase this risk. This key threatening process is unlikely to have a significant impact in the context of the proposed activity.

CONCLUSION

The proposed activity may result in a significant adverse impact on the local occurrence of the Key's Matchstick Grasshopper.

Appendix C: Matters of National Environmental Significance

MNES RELEVANT TO THE PROPOSED ACTIVITY

Remnant native vegetation within the subject land has been identified as *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest*.

This PCT is a component of the Commonwealth MNES **White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland** community, which is listed as being Critically Endangered.

Survey data have confirmed that the community present on the site meets minimum condition criteria to be included in the EPBC Act listing. Refer to 4.2.2.5 of this BDAR.

A Threatened Species Test of Significance has determined that the proposed activity is likely to have a significant impact on the local occurrence of this MNES.

Ten fauna species predicted to occur on the site by the BAM-C are MINES listed species:

Anthochaera phrygia	Regent Honeyeater	CE
Callocephalon fimbriatum	Gang Gang Cockatoo	E
Calyptorhynchus lathami	Glossy Black Cockatoo	V
Climacteris picumnus victoriae	Brown Treecreeper (South-eastern)	V
Daysurus maculatus	Spotted Tail Quoll	E
Hirundapus caudacutus	White Throated Needletail	V
Lathamus discolor	Swift Parrot	CE
Melanodryas cucullata cucullata	Hooded Robin (South-eastern)	E
Pteropus poliocephalus	Grey Headed Flying Fox	V
Stagonopleura guttata	Diamond Firetail	V

These fauna species are highly mobile and wide ranging. It is not likely that the removal of 1.8 hectares of habitat required by the project will have a significant impact on the viability of any of these species.

A number of migratory bird species listed under the EPBC Act may utilise the site on occasion, but it is not likely that the removal of 1.8 hectares of habitat required by the project will have a significant impact on the viability of any of these species.

Two MNES (not predicted by the BAM-C) have been confirmed to be present:

Key's Matchstick Grasshopper *Keyacris scurra* (Endangered) and Hoary Sunray *Leucochrysum albicans* subspecies *triocolor* (Endangered).

A Threatened Species Test of Significance has determined that the proposed activity may have a significant impact on the local occurrence of the Key's Matchstick Grasshopper.

A Threatened Species Test of Significance has determined that the proposed activity is unlikely to have a significant impact on the local occurrence of the Hoary Sunray.

Measures to avoid and minimise impacts on MNES

Measures to avoid and minimise impacts on biodiversity values of the subject land and on MNES are described in Chapter 7 of this BDAR.

Impacts to MNES

The project will involve removal of approximately 1.8 hectares of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, which comprises habitat for Key's Matchstick Grasshopper and Hoary Sunray.

The vegetation to be removed also provides potential habitat for other MNES fauna species, as described above.

Mitigation measures relevant to MNES

Mitigation measures are presented in Chapter 8.4 of this BDAR.

Final offset requirements for MNES

Based on BAM-C output, the following biodiversity offset credits are required for impacts on MNES resulting from this project:

- 84 Ecosystem Credits for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (and associated MNES fauna)
- 67 Species Credits for Key's Matchstick Grasshopper
- 400 Species Credits for Hoary Sunray

Refer to Appendix F BAM Credit Reports

Appendix D: Vegetation Survey Data: BAM Plot Data Sheet

BAM Site Field Survey Form	Date: 24. 11. 2022	Site Record Sheet No. 1

Survey Name	Zone ID	Recorders
Sludge Lagoons	Box Gum woodland	Brian Faulkner

Weather	20°C Sunny light wind from WNW

Plot Location		Plot ID: BAM 1
Latitude	Longitude	Plot Midline Bearing from 0 m
-34.748433	149.693907	298°

IBRA REGION	SE H	
IBRA SUBREGION	Monaro	
MITCHELL LANDSCAPE	Gundary Plains	
VEGETATION CLASS	Grassy Woodland	Confidence (H) M L
PLANT COMMUNITY TYPE	PCT 1330	Confidence (H) M L

BAM Attribute (1000 m² plot)			
DBH		Stem Count	Stems with hollows
80 + cm		—	
50 – 79 cm	(2)	11 (Pinus radiata)	
30 – 49 cm	(5)	1111	1
20 – 29 cm	(9)	11111111	
10 – 19 cm	(19)	11111111111111111	
5 – 9 cm	(5)	1111	
< 5 cm	(14)	11111111111111	
Length of logs (m). (> or = to 10 cm diameter, > 50 cm in length			8 metres

Page 1 of 5

BAM Site Field Survey Form	Date: 24.11.2022	Site Record Sheet No. 1

BAM Attribute (400 m² plot)		Sum Values
Count of Native Richness	Trees	4
	Shrubs	2
	Grasses etc	8
	Forbs	14
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	33
	Shrubs	0.2
	Grasses etc	23.2
	Forbs	1.8
	Ferns	0
	Other	0
High Threat Weed cover		31.6

BAM Attribute Five x (1 x 1 m) plots																				
Litter %						Bare Ground %						Cryptogram %						Rock %					
85	90	35	20	5		15	0	50	50	80		0	0	5	5	10		0	0	1	25	1	
Mean score: 47%						Mean score: 39%						Mean score: 4%						Mean score: 5.4%					

BAM Site Field Survey Form	Date: 24.11.2022	Site Record Sheet No. 11

400 m² Plot

GF Code	Species Name	N, E or HTE	Cover	Abundance
T	Eucalyptus melliodora	N	25	12
	Hypericum perforatum	HTE	20	1000
	Pinus radiata	HTE	10	2
T	Eucalyptus bridgesiana	N	2	1
T	Brachychiton populneus	N	1	1
F	Gonocarpus tetragynus	N	0.5	100
F	Leptorhynchos squamatus	N	0.1	100
	Hypochoeris radicata	E	1	500
S	Lissanthe strigosa	N	0.1	5
	Plantago lanceolata	E	5	1000
	Sonchus oleraceus	E	0.1	50
G	Austrostipa scabra	N	5	500
F	Dichondra repens	N	0.1	100
	Medicago polymorpha	E	1	500
G	Poa sieberiana	N	5	1000
	Nassella trichotoma	HTE	0.1	10
	Pyracantha angustifolia	HTE	0.1	3
	Cotoneaster glaucophyllus	HTE	0.1	5
	Cirsium vulgare	E	0.1	10
	Petrorhagia nanteuilii	E	0.1	50
G	Rytidosperma sp.	N	2	200
F	Pseudognaphalium luteoalbum	N	0.1	100
	Conyza sp.	E	0.1	10
G	Themeda triandra	N	5	500
F	Wahlenbergia stricta	N	0.1	50
F	Calocephalus citreus	N	0.1	50
	Ranunculus pumilio	E	0.1	100
	Vulpia sp.	E	5	1500
G	Microlaena stipoides	N	5	1000

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... 100% (foliage cover)

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ... 1000, ...

BAM Site Field Survey Form	Date: 24.11.2022	Site Record Sheet No. 1

400 m² Plot

GF Code	Species Name	N, E or HTE	Cover	Abundance
	Crataegus monogyna	HTE	1	2
	Cupressus sp.	E	0.1	1
S	Cassinia sifton	N	0.1	5
G	Austrostipa bigeniculata	N	0.1	100
	Vicia sativa	E	0.1	1
	Rosa rubiginosa	HTE	0.1	2
	Dactylis glomerata	E	2	200
G	Schoenus apogon	N	1	100
	Briza maxima	E	0.3	50
F	Chrysocephalum apiculatum	N	0.1	50
F	Acaena agnipila	N	0.1	10
G	Lomandra filiformis coricea	N	0.1	1
F	Dianella revoluta	N	0.1	1
F	Bulbine bulbosa	N	0.1	5
	Ligustrum lucidum	HTE	0.1	1
	Rubus fruticosus	HTE	0.1	1
F	Oxalis perennans	N	0.1	10
	Centaurium erythraea	E	0.1	50
F	Vittadinia muelleri	N	0.1	50
F	Asperula conferta	N	0.1	100
	Juniperus sp.	E	0.1	1
F	Euchiton sphaericus	N	0.1	10
	Holcus lanatus	E	0.1	1
	Aira sp.	E	0.1	1
T	Eucalyptus blakelyi	N	5	9

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... 100% (foliage cover)

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ... 1000, ...

BAM Site Field Survey Form	Date: 24.11.2022	Site Record Sheet No. 1

Appendix E: Survey Data: Flora and Fauna Lists

TABLE 35: SURVEY DATA FLORA AND FAUNA LISTS		
Native flora species		
Scientific name	**Common name**	**BAM Growth Form**
Acacia baileyana	Cootamundra Wattle	Shrub
Acacia dealbata	Silver Wattle	Tree
Acacia decurrens	Early Black Wattle	Tree
Acacia falciformis	Broad Leaf Hickory	Shrub
Acacia floribunda	Gossamer Wattle	Shrub
Acacia genistifolia	Early Wattle	Shrub
Acacia melanoxylon	Blackwood Wattle	Tree
Acaena ovina	Acaena	Tree
Aristida ramosa	Purple Wire Grass	Grass & Grass-like
Asperula conferta	Common Woodruff	Forb
Astroloma humifusum	Cranberry Heath	Shrub
Austrostipa bigeniculata	Tall Spear Grass	Grass & Grass-like
Austrostipa densiflora	Brush-tail Spear Grass	Grass & Grass-like
Austrostipa scabra	Corkscrew Grass	Grass & Grass-like
Bothriochloa macra	Red Stem Grass	Grass & Grass-like
Brachychiton populneus	Kurrajong	Tree
Brachyloma daphnoides	Daphne Heath	Shrub
Brachyscome rigidula	Leafy Daisy	Forb
Bulbine bulbosa	Bulbine Lily	Forb
Caladenia carnea	Pink Fingers	Forb
Calocephalus citreus	Lemon Beautyheads	Forb
Cassinia sifton	Sifton Bush	Shrub
Cheilanthes sieberi	Rock Fern	Fern
Chloris truncata	Windmill Grass	Grass & Grass-like
Chrysocephalum apiculatum	Common Everlasting	Forb

