

Molonglo Stage 3 Development Area:
Vegetation Classification and Condition Assessment

FINAL REPORT

Prepared for the ACT Land Development Agency

29 FEBRUARY 2016

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Contents

Glossary	iv
Summary	v
1 Introduction	1
1.1 Project background	1
1.2 Scope of assessment	2
1.3 Location of the study area	2
2 Methods	6
2.1 Literature and database review.....	6
2.2 Site investigation	7
2.2.1 Vegetation classification and condition assessment.....	7
2.2.2 Fauna assessment	8
2.2.3 Permits and Licences.....	8
2.3 Limitations	8
2.4 Mapping	9
3 Legislative context	10
3.1 Commonwealth.....	10
3.1.1 Environment Protection and Biodiversity Conservation Act 1999	10
3.1.2 Australian Capital Territory (Planning and Land Management) Act 1988 (Cth)	10
3.1.3 National Capital Plan 2014.....	11
3.2 Territory Legislation.....	11
3.2.1 Nature Conservation Act 2014	11
3.2.2 Planning and Development Act 2007	11
3.2.3 ACT Government Territory Plan 2016	13
3.2.4 Pest Plant and Animals Act 2005	13
4 Results	14
4.1 Landscape context.....	14
4.2 Flora	14
4.3 Vegetation communities	15
4.4 Ecological Constraints	34
4.4.1 Hollow-bearing trees	34
4.4.2 Pink-tailed Worm-lizard habitat	35
4.4.3 Waterways	35
4.4.4 Declared Pest Plants.....	36
4.5 Threatened biota	39
5 Ecological impacts and recommendations	41
5.1 Ecological impacts.....	41
5.2 Recommendations	43

6	Conclusion	47
	References.....	49
	Appendices.....	51
Appendix 1	Flora	52
Appendix 2	Fauna.....	57
Appendix 3	Figure 4. Detailed Map of Ecological Values	59
Appendix 4	Figure 5. Detailed Map of Fauna Habitat Values	60

Tables

Table 1	Vegetation communities of the study area	15
Table 2	Declared pest plant species recorded in the study area.	36
Table 3	Summary of threatened biota occurring or likely to occur in the study area.....	39
Table 4	Ecological values, impacts and recommendations	44
Table A.1	Flora species recorded from the subject site.....	52
Table A.2	Vertebrate fauna recorded from the study area (current assessment)	57

Figures

Figure 1	Location of the study area, ACT	5
Figure 2	Ecological features of the study area, ACT.....	37
Figure 3	Fauna habitat values within the study area, ACT	38

Plates

Plate 1	Moderately Modified Yellow Box – Red Gum Grassy Woodland	17
Plate 2	Substantially Modified Yellow Box – Red Gum Grassy Woodland	19
Plate 3	Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees.....	21
Plate 4	Moderately Modified – Natural Temperate Grassland	23
Plate 5	Substantially Modified – Native Pasture.....	25
Plate 6	Tableland Riparian Woodland	27
Plate 7	Burgan Tableland Shrubland	28
Plate 8	Sedgeland	30
Plate 9	Exotic Pasture	32
Plate 10	Pine Plantation	33
Plate 11	Exotic Trees and Shrubs	34

Glossary

ACTPLA	ACT Government Planning and Land Authority
AMS	Adaptive Management Strategy
CBD	Central Business District
CEEC	Critically Endangered Ecological Community
Client	The proponent of the proposed Molonglo Stage 3 Development, the ACT Land Development Agency
DA	Development Application
DBH	Diameter at Breast Height
DoE	Commonwealth Department of the Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
ESDD	Environment and Sustainable Development Directorate
FUA	Future Urban Area
HBT	Hollow Bearing Tree
KTP	Key Threatening Process
LDA	ACT Government Land Development Agency
Locality	The area within a 10 kilometre radius of the Molonglo Valley Stage 3 study area
MNES	Matters of National Environmental Significance
NC Act	ACT Nature Conservation Act 2014
NCP	National Capital Plan
NES	National Environmental Significance
NSW	New South Wales
P&D Act	ACT Planning and Development Act 2007
PPA Act	ACT Pest Plant and Animals Act 2005
Proposal	The Molonglo Stage 3 Development Area as proposed by the ACT Land Development Agency
SIC	Significant Impact Criteria
Study area	The area of impact for the proposed works
Territory Plan	ACT Territory Plan 2016

Summary

Biosis Pty Ltd has been engaged by the ACT Land Development Agency (LDA) (the 'Client') to undertake flora specialist technical services, specifically a vegetation classification and condition assessment, for the proposed Molonglo Valley Stage 3 Urban Area, Molonglo, ACT (the Proposal).

Biosis understands that the ACT Government is currently undertaking a Preliminary Risk Assessment for a Section 211 (s.211) exemption from requiring an Environmental Impact Statement (EIS) under the ACT *Planning and Development Act 2007* for the proposed development. In order to proceed with the Preliminary Risk Assessment, the ACT Government requires further information regarding the existing vegetation within the Molonglo Stage 3 Development Area between previously assessed patches of Yellow Box – Red Gum Grassy Woodland and potential Pink Tailed Worm Lizard (PTWL) *Aprasia parapulchella* habitat (the study area). Additional information is required regarding extent and nature of potential impacts associated with the proposal using the Future Urban Area (FUA) boundary as defined by the ACT Territory Plan (Act Government 2016) which demarcates the outer limits of the proposed development.

Ecological values

Key ecological values identified within the study area include:

- 26.79 hectares of Box – Gum Woodland comprising of:
 - 1.80 hectares (0.28 hectares within FUA boundary) of the CEEC Moderately Modified – Yellow Box – Red Gum Grassy Woodland (EPBC and NC Act).
 - 12.35 hectares (0.57 hectares within FUA boundary) of Substantially Modified Yellow Box – Red Gum Grassy Woodland (not meeting the listing criteria for the threatened Box – Gum Woodland community).
 - 12.64 hectares (11.96 hectares within FUA boundary) of Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees (not meeting the listing criteria for the threatened Box – Gum Woodland community).
- 33.44 hectares of Natural Temperate Grassland comprising of:
 - 0.75 hectares (0.05 hectares within FUA boundary) of Moderately Modified - Natural Temperate Grassland (EPBC Act and NC Act).
 - 32.69 hectares (22.42 hectares within FUA boundary) of Substantially Modified – Native Pasture (not meeting the listing criteria for the threatened Grassland community).
- 137.39 hectares of native vegetation comprising of:
 - 56.03 hectares (none of which falls within the FUA boundary) of Tableland Riparian Woodland.
 - 3.66 hectares (1.40 hectares within FUA boundary) of Burgan Tableland Shrubland.
 - 2.87 hectares (0.95 hectares within FUA boundary) of Sedgeland.
 - 17.15 hectares (3.07 hectares within FUA boundary) of Revegetated Land.
- 18 hollow-bearing trees (17 within the FUA boundary) all Blakely's Red Gum, *Eucalyptus blakelyi*.

- 117.45 hectares (36.70 hectares within FUA boundary) of foraging, breeding and dispersal habitat for the Pink-tailed Worm-lizard.
- 1 population of Leek Orchids (9 individuals) which are yet to be identified to species level (none of which occur within the FUA boundary).
- 56.03 hectares (none of which falls within the FUA boundary) of vegetated Riparian Corridor providing regional connectivity via the Molonglo and Murrumbidgee River.

Government legislation and policy

An assessment of the project against key biodiversity legislation and policy is provided and summarised below.

Legislation / Policy	Relevant ecological feature on site	Permit / Approval required
Environment Protection and Biodiversity Conservation Act 1999	<p>Matters of national Environmental Significance include presence of:</p> <ul style="list-style-type: none"> • Yellow Box – Red Gum Grassy Woodland CEEC. • Natural Temperate Grassland EECs present. <p>Potential habitat for threatened fauna:</p> <ul style="list-style-type: none"> • Pink-tailed Worm-lizard, Superb Parrot and Swift Parrot, Glossy Black Cockatoo and Migratory species, Rainbow Bee-eater. <p>Potential habitat for threatened flora:</p> <ul style="list-style-type: none"> • Hoary Sunray, Small Purple-pea, Tarengo Leek Orchid and Button Wrinklewort. 	N/A
ACT Nature Conservation Act 2014	<p>Ecological communities present include presence of:</p> <ul style="list-style-type: none"> • Yellow Box – Red Gum Grassy Woodland CEEC. • Natural Temperate Grassland EECs present. <p>Potential habitat for threatened fauna:</p> <ul style="list-style-type: none"> • Pink-tailed Worm-lizard, Superb Parrot and Swift Parrot and Little Eagle. <p>Potential habitat for threatened flora:</p> <ul style="list-style-type: none"> • Hoary Sunray, Small Purple-pea, Tarengo Leek Orchid and Button Wrinklewort 	N/A
Fisheries Act 2000	<p>Threatened fish with a moderate likelihood of occurrence include:</p> <p>Macquarie Perch and Murray River Crayfish.</p>	N/A
ACT Planning and Development Act 2007	<p>The study area contains:</p> <ul style="list-style-type: none"> • Yellow Box – Red Gum Grassy Woodland CEEC. • Natural Temperate Grassland EECs present. <p>Potential habitat for threatened fauna:</p> <ul style="list-style-type: none"> • Pink-tailed Worm-lizard, Superb Parrot and Swift Parrot, Glossy Black Cockatoo and Migratory species, Rainbow Bee-eater. <p>Potential habitat for threatened flora:</p> <ul style="list-style-type: none"> • Hoary Sunray, Small Purple-pea, Tarengo Leek Orchid and Button Wrinklewort. 	N/A
Pest Plants and Animals Act 2005	<p>The following noxious weeds are present within the subject site:</p> <ul style="list-style-type: none"> • African Boxthorn, African Lovegrass, Blackberry, Box Elder, Chilean Needle Grass, Cootamundra Wattle, Cotoneaster, False Acacia, 	Under the Pest Plants and Animals Act 2005

Legislation / Policy	Relevant ecological feature on site	Permit / Approval required
	Hawthorn, Patterson's Curse, Radiata Pine, Saffron Thistle, Willow, Scotch Thistle, St Johns Wort and Sweet Briar.	landowners are to control all declared weeds.

Recommendations

The primary recommendation for the proposed development to minimise impacts to ecological values within the study area is to avoid or reduce removal of native vegetation and fauna habitat, and avoid disruption to connectivity along the riparian corridors of Molonglo River and its tributaries.

The current proposal will require the removal of all vegetation present within the FUA boundary, with the exception of vegetation existing within the three conservation areas, Kama Reserve, Molonglo River Park and Block GG, as specified by the Molonglo Valley Plan for the Protection of Matters of Environmental Significance (NES Plan).

This equates to the removal of 686.03 hectares of vegetation comprising of 40.72 hectares of native vegetation, and 645.31 hectares of exotic vegetation including 0.28 hectares of the CEEC Moderately Modified Yellow Box – Red Gum Grassy Woodland (EPBC and ACT NC Act) and 0.05 hectares of EEC Moderately Modified – Natural Temperate Grassland (EPBC and ACT NC Act).

The NES Plan for the Molonglo Valley Stage 3 Development has already incorporated the majority of the ecological values previously identified within the study area into conservation zones which are to be preserved in perpetuity. It is recommended that the hollow-bearing trees within the Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees community be retained along with the 0.28 hectares of Moderately Modified - Yellow Box – Red Gum Grassy Woodland CEEC (EPBC and NC Act) and the 0.05 hectares of Moderately Modified - Natural Temperate Grassland EEC (EPBC Act). The remaining native vegetation detected during the field survey comprising of Box-Gum Woodland (not conforming to the listed community descriptions), Native Pasture and Burgan Tableland Scrubland is not considered to be significant. Tableland Riparian Woodland is not affected by this Proposal.

Although the Leek Orchid population detected during the current survey do not occur within the FUA boundary, it is recommended that the population undergoes a further targeted survey in late November–early December to identify the plant to species level and rule out the presence of the threatened Tarengo Leek Orchid *Prasophyllum petilum*. No further targeted surveys are recommended for threatened flora species within the study area defined by this report.

1 Introduction

1.1 Project background

Biosis Pty Ltd has been commissioned by the ACT Land Development Agency (the 'Client') to undertake a vegetation classification and condition assessment of the proposed Molonglo Valley Stage 3 Development Area, Molonglo Valley, ACT (the Proposal). The results of this assessment are to be used to inform the preparation of a Preliminary Risk Assessment (PRA) to inform a s.211 exemption from the requirement to prepare an Environmental Impact Statement (EIS) for the Proposal under the ACT *Planning and Development Act 2007* (P&D Act). A s.211 exemption allows the ACT Environment Minister (the 'Minister') to grant a conditional EIS exemption if satisfied that previous studies have adequately identified the potential environmental impacts associated with the Proposal.

An application for a s.211 exemption requires that the proponent provide sufficient information regarding the Proposal including:

- A description of the Proposal.
- A Preliminary Risk Assessment which evaluates the significance of the potential impacts of the Proposal.
- Sufficient detail about the previous investigations and studies supporting the application, and
- Details of public consultation undertaken.

Prior surveys have been undertaken of the vegetation communities existing in Kama Nature Reserve, located adjacent to the western perimeter of the Molonglo Valley Stage 3 Development Area (the 'Development Area') on land adjacent to William Hovell Drive. Surveys have also covered the Riparian Woodlands situated along the Molonglo River riparian corridor (Eco Logical Australia 2009, 2013; Umwelt 2015a). These surveys detected the presence of patches of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland of varying sizes and condition classes (meeting EPBC Act and NC Act criteria) and Natural Temperate Grassland (meeting EPBC and NC Act criteria) within the Development Area. Previous surveys also detected the presence of potential Pink-tailed Worm-lizard *Aprasia parapulchella* habitat (Osborne & Wong 2010).

The results of these surveys were used to inform the Molonglo Valley Plan for the Protection of Matters of National Environmental Significance (MNES) (the 'NES Plan') (ACTPLA 2011) and the subsequently developed Adaptive Management Strategy (AMS). The NES Plan was developed as part of an EPBC Act strategic assessment to determine the potential impacts from the proposed development within the Molonglo Valley. In September 2011, the NES Plan was endorsed by the Delegate for the Commonwealth Minister for the Environment on 07 of October 2011.

The NES Plan outlines the ACT Government's commitments in relation to avoidance and mitigation of potential impacts to MNES. Where such impacts cannot be avoided or mitigated, the NES Plan details the measures that will be implemented to offset residual impacts. Commitments include the preparation and implementation of plans of management (Operation Plans) and adaptive management strategies and the establishment of conservation areas which contain *White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands* (synonymous with Yellow Box – Red Gum Grassy Woodland [ACT] and henceforth referred to as Box – Gum Woodland), *Natural Temperate Grassland of the Southern Tablelands of NSW and the ACT* (henceforth referred to as Natural Temperate Grassland) and Pink-tailed Worm-lizard habitat. These conservation areas consist of Kama Nature Reserve which abuts the western perimeter of the

Development Area and Molonglo River Park (comprising the riparian corridor of the Molonglo River and the block designated as 'GG' located adjacent to the central eastern perimeter of the Development Area).