Chrysocephalum semipapposum	Clustered Everlasting	Forb
Convolvulus angustisissmus	Blushing Bindweed	Vine
Crassula sieberiana	Austral Stonecrop	Forb
Cryptandra amara	Bitter Cryptandra	Shrub
Cynodon dactylon	Couch	Grass & Grass-like
Daucus glochidiatus	Native Carrot	Forb
Daviesia latifolia	Hop Bitter Pea	Shrub
Dianella revoluta	Black Anther Flax Lily	Forb
Dillwynia sericea	Showy Parrot Pea	Shrub
Diuris pardina	Leopard Orchid	Forb
Eryngium ovinum	Blue Devil	Forb
Eucalyptus blakelyi	Blakely's Red Gum	Tree
Eucalyptus bridgesiana	Apple Box	Tree
Eucalyptus cinerea	Argyle Apple	Tree
Eucalyptus dives	Broad Leaf Peppermint	Tree
Eucalyptus mannifera	Brittle Gum	Tree
Eucalyptus melliodora	Yellow Box	Tree
Galium gaudichaudii	Rough Bedstraw	Forb
Glycine tabacina	Variable Glycine	Vine
Gnaphalium luteoalbum	Jersey Cudweed	Forb
Gonocarpus tetragynus	Poverty Raspwort	Forb
Goodenia hederacea	Ivy Goodenia	Forb
Goodenia pinnatifida	Scrambled Eggs	Forb
Hardenbergia violacea	False Sarsaparilla	Vine
Hibbertia obtusifolia	Grey Guinea Flower	Forb
Hydrocotyle laxiflora	Stinking Pennywort	Forb
Hypericum gramineum	Small St John's Wort	Forb
Kennedia prostrata	Running Postman	Vine
Leptorhynchos squamatus	Scaly Buttons	Forb
Leucochrysum albicans tricolor	Hoary Sunray	Forb
Lissanthe strigosa	Peach Heath	Shrub

Lomandra filiformis	Wattle Mat Rush	Grass & Grass-like
Lomandra multiflora	Many Flowered Mat Rush	Grass & Grass-like
Lythrum hyssopifolia	Hyssop Loosestrife	Forb
Melichrus urceolatus	Urn Heath	Shrub
Microlaena stipoides	Weeping Grass	Grass & Grass-like
Microseris lanceolata	Murnong	Forb
Microtis unifolia	Common Onion Orchid	Forb
Mirbelia oxylobioides	Mountain Mirbelia	Shrub
Oxalis exilis	Slender Sorrel	Forb
Oxalis perennans	Grassland Wood Sorrel	Forb
Pimelea curviflora	Curved Riceflower	Shrub
Plantago gaudichaudii	Narrow Plantain	Forb
Poa labillardieri	Native Tussock	Grass & Grass-like
Poa sieberiana	Snow Grass	Grass & Grass-like
Poranthera microphylla	Small Poranthera	Forb
Pultenaea microphylla	Spreading Bush Pea	Shrub
Pultenaea subspicata	Low Bush Pea	Shrub
Rytidosperma spp.	Wallaby Grass	Grass & Grass-like
Stackhousia monogyna	Creamy Candles	Forb
Themeda triandra	Kangaroo Grass	Grass & Grass-like
Thysanotus patersonii	Twining Fringe Lily	Forb
Tricoryne elatior	Yellow Rush Lily	Forb
Triptilodiscus pygmaeus	Austral Sunray	Forb
Vittadinia muelleri	Mueller's Fuzz Weed	Forb
Wahlenbergia communis	Tufted Bluebell	Forb
Wahlenbergia stricta	Tall Bluebell	Forb
Wurmbea dioica	Early Nancy	Forb

TABLE 35: SURVEY DATA FLORA AND FAUNA LISTS				
Exotic flora species				
Scientific name	**Common name**	**BAM status**	**WONS**	**Regional Priority**
Acetosella vulgaris	Sheep's Sorrel	High Threat Exotic		
Aira sp.	Hair Grass			
Avena sp.	Oat			
Briza minor	Shivery Grass			
Bromus hordeaceus	Soft Brome			
Cirsium vulgare	Spear Thistle			
Conyza sp.	Fleabane			
Cotoneaster sp.	Cotoneaster	High Threat Exotic		
Crataegus monogyna	Hawthorn	High Threat Exotic		
Cupressus sp.	Cypress			
Echium plantagineum	Paterson's Curse			
Eragrostis curvula	African Love Grass	High Threat Exotic		Yes
Foeniculum vulgare	Fennel			
Freesia sp.	Freesia			
Galium aparine	Cleavers			
Gamochaeta purpurea	Purple Cudweed			
Genista monspessulana	Cape Broom	High Threat Exotic	Yes	Yes
Hedera helix	English Ivy	High Threat Exotic		
Hirschfieldia incana	Buchan Weed			
Holcus lanatus	Yorkshire Fog			

Hypericum perforatum	St John's Wort	High Threat Exotic		
Hypochaeris glabra	Smooth Catsear			
Hypochaeris radicata	Catsear			
Juniperus sp.	Juniper			
Ligustrum lucidum	Large Leaf Privet	High Threat Exotic		
Ligustrum sinense	Small Leaf Privet	High Threat Exotic		
Lonicera japonica	Japanese Honeysuckle	High Threat Exotic		
Lycium ferocissimum	African Box Thorn	High Threat Exotic	Yes	
Medicago polymorpha	Burr Medick			
Narcissus sp.	Daffodil/Narcissus			
Nassella neesiana	Chilean Needle Grass	High Threat Exotic		
Nassella trichotoma	Serrated Tussock	High Threat Exotic	Yes	Yes
Olea africana	African Olive	High Threat Exotic		
Oxalis articulata	Pink Wood Sorrel			
Petrorhagia nanteuilii	Proliferous Pink			
Pinus radiata	Radiata Pine	High Threat Exotic		
Plantago lanceolata	Ribwort			
Prunus cerasifera	Cherry Plum			
Pyracantha angustifolia	Firethorn	High Threat Exotic		
Rosa rubiginosa	Sweet Briar	High Threat Exotic		

Rubus fruticosus aggregate	Blackberry	High Threat Exotic	Yes	Yes
Sonchus oleraceus	Sowthistle			
Sorbus domestica	Service Tree			
Trifolium arvense	Haresfoot Clover			
Ulex europaeus	Gorse	High Threat Exotic	Yes	Yes
Viburnum tinus	Viburnum			
Vicia sativa	Vetch			
Vulpia spp.	Rat's Tail Fescue			
Viola odorata	Sweet Violet			
Yucca sp.	Yucca			

TABLE 35: SURVEY DATA FLORA AND FAUNA LISTS		
Fauna recorded on site		
Scientific Name	**Common Name**	**Comment**
Acanthiza chrysorrhoa	Yellow Rumped Thornbill	Sighted
Anthochaera carunculata	Red Wattlebird	Heard
Cacatua galerita	Sulphur Crested Cockatoo	Heard
Colluricinda harmonica	Grey Shrike Thrush	Heard
Corvus coronoides	Australian Raven	Heard
Crinia signifera	Eastern Common Froglet	Heard calling
Dacelo novaeguineae	Laughing Kookaburra	Sighted
Gymnorhina tibicen	Australian Magpie	Sighted
Keyacris scurra	Key's Matchstick Grasshopper	Sighted
Lampropholis delicata	Dark Flecked Garden Skink	Sighted
Lampropholis guichenoti	Common Garden Skink	Sighted
Limnodynastes tasmaniensis	Spotted Marsh Frog	Heard calling
Macropus giganteus	Eastern Grey Kangaroo	Scats
Malurus cyaneus	Superb Fairy Wren	Sighted
Manorina melanocephala	Noisy Miner	Sighted

Oryctolagus cuniculus	Rabbit	Scats
Platycercus elegans	Crimson Rosella	Sighted
Rhipidura leucophrys	Wille Wagtail	Sighted
Strepera graculina	Pied Currawong	Sighted
Tachyglossus aculeatus	Short-beaked Echidna	Diggings
Tiliqua rugosa	Shingleback Skink	Sighted
Turdus merula	Eurasian Blackbird	Sighted
Vulpes vulpes	Fox	Scats & Sighted

BAM Credit Summary Report

Proposal Details

Assessment Id 00043567/BAAS21005/23/00043887	Proposal Name Goulburn WTP Residuals Handling Facility	BAM data last updated * 22/06/2023
Assessor Name Brian Erik Faulkner	Report Created 23/10/2023	BAM Data version * 61
Assessor Number BAAS21005	BAM Case Status Open	Date Finalised To be finalised
Assessment Revision 0	Assessment Type Part 5 Development (Small Area)	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Goulburn Tableland Box-Gum Grassy Forest												
1	3373_PCT 3373Moderate	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 Highla	75.7	75.7	1.8	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	84
											Subtotal	**84**
											Total	**84**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Keyacris scurra / Key's Matchstick Grasshopper (Fauna)									
3373_PCT3373 Moderate	75.7	75.7	1.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	67
								Subtotal	**67**
Leucochrysum albicans subsp. tricolor / Hoary Sunray (Flora)									
3373_PCT3373 Moderate	N/A	N/A	1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	2
								Subtotal	**2**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00043567/BAAS21005/23/00043887	Proposal Name Goulburn WTP Residuals Handling Facility	BAM data last updated * 22/06/2023
Assessor Name Brian Erik Faulkner	Assessor Number BAAS21005	BAM Data version * 61
Proponent Names	Report Created 23/10/2023	BAM Case Status Open
Assessment Revision 0	Assessment Type Part 5 Development (Small Area)	Date Finalised To be finalised

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
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 Highla	Critically Endangered Ecological Community	3373-Goulburn Tableland Box-Gum Grassy Forest
Species		

Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Ephippiorhynchus asiaticus / Black-necked Stork

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3373-Goulburn Tableland Box-Gum Grassy Forest	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 Highla	1.8	84	0	84

3373-Goulburn Tableland Box-Gum Grassy Forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
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 Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347,	-	3373_PCT3373 Moderate	Yes	84	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Keyacris scurra / Key's Matchstick Grasshopper	**3373_PCT3373Moderate**	1.8	67.00
Leucochrysum albicans subsp. tricolor / Hoary Sunray	**3373_PCT3373Moderate**	1.0	2.00

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options	Like-for-like credit retirement options	
Keyacris scurra / Key's Matchstick Grasshopper	Spp	IBRA subregion
	Keyacris scurra / Key's Matchstick Grasshopper	Any in NSW
Leucochrysum albicans subsp. tricolor / Hoary Sunray	Spp	IBRA subregion
	Leucochrysum albicans subsp. tricolor / Hoary Sunray	Any in NSW

BAM Candidate Species Report

Proposal Details

Assessment Id 00043567/BAAS21005/23/00043887	Proposal Name Goulburn WTP Residuals Handling Facility	BAM data last updated * 22/06/2023
Assessor Name Brian Erik Faulkner	Report Created 23/10/2023	BAM Data version * 61
Assessor Number BAAS21005	Assessment Type Part 5 Development (Small Area)	BAM Case Status Open
Assessment Revision 0	Date Finalised To be finalised	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Keyacris scurra Key's Matchstick Grasshopper	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Leucochrysum albicans subsp. tricolor Hoary Sunray	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

Common Name	Scientific Name
Key's Matchstick Grasshopper	Keyacris scurra
Hoary Sunray	Leucochrysum albicans subsp. tricolor

BAM Candidate Species Report

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Regent Honeyeater	Anthochaera phrygia	Refer to BAR
Swift Parrot	Lathamus discolor	Refer to BAR

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00043567/BAAS21005/23/00043887	Goulburn WTP Residuals Handling Facility	22/06/2023
Assessor Name	**Report Created**	**BAM Data version ***
Brian Erik Faulkner	23/10/2023	61
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS21005	Part 5 Development (Small Area)	Open
Assessment Revision		**Date Finalised**
0		To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	3373-Goulburn Tableland Box-Gum Grassy Forest
Black Falcon	Falco subniger	3373-Goulburn Tableland Box-Gum Grassy Forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3373-Goulburn Tableland Box-Gum Grassy Forest
Diamond Firetail	Stagonopleura guttata	3373-Goulburn Tableland Box-Gum Grassy Forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3373-Goulburn Tableland Box-Gum Grassy Forest
Flame Robin	Petroica phoenicea	3373-Goulburn Tableland Box-Gum Grassy Forest
Gang-gang Cockatoo	Callocephalon fimbriatum	3373-Goulburn Tableland Box-Gum Grassy Forest
Grey-headed Flying-fox	Pteropus poliocephalus	3373-Goulburn Tableland Box-Gum Grassy Forest
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	3373-Goulburn Tableland Box-Gum Grassy Forest
Little Eagle	Hieraaetus morphnoides	3373-Goulburn Tableland Box-Gum Grassy Forest
Little Lorikeet	Glossopsitta pusilla	3373-Goulburn Tableland Box-Gum Grassy Forest
Little Whip Snake	Suta flagellum	3373-Goulburn Tableland Box-Gum Grassy Forest

BAM Predicted Species Report

Powerful Owl	Ninox strenua	3373-Goulburn Tableland Box-Gum Grassy Forest
Regent Honeyeater	Anthochaera phrygia	3373-Goulburn Tableland Box-Gum Grassy Forest
Rosenberg's Goanna	Varanus rosenbergi	3373-Goulburn Tableland Box-Gum Grassy Forest
Scarlet Robin	Petroica boodang	3373-Goulburn Tableland Box-Gum Grassy Forest
Speckled Warbler	Chthonicola sagittata	3373-Goulburn Tableland Box-Gum Grassy Forest
Spotted Harrier	Circus assimilis	3373-Goulburn Tableland Box-Gum Grassy Forest
Spotted-tailed Quoll	Dasyurus maculatus	3373-Goulburn Tableland Box-Gum Grassy Forest
Square-tailed Kite	Lophoictinia isura	3373-Goulburn Tableland Box-Gum Grassy Forest
Swift Parrot	Lathamus discolor	3373-Goulburn Tableland Box-Gum Grassy Forest
Varied Sittella	Daphoenositta chrysoptera	3373-Goulburn Tableland Box-Gum Grassy Forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	3373-Goulburn Tableland Box-Gum Grassy Forest
White-throated Needletail	Hirundapus caudacutus	3373-Goulburn Tableland Box-Gum Grassy Forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black-necked Stork	Ephippiorhynchus asiaticus	3373-Goulburn Tableland Box-Gum Grassy Forest
Glossy Black-Cockatoo	Calyptorhynchus lathami	3373-Goulburn Tableland Box-Gum Grassy Forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black-necked Stork	Ephippiorhynchus asiaticus	Refer to BAR
Glossy Black-Cockatoo	Calyptorhynchus lathami	Refer to BAR

Appendix G: Justification of Project Location and Design

Goulburn Drinking Water Treatment Plant (WTP) – Proposed Extension

Why?

Under the *NSW Public Health Act 2010* Council is required as a water authority to provide drinking water which is fit for human consumption, with the relevant State Minister having the authority to intervene should drinking water be unfit for human consumption. Furthermore, under the Act, water suppliers must have a quality assurance program (Council's Drinking Water Management Plan) which identifies Council's roles and responsibilities regarding drinking water quality such as health based targets and aesthetic limits to ensure customers can safely and comfortably drink the water provided.

Council adopted a key strategic planning document for the future growth and development of the Local Government Area, namely the *Urban and Fringe Housing Strategy*. One of the intentions of the Strategy is to provide criteria for the consideration of Planning Proposals in future for land located on the fringe of the towns, specifically Goulburn and Marulan. Given the housing growth identified for Goulburn, it is anticipated that increased support from local infrastructure such as drinking water supply will also increase. The adoption of the *Urban and Fringe Housing Strategy* assists with infrastructure planning by identification of future growth potential and urban release areas. On this basis the Planning Proposal is consistent with this Strategy.

What?

The treatment processes of water for use as a potable supply result in sludge as a bi-product. The sludge contains water which needs to be extracted as much as possible. The sludge needs to be transported from the site for disposal at a waste management facility (by truck). The less the sludge is dewatered (i.e. not enough water evaporated or removed), the more water needs to be disposed of with the sludge. This increases the volume of the sludge moved offsite, and hence results in more truck loads and higher disposal fees. This adds to the long-term cost of operating the facility and adds to the environmental impacts associated with the operation.

The sludge produced does not have an odour but does contain residues from the treatment process. The water treatment process uses the following chemicals:

- Potassium Permanganate – for oxidation of manganese;
- Powdered Activated Carbon (PAC) - for taste and odour; and
- Aluminium Sulphate (Alum) - for coagulation.

The sludge produced will likely be predominately PAC and flocculated material from the raw water (due to the addition of potassium permanganate and alum).

For the sludge dewatering process design, Hunter H2O used the following inputs:

- Yearly average day of 10.75ML to match the 2040 yearly headworks supply estimate of 3.765ML using a recovery of 96%
- Coagulant addition of 60mg/L aluminium sulphate, as 100%, as an average over the year
- PAC addition of 5 mg/L as an average over the year (equivalent to 20 mg/L for 3 months a year)
- Sludge concentration of 3% in the lagoon when it is taken offline
- Two lagoons, each being sized to accept 12 months of sludge in the year 2040

Council engaged Hunter H2O to develop an options study to review what methods were available and practical for the dewatering of sludge from the Goulburn WTP. The options study reviewed the implementation of the following methods of sludge dewatering for the Goulburn WTP for a 30 year time frame:

- Drying Beds
- Mechanical Dewatering
- Sedimentation Lagoons

Drying beds were ruled out as there was not enough Council-owned land available for the number of drying beds required, based on the amount of sludge that will be produced now and with the predicted quantities based on population growth. So mechanical dewatering and sedimentation lagoons were effectively compared.

Mechanical de-watering was considered as this option results in a lesser area being required and therefore potentially less land clearing to provide for the lagoons or drying beds.

Sedimentation lagoons were seen as the superior option for several reasons:

- They produce less noise than mechanical dewatering.
- The sludge concentration is double that to mechanical dewatering (i.e. a far more effective process for getting water out). Mechanical dewatering can typically produce sludge at a concentration of about 20%, whereas sedimentation lagoons can generally produce sludge at 40% concentration.
- The sludge concentration produced by mechanical dewatering isn’t high enough to be disposed of at the Goulburn WMC, so the sludge will have to go to Veolia in Tarago instead. This will increase transportation costs (it is approximately 55km each way

from the WTP to Tarago) as well as greenhouse emissions transporting the sludge from Goulburn to Tarago for disposal.

- Sedimentation lagoons don't require a thickening polymer to increase sludge concentration. The 20% sludge concentration above for mechanical dewatering includes polymer dosing*
- Mechanical dewatering requires additional resources, such as labour and electricity. Sedimentation lagoons are less resource intensive, requiring some additional labour but no additional electricity (with no mechanical equipment to operate). The power supply at the Goulburn WTP will need to be upgraded for mechanical dewatering to be installed.

*Polymer water treatment can have some risks, such as:

- Exposure to **acrylamide monomer**, which is a probable human carcinogen[1].
- Degradation of **polymer mechanical, surface, and morphological characteristics** by free available chlorine[2].
- Spills of **polymer solutions**, which can be costly, time-consuming and hazardous to clean up[3].

You can learn more about these risks and how to avoid them from the links below.