The vegetation community mapping created for the strategic assessment by EcoLogical Australia in 2009 and used in the NES Plan was not intended to provide a vegetation condition benchmark. Accordingly, further ecological surveys and mapping were undertaken during 2012-2013 with the objective of providing this benchmark (EcoLogical Australia 2013). Subsequent surveys have confirmed and refined the initial identification of the Box-Gum Woodland and Natural Temperate Grassland vegetation communities and condition classes throughout the designated conservation areas specified under the NES Plan (EcoLogical 2009, 2013; Umwelt 2013a, 2013b, 2015a, 2015b). Whilst there is adequate current information available for these areas, there is little information regarding the vegetation communities existing throughout the remainder of the Development Area.

In order to proceed with the Preliminary Risk Assessment, the ACT Government requires further information regarding the existing vegetation within the Development Area, in particular, the identification of vegetation communities and species existing between patches of previously mapped Box – Gum Woodland and potential Pink-tailed Worm-lizard habitat (the study area). Furthermore, information is required regarding extent and nature of potential impacts associated with the proposal based on the Future Urban Area (FUA) boundary as defined by the ACT Territory Plan (Act Government 2016) which has been used to demarcate the outer limits of proposed construction works.

1.2 Scope of assessment

The objectives of this investigation are to:

- Undertake a vegetation classification and condition assessment as per the methodology described in Section 2.2.1.
- Refinement of vegetation community mapping between areas of previously mapped Box – Gum Woodland and Pink-tailed Worm-lizard habitat.
- Mapping of vegetation communities as defined by the NC Act as 'native vegetation'.
- Mapping of ecological values and constraints (e.g. threatened flora presence, substantial infestations of noxious weeds, hollow-bearing trees, rock outcrops, waterways, etc.).
- Review the implications for the Proposal of the relevant biodiversity legislation and policy.
- Identify potential implications for the Proposal and provide recommendations to assist with development design.
- Provide recommendations for the Proposal, including justification for further assessment (if required) and mitigation measures (if any) required for the Proposal to proceed, developed in accordance with best practice and project requirements.

1.3 Location of the study area

The 'study area' for this investigation is the Molonglo Valley Stage 3 Development Area located in the Molonglo Valley, approximately nine kilometres west of the Canberra CBD (Figure 1). The study area consists of an approximately 500 hectare parcel of Government held and privately leased land formally known as Molonglo Valley Registered Rural Blocks 3, 4, 5, 6, 7, 10, 12, 13, 14, 15, 16, 71, and Approved Rural Blocks 41, 43, 44, 45, 46, 47, 72, including the adjacent road reserves associated with William Hovell Drive and Coppins Crossing Road. The study area is bound by William Hovell Drive to the north, Tuggeranong Parkway and the

National Arboretum to the east, the Molonglo River to the south and Kama Nature Reserve to the west. The study area is bisected by Coppins Crossing Road which runs in a generally north/south direction. The study area has been divided into two halves for ease of field investigation and reporting, with the western half of the study area encompassing land between Kama Nature Reserve and Coppins Crossing Road and the eastern half of the study area consisting of the land between Coppins Crossing Road and the Tuggeranong Parkway/the National Arboretum.

The land comprising the study area is proposed for release for future urban development with a view to accommodating approximately 55,000 new residents over the next 30 years (ACTPLA 2011). The land comprising the study area has been assigned the following zones according to the ACT Government Territory Plan 2016:

- RZ1 – Suburban.
- CZ1 – Core Zone.
- CZ4 – Local Centre.
- NUZ4 – River Corridor.
- CF – Community Facilities.
- PRZ1 – Urban Open Space.
- TSZ1 – Transport.
- RZ3 – Urban Residential.
- DES – Designated.
- NUZ3 – Hills, Ridges and Buffer Areas.

The study area is within the:

- South Eastern Highlands Bioregion
- Murray-Darling River Basin (Murrumbidgee Catchment)
- Molonglo Valley District (managed by Territory and Municipal Services, TAMS).

The study area presents with an east to south-east aspect and is relatively flat throughout its central portion, becoming mildly undulating as the land rises in elevation towards the north, giving rise to low hills along the northern margins. Low hills are also prevalent throughout the southern portion of the study area. Land adjoining the banks of the Molonglo River presents with a west to south aspect as the land descends steeply towards the span of the Molonglo River proper. Two powerline easements traverse the study area, one located along the southern perimeter just north of the Molonglo River, crossing in a north-west/south-east direction, and the other located along the eastern perimeter of the study area crossing in a north/south direction.

The Molonglo River, which flows through Canberra, forms the southern boundary of the study area, meandering across the site in an east/west direction. Two tributaries of the Molonglo River also traverse the site, Deep Creek which extends along the western perimeter of the study area travelling in a north/south direction and, Coppins Creek, traversing the eastern half of the study area in a north-east/south-west direction.

Three conservation areas exist within close proximity to the study area, being Kama Nature Reserve which abuts the western perimeter of the study area, Black Mountain Nature Reserve approximately one kilometre to the north-east and Lower Molonglo Nature Reserve approximately 900 metres to the north-west. Lower Molonglo Nature Reserve directly links with Woodstock Nature Reserve, the Murrumbidgee River Corridor and Stony Creek Nature Reserve, facilitating connectivity for fauna species throughout the locality.

Soils throughout the majority of the study area comprise of the *Burra transferral soil landscape* (Jenkins 2000) intergrading with a linear strip of the *Williamsdale transferral soil landscape* which bisects the eastern half of

the study area. The *Paddys River alluvial soil landscape* underlies the area of land occupied by the Molonglo River. The Burra transferral soil landscape occurs extensively throughout the Canberra Lowlands including the western foreshore of the Googong Reservoir and suburbs in the vicinity of Tuggeranong on rolling low hills and alluvial fans and ridges with gently inclined slopes. The Burra transferral soil landscape is influenced by the underlying geology of Silurian volcanics giving rise to shallow or moderately deep hardsetting soils ranging from brown sandy loams on crests to red-brown sandy clays on midslopes and yellow light clay on lower slopes and drainage lines. Burra transferral soils are strongly acidic with low soil fertility, low water holding capacity, low permeability, and are susceptible to mass movement hazards as well as mild sheet or gully erosion when surface vegetation is absent.

The Williamsdale transferral soil landscape occurs on the Canberra Lowlands including the Isabella Plains and to the east of the Murrumbidgee River on undulating rises, fans, valley flats and depressions. The Williamsdale transferral soil landscape is influenced by the underlying geology of Silurian volcanics in association with alluvial material giving rise to deep brown or yellow loams to sandy clay loams on upper rises and fans, moderately to very deep yellow sandy loams on lower rises and fan elements. Williamsdale transferral soils are hardsetting, erosive and dispersible with acidic topsoils which experience seasonal waterlogging.

The Paddys River alluvial soil landscape occurs on land associated with the high energy streams of the Cullarin Upland, Clear Range and Canberra Lowlands including the Molonglo River on stream channels and adjacent riparian corridors. The Paddys River alluvial soil landscape is influenced by the underlying geology of Quaternary alluvium-gravel, sand, loam and clays giving rise to deep well drained soils ranging from brown sands to yellowish brown loamy sand on riparian features to deep poorly drained yellowish brown loose sand on stream or river beds. Paddys River alluvial soils are highly permeable, possess low fertility and present with high erodibility especially in regards to gully erosion and wind erosion.

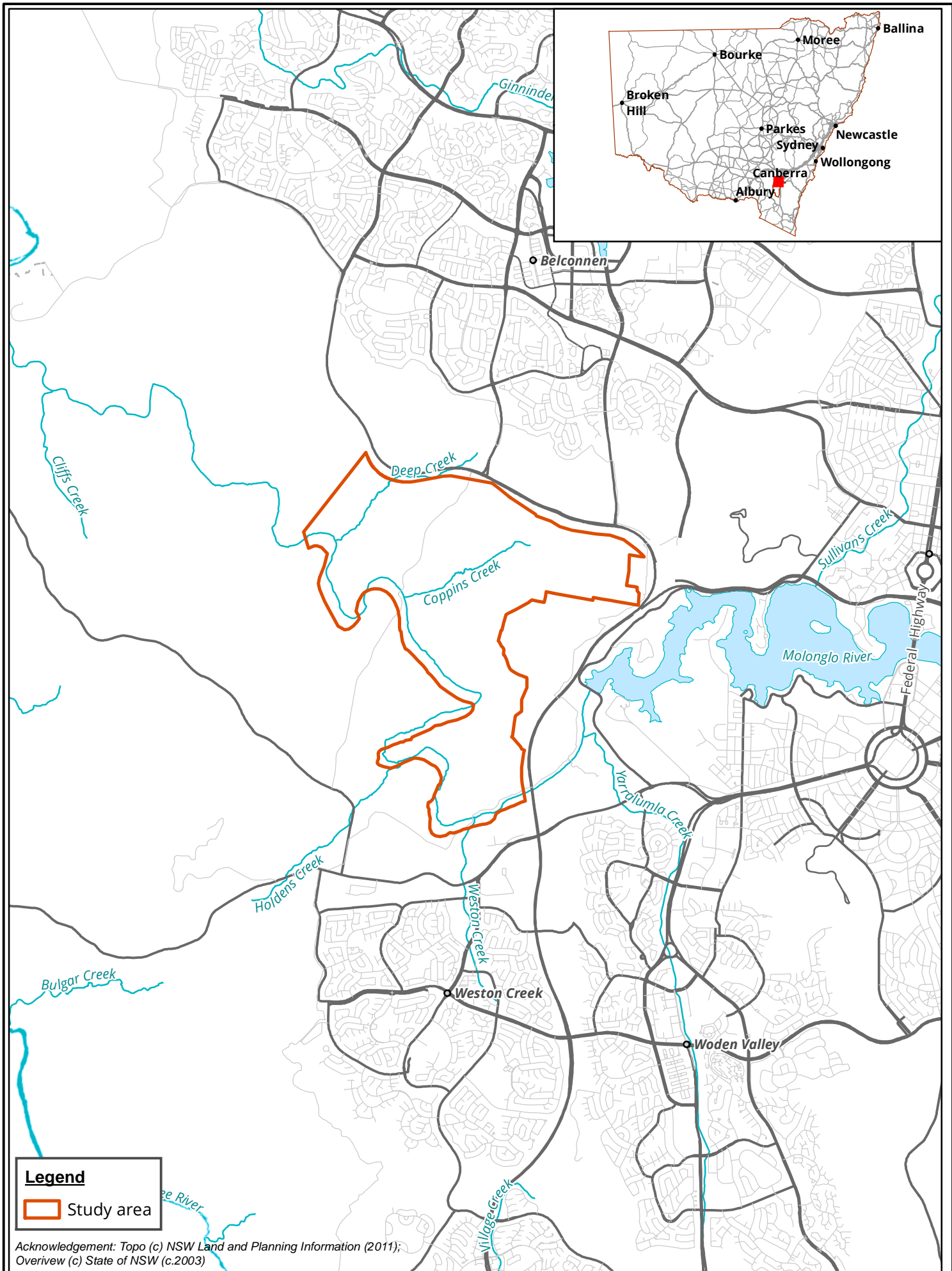
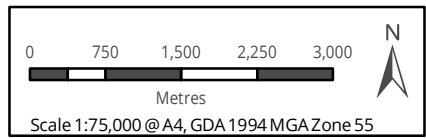


Figure 1: Location of the study area



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Checked by: NRT, Drawn by: LH, Last edited by: Iharley
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2 Methods

2.1 Literature and database review

In order to provide a context for the study area, records from the following databases were collated and reviewed:

- Commonwealth Department of the Environment (DoE) Protected Matters Search Tool for matters protected by the EPBC Act (MNES).
- ACT Pest Plants and Animals (Pest Plants) Declaration 2015 (No 1) search for noxious species potentially occurring within the study area.
- ACT Pest Plants and Animals (Pest Animals) Declaration 2005 (No 1) search for pest animals potentially occurring within the study area.

Other sources of biodiversity information:

- Relevant vegetation mapping derived from past assessments of the study area including:
 - GIS data from the NES Plan (ELA 2009) and the ELA (2013) data used for the AMS, provided by Todd Nowak (Economic Development Directorate); and
 - GIS data for Kama Nature Reserve, provided by Umwelt, from the Umwelt (2010b) study.

The following reports, documents and plans were also reviewed:

- ACT Flora and Fauna Committee final determinations for threatened biodiversity.
- Molonglo Valley Plan for the Protection of Matters of Environmental Significance (NES Plan) (ACTPLA 2011).
- Molonglo Valley Vegetation Survey - Baseline Condition Assessment (EcoLogical Australia, 2013).
- Molonglo Stage 3 s.211 Application Supporting Documentation (Umwelt, 2015a).
- Molonglo Stage 3 Ecological Values of the Kama Nature Reserve – Molonglo Stage 3 Outer Asset Protection Zone – Vegetation Mapping Comparison (Umwelt, 2013a).
- Ecological Values of the Kama Nature Reserve: Molonglo Stage 3 outer asset protection zone (Umwelt, 2013b).
- Survey Guidelines for Determining Lowland Vegetation Classification and Condition in the ACT (ACT Government, 2012).
- EPBC Act Policy Statement 3.5 – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (DEH 2006a);
- Action Plan No.27 – Woodlands for Wildlife: ACT Lowland Woodland Conservation Strategy (ACT Government 2004); and
- Action Plan No.28 – A Vision Splendid of the Grassy Plains Extended: ACT Lowland Native Grassland Conservation Strategy (ACT Government 2005a).

2.2 Site investigation

2.2.1 Vegetation classification and condition assessment

The vegetation classification and condition assessment was undertaken from 15 to 18 December 2015 by Nicola Trulock (Botanist) and Dr Samuel Reid (Ecologist) of Biosis with a combined survey effort of eighty (80) person hours. The vegetation classification and condition assessment was conducted in accordance with the methodology provided in the *ACT Survey Guidelines for Determining Lowland Vegetation Classification and Condition in the ACT* (ACT Government 2012). This survey methodology uses a combination of step point transects and 20 x 20 metre quadrats for assessing native grassland and a combination of step point transects, vertical and horizontal stratification including dominant species per strata layer and the random meander technique (Cropper 1993) to assess grassy woodland and riparian woodland. Specific objectives of the flora assessment were to assess the ecological values of the study area, determine the vegetation types and communities within the study area, detect the presence of threatened species, populations and ecological communities (biota) according to the EPBC Act and NC Act, and determine the nature and extent of impacts associated with the Proposal.

General classification of native vegetation used in this report is based on the classification system in Keith (Keith 2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is vegetation type. The vegetation community definition used for this report is based on the classification system provided in Appendix B of the ACT Vegetation Survey Guidelines (ACT Government 2012) provided by the Client on 10 December 2015 which categorises vegetation into communities based on species composition and presence of indicative species, soil and geological characteristics, climate and landscape position.