[1]: https://www.dcceew.gov.au/environment/protection/npi/substances/fact-sheets/acrylamide [2]: https://www.scirp.org/journal/paperinformation.aspx?paperid=109745 [3]: https://www.watertechonline.com/wastewater/article/14297129/watsonmarlow-fluid-technology-group-how-to-eliminate-the-risk-and-mess-of-polymer-spills

Sedimentation lagoons are a more operationally suitable option moving forward, with a comparison of the costs of sedimentation lagoons vs mechanical dewatering provided below.

	Sedimentation Lagoons	Mechanical Dewatering
Capital Cost	$4.12M (+/- 50%)	$5.43M (+/- 50%)
Operational Costs	$129k	$269k
Net Present Value	$5.49M	$8.28M

It is proposed at this point that sludge produced as part of the treatment process will be held in a sludge lagoon/s with a designed detention time of 10 months, dependant on the amount of sludge produced and the prevailing weather conditions. The options for the site include 2 lagoons, with a 10 month filling time and 10 month drying time.

Based on the inputs above, Hunter H2O found that sedimentation lagoons would need to meet the following parameters:

- A 2040 yearly production of 116 tonnes of dry solids
- Two lagoons required, each with a base dimension of 30m x 80m to meet the constraints of the site.
- A yearly volume of 314 m^3 of sludge produced at a solids concentration of 35%
- At 3% dry solids and a yearly average day of 13ML (4,745 ML/annum), under-drains may be required in the lagoons to effectively dry the sludge.

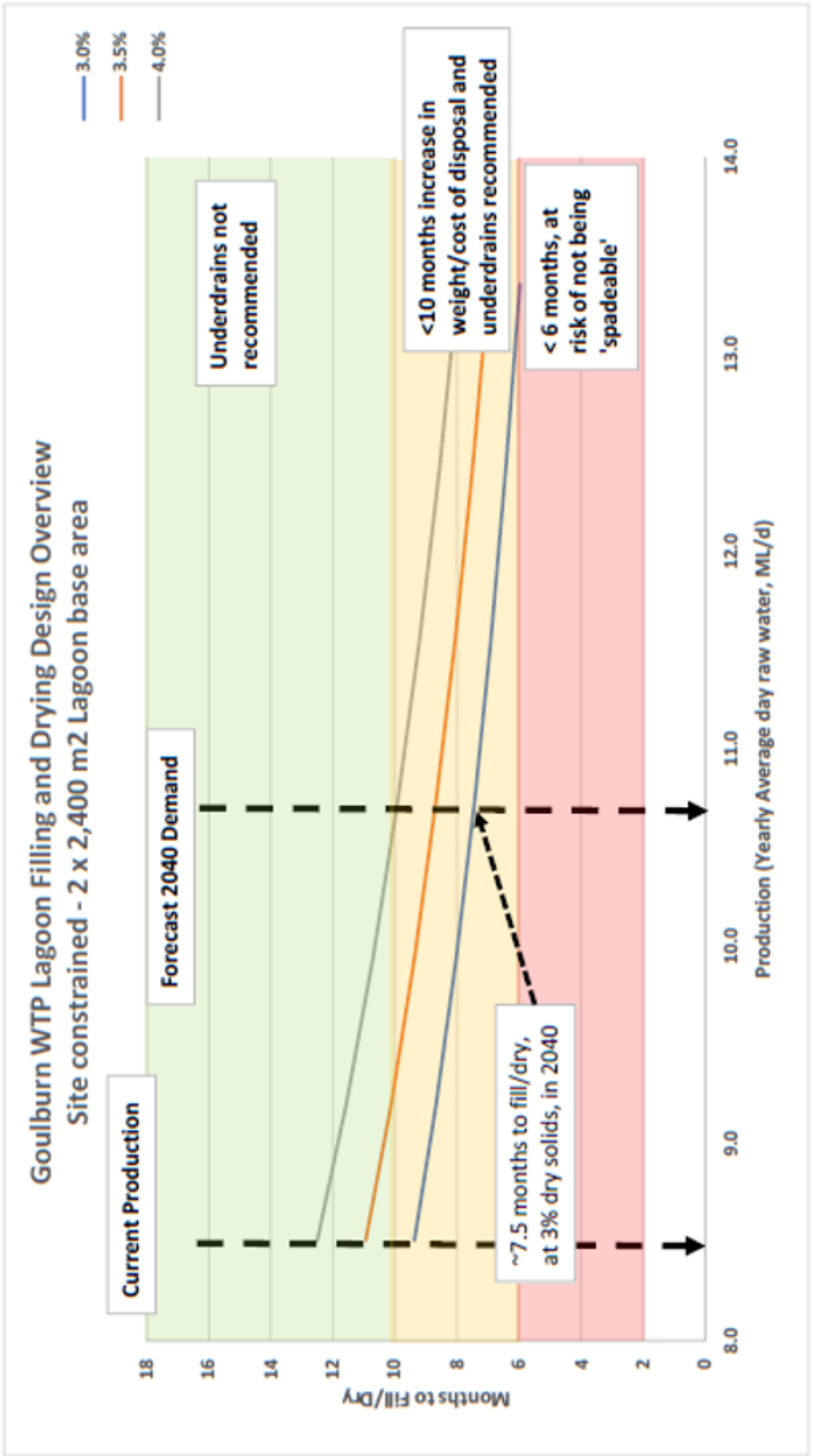
Generally sedimentation lagoons have a 500mm freeboard. This can be modified if it is found that 500mm freeboard is not enough to prevent overflow in relation to the flooding risks to be considered with the review of environmental factors (REF). The lagoons would also be lined, to avoid seepage through the ground.

Previous work has indicated that the maximum base area of two lagoons on the available site is for each lagoon to have a surface area of 2,400 m2 (30m by 80m). The sensitivity of the filling, and hence drying time, through using lagoons smaller than ideal have been investigated and are displayed in the figure below against the yearly average day production and with 3%, 3.5% and 4% dry solids.

- Year 2021 filling time of 9 months at 3% and 12 months at 4% dry solids
- Year 2040 filling time of 7.5 months at 3% and 10 months at 4% dry solids
- At 3% dry solids the lagoons reach their capacity at a yearly average day of 13ML (4,745 ML/annum)
- At 4% dry solids and a yearly average day of 13ML the lagoons have an 8 month fill and dry cycle.

The design of any new treatment facility would need to consider proximity and impact of the facility on the identified water courses and on water quality.

Therefore, both the construction and operation of any future treatment lagoons would need to be designed in accordance with the neutral or beneficial effect test principles in State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Chapter 6 – Sydney Drinking Water Catchment.


Goulburn WTP Lagoon Filling and Drying Design Overview
Site constrained - 2 x 2,400 m2 Lagoon base area
3.0%
3.5%
4.0%
Underdrains not recommended
<10 months increase in weight/cost of disposal and underdrains recommended
< 6 months, at risk of not being 'spadeable'
Forecast 2040 Demand
Current Production
~7.5 months to fill/dry, at 3% dry solids, in 2040
Months to Fill/Dry
0
2
4
6
8
10
12
14
16
18
Production (Yearly Average day raw water, ML/d)
8.0
9.0
10.0
11.0
12.0
13.0
14.0

The NSW Department of Planning and Environment (DPE) – Water Unit are supportive of sedimentation lagoons, noting previously that:

> *"Thanks for the involving us in the meeting this morning to discuss options to manage sludge and backwash wastewater from Goulburn Water Filtration Plant. We agreed, after taking all factors into consideration, that the lagoon option with underdrains seems the best practicable solution compared to drying beds or centrifuge options. The drying beds or the centrifuge options do not appear to be practicable as they have inherent risks which are difficult or not possible to overcome. Looking forward to further developments on this project."*

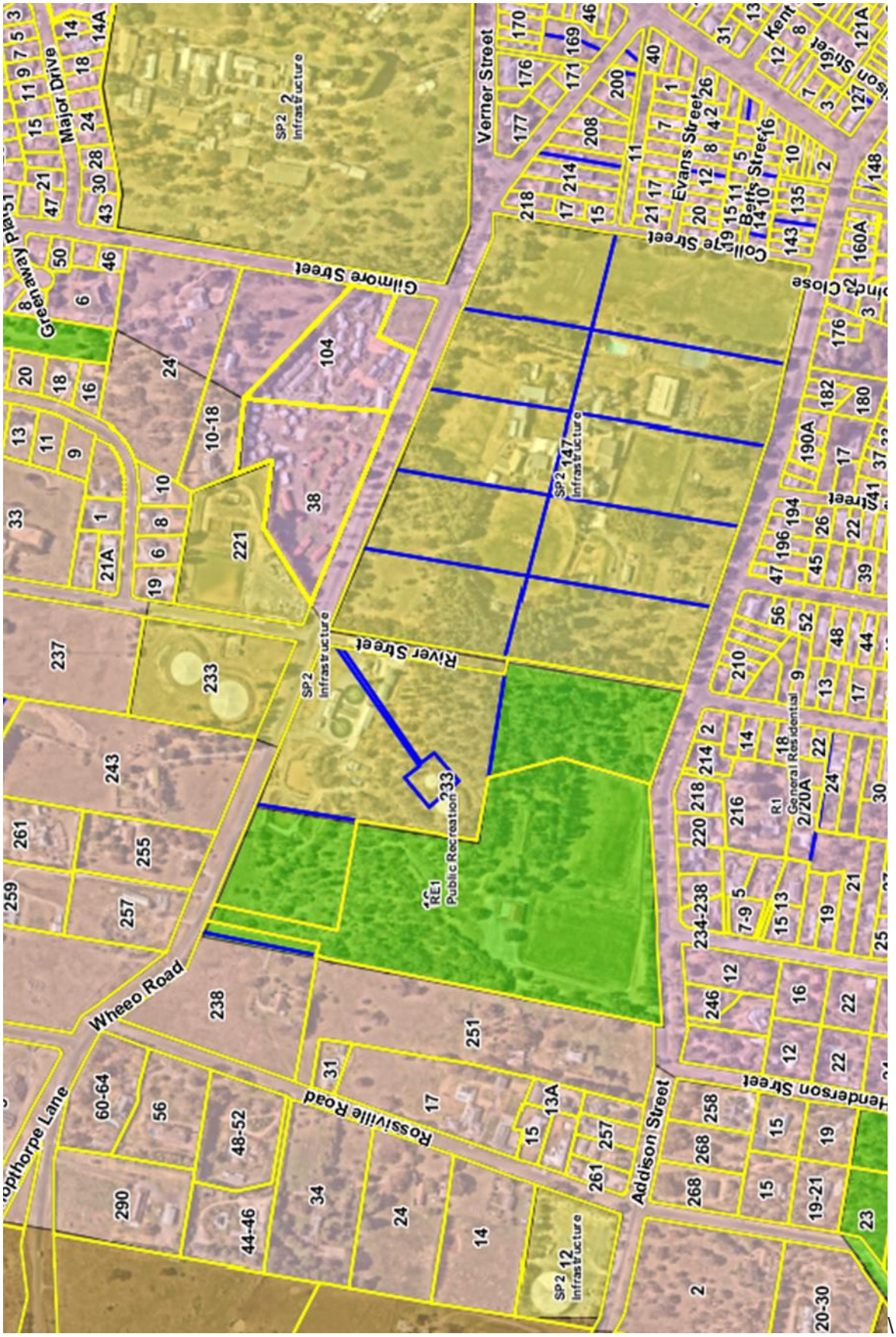
Based on the above, the planning proposal is considered the best option and required to provide a planning pathway for the construction of sedimentation lagoons. From the report they are a much better option despite the environmental consequences of clearing the trees on site, however they will allow Council to not only better manage its sludge but do so in a more sustainable and environmentally friendly way.

Where?

The reasons why this site has been selected are:

- Proximity of lagoons to the existing water treatment plant
- The site is secure and can be supervised easily by staff
- The site is likely to already be affected by contaminants from the treatment process associated with the existing lagoons.
- The land is already owned by Council.
- The site is large enough for the lagoons/ponds required.
- The cost of expansion and operation will be lower.
- Sites with overland flows and proximity to water courses should be avoided due to potential water quality contamination in excessive rain events. The site selected is relatively elevated and not affected by overland flows/stormwater.
- The additional lagoons will provide some bushfire risk hazard reduction to the existing facility which is key infrastructure for Goulburn.
- The site is mostly surrounded by non-residential uses and therefore likely to have less impact on surrounding residential areas.

The following provides an analysis of the locality in relation to the suitability of the site chosen and reasons as to why alternate sites have not been selected in order to avoid vegetation clearing. As stated above, mechanical water was also considered as an optional water treatment method as it uses less land but has other environmental impacts which are also considered to be undesirable.


Verner Street
Major Drive
Gilmore Street
Greenaway Place
Evans Street
Betts Street
College Street
Close
River Street
Wheeo Road
Rossiville Road
Addison Street
Henderson Street
Copthorpe Lane
SP2 Infrastructure
RE1 Public Recreation
R1 General Residential

Location	Zoning	Infrastructure on site	Reasons site is not suitable
1	R5 Large Lot Residential	Housing	• An extension of the network to the site would be required, as the site is further away this would add to the cost. • For security and operational purposes, it would be easier having the sludge lagoons at the same facility. • Proximity to water courses which are subject to overland flows (stormwater flooding) and impacts on Sydney Drinking Water Catchment. Ideally there should be no opportunity for contaminated residues to enter water courses or drainage lines. The subject site is ideal as it is not affected by drainage lines or stormwater flooding. • The site would also need to be rezoned to allow public utility infrastructure. • The site also has housing on it and given the proximity to town would be highly desirable for property development. Council would be required to purchase the lot at market value, likely inflated due to the development potential. • Greater potential for future residential development and land use conflict.
2	R5 Large Lot Residential	Housing	• Site would require rezoning. • The site also has a house on it and given the proximity to town would be highly desirable for property development. • Council would be required to purchase the lot at market value, likely inflated due to the development potential. • Proximity to water courses which are subject to overland flows (stormwater flooding) and impacts on Sydney Drinking Water Catchment. Ideally there should be no opportunity for contaminated residues to enter water courses or drainage lines. The subject site is ideal as it is not affected by drainage lines or stormwater flooding. • Greater potential for future residential development and land use conflict.
3	R5 Large Lot Residential	Housing	• Site contains existing radio tower facility. • Current DA for subdivision. Council would be required to purchase the lot/s at market value, likely inflated due to the development potential. • Closer proximity to future residential is also undesirable. • The site is further away from the existing treatment facility. Therefore, increased cost of additional pipework and pumping operation. • The site would also need to be rezoned to allow public utility infrastructure.

4	R5 Large Lot Residential	Housing	• Greater potential for future residential development and land use conflict. • Site would require rezoning. • The site also has a house on it and given the proximity to town would be highly desirable for property development. Council would be required to purchase the lot at market value, likely inflated due to the development potential. • Greater potential for future residential development and land use conflict.
5	R5 Large Lot Residential	Housing	. • The site also has a house on it and given the proximity to town would be highly desirable for property development. Council would be required to purchase the lot at market value, likely inflated due to the development potential. • Greater potential for future residential development and land use conflict. • The site would also need to be rezoned to allow public utility infrastructure
6	SP2 Infrastructure Purpose – Public Utility	Water reservoirs	• Site currently has two water reservoirs on it which are key to the town's water supply. • The amount of available land is also not sufficient for the lagoons required
7	SP2 Infrastructure Purpose – Public Utility	Heritage water infrastructure Storage area	• Site currently has heritage infrastructure which cannot be removed or demolished. Re-commissioning of the heritage tanks was considered but sedimentation would need to be removed as a part of the process by hand so as not to damage the existing structures. This is impractical and would have WHS implications. • The site is also not large enough for the two lagoons required.
8	R1 General Residential	Retirement Housing	• Density of existing development and cost (unfeasible)- the site is developed with a retirement village. Council would need to purchase the site at market value (if at all due to the likely resistance from the owners and residents), displace these residents and demolishing the housing on the site. • The site would also need to be rezoned to allow public utility infrastructure. • Greater potential for land use conflict.
9	SP2 Infrastructure Purpose – Educational Establishment	TAFE Goulburn	• The site currently houses the TAFE in Goulburn. • Distance from the existing plant would add to cost of the project and operational costs. • Council would need to purchase the site and demolish the site to construct the lagoons. • The site would also need to be rezoned to allow public utility infrastructure

10	R5 Large Lot Residential	Housing	• The site currently has a DA (DA/0586/2122) for a 6-lot subdivision. • Council would need to purchase the land at market value (increased due to development potential) and rezone the land. • The site also slopes to the north to north-west, so may not be able to have the lagoons onsite without major earthworks. • Proximity to water courses which are subject to overland flows (stormwater flooding) and impacts on Sydney Drinking Water Catchment. Ideally there should be no opportunity for contaminated residues to enter water courses or drainage lines. The subject site is ideal as it is not affected by drainage lines or stormwater flooding.
11	R5 Large Lot Residential	Housing	• An extension of the network to the site would be required, as the site is further away this would add to the cost. • For security and operational purposes, it would be easier having the sludge lagoons at the same facility. • Each lot has housing on it, with future subdivision potential. Council would need to purchase multiple lots at market value, likely inflated due to the potential subdivision of the land that is possible. Council would then also have to rezone the land to allow the construction of the lagoons. • Any pipework from the water treatment plant to the lagoon so this site would need to run through the road reserve (Council cannot access water infrastructure on private property outside of work hours under s.191 of the Local Government Act 1993). This would increase the length of water main required, increasing running costs. • Greater potential for future residential development and land use conflict.
12	R5 Large Lot Residential	Vacant	• The site currently has development interest (FMA/0005/2324) for a 16-lot subdivision, with multiple enquiries to Council regarding potential development of the site. Council would need to purchase the land at market value (increased due to development potential) and rezone the land. • The site also slopes severely to the north-east, making the construction of the lagoons impractical given the shape of the block. Any pipework from the water treatment plant to the lagoon so this site would need to run through the road reserve (Council cannot access water infrastructure on private property outside of work hours under s.191 of the Local Government Act 1993). This would increase the length of water main required, increasing running costs.

			• Greater potential for future residential development and land use conflict.
13	R5 Large Lot Residential	Housing	• Each lot has housing on it, with future subdivision potential. Council would need to purchase multiple lots at market value, likely inflated due to the potential subdivision of the land that is possible. • Council would then also have to rezone the land to allow the construction of the lagoons. • Any pipework from the water treatment plant to the lagoon so this site would need to run through the road reserve (Council cannot access water infrastructure on private property outside of work hours under s.191 of the Local Government Act 1993). This would increase the length of water main required, increasing running costs.
14	SP2 Infrastructure Purpose – Public Utility	Water Reservoir	• Site currently has a large water reservoir on it which supplies more than half of Goulburn with water. • The vacant land on the site is also earmarked for a second reservoir, which will be required as Goulburn's population grows. • The amount of available land is also not sufficient for the size of the lagoons required
15	RE1 Public Recreation	Football field	• The site currently has a rugby field used by the community. • Council would need to demolish all infrastructure on the site, and rezone and reclassify the land to operational under the Local Government Act. • The site also slopes to the west and south-west (except for the sports field itself) so would require major earthworks to construct the lagoons. • The site also has yellow box, which is the same vegetation on the lot proposed for the location of the sedimentation lagoons. • Proximity to water courses over sections of the site which are subject to overland flows (stormwater flooding) and impacts on Sydney Drinking Water Catchment. Ideally there should be no opportunity for contaminated residues to enter water courses or drainage lines. The subject site is ideal as it is not affected by drainage lines or stormwater flooding.
16	RE1 Public Recreation	Vacant	• Excessive gradient as the site slopes severely to the south. There is also a ridge to the north of the site, with the water treatment plant on the north side of this ridge. As a result, any water would need to be pumped up and over the ridge to the lagoon located on the property.