A list of flora species was compiled for each vegetation type and can be found in Section 4.3.

The general condition of native vegetation was observed as well as the effects of current seasonal conditions. Notes were made on specific issues such as substantial declared pest plant infestations, evidence of management works, impacts of the current grazing regime and the regeneration capacity of the vegetation.

The location of all hollow-bearing trees identified in the study area was recorded using a handheld GPS and attributes such as species, DBH, habitat value and health were recorded in field data sheets.

Based on the results of the survey, each patch of Box - Gum Woodland was:

- classified in accordance with the 'Degree of Modification' categories provided in Section 2.5 of ACT Action Plan 27 – ACT Lowland Woodland Conservation Strategy; and
- assessed against the flow chart provided in the EPBC Act Policy Statement 3.5 – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (DEH 2006a).

Based on the results of the survey each patch of Natural Temperate Grassland was:

- classified in accordance within the 'Degree of Modification' categories provided in Section 2.5 of ACT Action Plan 28 -ACT Lowland Native Grassland Conservation Strategy; and
- assessed for conformity with the EPBC Act listing criteria for the listed community using the method outlined in *A Method to Assess Grassy Ecosystem Sites: Using Floristic Information to Assess a Site's Quality* (Rehwinkel 2007).

2.2.2 Fauna assessment

The fauna assessment involved the compilation of a list of all species incidentally observed during the vegetation classification and condition assessment conducted from 15 to 18 December 2015 by Nicola Trulock (Botanist) and Dr Samuel Reid (Ecologist) of Biosis over eighty (80) person hours. The fauna assessment was opportunistic in nature, consisting of direct and indirect observation as well as identification of habitat and resource availability. Additionally, likelihood of fauna presence was determined primarily on the basis of the types and qualities of habitat(s) present. No active searches or targeted surveys for fauna were undertaken during this vegetation classification and condition survey. Incidental observations of fauna species were recorded with a view to characterising the values of the study area and the investigation was not intended to provide a comprehensive survey of all fauna species that have the potential to utilise the study area from time to time.

2.2.3 Permits and Licences

Biosis did not require a permit for this project from Territory and Municipal Services Directorate (TaMSD) as there was no capture or handling of animals involved with the vegetation classification and condition assessment. Biosis is covered by approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2017) which is valid within the ACT.

2.3 Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The current vegetation classification and condition assessment was conducted at the start of summer, which is an optimal time for survey as the majority of flora species were in flower and readily identifiable and herpetofauna, avifauna and vertebrate mammals were not in torpor and were more likely to be active. The field investigation was conducted on a series of consecutive days which were typically warm and clement at a time when resident species were more likely to be active. The survey effort of eighty hours expended within the study area is considered to be more than adequate to determine the presence of flora and fauna species including the majority of threatened species with the exception of the Pink-tailed Worm-lizard as well as resident amphibian and microbat species. These species require a targeted survey using specialised techniques at specific times of day or specific seasons and are outside the scope of this assessment.

Database searches, and associated conclusions on the likelihood of species to occur within the study area, are reliant upon external data sources and information managed by third parties.

The Molonglo River and associated tributaries, Deep Creek and Coppins Creek, traverse the study area. A thorough survey for aquatic fauna was not conducted on these tributaries as assessment of the aquatic ecological values was beyond the scope of this assessment. The implications of relevant biodiversity legislation (e.g. EPBC / NC Act/ACT Fisheries Act) cannot be fully assessed without an assessment of aquatic habitat and fauna. However, mitigation measures have been recommended that would be applicable to the prevention of impacts to these waterways and their associated ecological values.

Impact areas used for this vegetation classification and condition assessment have been based on Lot DP information acquired by Biosis in addition to a GIS shapefile of the FUA boundary as displayed in the ACT Government Territory Plan (ACT Government 2016) provided by the Client. There are slight discrepancies between the study area boundary and FUA boundary arising from the encroachment of the National Arboretum, Canberra, into the FUA which is not yet reflected in the current version of the Territory Plan map

layer. Therefore, the areas of the FUA which overlap the study area boundary are to be disregarded for the purposes of this report.

2.4 Mapping

Mapping data was collected from the study area with a Samsung Tablet using ArcGIS Collector (uncorrected) (GDA94) uploaded with an aerial photo of the study area produced by NearMap (NearMap 2015) in combination with previous shapefiles detailing Pink-tailed Worm-lizard habitat patches, the study area boundary and vegetation community mapping from previous ecological surveys, previously provided to Biosis by the Client. A shapefile displaying the FUA boundary as defined by the Territory Plan (ACT Territory 2016), provided by the Client, was used to determine area of projected impacts associated with the Proposal. Existing vegetation between patches of previously mapped Box - Gum Woodland was assigned into different vegetation zones and represented as a polygon within ArcGIS Collector with all features relevant to the flora assessment recorded in the accompanying attribute table. Field mapping of these vegetation zones was refined using information derived from the accompanying field survey and then published in pdf form as part of the final report. The accuracy of this mapping is subject to the accuracy of the GPS units (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files containing the relevant flora and fauna spatial data are available to incorporate into design concept plans. However, this mapping may not be sufficiently precise for detailed design purposes.

3 Legislative context

This section provides an overview of key biodiversity legislation and government policy considered in this assessment. Where available, links to further information are provided. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

3.1 Commonwealth

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (NES) protected under the Act.

Matters of NES identified under the EPBC Act relevant to biodiversity and the Proposal include:

- Wetlands of international importance (also known as 'Ramsar' wetlands);
- Nationally threatened species and ecological communities; and
- Migratory species.

Under the EPBC Act, activities that have the potential to result in significant impacts on Matters of NES must be referred to the Commonwealth Minister for the Environment for assessment.

One CEEC, White Box – Yellow Box – Red Gum Grassy Woodland and Derived Native Grassland and one EEC Natural Temperate Grassland, have been detected within the study area during prior surveys conducted by Eco Logical (Eco Logical Australia 2009). Furthermore, the threatened species, Pink-tailed Worm-lizard, Superb Parrot and Swift Parrot have also been detected within the study area during prior surveys (Eco Logical 2009, 2013). Threatened species and ecological communities detected during this vegetation classification and condition assessment that are protected by the EPBC Act are outlined in Section 0. An assessment of the potential impacts to all Matters of NES under the provisions of the EPBC Act, including recommendations, is provided in Section 5.

3.1.2 Australian Capital Territory (Planning and Land Management) Act 1988 (Cth)

The Australian Capital Territory (Planning and Land Management) Act 1988 (P&LM Act) is the legislative instrument which allows the ACT Government to administer to lands within the ACT in conjunction with the Commonwealth Government. Ownership of land within the ACT is retained by the Commonwealth Government, being leased to occupiers as opposed to being sold freehold. Land managed by the Commonwealth Government is referred to as National Land and is subject to the National Control Plan, whereas land managed by the ACT Government is referred to as Territory Land and is subject to the Territory Plan. The Commonwealth Government is also responsible for developments on Territory Land which has been identified as possessing the special characteristics of the national capital, otherwise known as 'Designated Land'. Other land under Commonwealth Government administration as part of the P&LM Act is land designated as subject to 'Special Requirements' inasmuch as it is in the interests of the national capital to ensure that the land be developed by the ACT and Commonwealth Government.

The P&LM Act also underpins the creation and maintenance of the National Capital Plan which sets out the planning principles for all land in the ACT, specifically National Land, Designated Areas and Special Requirement Areas.

3.1.3 National Capital Plan 2014

The National Capital Plan (NCP) was established under Part III of the P&LM Act 1988. The primary objective of the NCP is to ensure that all development within Canberra and the ACT is in accordance with their National Significance as stated in section VII of the NCP (National Capital Authority 2014) with particular attention to:

- *The pre-eminence of the role of Canberra and the Territory as the National Capital.*
- *Preservation and enhancement of the landscape features which give the National Capital its character and setting.*
- *Respect for the key elements of Walter Burley Griffin's formally adopted plan for Canberra.*
- *Creation, preservation and enhancement of fitting sites, approaches and backdrops for national institutions and ceremonies as well as National Capital Uses.*
- *The development of a city which both respects environmental values and reflects the national concerns with the sustainability of Australia's urban areas.*

The NCP outlines specific conditions of planning, design and development and is restricted to National Land, Designated Areas and Special Requirement Areas. The NCP also outlines land use codes accompanied with a range of planning policies and permitted uses.

3.2 Territory Legislation

3.2.1 Nature Conservation Act 2014

The Nature Conservation Act 2014 (NC Act) is the chief legislation for the protection of native plants and animals in the ACT and for the management of the conservation reserve network. The NC Act protects native plants and animals, and provides management authority for conservation lands. The NC Act provides the legal underpinning of nature conservation policy, management and action across the ACT. The NC Act requires that potential impacts be assessed when there is the likelihood that a proposed action has the potential to impact (directly or indirectly) upon NC Act listed biota. The NC Act also provides a definition for 'native vegetation' which is defined as present if:

- Trees or shrubs indigenous to the area have a canopy cover of 10% or greater in any stratum; and/or
- Native plants indigenous to the area comprise 50% or more of the cover of the understorey (grasses, small shrubs, forbs, sedges etc.).

3.2.2 Planning and Development Act 2007

The Planning and Development Act 2007 (P&D Act) is the overarching legislation for assessing and coordinating input into development applications. It determines which activities require development approval and how to assess development proposals. Developments can be assessed by a Code, Merit or Impact Track.

Pursuant to the P&D Act, a development proposal will be assessed via the 'Impact Track' and require the preparation of an Environmental Impact Statement (EIS) if the development will have any of the impacts listed under Part 4.3 of Schedule 4 of the Act.

The ecological impacts that trigger the requirement to prepare an EIS, of relevance to the proposal are:

Item 1. Proposal that is likely to have a significant adverse environmental impact on 1 or more of the following, unless the conservator of flora and fauna provides an environmental significance opinion indicating that the proposal is not likely to have a significant adverse environmental impact:

- (a) a critically endangered species;*
- (b) an endangered species;*
- (c) a vulnerable species;*
- (d) a conservation dependent species;*
- (e) a provisionally listed threatened species;*
- (f) a listed migratory species;*
- (g) a threatened ecological community;*
- (h) a protected native species;*
- (i) a Ramsar wetland;*
- (j) any other protected matter*

Item 2. Proposal involving—

- (a) the clearing of more than 0.5ha of native vegetation in a native vegetation area, on land that is designated as a future urban area under the territory plan unless the conservator of flora and fauna produces an environmental significance opinion that the clearing is not likely to have a significant adverse environmental impact.*
- (b) the clearing of more than 5.0ha of native vegetation in a native vegetation area, on land that is designated as a future urban area under the territory plan, unless the conservator of flora and fauna produces an environmental significance opinion that the clearing is not likely to have a significant adverse environmental impact.*

Item 3. Proposal will result in a significant adverse environmental impact on a:

- (c) a prescribed environmental value mentioned in the Territory Plan (Water use catchment general code) of a natural waterway or aquifer.*

When a proposed development requires an EIS, the Environment and Sustainable Development Directorate (ESDD) prepares a scoping document that identifies all the matters that are to be addressed by the proponent in the EIS.

With regard to the above, it is noted that amendments to the P&D Act (effective as at February 2011) have provided the opportunity for an application to be made under Section 211(s.211) of the P&D Act for an exemption from requiring an EIS from the ACT Conservator for Flora and Fauna for proposals that are regarded as likely to result in a significant adverse environmental impact (in relation to the triggers identified above). The Minister may grant an exemption if he is satisfied that previous studies have adequately identified and addressed potential environmental impacts of the Proposal. If an EIS exemption is granted, then the Proposal may progress towards the Development Application (DA) without the need for an EIS.

The P&D Act also underpins the existence of the independent planning authority, ACT Planning and Land Authority (ACTPLA), which is responsible for administering the Territory Plan and managing approvals for development applications and the leasing of land. The P&D Act has also provided for the establishment of the ACT Land Development Agency with the purpose of developing land for future urban release.

3.2.3 ACT Government Territory Plan 2016

The aim of the ACT Government Territory Plan 2016 (Territory Plan) is to ensure that land is developed in a manner which is not inconsistent with the National Capital Plan as well as ensuring that the planning and development of the ACT is consistent with the primary objective of providing the people of the ACT with an attractive, safe and efficient environment in which to live, work and partake in recreation (ACT Government, 2013).

The Territory Plan is also responsible for the management of land use codes and associated objectives for all Territory land.

3.2.4 Pest Plant and Animals Act 2005

The *Pest Plant and Animals Act 2005* (PPA Act) was enacted to provide for the identification, classification and control of pest plants (noxious weeds) and animals. The PPA Act aims to reduce the negative impact of noxious weeds and pest animal species on the economy, community and environment of the ACT by:

- Establishing control mechanisms to prevent the establishment of significant new noxious weeds or pest animal species in the ACT.
- Preventing, eliminating or restricting the spread of particular significant noxious weeds and pest animal species in the ACT.
- Effectively managing widespread significant noxious weeds and pest animal species in the ACT.

Plants declared under the PPA Act are currently listed under *Pest Plants and Animals (Pest Plants) Declaration 2015 (No 1)* available from the TAMS website (ACT Government 2015). Pest animals declared under the PPA Act are currently listed under *Pest Plants and Animals (Pest Animals) Declaration 2005 (No 1)* available from the TAMS Website (ACT Government 2005b). The PPA Act is supported by a number of regulations and is administered by TAMSD.

Noxious weeds are discussed further in Section 4.4.4 with recommendations for adhering to the PPA Act provided in Section 5.2

4 Results

The ecological features of the study area are described below and mapped in Figure 2. A more detailed version of the ecological features overview map can be found in Appendix 3

4.1 Landscape context

The study area contains 22 separate patches of Box - Gum Woodland in varying condition classes which have been categorised according to the ACT Government's 'Degree of Modification' categories provided in Section 2.5 of ACT Action Plan 27 (ACT Government 2004). The study area also contains 26 small patches of the Natural Temperate Grassland community in varying condition classes which have been classified according to the ACT Government 'Degree of Modification' categories provided in Section 2.5 of ACT Action Plan 28 (ACT Government 2005a). Riparian woodland and Sedgeland communities of varying quality line the banks of the Molonglo River and its adjoining tributaries. These native vegetation communities are set within a matrix of pastoral land which has been cleared of native vegetation and is currently used for livestock grazing and Radiata Pine *Pinus radiata* plantations. Surrounding land uses include public open space, low density residential, road infrastructure, environmental conservation and agricultural land.

The dominant geology within the study area consists of soils derived from Silurian volcanics comprising the Burra and to a lesser extent, the Williamsdale Soil Landscapes (Jenkins, 2000), with soils characteristically shallow on rises and hilltops to moderately deep on slopes and flats, hardsetting and ranging from loams on crests and rises to clay loams along slopes and flats. Soils within depressions and along creek-lines displayed a tendency to waterlogging, demonstrated by the presence of mesic species which will tolerate poorly drained soils. Mild sheet and rill erosion was evident in disturbed areas and evidence of soil compaction resulting from cattle was evident throughout high traffic zones of the study area, most notably in the vicinity of both tributaries of the Molonglo River. Evidence of gully erosion was observed along the banks of the Molonglo River and both tributaries.