			• Due to the slope of the property and the size of the lot, it would not be possible to build two lagoons on this site, with one lagoon very difficult to build. • The site contains existing key water infrastructure (mains/pipework) that would need to be either built over (not recommended in case the pipe fails) or relocated at great expense.
17	SP2 Infrastructure Purpose – School	High school	• Heritage listed site. • Owned by Trinity College, a private school that has been in Goulburn for many years. Council would need to purchase the required area and ensure security measures were in place in relation to the location in proximity to a school. • Proximity to water courses over sections of the site which are subject to overland flows (stormwater flooding) and impacts on Sydney Drinking Water Catchment. Ideally there should be no opportunity for contaminated residues to enter water courses or drainage lines. The subject site is ideal as it is not affected by drainage lines or stormwater flooding.
18	R1 General Residential	Housing	• Density of existing development - the site currently has general residential housing on it. Council would need to purchase multiple sites at market value and demolish all structures on the site to provide for the sludge lagoons. • Council would then need to rezone the site for public utility infrastructure. • Greater potential for future residential development and land use conflict.
19	R1 General Residential	Housing	• Density of existing development - the site currently has general residential housing on it. Council would need to purchase multiple sites at market value and demolish all structures on the site to provide for the sludge lagoons. • Council would then need to rezone the site for public utility infrastructure. • Greater potential for future residential development and land use conflict.

Appendix H: *Keyacris scurra* Survey Protocol

SURVEY METHODOLOGY FOR *KEYACRIS SCURRA*

(This survey methodology has been developed by Goulburn Mulwaree Council following consultation with Dr Roger Farrow).

Surveys should be conducted between August and November (inclusive) and February to April.

Surveys should take place between 10.00 am and 4.00 pm on warm, sunny days when the grasshoppers are likely to be active.

The survey technique involves slow walking, shuffling transects with careful observation of the ground immediately in front of the feet.

Transects to be in parallel, about 5 metres apart, across the area of suitable habitat, covering about 100 m.

Suitable habitat is defined as *Themeda* dominated native grassland, derived native grassland, and open grassy woodland (with a groundcover layer dominated by native grasses and forbs), and open dry forest with an understory of heaths and some perennial grasses.

Survey transects can be discontinued if a *Keyacris* is visually confirmed. If presence is confirmed, no further survey effort is required.

If *Keyacris* is found, ideally this should be confirmed by taking photographs of the insect(s), with photographs showing details of facial features and antennae, and thorax.

Keyacris scurra can be confused with

(1) Nymphs of *Acrida conica*, the difference being that *Keyacris scurra* is completely wingless with no trace of wing buds

(2) Other Morabine grasshoppers that have longer antennae with more segments (12+).

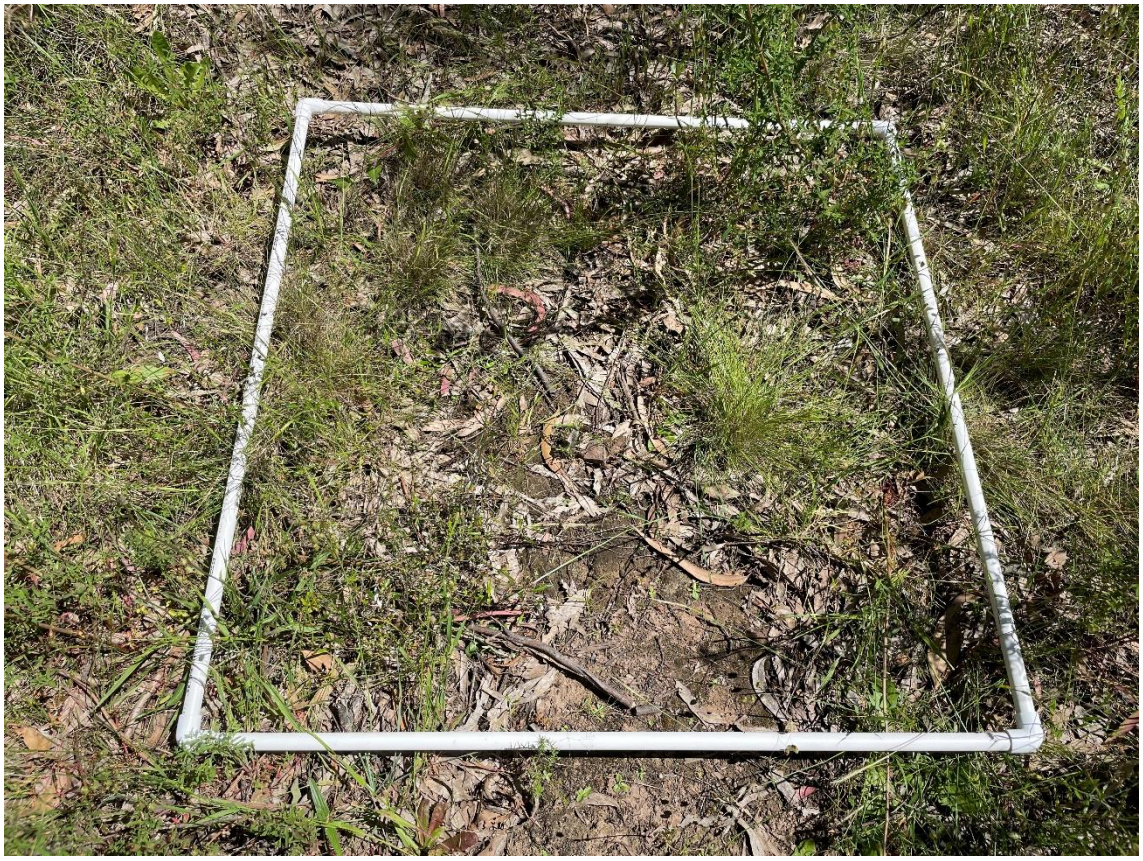
Appendix I: Supporting Photographs

BAM VIS Plot 25/11/2022.

BAM Litter plot 1.

BAM Litter Plot 2.

BAM Litter Plot 3.



BAM Litter Plot 4.

BAM Litter Plot 5.

***Keyacris scurra* photographed on site.**

***Leucochrysum albicans* subspecies *tricolor*. (Next two photos).**

***Tiliqua rugosa* photographed on site.**

PCT 3373 Goulburn Tableland Box-Gum Grassy Forest (next four photographs).

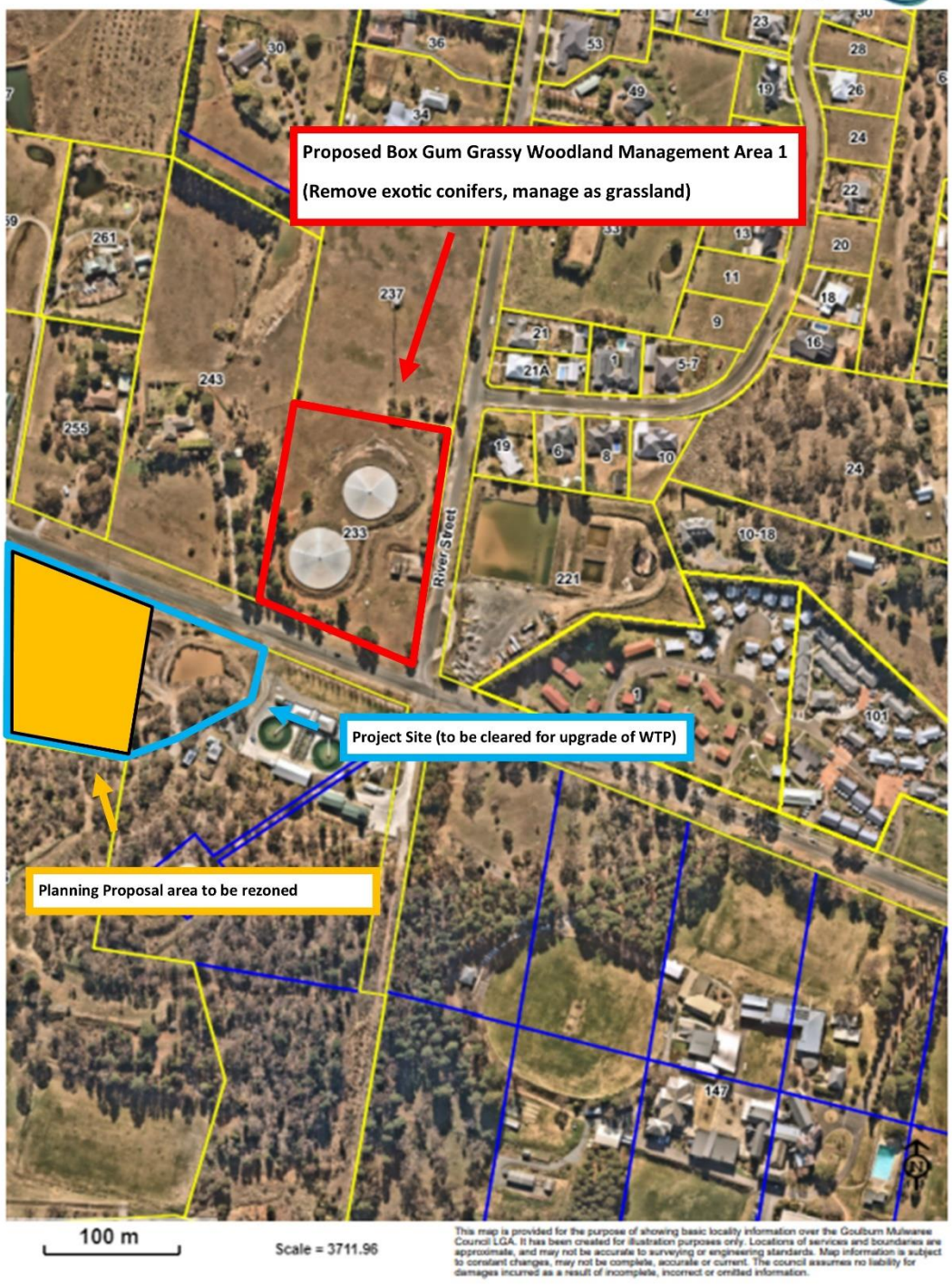
Existing Sludge Lagoons

APPENDIX J: PROPOSED BOX GUM GRASSY WOODLAND CONSERVATION AREAS

PROPOSED BOX GUM GRASSY WOODLAND MANAGEMENT AREA 1: DERIVED NATIVE GRASSLAND (LOT 1 DP 955969)