The study area is directly linked to bushland within Kama Nature Reserve and the National Arboretum via the contiguous nature of the patches of native vegetation within the conserved areas within the study area. The study area displays indirect connectivity to nearby reserves including Yarramundi Reach Reserve and Black Mountain Nature Reserve, both located approximately four kilometres to the east. Connectivity with the greater region of Canberra is provided by the Molonglo River and its tributaries which flow through the study area, connecting it to the Lower Molonglo Valley Nature Reserve, Woodstock Nature Reserve and the Murrumbidgee River Corridor and facilitating the movement of fauna throughout the landscape.

4.2 Flora

Species recorded during the flora assessment are listed in Table A.1 of Appendix 1 (flora). Unless of particular note, these species are not discussed further.

Nine important species (DEH 2006b) were recorded during the field investigation, Longhair Plume Grass *Dichelachne micrantha*, Wild Sorghum *Sorghum leiocladum*, Kangaroo Grass *Themeda triandra*, Common Everlasting *Chrysocephalum apiculatum*, Blue Devil *Eryngium ovinum*, Twining Glycine *Glycine clandestina*, Variable Glycine *Glycine tabacina*, Wiry Dock *Rumex dumosus* and False Sarsparilla *Hardenbergia violacea*.

One population of nine Leek Orchids *Prasophyllum* spp. was identified within the study area during the field assessment, none of which fall within the FUA boundary. The Leek Orchids were identified to genus level but

could not be identified to species level as the time since flowering was too long to determine distinguishing features of the species. The Leek Orchids were all observed to have flowered between late November and the first few days of December. It is possible that the Leek Orchid found during the current field investigation is the threatened Tarengo Leek Orchid *Prasophyllum petilum* and as such further assessment is recommended to determine the identity of the orchid to species level.

No threatened flora species or populations were identified during the field investigation.

4.3 Vegetation communities

The vegetation existing throughout the majority of the study area has been modified by past disturbances which include vegetation clearance, cattle grazing, pasture improvement, cropping, construction of rural residences and associated outbuildings, fence installation and disturbances associated with the Radiata Pine plantation. Further historical disturbance has occurred in association with the construction and maintenance of the ActewAGL powerline easement as well as the construction of the surrounding roads.

Given the topographical/geological characteristics (elevation, aspect, geology etc) of the study area and the floristic composition of the vegetation communities occurring within and adjoining the study area, it can be determined that pre European settlement, the study area would have supported a mosaic of Box - Gum Woodland on slopes and low hills, grading into Natural Temperate Grassland at lower elevations, specifically along flats. Tableland Riparian Woodland would have lined the banks of the Molonglo River and its tributaries.

A total of nine native vegetation communities and three exotic vegetation communities were identified within the study area during the field investigation, of which only eight native vegetation communities and three exotic vegetation communities occur within the FUA boundary. The native vegetation communities occurred in disjunct patches in areas of the landscape which are not subject to grazing due to being fenced off, situated amongst rocky outcrops or located atop hills or steep slopes.

The ecological features observed within the study area are outlined below (Table 1), separated into the vegetation communities within which they occur (refer also to Figure 2 and Appendix 3).

Table 1 Vegetation communities of the study area

Moderately Modified Yellow Box – Red Gum Grassy Woodland	
Extent within subject site	1.80 hectares of the CEEC Moderately Modified Yellow Box – Red Gum Grassy Woodland (meeting EPBC and NC Act listing criteria) was detected within the study area, of which 0.28 hectares occurs within the FUA boundary. The Moderately Modified - Yellow Box – Red Gum Grassy Woodland community occurs in one medium sized patch atop a low hill located to the north of the eastern half of the study area. The patch is surrounded by a matrix of exotic pasture. Grazing impacts were evident throughout the margins of the community, generally being confined to the slopes and areas lacking rocky outcrops.
Description	The structural formation of the community consists of two well defined strata, a canopy layer of woodland trees up to 15 metres tall and an understorey layer comprising of herbs and grasses. A third under-developed strata was present within this community, consisting entirely of exotic shrubs. The canopy layer is dominated by Yellow Box <i>Eucalyptus melliodora</i> and Red Gum <i>Eucalyptus blakelyi</i> interspersed with occasional Apple Box <i>Eucalyptus bridgesiana</i> , all of which were mature. No juvenile Eucalyptus species were evident within this community, demonstrating a lack of active recruitment. The understorey consists of a diverse array of native herbs and grasses including Kangaroo Grass <i>Themeda triandra</i> , Wild Sorghum <i>Sorghum Leiocladum</i> , Weeping Grass <i>Microlaena stipoides</i> , Ringed Wallaby Grass <i>Rytidosperma caespitosum</i> , Fuzzweed <i>Vitadina cuneata</i> ,

Moderately Modified Yellow Box – Red Gum Grassy Woodland	
	<p>Bidgee Widgee <i>Acaena novae-zelandiae</i> and Many-flowered Mat-rush <i>Lomandra multiflora</i>. Important species found within this community include Wild Sorghum <i>Sorghum Leiocladum</i>, Kangaroo Grass <i>Themeda triandra</i>, Common Everlasting <i>Chrysocephalum apiculatum</i>, Blue Devil <i>Eryngium ovinum</i>, and Variable Glycine <i>Glycine tabacina</i>. Common paddock weeds have integrated substantially into the margins of the Yellow Box-Red Gum Grassy Woodland as its small patch size increases the impact of edge effects. Exotic species most prevalent within the margins of the community are predominantly bird and mammal dispersed species including Sweet Briar <i>Rosa rubiginosa</i>, Blackberry <i>Rubus fruticosus</i> spp. aggregate, Wild Oats <i>Avena fatua</i>, Saffron Thistle <i>Carthamus lanatus</i>, St Johns Wort <i>Hypericum perforatum</i>, Scotch Thistle <i>Onopordium acanthium</i> and Skeleton Weed <i>Chondrilla juncea</i>.</p>
Condition	<p>The patch of Yellow Box-Red Gum Grassy Woodland is in the Moderately Modified Lowland Woodland condition class as the community has been modified by sporadic bouts of grazing, has a canopy cover of 20%, possesses a moderate diversity and cover of native species which includes disturbance tolerant species and a few grazing sensitive species. The Yellow Box-Red Gum Grassy Woodland – Moderately Modified Lowland Woodlands community contains a low density of weed species throughout the central portion of the patch to a moderate density of exotic species along its margin resulting from surrounding pastoral land use. The patch of remnant Moderately Modified - Yellow Box-Red Gum Grassy Woodland displays high regenerative potential and may exhibit a positive response to ecological restoration.</p>
Associated soils, rainfall and landscape position	<p>The patch of Moderately Modified - Yellow Box – Red Gum Grassy Woodland is found atop a hill between 620 – 627 metres above sea level located in the north of the eastern half of the study area. Soils associated with this patch vegetation consist of the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).</p>
Threatened ecological community	<p>Commonwealth EPBC Act: Critically Endangered ACT NC Act: Endangered <u>EPBC Act Justification:</u> The 1.80 hectares of Moderately Modified - Yellow Box – Red Gum Grassy Woodland within the study area is deemed consistent with the definition under the EPBC Act. The community meets the listing criteria in regards to size (1.80 hectares), elevation (620-627 metres above sea level), annual rainfall (620 millimetres), soils (highly fertile), structural composition (canopy overtopping an understorey containing grasses and herbs), presence of the indicative canopy species (Yellow Box, Blakely's Red Gum and Apple Box) and presence of important species (5 important species). However, the vegetation was found to contain 11 out of the 12 native non-grass understorey species required by the EPBC Act. The patch exhibited a great degree of diversity within the understorey layer and had the survey been undertaken in Spring rather than Summer, when certain species such as Early Nancy <i>Wurmbea dioica</i> are flowering, it is believed that up to 14 species could have been recorded (Rob Spiers pers.comm. 29 January 2016). Therefore a decision has been made to apply the precautionary principle and define this community as consistent with EPBC Act listing criteria. <u>NC Act Justification:</u> 1.80 hectares of the Moderately Modified - Yellow Box – Red Gum Grassy Woodland found throughout the study area is consistent with the definition under the ACT NC Act based on the presence of diagnostic species (20 species including the presence of three characteristic canopy tree species), soil characteristics (soils displaying relatively high fertility), and structural characteristics (canopy overtopping an understorey of grasses and herbs) (ACT Government 1999, 2004).</p>
Threatened species / fauna habitat	<p>Moderately Modified - Yellow Box – Red Gum Grassy Woodland within the study area potentially provides moderate quality habitat for threatened flora including Hoary Sunray <i>Leucochrysum albicans</i> var. <i>tricolor</i>, Small Purple-pea <i>Swainsonia recta</i> and Button Wrinklewort <i>Rutidosis leptorrhynchoides</i> however, these species were not detected during</p>

Moderately Modified Yellow Box – Red Gum Grassy Woodland

the site assessment. The vegetation contains a variety of ecological features which may form habitat for threatened fauna species within the locality including roosting, nesting and foraging habitat for local and transient avifauna including the threatened Swift Parrot *Lathamus discolor* and Superb Parrot *Polytelis swainsonii*. The vegetation does support potential high quality habitat present for the Pink-tailed Worm-lizard *Aprasia parapulchella* in the form of rocky outcrops of volcanic origin amidst a groundcover of native grasses and herbs.



Plate 1 Moderately Modified Yellow Box – Red Gum Grassy Woodland

Substantially Modified Yellow Box – Red Gum Grassy Woodland

Extent within the study area

12.35 hectares of Substantially Modified Yellow Box – Red Gum Grassy Woodland (henceforth referred to as Substantially Modified Lowland Woodland) has been recorded within the study area, of which 0.57 hectares occurs within the FUA boundary. The Substantially Modified Lowland Woodland community occurs in a number of large to medium sized patches along the roadside interface adjacent to William Hovell Drive. Three other patches can be found within the study area, two small patches contiguous with the Moderately Modified - Yellow Box – Red Gum Grassy Woodland, and one large patch at the northern end of the western half of the study area. These patches are generally surrounded by a matrix of exotic pasture, with the exception of the tracts of this community which exist within the roadside interface. These patches of vegetation are exposed to William Hovell Drive on their northern perimeter and exotic pasture on the southern perimeter. Grazing impacts were evident throughout the margins of the vegetation patches surrounded by exotic pasture, whereas the vegetation existing in the roadside interface was highly edge affected.

Substantially Modified Yellow Box – Red Gum Grassy Woodland

Description	<p>The structural formation of the community consists of two well defined strata, a canopy layer of woodland trees up to 15 metres tall and an understorey layer comprising of herbs and grasses. The canopy layer is dominated by Red Gum and Brittle Gum <i>Eucalyptus mannifera</i> interspersed with occasional Yellow Box, of which all were mature. No juvenile eucalypts were evident within this community, demonstrating a lack of active recruitment. The understorey consists of a diverse array of native herbs and grasses which is dominated by Rough Speargrass <i>Austrostipa scabra</i>. Other understorey species include Common Wheatgrass <i>Elymus scaber</i>, Hairy Panic <i>Panicum effusum</i>, Longhair Plume Grass <i>Dichelachne crinita</i>, Kangaroo Grass, Weeping Grass, Ringed Wallaby Grass, Tufted Bluebell <i>Wahlenbergia communis</i>, Yanganbil <i>Austrostipa bigeniculata</i> and Mat-rush <i>Lomandra bracteata</i>. Important species found within this community include Longhair Plume Grass and Kangaroo Grass. Common paddock weeds have integrated substantially into the margins of the Substantially Modified Lowland Woodland as its medium patch size and exposure to continuous disturbance (vehicular traffic, cattle grazing etc.) increases the impact of edge effects. Exotic species most prevalent throughout the community are animal and water dispersed including Cocksfoot Grass <i>Dactylis glomerata</i>, Tall Fescue <i>Festuca elatior</i>, Wild Oats, Phalaris <i>Phalaris aquatica</i>, Goatsbeard <i>Tragopogon dubius</i>, Proliferous Pink <i>Petrorhagia nanteuilii</i>, Saffron Thistle, St Johns Wort, Prickly Lettuce <i>Lactuca serriola</i>, Smooth Catsear <i>Hypochaeris glabra</i> and Buchan Weed <i>Hirschfeldia incana</i>.</p>
Condition	<p>The patches of Yellow Box-Red Gum Grassy Woodland are in the Substantially Modified Lowland Woodland condition class as the community has been substantially modified by continuous grazing, and disturbances from road construction and vehicular traffic, have a canopy cover of between 8-50%, possess poor species diversity and moderate cover of native species which includes disturbance tolerant species only. The Substantially Modified Lowland Woodland community contains moderate ingress of weed species throughout the entire area of the patches which have resulted from surrounding pastoral land use and vehicular traffic. These patches of Substantially Modified Lowland Woodland display low regenerative potential and are unlikely to exhibit a positive response to ecological restoration.</p>
Associated soils, rainfall and landscape position	<p>The patches of Substantially Modified Lowland Woodland occur along the roadside interface adjacent to William Hovell Drive, a small sized patch atop the hill on the northern end of the eastern half of the study area, and a medium patch along the northern end of the western half of the study area. Patches of Substantially Modified Lowland Woodland occur between 580 – 626 metres above sea level and are located in patches along the northern ends of the western and eastern half of the study area. Soils associated with the patches of Substantially Modified Lowland Woodland comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).</p>
Threatened ecological community	<p>Commonwealth EPBC Act: Critically Endangered (Not Consistent) ACTNC Act: Endangered (Not Consistent) EPBC Act Justification: The 12.35 hectares of Substantially Modified Lowland Woodland within the study area are not deemed consistent with the definition under the EPBC Act. The Substantially Modified Lowland Woodland community meets the listing criteria in regards to size (12.35 hectares), elevation (580-626 metres above sea level), annual rainfall (620 millimetres), soils (highly fertile), structural composition (canopy overtopping an understorey containing grasses and herbs), presence of the indicative canopy species (Yellow Box, Blakely's Red Gum and Brittle Bark) and presence of important species (2 important species). However, the Substantially Modified Lowland Woodland community did not contain at least 12 native non-grass understorey species (i.e. only 4 species were recorded), thus failing to meet the full EPBC listing criteria. <u>NC Act Justification:</u> 12.35hectares of the Substantially Modified Lowland Woodland found throughout the study area is not consistent with the definition under the ACT NC Act as the</p>

Substantially Modified Yellow Box – Red Gum Grassy Woodland

community is in too degraded a condition to represent the EEC. This is based on the presence of diagnostic species (16 species including the presence of three characteristic canopy tree species), soil characteristics (soils displaying relatively high fertility), and structural characteristics (canopy overtopping an understorey of grasses and herbs) (ACT Government 1999, 2004).

Threatened species / fauna habitat

Substantially Modified Lowland Woodland within the study area is considered too degraded to provide habitat for threatened flora known or likely to occur within the locality as they are considered grazing sensitive species. No threatened flora species were detected during the site assessment. Substantially Modified Lowland Woodland contains a variety of ecological features which may form habitat for threatened fauna species within the locality including roosting, nesting and foraging habitat for local and transient avifauna including the threatened Swift Parrot *Lathamus discolor* and Superb Parrot *Polytelis swainsonii*. One hollow-bearing tree was identified within this community which may provide roosting habitat for local avifauna, microbats and arboreal mammals. In particular, there is potential moderate quality habitat present for the Pink-tailed Worm-lizard *Aprasia parapulchella* in the patch adjacent to the Moderately Modified - Yellow Box – Red Box Grassy Woodland in the form of rocky outcrops of volcanic origin amidst a groundcover of native grasses and herbs.



Plate 2 Substantially Modified Yellow Box – Red Gum Grassy Woodland

Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees

Extent within the study area

12.64 hectares of Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees (Henceforth referred to as Severely Modified Lowland Woodland – Paddock Trees) were recorded within the study area, of which 11.96 hectares occurs within the FUA boundary. The Severely Modified Lowland Woodland – Paddock Trees community occurs in a number of large to medium sized patches on flat and elevated land within the central section of the eastern half of the study area. These patches are surrounded by a matrix of exotic pasture and evidence of grazing was evident throughout the entirety of this

Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees	
	community.
Description	The structural formation of the community consists of two well defined strata, a canopy layer of woodland trees up to 15 metres tall and an understorey layer comprising predominantly of grasses. The canopy layer is dominated by Blakely's Red Gum intermixed with the subdominant Yellow Box, all of which were mature. No juvenile eucalypts were evident within this community, demonstrating a lack of active recruitment. The understorey consists of a depauperate representation of native grasses which are severely impacted by competitive interactions with exotic species. Native species within the understorey include Yanganbil, Windmill Grass <i>Chloris truncata</i> , Weeping Grass and Wiry Dock <i>Rumex dumosus</i> . Important species found within this community include Wiry Dock. Common paddock weeds have heavily infested the understorey of the Yellow Box-Red Gum Grassy Woodland as its exposure to cattle and sheep grazing has reduced the overall diversity to the extent that only grazing tolerant native species persist. Exotic species most prevalent throughout the community are predominantly animal and water dispersed including Barley Grass <i>Hordeum leporinum</i> , Rat's Tail Fescue <i>Vulpia myuros</i> , Wild Oats, Phalaris, Vervain <i>Salvia verbenaca</i> , Saffron Thistle, Scotch Thistle, St Johns Wort, Sweet Briar, African Boxthorn <i>Lycium ferocissimum</i> , White Horehound <i>Marrubium vulgare</i> and Buchan Weed.
Condition	The patches of Yellow Box-Red Gum Grassy Woodland are in the Severely Modified Lowland Woodland condition class as the community has been severely modified by continuous grazing from cattle and sheep over a long duration, has a canopy cover of less than 10%, possesses extremely poor species diversity and low cover of native species, which includes disturbance tolerant species only. The Severely Modified Lowland Woodland – Paddock Trees community contains high ingress of weed species throughout the entire area of the patches which have resulted from surrounding pastoral land use. These patches of Severely Modified Lowland Woodland – Paddock Trees display negligible regenerative potential and are highly unlikely to exhibit a positive response to ecological restoration.
Associated soils, rainfall and landscape position	The patches of Severely Modified Lowland Woodland – Paddock Trees occur on the elevated land within the central section of the eastern half of the study area. These patches of vegetation occur between 590 – 610 metres above sea level and are located just north of the conservation area labelled GG in the NES Plan. Soils associated with the patches of Severely Modified Lowland Woodland – Paddock Trees comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Critically Endangered (Not Consistent) ACT NC Act: Critically Endangered (Not Consistent) <u>EPBC Act Justification:</u> The 12.64 hectares of Severely Modified Lowland Woodland – Paddock Trees within the study area is not deemed consistent with the definition under the EPBC Act. The Severely Modified Lowland Woodland – Paddock Trees community meets the listing criteria in regards to elevation (580-626 metres above sea level), annual rainfall (620 millimetres), soils (highly fertile), structural composition (canopy overtopping an understorey containing grasses and herbs), presence of the indicative canopy species (Yellow Box and Blakely's Red Gum) and presence of important species (one important species). However, the Severely Modified Lowland Woodland – Paddock Trees community did not contain a cover of over 50% native species, individual patches were not over 5 hectares in size and did not contain at least 12 native non-grass understorey species (i.e.

Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees

only one species was recorded), thus failing to meet the full EPBC listing criteria.
NC Act Justification: 12.64 hectares of the Severely Modified Lowland Woodland – Paddock Trees found throughout the study area is not consistent with the definition under the ACT NC Act as the community is in too degraded a condition to represent the EEC. This is based on the presence of diagnostic species (6 species including the presence of two characteristic canopy tree species), soil characteristics (soils displaying relatively high fertility), and structural characteristics (canopy overtopping an understorey of grasses) (ACT Government 1999, 2004).

Threatened species / fauna habitat

Severely Modified Lowland Woodland – Paddock Trees within the study area is considered too degraded to provide habitat for threatened flora known or likely to occur within the locality as they are considered grazing sensitive species. No threatened flora species were detected during the site assessment. The community contains a variety of ecological features which forms habitat for threatened fauna species within the locality including roosting, nesting and foraging habitat for local and transient avifauna including the threatened Swift Parrot and Superb Parrot. In particular, there are a total of thirteen hollow-bearing trees in this community which may form habitat for local avifauna, microbats and arboreal mammals. One of these hollow-bearing trees was occupied by a breeding pair of Sulphur-crested Cockatoos *Cacatua galerita* and their chick. There is negligible habitat present for the Pink-tailed Worm-lizard in the patches of Severely Modified Lowland Woodland – Paddock Trees as they do not contain rocky outcrops of volcanic origin.



Plate 3 Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees

Moderately Modified – Natural Temperate Grassland (Dry Themeda Grassland)

Extent within the study area	<p>There are three small patches of Moderately Modified – Natural Temperate Grassland consisting of Dry Themeda Grassland with a combined total of 0.75 hectares in the study area. Only one of these patches comprising 0.05 hectares occurs within the FUA boundary. These patches of Moderately Modified – Natural Temperate Grassland are highly disjunct and tend to occupy sites which contained a high level of rocky outcrops. Two are in locations which do not allow cattle grazing and one is protected from the worst excesses of grazing by virtue of its rocky nature.</p>
Description	<p>The structural formation of the community consists of one well defined strata, a groundcover layer of native perennial grasses (approximately 40% cover) and herbs (approximately 60% cover) up to 0.5 metres tall. The Groundcover layer supports native grasses such as Kangaroo Grass along with co-dominants Wild Sorghum and Red Grass <i>Bothriochloa macra</i>. Less dominant grasses include Hairy Panic, Longhair Plumegrass and Common Wheatgrass with a few scattered Ringed Wallaby Grass, Rough Speargrass and Yanganbil. These native grasses are interspersed with a variety of native herbs such as Common Everlasting, Bidgee Widgee, Rice Flower <i>Pimelea curviflora</i> var. <i>sericia</i>, Fuzzweed, Hairy Cutleaf Daisy <i>Brachyscome rigidula</i>, Climbing Saltbush <i>Einadia nutans</i>, Sprawling Bluebell <i>Wahlenbergia gracilis</i>, Tufted Bluebell, Star Cudweed <i>Euchiton sphaericus</i>, Small St Johns Wort <i>Hypericum gramineum</i>, Mat-rush and Many-flowered Mat-rush. A single population of Leek Orchids, <i>Prasophyllum</i> spp. was detected in the patch near the area being regenerated by Greening Australia. The Leek Orchid could not be identified to species level as the inflorescence had degraded to the extent that identifying characteristics could not be discerned. Common paddock weeds are present in small numbers within this community, mainly along patch margins. Exotic species found within this community are predominantly water and animal dispersed including Wild Oats, Soft Brome <i>Bromus molliformis</i>, Proliferous Pink, Rat's Tail Fescue, Catsear <i>Hypochaeris radicata</i> and Lambs Tongues <i>Plantago lanceolata</i>. Less common weeds include St Johns Wort, Sweet Briar, Blanket Weed <i>Verbascum thapsus</i>, Vervain and Blackberry.</p>
Condition	<p>The patches of Natural Temperate Grassland are in the Moderately Modified condition class as the community has been modified by sporadic grazing by livestock in the past, evident through the absence of more grazing sensitive species such as Bulbine Lily <i>Bulbine bulbosa</i> and Common Billy-buttons <i>Craspedia variabilis</i>. The community possesses a moderate to high species diversity and high cover of native species which includes some grazing sensitive species. The Moderately Modified – Natural Temperate Grassland community contains low ingress of weed species along patch margins resulting from surrounding pastoral land use. These patches of Moderately Modified – Natural Temperate Grassland display high regenerative potential and are likely to exhibit a positive response to ecological restoration.</p>
Associated soils, rainfall and landscape position	<p>The patches of Moderately Modified – Natural Temperate Grassland occur on slightly sloping ground with a south to south-west aspect amongst rocky outcrops. These patches of vegetation occur between 550– 565 metres above sea level. Soils associated with the community comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).</p>

Moderately Modified – Natural Temperate Grassland (Dry Themeda Grassland)

Threatened ecological community

Commonwealth EPBC Act: Endangered
 ACT NC Act: Endangered
EPBC Act Justification: The 0.75 hectares of Moderately Modified – Natural Temperate Grassland within the study area is consistent with the definition under the EPBC Act. The Moderately Modified – Natural Temperate Grassland community meets the listing criteria in regards to elevation (550-565metres above sea level), soils (highly fertile), structural composition (groundcover layer containing perennial grasses and up to 70% herbs), presence of indicative species (11 species) and Floristic Value Scores (7, 12, 13 and 19).
NC Act Justification: 0.75 hectares of the Moderately Modified – Natural Temperate Grassland found throughout the study area is consistent with the definition under the ACT NC Act as the community is in moderate to high condition and represents the EEC. This is based on the presence of diagnostic species (11species), soil characteristics (soils displaying relatively high fertility), structural characteristics (canopy overtopping an understorey of grasses) and Botanical Significance Rating (3) (ACT Government 2005a).

Threatened species / fauna habitat

Moderately Modified – Natural Temperate Grassland within the study area is considered to provide habitat for grazing sensitive threatened flora known or likely to occur within the locality including Tarengo Leek Orchid, Small Purple-pea, Button Wrinklewort, Hoary Sunray and Austral Toadflax *Thesium australe*. No threatened flora species were detected during the site assessment with the exception of the leak orchid which may possibly be the Tarengo Leek Orchid, this cannot be ruled out until the identity of the Leek Orchid found in the study area is confirmed. The community contains a variety of ecological features which may form foraging habitat for threatened fauna species within the locality in particular, the Pink-tailed Worm-lizard as the community co-occurs with rocky outcrops of volcanic origin.



Plate 4 Moderately Modified – Natural Temperate Grassland

Substantially Modified – Native Pasture (Austrostipa Grassland)

Extent within the study area	<p>There is approximately 32.69 hectares of Substantially Modified – Native Pasture consisting of Austrostipa Grassland within the study area, of which 22.42 hectares occurs within the FUA boundary. This community comprises of multiple small, medium and large patches within a matrix of exotic pasture. These patches of Substantially Modified – Native Pasture are contiguous throughout the north-east corner of the eastern half of the study area. The remainder of the patches within the eastern and western halves of the study area have a highly disjunct distribution, some of which co-occur with rocky outcrops. All patches of the community are subject to an intense grazing regime primarily by cattle and sheep as well as native fauna such as the Eastern Grey Kangaroo <i>Macropus giganteus</i>.</p>
Description	<p>The structural formation of the community essentially consists of two separate strata, an upper groundcover layer of native perennial grasses up to 1 metre tall and a lower groundcover layer of native perennial grasses (85%) and herbs (15%) up to 0.5 metres tall. The upper groundcover layer is dominated by Yanganbil. The lower groundcover layer comprises of a mixture of Rough Speargrass, Weeping Grass, Ringed Wallaby Grass, Wallaby Grass <i>Rytidosperma laeve</i>, Common Wheatgrass and Red Grass, Fuzzweed, Daisy <i>Brachyscome heterodonta</i>, Wiry Dock, Bidgee Widgee, Sprawling Bluebell, Oxalis <i>Oxalis perennans</i>, Common Everlasting, Twining Glycine, Mat-rush and Many-flowered Mat-rush. Common paddock weeds are present in moderate numbers throughout the community, increasing to high ingress along patch margins. Exotic species found within this community are predominantly water and animal dispersed including Wild Oats, Soft Brome, Saffron Thistle, Scotch Thistle, Proliferous Pink, Rat's Tail Fescue, Barley Grass, Phalaris, Cocksfoot Grass, St Johns Wort, Sweet Briar, Blanket Weed, Skeleton Weed, Buchan weed, Vervain and Blackberry.</p>
Condition	<p>The patches of Native Pasture are in the Substantially Modified condition class as the community has been highly modified by continuous grazing by livestock in the past which is evident through the abundance of grazing tolerant grass species and moderate levels of weed ingress. The community possesses low species diversity although there is a high cover of native species. These patches of Substantially Modified – Native Pasture display low regenerative potential and are unlikely to regain their former diversity in response to ecological restoration.</p>
Associated soils, rainfall and landscape position	<p>The patches of Substantially Modified – Native Pasture occur on flat to slightly sloping ground. The community occurs between 545– 620 metres above sea level. Associated soils comprise the Burra and Williamsdale transferral soil landscapes. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).</p>
Threatened ecological community	<p>Commonwealth EPBC Act: Endangered (Not Consistent) ACT NC Act: Endangered (Not Consistent) <u>EPBC Act Justification:</u> The 32.69 hectares of Substantially Modified – Natural Temperate Grassland within the study area is not consistent with the definition under the EPBC Act. The Substantially Modified – Native Pasture community meets the listing criteria in regards to elevation (545-620 metres above sea level), soils (highly fertile), structural composition (upper and lower groundcover) and cover abundance (>80%) but fails to meet the criteria in regard to presence of indicative species (8 species) and Floristic Value Scores (between 1-3). <u>NC Act Justification:</u> 32.69 hectares of the Substantially Modified – Native Pasture found throughout the study area is not consistent with the definition under the ACT NC Act as the community too degraded to represent the EEC. This is based on the low number of diagnostic species (8 species), soil characteristics (soils displaying relatively high fertility), and structural characteristics (upper and lower groundcover layer) and Botanical Significance Rating (5) (ACT Government 2005a).</p>

Substantially Modified – Native Pasture (Austrostipa Grassland)

Threatened species / fauna habitat

Substantially Modified – Native Pasture within the study area is not considered to provide habitat for grazing sensitive threatened flora species and no threatened flora species were detected during the site assessment. The community contains a variety of ecological features, including one hollow-bearing tree which may form roosting habitat for avifauna, microbats and arboreal mammals. Foraging habitat is available for threatened fauna species within the locality in particular, the Pink-tailed Worm-lizard as the community sometimes co-occurs with rocky outcrops of volcanic origin.