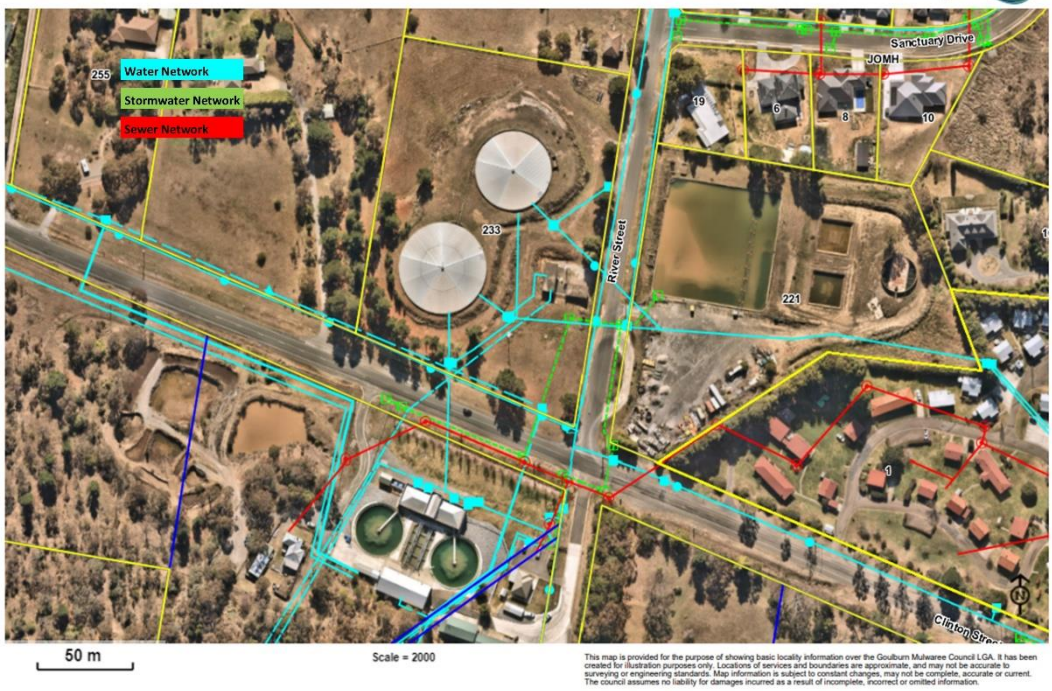
This land is located at the corner of Wheeo Road and River Street as shown in Figure 1.

FIGURE 1: PROPOSED BOX GUM GRASSY WOODLAND MANAGEMENT AREA 1



The land comprises approximately 2.053 hectares and is developed with two water reservoirs. There is significant underground pipework associated with the reservoirs and large parts of the site are not suitable for revegetation with trees, as shown in Figure 2. These areas can however be managed as grassland without this having any adverse impacts on the reservoirs or associated infrastructure.

FIGURE 2: SERVICES BOX GUM GRASSY WOODLAND PROPOSED MANAGEMENT AREA 1



Although the land is mapped in SEED SVTM Extant PCT as being cleared of native vegetation, the groundcover in most parts has been found in a preliminary site inspection to contain a high component of native grassland species, including Kangaroo Grass *Themeda triandra*, Red Stem Grass *Bothriochloa m*acra, Weeping Grass *Microlaena stipoides*, Snow Grass *Poa sieberiana*, Corkscrew Grass *Austrostipa scabra* and Wallaby Grasses *Rytidosperma* spp.

Forbs present on the site include Common Everlasting *Chrysocephalum apiculatum*, Ivy Goodenia *Goodenia hederacea*, Lemon Beauty Heads *Callocephalus citreus*, Tufted Bluebell *Wahlenbergia communis*, Fuzzweed *Vittadinia* spp. and Common Raspwort *Gonocarpus tetragynus*.

Remnant vegetation on nearby land is mapped as being *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest* and has been confirmed to meet criteria for identification as this plant community. The vegetation present on the site almost certainly represents a native grassland derived from this PCT.

The photograph below shows representative groundcover on part of this site.

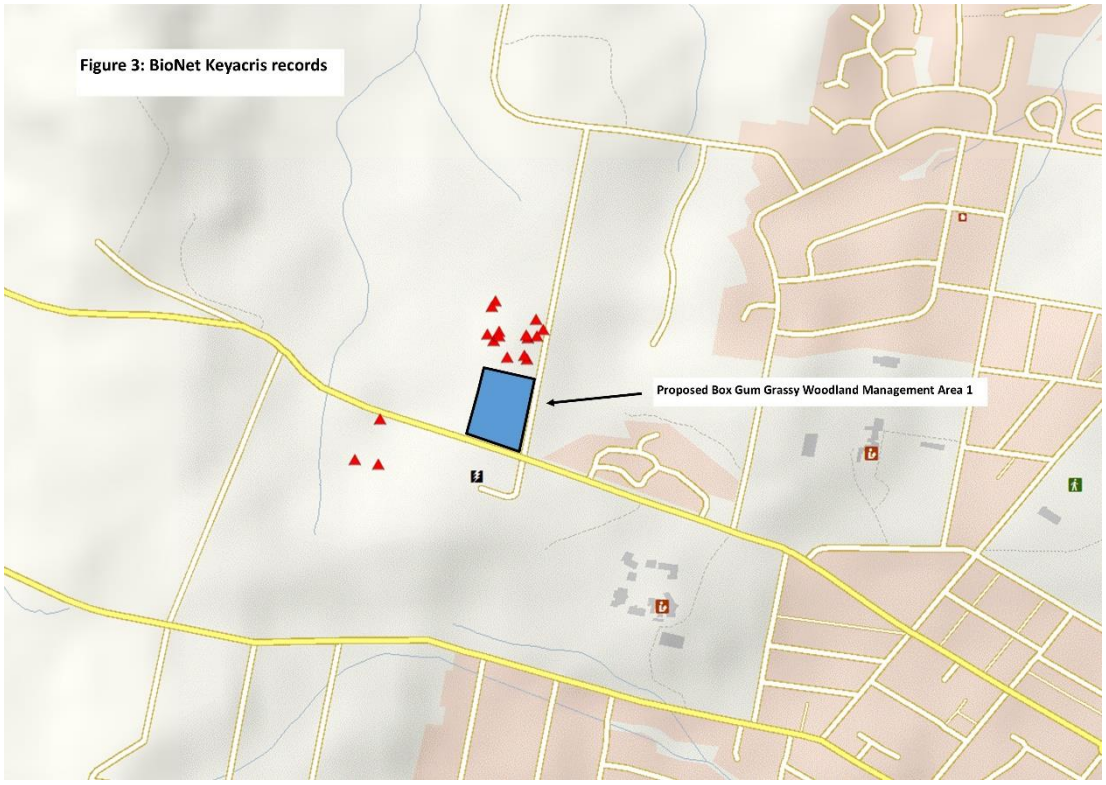
The area of remnant native vegetation present has been estimated to comprise approximately I hectare.

The grassland provides potential habitat for the Endangered Key's Matchstick Grasshopper (*Keyacris scurra*) and the Endangered Hoary Sunray (*Leucochrysum albicans* variety *tricolor*).

Key's Matchstick Grasshopper has been confirmed to be present on immediately adjoining land to the north, as shown in Figure 3, and is highly likely also to be present on the site.

Hoary Sunray is also highly likely to be present.

Targeted surveys for Key's Matchstick Grasshopper and Hoary Sunray are planned to be conducted on the site in Autumn 2024 to confirm this.



Trees currently present on the site comprise almost entirely a mixture of exotic Pines *Pinus radiata* and Cypresses *Cupressus* spp. However, there are some Blackwood Wattle *Acacia melanoxylon* trees present, mostly represented by naturally regenerating saplings. The proposal is to remove the exotic conifers from the site and retain the existing native trees, and to replant these parts of the site with additional suitable small native tree and shrub species representative of PCT 3373.

Due to the presence of the water reservoirs and associated infrastructure, only a limited number of trees can be planted, and these must be placed near property boundaries and well away from existing critical infrastructure including pipes and access points. Due to this constraint, the proposal is to maintain the majority of the site as a derived native grassland by carefully timed, strategic slashing.

In addition, use of larger trees is not suited to the site and tree species to be selected are midstorey species that usually do not grow to greater than 5 metres in height in the Goulburn Mulwaree LGA.

Above: Tree located to the right of this photograph is *Acacia melanoxylon*. Photograph below shows natural regeneration of this tree species on the site.

Small trees/tall shrubs proposed to be used for supplentary plantings may include Broad-leaf Hickory *Acacia falciformis*, Blackwood *Acacia melanoxylon* (as noted already present), Hickory Wattle *Acacia implexa* and Black She Oak *Allocasuarina littoralis*.

Smaller shrub species may include Poverty Wattle *Acacia dawsonii*, Early Wattle *Acacia genistifolia*, Prickly Moses *Acacia ulicifolia*, Kangaroo Thorn *Acacia paradoxa*, Sunshine Wattle *Acacia terminalis*, Hop Bitter-pea *Daviesia latifolia*, Narrow-leaved Bitter Pea *Daviesia leptophylla*, Leafy Bitter Pea *Daviesia mimosoides*, Showy Parrot Pea *Dillwynia sericea* and Native Indigo *Indigofera australis*.

Key's Matchstick Grasshopper has an annual life cycle. Eggs are laid in the ground in spring, and the adult insects die off in late spring. The eggs hatch towards the end of summer, coinciding with the arrival of cooler weather and rainfall. Nymphs are present over winter, maturing into adults from May onwards.