Plate 5 Substantially Modified – Native Pasture

Tableland Riparian Woodland

Extent within the study area

There is approximately 56.03 hectares of Tableland Riparian Woodland lining the banks of the Molonglo River and the majority of the length of its tributaries within the study area, none of which occurs within the FUA boundary. This linear patch of Moderately Modified – Natural Temperate Grassland has been fenced off from cattle and is protected from grazing throughout the majority of its extent along the Molonglo River, with this stretch being in moderate condition. The remaining Tableland Riparian Woodland lining the tributaries of the Molonglo River is exposed to cattle and is more degraded as a result.

Description

The structural formation of the community consists of three well defined strata, a canopy layer overtopping a midstorey layer of shrubs and small trees and an understorey layer of native perennial grasses and sedges up to a metre tall. The canopy layer is dominated by River She-oak *Casuarina cunninghamiana* with occasional Snow Gum *Eucalyptus pauciflora* and Brittle Gum dotted along the upper banks (only along the Molonglo River). Midstorey species include Silver Wattle *Acacia dealbata*, Red-stemmed Wattle *Acacia rubida*, Black Wattle *Acacia mearnsii*, Coast Myall *Acacia binervia*, Native Blackthorn *Bursaria spinosa* var. *lasiophylla* and Prickly Teatree *Leptospermum continentale*. The understorey comprises of a mixture of native grasses and sedges including Tall Sedge *Carex appressa*, Paddock Lovegrass *Eragrostis leptostachya*, Common Fringe Sedge *Fimbristylis dichotoma*, Rush *Jucus australis*, Blowngrass *Lachnagrostis aemula*, Oxalis, Common Reed *Phragmites australis*,

Tableland Riparian Woodland	
	<p>Tussock Grass <i>Poa labillardierei</i>, Weeping Grass, Ringed Wallaby Grass, Common Wheatgrass, Kangaroo Grass and <i>Cynoglossum australe</i>. Weeds are present in moderate abundance throughout the community, increasing towards the eastern end of the Molonglo River and along the extents of the tributaries that are exposed to high levels of livestock grazing. Exotic species found within this community are predominantly water and animal dispersed including Box Elder <i>Acer negundo</i>, Willow <i>Salix</i> spp., Lombardy Poplar <i>Populus nigra</i>, Wild Oats, Soft Brome, Spear Thistle <i>Cirsium vulgare</i>, Hemlock Conium <i>maculatum</i>, Fleabane <i>Conyza</i> spp., Hawthorn <i>Crataegus monogyna</i>, Umbrella Sedge <i>Cyperus eragrostis</i>, Phalaris, Cocksfoot Grass, Tall Fescue, St Johns Wort, Perennial Rye Grass <i>Lolium perenne</i>, Watercress <i>Nasturtium microphyllum</i> and Annual Beardgrass <i>Polypogon monspeliensis</i>.</p>
Condition	<p>The patches of Tableland Riparian Woodland are in moderate condition throughout the majority of the stretch along the Molonglo River with all structural layers intact and displaying a low to moderate level of weed ingress. The Tableland Riparian Woodland lining the tributaries of the Molonglo River exists as disjunct stretches of vegetation, sometimes missing the midstorey or canopy strata layer and displaying a moderate to high level of weed ingress. The community possesses low to moderate species diversity and a moderate cover abundance of native species. The Tableland Riparian Woodland lining the Molonglo River displays moderate regenerative potential and may improve in response to ecological restoration. The vegetation along the tributaries of the Molonglo River display low regenerative potential and are less likely to regain their former diversity in response to ecological restoration.</p>
Associated soils, rainfall and landscape position	<p>The Tableland Riparian Woodland occurring throughout the study area occupies the riparian corridor associated with the Molonglo River and its tributaries. These patches of vegetation occur between 500– 589 metres above sea level. Soils associated with the Tableland Riparian Woodland comprise the Paddys River alluvial soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).</p>
Threatened ecological community	<p>Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed</p>
Threatened species / fauna habitat	<p>Tableland Riparian Woodland within the study area is not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. Tableland Riparian Woodland contains a variety of ecological features which may form habitat for threatened species within the locality including roosting and foraging habitat for the Glossy Black Cockatoo <i>Calyptorhynchus lathami</i> and foraging habitat for the Little Eagle <i>Hieraetus morphnoides</i>. In particular, there is potential moderate quality habitat present for the Pink-tailed Worm-lizard in the form of rocky outcrops of volcanic origin.</p>

Tableland Riparian Woodland



Plate 6 Tableland Riparian Woodland

Burgan Tableland Shrubland

<p>Extent within the study area</p>	<p>There is approximately 3.66 hectares of Burgan Tableland Shrubland in the study area which is found growing in the vicinity of the Molonglo River between the Tableland Riparian Woodland and Substantially Modified – Native Pasture communities. Of this, only 1.40 hectares occurs within the FUA boundary. This community was also found atop a hill located in the southern end of the eastern half of the study area, as secondary regrowth after prior vegetation clearance. The patches of Burgan Tableland Shrubland growing within the vicinity of the Molonglo River have been fenced off and are protected from livestock grazing.</p>
<p>Description</p>	<p>The structural formation of the community consists of two well defined strata, a midstorey layer of shrubs overtopping an understorey layer of native perennial grasses and herbs up to 0.7 metres tall. The midstorey layer is dominated by a combination of Native Blackthorn, Prickly Teatree, Red-stemmed Wattle, Black Wattle, Narrow-leaf Hopbush <i>Dodanea viscosa</i> subsp. <i>angustissima</i>. The understorey supports Kangaroo Grass, Fuzzweed, Bidgee Widgee, Rough Speargrass, Yanganbil, Red Grass, Common Everlasting, Common Wheatgrass, Native Geranium <i>Geranium solanderi</i>, Twining Glycine, Mat-rush, Many-flowered Mat-rush and Tussock Grass. Exotic species found within this community are predominantly water and animal dispersed including Rat's Tail Fescue, Blanket Weed, Blackberry, Sweet Briar, Lambs Tongues, Phalaris, Proliferous Pink, Prickly Lettuce, St Johns Wort, Buchan Weed, Fleabane, Soft Brome and Wild Oats.</p>
<p>Condition</p>	<p>The patches of Burgan Tableland Shrubland are in moderate condition throughout the majority of the stretch adjacent to the Molonglo River with all structural layers intact and displaying a low to moderate level of weed ingress. The Burgan Tableland Shrubland atop the low hill near the area of regeneration to the south of the eastern half of the study area is in poor condition with a disjunct midstorey layer and a moderate level of weed ingress. The community possesses low to moderate species diversity and a moderate cover</p>

Burgan Tableland Shrubland

	abundance of native species. The Burgan Tableland Woodland lining the Molonglo River and atop the hill near the area undergoing ecological restoration display moderate regenerative potential and may improve in response to ecological restoration.
Associated soils, rainfall and landscape position	The Burgan Tableland Shrubland occurring throughout the study area occupies the stretch of land existing between the Tableland Riparian Woodland and the Substantially Modified – Native Pasture, displaying a south to south-west aspect. The patch atop the hill near the areas undergoing ecological restoration occurred on the southern, south-western and south-eastern aspects of the hill. These patches of Burgan Tableland Shrubland occur between 525– 576 metres above sea level. Soils associated with the Burgan Tableland Shrubland comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed
Threatened species / fauna habitat	Burgan Tableland Shrubland within the study area is not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. Burgan Tableland Shrubland contains a variety of ecological features which may form habitat for generalist species within the locality including roosting and foraging habitat for insectivorous birds and potential foraging habitat for the Little Eagle. In particular, there is potential moderate quality habitat present for the Pink-tailed Worm-lizard in the form of rocky outcrops of volcanic origin.



Plate 7 Burgan Tableland Shrubland

Sedgeland	
Extent within the study area	There is approximately 2.87 hectares of Sedgeland in the study area which occurs as a linear strip lining the tributary of the Molonglo River traversing the study area adjacent to its western and northern perimeter. A total of 0.95 hectares of Sedgeland occurs within the FUA boundary. This community was also found fringing a dam located in the western half of the study area on land which forms the property of "Glenloch".
Description	The structural formation of the community essentially consists of two separate strata, an upper groundcover layer of tall sedges and a lower groundcover layer of small sedges. The upper groundcover layer is dominated by Common Fringe-sedge and Cumbungi <i>Typha</i> spp. The lower groundcover layer included Tall Sedge, Swamp Dock <i>Rumex brownii</i> , Bidgee Widgee, Rush, Willow Herb <i>Epilobium billardioreanum</i> , <i>Cynoglossum austral</i> and <i>Eleocharis acuta</i> . Exotic species found within this community are predominantly water and animal dispersed including Shivery Grass <i>Briza minor</i> , Umbrella Sedge, Cocksfoot Grass, Tall Fescue, Yorkshire Fog <i>Holcus lanatus</i> , Nasturtium, Lambs Tongues, Phalaris, Annual Speargrass, Fleabane, Wild Oats and Broadleaf Dock <i>Rumex obtusifolius</i> .
Condition	The patches of Sedgeland are in poor to moderate condition throughout the majority of the stretch along the tributary to the Molonglo River as well as along the perimeter of the dam. The community has disjunct structural layers and has a moderate level of weed ingress. The community possesses low to moderate species diversity and a moderate cover abundance of native species. This community displays some regenerative potential, relying mainly on aquatic birds as a seed source and may improve in response to ecological restoration.
Associated soils, rainfall and landscape position	The Sedgeland occurring throughout the study area occupies stretches of the Molonglo River tributaries and the main dam of "Glenloch" which contain slow flowing or still water. These patches of Sedgeland occur between 520– 592 metres above sea level. Soils associated with Sedgeland comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed
Threatened species / fauna habitat	The Sedgeland within the study area is not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. The Sedgeland community contains a variety of ecological features which may form habitat for generalist species within the locality including roosting and foraging habitat for aquatic birds and potential foraging habitat for the Migratory Eastern Giant Egret <i>Ardea modesta</i> .

Sedgeland



Plate 8 Sedgeland

Revegetated Land

Extent within the study area	<p>There is approximately 17.15 hectares of land within the study area which is currently undergoing a revegetation and ecological restoration program administered by Greening Australia. Of this, only 3.07 hectares of revegetated land occurs within the FUA boundary. These revegetated zones are located within the south – western corner of the eastern half of the study area adjacent to the Pine Plantation.</p>
Description	<p>The structural formation of the community currently consists of a single stratum, a ground-layer of revegetated groundcover plants and sapling shrubs and trees. Species used for revegetation in this area include Broad – leaved Peppermint, Yellow Box, Red Gum, Snow Gum, Red – stemmed Wattle, Silver Wattle, Kangaroo Grass, False Sarsparilla <i>Hardenbergia violacea</i>, Many-flowered Mat-rush, Clustered Everlasting <i>Chrysocephalum semipapposum</i>, Common Everlasting, Tussock Grass, Weeping Grass and Native Raspberry <i>Rubus parvifolius</i>. Exotic species found within this community are predominantly animal dispersed including Wild Oats, Vervain, Blanket Weed, Rat's Tail Fescue, Proliferous Pink, Scotch Thistle, Prickly Lettuce, St Johns Wort, Buchan Weed, Fleabane and Saffron Thistle.</p>
Condition	<p>The patches of Revegetated Land are in moderate condition throughout and are visibly benefitting from the current regime of ecological restoration and post – revegetation maintenance. The plantings all looked visibly healthy with no visible sign of plant pathogens present. The community possesses low to moderate species diversity and a moderate cover abundance of native species. This community displays regenerative potential and is visibly benefitting from the revegetation and ecological restoration program.</p>
Associated soils, rainfall and landscape position	<p>The Revegetated Land occurring within the study area is mainly concentrated in the south – west corner of the eastern half of the study area, within the western perimeter of the Molonglo River Park. The Revegetated Land is creating a buffer zone between the</p>

Revegetated Land	
	Molonglo River Park and the Molonglo Valley Stage 3 Development Area. The Revegetated Land occurs on land between 540– 592 metres above sea level. Soils associated with Revegetated Land areas comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed
Threatened species / fauna habitat	The Revegetated Land zones within the study area are not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. The Revegetated Land zones contain very few ecological features which may form habitat for generalist species within the locality, mainly limited foraging habitat for Eastern Grey Kangaroos <i>Macropus giganteus</i> and other opportunistic species.

Exotic Pasture	
Extent within the study area	There is approximately 528.79 hectares of Exotic Pasture which covers the majority of the study area, of which 408.44 hectares occurs within the FUA boundary. This community predominantly occupies flats and low rises throughout the landscape. There were four distinct sub-communities defined by their dominant species being: Wild Oats dominant. Rat's Tail Fescue dominant. Phalaris dominant. Barley Grass dominant.
Description	The structural formation of the community consists of defined single strata, a groundcover layer of perennial exotic grasses and herbaceous annuals. The groundcover layer is dominated by Wild Oats, Barley Grass, Rat's Tail Fescue or Phalaris and contains the following species Sheep Sorrel <i>Acetosella vulgaris</i> , Soft Brome, Scotch Thistle, Saffron Thistle, Fleabane, Cocksfoot Grass, Goose Grass, Blanket Weed, Buchan Weed, St John's Wort, Catsear, Perennial Rye Grass and Blackberry. There are a small number of native species as widely scattered individuals throughout this community including Cotton Fireweed <i>Senecio quadridentatus</i> , Wiry Dock, Pigweed <i>Portulaca oleracea</i> , Weeping Grass, Twining Glycine, Climbing Saltbush, Pink Bindweed <i>Convolvulus erubescens</i> , Rough Speargrass and Yanganbil,
Condition	The patches of Exotic Pasture are in poor condition throughout the majority of the study area with only a few scattered grazing tolerant native grasses and herbs found in a widely dispersed distribution. The remainder of the community is comprised completely of exotic grasses and herbaceous annuals, accounting for approximately 98% cover. This community displays negligible regenerative potential and is highly unlikely to improve in response to ecological restoration.
Associated soils, rainfall and landscape position	The Exotic Pasture occurring throughout the study area occupies vast stretches of land which is subject to a continuous grazing regime. These patches of Exotic Pasture occur between 520– 615 metres above sea level. Soils associated with the Exotic Pasture community comprise the Burra and Williamsdale transferral soil landscapes. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed
Threatened species / fauna habitat	The Exotic Pasture within the study area is not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. The Exotic Pasture contains a variety of

Exotic Pasture

ecological features which may form habitat for generalist species within the locality including foraging habitat for the Little Eagle. Three Hollow-bearing trees were recorded within this community which may form roosting habitat for local avifauna, arboreal mammals and microbats. In particular, there is potential poor quality habitat present for the Pink-tailed Worm-lizard in the form of rocky outcrops of volcanic origin.



Plate 9 Exotic Pasture

Pine Plantation

Extent within the study area	There is approximately 264.07 hectares of Pine Plantation growing on the low hills and slopes within the central and south-east sections of the eastern half of the study area and 190.65 hectares occurs within the FUA boundary.
Description	The structural formation of the community consists of one well defined strata, a canopy layer and one under developed strata consisting of a sparse and highly disjunct groundcover layer. The canopy layer consisted entirely of Radiata Pine <i>Pinus radiata</i> . The groundcover layer comprised of Fleabane, Creeping Oxalis <i>Oxalis corniculata</i> , Blackberry and Blanket Weed. A small number of native species were found within the groundcover layer including Cotton Fireweed, Pigweed, Weeping Grass, Climbing Saltbush and Pink Bindweed.
Condition	The patches of Pine Plantation are in poor ecological condition throughout their extent with only a few native species managing to retain a foothold primarily in patches where sunlight is able to reach the ground as a result of breaks in the canopy. This community displays negligible regenerative potential and is highly unlikely to improve in response to ecological restoration.
Associated soils, rainfall and landscape position	The Pine Plantation occurring throughout the study area occupies the majority of the land within the south-east quarter of the study area. The patches of Pine Plantation occur between 540– 615 metres above sea level. Soils associated with the Exotic Pasture community comprise the Burra transferral soil landscape. The Molonglo Valley area

Pine Plantation	
	experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed
Threatened species / fauna habitat	The Pine Plantation within the study area is not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. The Pine Plantation contains limited ecological features which may form habitat for generalist species within the locality including roosting and foraging habitat.



Plate 10 Pine Plantation

Exotic Trees and Shrubs	
Extent within the study area	There are approximately 70.24 hectares of Exotic Trees and Shrubs growing on low hills, slopes and flats in close proximity to farm buildings and the Pine Plantation and 46.23 hectares occurs within the FUA boundary.
Description	The structural formation of the community consists of two well defined strata, a canopy or midstorey layer and an understorey layer consisting of predominantly exotic grasses and herbaceous annuals. The canopy layer consists of a range of exotic ornamental species depending on location of the patch including Black Locust <i>Robinia pseudoacacia</i> , Lemon <i>Citrus x limon</i> , English Oak <i>Quercus robur</i> , Silky Oak <i>Grevillea robusta</i> , Lombardy Poplar, Hawthorn and Radiata Pine. Blackberry completely dominates this community in areas that contain a midstorey layer rather than a canopy. The groundcover layer comprises of Rat's Tail Fescue, Barley Grass, Saffron Thistle, Blanket Weed, Wild Oats, Lambs Tongues and Catsear. Native species occurring in this community are confined to Weeping Grass, Ringed Wallaby Grass, Yanganbil, Rough Speargrass and Blakely's Red Gum.

Exotic Trees and Shrubs	
Condition	The patches of Exotic Trees and Shrubs are in extremely poor ecological condition throughout their extent with only two native species amounting to only a few widely dispersed individuals. This community displays negligible regenerative potential and is highly unlikely to improve in response to ecological restoration.
Associated soils, rainfall and landscape position	The Exotic Trees and Shrubs community occurs in areas of land which exist in close proximity to farm buildings and the Pine Plantation. These patches of Exotic Trees and Shrubs occur between 545– 610 metres above sea level. Soils associated with the Exotic Pasture community comprise the Burra transferral soil landscape. The Molonglo Valley area experiences an annual average rainfall of 620 millimetres (BoM 2016a, 2016b).
Threatened ecological community	Commonwealth EPBC Act: Not Listed ACT NC Act: Not Listed
Threatened species / fauna habitat	The Exotic Trees and Shrubs community within the study area is not considered to provide habitat for threatened flora species known or likely to occur within the locality and no threatened species were detected during the site assessment. The Exotic Trees and Shrubs community contains limited ecological features which may form habitat for generalist species within the locality including roosting and foraging habitat.



Plate 11 Exotic Trees and Shrubs

4.4 Ecological Constraints

4.4.1 Hollow-bearing trees

Eighteen hollow-bearing trees were recorded within the study area of which seventeen occur within the FUA boundary (Figure 2). All of the hollow-bearing trees were Blakely's Red Gum and were estimated to be between 150 to 250 years old. One hollow-bearing tree was observed to be occupied by a breeding pair of Sulphur-crested Cockatoos *Cacatua galerita* and their chick.

The majority of the hollow-bearing native trees within the Yellow Box – Red Gum Grassy Woodland present throughout the study area and FUA boundary have a trunk diameter at breast height in excess of 50 centimetres with the largest in excess of 100 centimetres. The removal of these native Eucalypts will result in a decrease in the foraging, roosting and nesting habitat available to local and transient hollow-dependent and nectivorous fauna species, particularly the threatened Swift Parrot, Superb Parrot and the Regent Honeyeater whose habitat requirements align closely with the Yellow Box – Red Gum Grassy Woodland vegetation community footprint.

4.4.2 Pink-tailed Worm-lizard habitat

Areas of previously mapped Pink-tailed Worm-lizard habitat within the study area (Osborne and Wong 2010) were assessed to determine vegetation community composition and condition. The results of this assessment are reflected in the fauna habitat values mapping resulting from the field investigation (Figure 3: Appendix 4). Only a few patches of previously mapped Pink-tailed Worm-lizard habitat were co-incident with Box – Gum Woodland and Natural Temperate Grassland patches mapped during this vegetation classification and condition assessment whereas a large proportion of the previously mapped patches corresponded with Tableland Riparian Woodland and Burgan Tableland Shrubland. These patches could potentially form moderate to high quality habitat for the Pink-tailed Worm-lizard. The remainder of the Pink-tailed Worm-lizard habitat was aligned with Substantially Modified Native Pasture or Exotic Pasture, providing poor to moderate quality potential habitat for this species. No Pink-tailed Worm-lizards were observed over the duration of the field investigation.

4.4.3 Waterways

The Molonglo River traverses the study area for approximately 11 kilometres along the south-eastern, southern and south-western boundaries. The Molonglo River and its riparian corridor have been fenced and livestock excluded. The majority of the Molonglo River supports Tableland Riparian Woodland with the exception of the extreme south-eastern corner which grades into the Exotic Trees and Shrubs community with a dominance of European Ash *Fraxinus excelsior*, Box Elder and Willow. Evidence of gully, rill and sheet erosion was detected within the riparian corridor of the Molonglo River, primarily in areas which have experienced historical vegetation clearance and disturbance.

Two tributaries of the Molonglo River also traverse the study area, Deep Creek and Coppins Creek. Deep Creek runs 2.4 kilometres from the northern boundary of the study area along the western perimeter before flowing into the Molonglo River to the south. The other tributary, Coppins Creek, runs for 3.1 kilometres in a south-western direction from the Dam located on the property, "Glenloch", to flow into the Molonglo River. Both of these tributaries are unfenced and are freely accessed by livestock.

Deep Creek exists in higher ecological condition than Coppins Creek. Deep Creek supports the Sedgeland community adjacent to the western perimeter of the study area and supports Tableland Riparian Woodland along its northern reach. Deep Creek is host to a variety of weeds, predominantly Weeping Willow *Salix babylonica* and Phalaris. Deep Creek displays gully, rill and sheet erosion along the reach adjacent to the western perimeter of the study area, whereas the northern reach is relatively intact, although rill and sheet erosion is present.

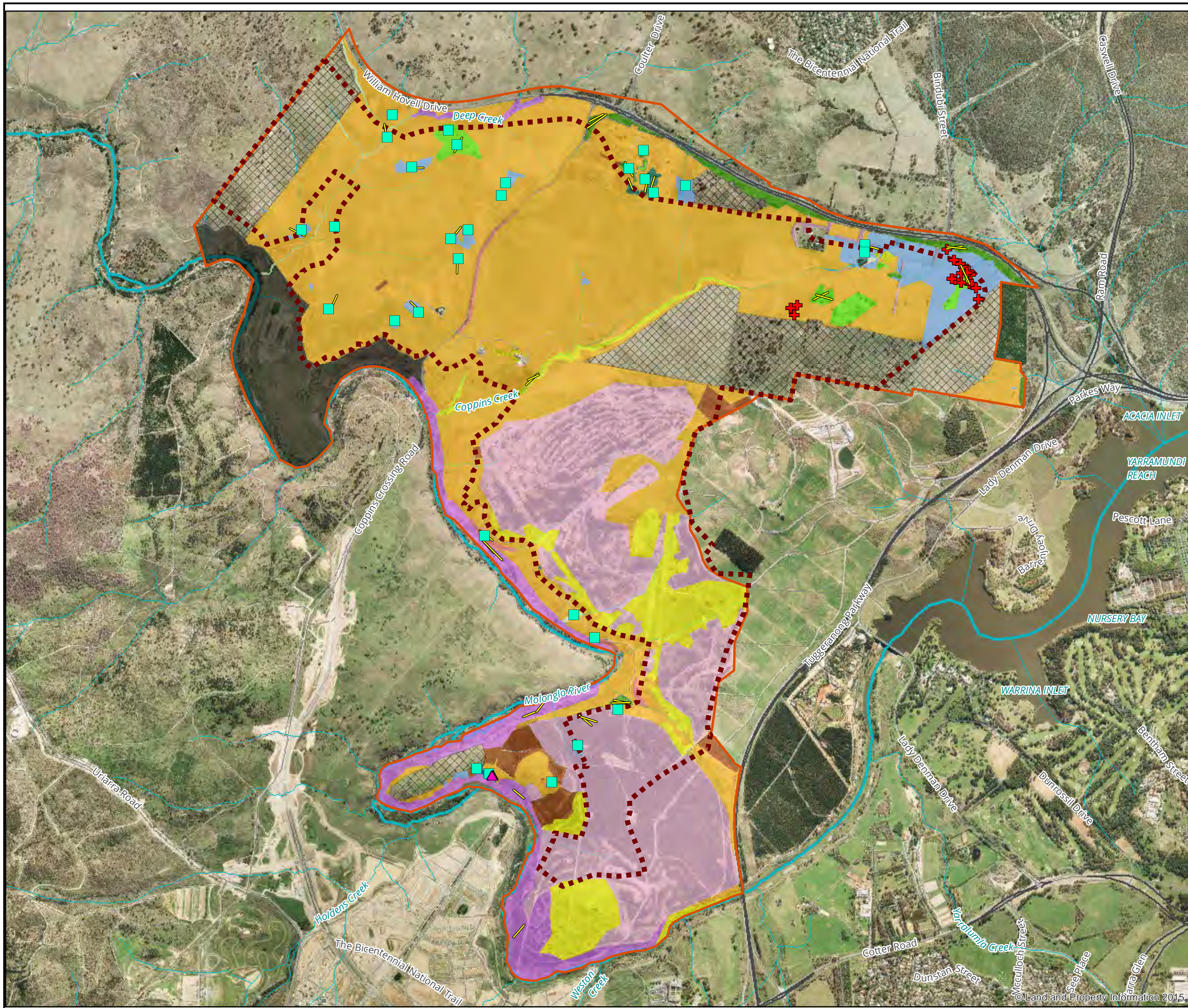
Coppins Creek is in a highly degraded condition predominantly supporting weeds such as Lombardy Poplar, Hawthorn and Blackberry. Cattle were observed to have direct access to Coppins Creek and the resulting severe soil compaction is evident. There is evidence of gully, rill and sheet erosion within close proximity to Coppins Creek in areas which lack vegetation cover.

4.4.4 Declared Pest Plants

During the site investigation sixteen (16) weeds declared noxious species under the *Pest Plants and Animals Act 2005* were recorded. These noxious weeds are outlined in Table 2 below.

Table 2 Declared pest plant species recorded in the study area.

Scientific name	Common name	Class	Management requirement
<i>Lycium ferocissimum</i>	African Boxthorn	2,4	<i>The pest plant must be suppressed and propagation and supply is prohibited.</i>
<i>Eragrostis curvula</i>	African Love Grass	3	<i>The pest plant must be contained.</i>
<i>Rubus fruticosus</i> sp. agg.	Blackberry	3,4	<i>The plant is a pest plant which must be contained and whose propagation and supply is prohibited.</i>
<i>Acer negundo</i>	Box Elder	4	<i>The plant is a pest plant whose propagation and supply is prohibited.</i>
<i>Nassella neesiana</i>	Chilean Needle Grass	3,4	<i>The plant is a pest plant which must be contained and whose propagation and supply is prohibited.</i>
<i>Acacia baileyana</i>	Cootamundra Wattle	4	<i>The plant is a pest plant whose propagation and supply is prohibited.</i>
<i>Cotoneaster glaucophyllus</i>	Cotoneaster	4	<i>The plant is a pest plant whose propagation and supply is prohibited.</i>
<i>Robinia pseudoacacia</i>	False Acacia	4	<i>The plant is a pest plant whose propagation and supply is prohibited.</i>
<i>Crataegus monogyna</i>	Hawthorn	3,4	<i>The plant is a pest plant which must be contained and whose propagation and supply is prohibited.</i>
<i>Echium plantagineum</i>	Patterson's Curse	3	<i>The pest plant must be contained.</i>
<i>Pinus radiata</i>	Radiata Pine	3	<i>The pest plant must be contained.</i>
<i>Carthamus lanatus</i>	Saffron Thistle	3	<i>The pest plant must be contained.</i>
<i>Salix</i> spp.	Willow	2,4	<i>The pest plant must be suppressed and propagation and supply is prohibited.</i>
<i>Onopordium acanthium</i>	Scotch Thistle	3	<i>The pest plant must be contained.</i>
<i>Hypericum perforatum</i>	St Johns Wort	3	<i>The pest plant must be contained.</i>
<i>Rosa rubiginosa</i>	Sweet Briar	2,4	<i>The pest plant must be suppressed and propagation and supply is prohibited.</i>



Legend

- Study area
- FUA boundary
- + Hollow-bearing trees
- ▲ Leek Orchid (*Prasophyllum* Sp.)
- Quadrat
- Transect

Vegetation community

- Moderately Modified - Yellow
- Box - Red Gum Grassy Woodland
- Substantially Modified Yellow
- Box - Red Gum Grassy Woodland
- Severely Modified Yellow
- Box - Red Gum Grassy Woodland - Paddock Trees
- Moderately Modified - Natural Temperate Grassland
- Substantially Modified - Native Pasture
- Burgan Tableland Shrubland
- Tableland Riparian Woodland
- Sedgeland
- Pine Plantation
- Revegetated Land
- Exotic Trees and Shrubs
- Exotic Pasture

Areas not surveyed

- No access
- Previously assessed

Figure 2: Vegetation communities of Molonglo 3 proposed development site, ACT - overview