The lifecycle of the grasshopper mimics that of many local grassland forbs, that commence growth in autumn, grow over the winter months, then flower and seed in spring, and then die back to dormant underground structures in early summer.

Slashing to maintain the area as a grassland and for bushfire management should therefore ideally occur in the period December to January, when the grasshoppers and the majority of forbs on site have completed their annual lifecycle and are in a dormant phase.

If slashing is required outside this period, the entire site should not be slashed in one continuous session. Slashing should be conducted in a series of three stages, each separated by at least three days.

This will allow time for grasshoppers and other invertebrates to move into freshly slashed areas and reduce killing due to slashing. The grasshoppers have a preference for open grassland and are likely to self-translocate from denser vegetation to mown areas if given time.

The Hoary Sunray flowers during most of the year, but has a peak flowering time in spring, with maximum seed set in late spring and early summer. Slashing the site between December and January should not have any adverse impacts on this species, and indeed is likely to beneficial as it prefers open grassland and is often abundant beneath power line easements and in road reserves that are maintained by regular mowing.

Monitoring and carefully targeted spot spraying to control invasive weeds such as Serrated Tussock *Nassella trichotoma*, African Box Thorn *Lycium ferocissimum*,

Firethorn *Pyracantha* spp., Gorse *Ulex europaeus* and Blackberry *Rubus fruticosus* will be done on an annual basis.

Preliminary quotes obtained from local arborists for felling and removal of the exotic conifers on the site are that this would cost between $20,000 and $25,000.

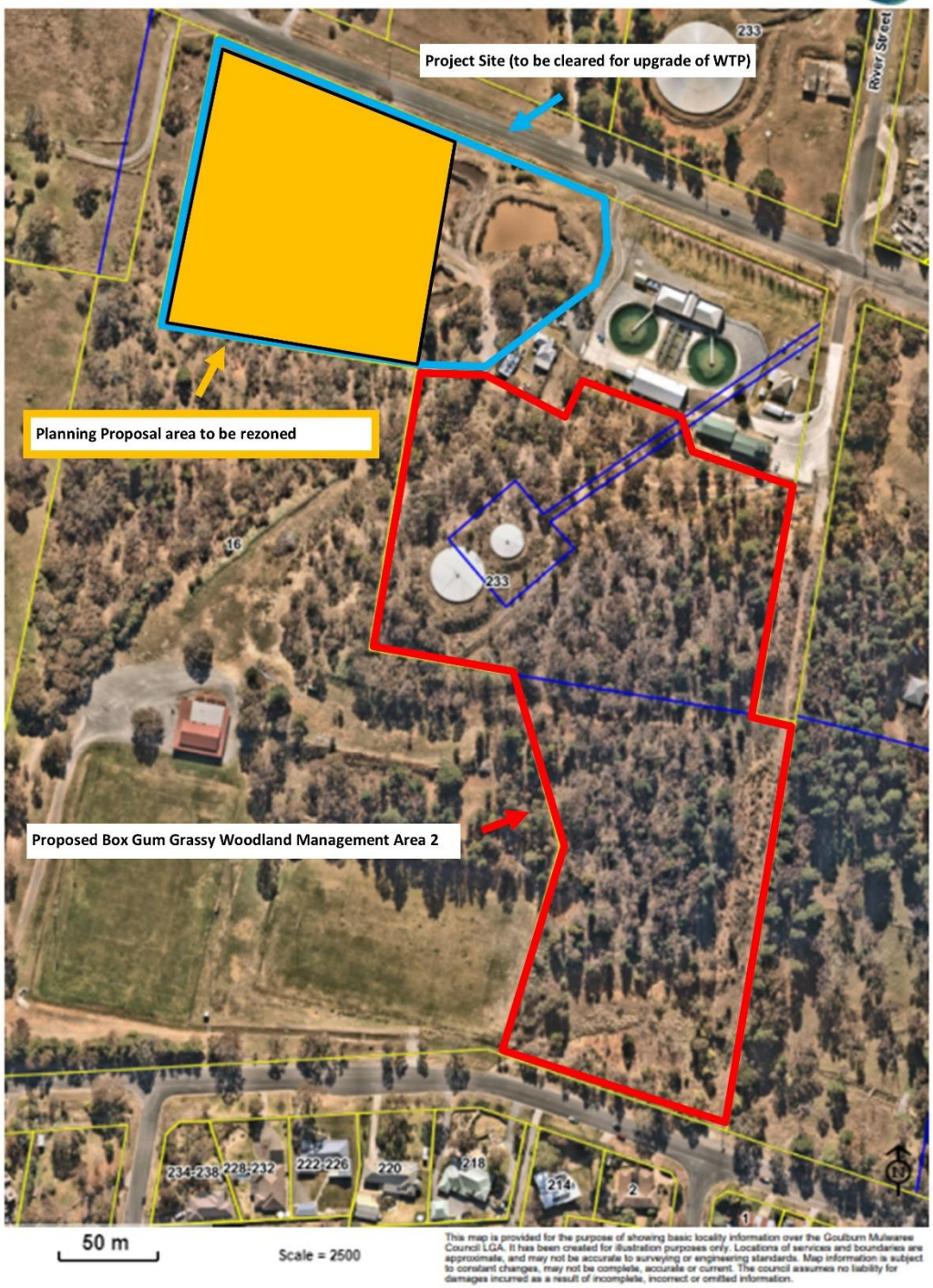
After the initial removal of the exotic conifers, the cost of planting a selection of suitable replacement trees and shrubs is estimated to be approximately $3,000.

Thereafter, ongoing management of the site will mostly involve occasional, carefully time slashing/mowing and weed management activities (monitoring and careful spot spraying as required). Ongoing maintenance can be met from Council's maintenance budget and conducted by Council staff.

PROPOSED BOX GUM GRASSY WOODLAND MANAGEMENT AREA 2: REMNANT BOX GUM WOODLAND (LOT 417 DP 872364, LOT 1 DP 511739 AND LOT 2 DP 511739)

The land is located to the south of the Water Treatment Plant, as shown in Figure 4.

FIGURE 4: PROPOSED BOX GUM GRASSY WOODLAND MANAGEMENT AREA 2



This site contains two large reservoir tanks and associated infrastructure but is otherwise largely uncleared. It supports approximately 5 hectares of *PCT 3373 Goulburn Tableland Box-Gum Grassy Forest* in similar condition to that present in the proposed project impact area, with a similar species assemblage.

This site is directly adjoining the proposed project area, as shown in Figure 3. The vegetation comprises a Eucalypt woodland with a canopy dominated by Yellow Box *Eucalyptus melliodora*, Apple Box *Eucalyptus bridgesiana* and Blakely's Red Gum *Eucalyptus blakelyi*, with scattered Brittle Gum *Eucalyptus mannifera*, Broad Leaf Peppermint *Eucalyptus dives* and Argyle Apple *Eucalyptus cinerea*.

The midstratum includes Early Black Wattle *Acacia decurrens*, Silver Wattle *Acacia dealbata*, Broad-leaf Hickory *Acacia falciformis* and Blackwood Wattle *Acacia melanoxylon.*

The lower shrub layer contains a variety of shrubs typical of the community, including Early Wattle *Acacia genistifolia*, Hop Bitter-pea *Daviesia latifolia*, Spreading Bush Pea *Pultenaea microphylla*, Daphne Heath *Brachyloma daphnoides*, Peach Heath *Lissanthe strigosa*, Bitter Cryptandra *Cryptandra amara*, Urn Heath *Melichrus urceolatus*, Grey Guinea Flower *Hibbertia obtusifolia* and Curved Riceflower *Pimelea curviflora*.

The groundcover layer features a diversity of native grasses, graminoids and forbs.

Common grasses include Weeping Grass *Microlaena stipoides*, Brushtail Spear Grass *Austrostipa densiflora*, Corkscrew Grass *Austrostipa scabra*, Snow Grass *Poa sieberiana* and Kangaroo Grass *Themeda triandra*.

Common forbs present include Scaly Buttons *Leptorhynchos squamatus*, Lemon Beauty Heads *Calocephalus citreus*, Common Everlasting *Chrysocephalum apiculatum*, Mueller's Fuzz Weed *Vittadinia muelleri*, Ivy Goodenia *Goodenia hederacea* and Black Anther Flax Lily *Dianella revoluta*.

However, this area is weed infested and has a significant infestation of Radiata Pines (*Pinus radiata*) present, some of which are very large and are clearly competing with native plants. Approximately 30 large Pines can be identified from aerial imagery.

This site has restricted access and historically has largely been unmanaged. Weed infestations have not been well controlled. The proposal is to use the "Drill & Fill" technique to kill the larger feral Pines, and to cut smaller specimens to ground level "Chop & Drop" (using best practice guidelines for Wilding Pine Control in sensitive natural bushland areas). Pine trees will not be removed from the site as this would involve significant disturbance and potential damage to remnant native vegetation. In

addition, felling and removing large trees would have an immediate impact on arboreal fauna of the area. The trees will be killed will be left in place and will continue to provide habitat as standing dead timber as they gradually decay. As the site is restricted with no public access, this should not represent a safety risk.

Following this initial targeted removal of Pines, a weed management plan will be developed and implemented on an on-going basis to reduce impacts of feral plants on the plant community.

Initial advice has been obtained from a qualified bushland regeneration practitioner who has indicated that Phase 1, removal of Pines, would involve a team of three working over two days, and that this would cost between $3,500 and $5,000.

Thereafter annual monitoring and follow up weed control is anticipated to require a similar work input, or less. Monitoring and follow up weed control can be either outsourced to a bushland regeneration contractor or can be conducted in-house by Goulburn Mulwaree Council staff.

Image below shows examples large Radiata Pines on the site, proposed to be killed by stem injection (“Drill and fill”).

Following two photographs show smaller feral Radiata Pines, proposed to be killed by cutting at ground level (“Chop and drop”).