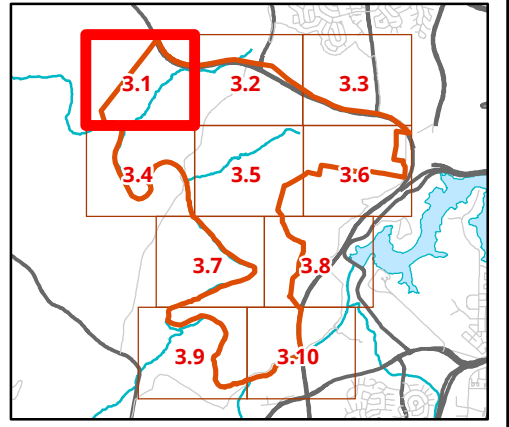
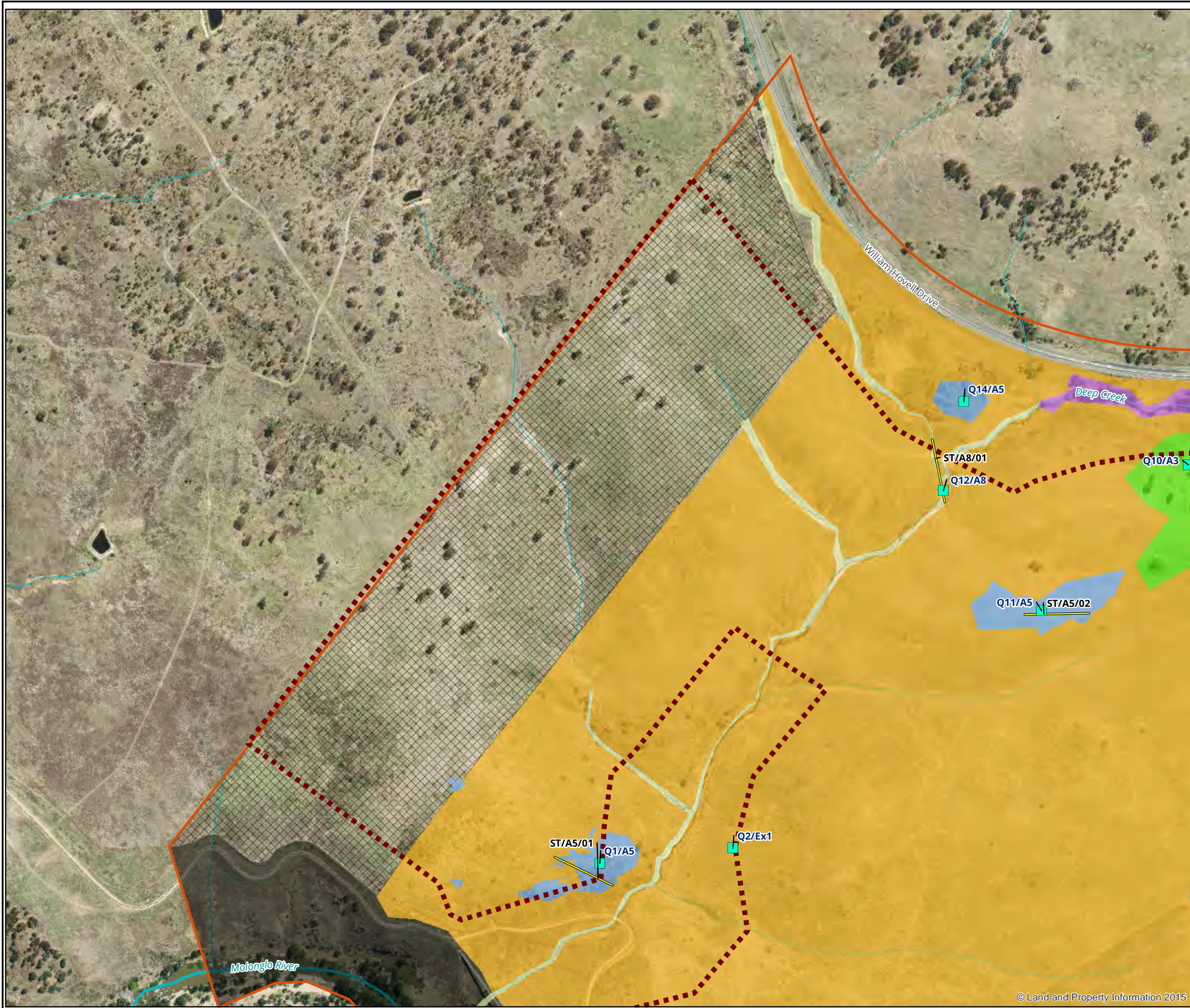
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Date: 26 February 2016,
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- Legend**
- Study area
 - FUA boundary
 - + Hollow-bearing trees
 - Quadrat
 - Transect
- Vegetation community**
- Severely Modified Yellow
 - Box - Red Gum Grassy Woodland - Paddock Trees
 - Substantially Modified - Native Pasture
 - Pasture
 - Tableland Riparian Woodland
 - Sedgeland
 - Exotic Pasture
- Areas not surveyed**
- No access
 - Previously assessed

Figure 3.1: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

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Coordinate System: GDA 1994 MGA Zone 55

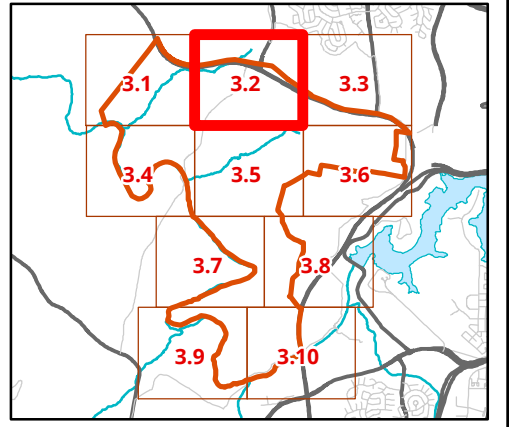
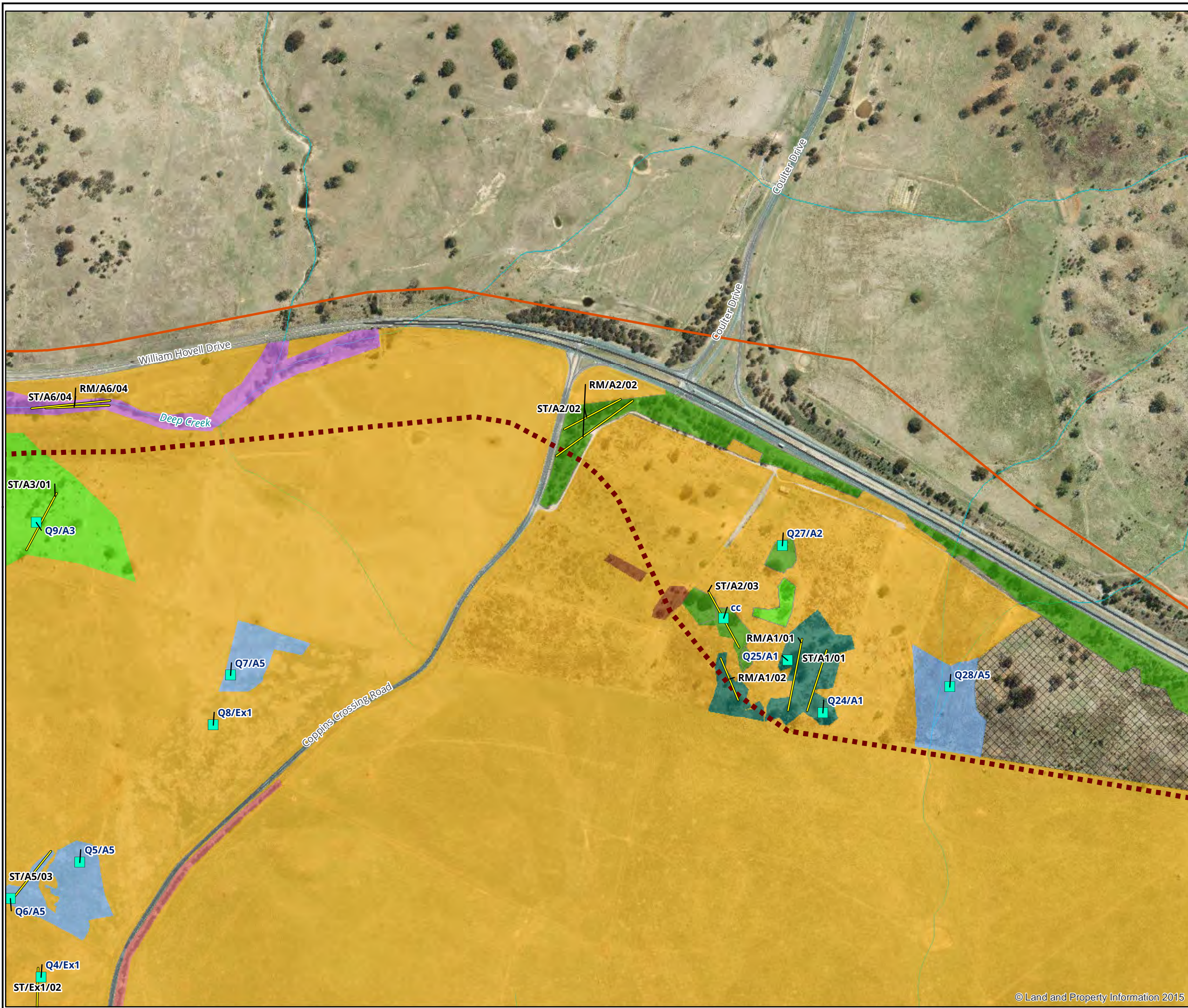
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- Legend**
- Study area
 - FUA boundary
 - + Hollow-bearing trees
 - Quadrat
 - Transect
- Vegetation community**
- Moderately Modified - Yellow
 - Box - Red Gum Grassy Woodland
 - Substantially Modified Yellow
 - Box - Red Gum Grassy Woodland
 - Severely Modified Yellow
 - Box - Red Gum Grassy Woodland - Paddock Trees
 - Substantially Modified - Native
 - Pasture
 - Burgan Tableland Shrubland
 - Tableland Riparian Woodland
 - Revegetated Land
 - Exotic Pasture
- Areas not surveyed**
- Previously assessed

Figure 3.2: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

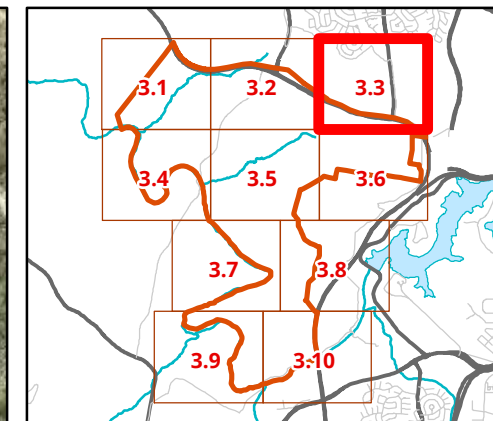
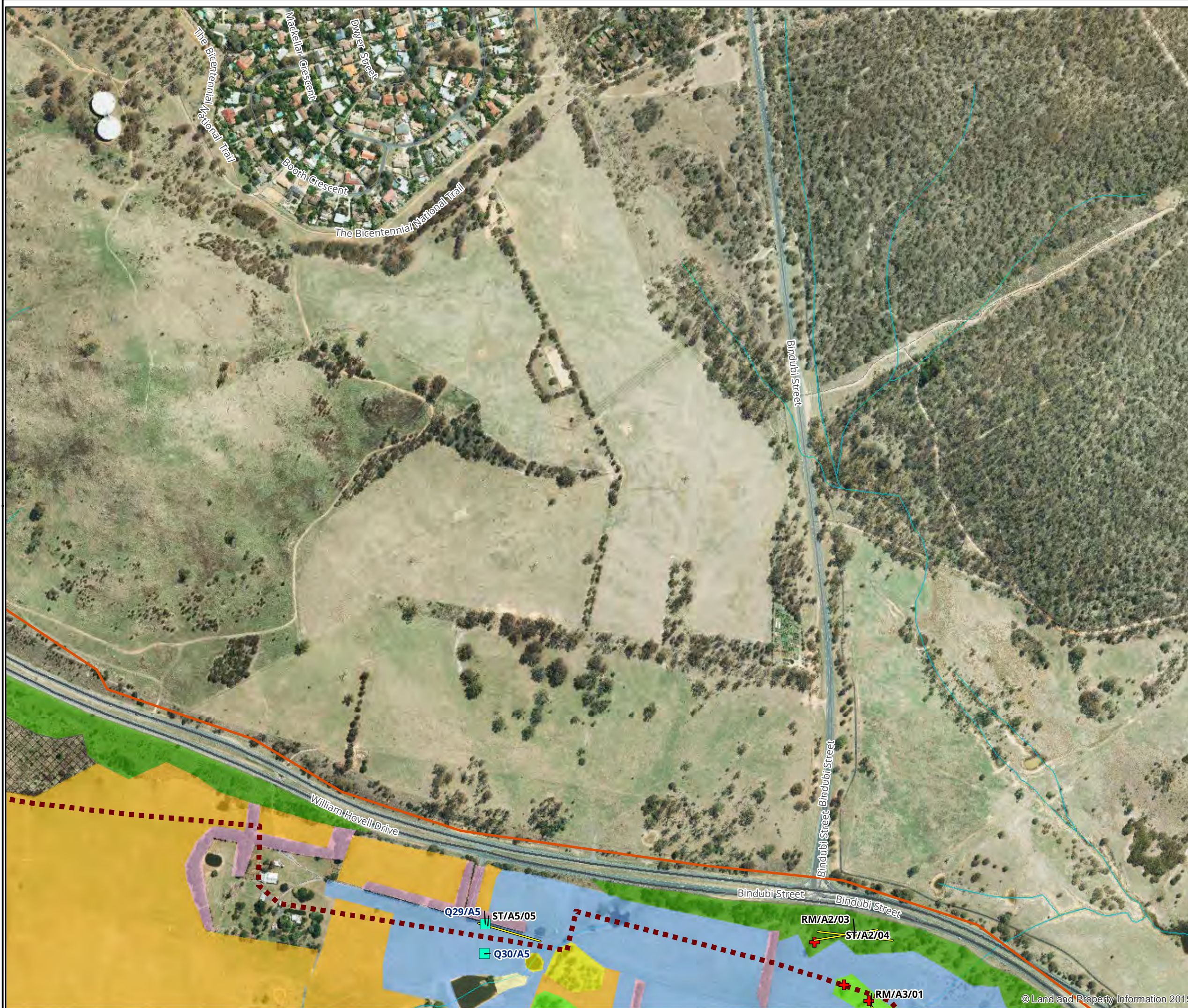
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Legend

- Study area
- FUA boundary
- + Hollow-bearing trees
- Quadrat
- Transect
- Vegetation community**
- Substantially Modified Yellow
- Box - Red Gum Grassy Woodland
- Severely Modified Yellow
- Box - Red Gum Grassy Woodland - Paddock Trees
- Substantially Modified - Native Pasture
- Pasture
- Sedgeland
- Pine Plantation
- Exotic Trees and Shrubs
- Exotic Pasture
- Areas not surveyed**
- Previously assessed

Figure 3.3: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

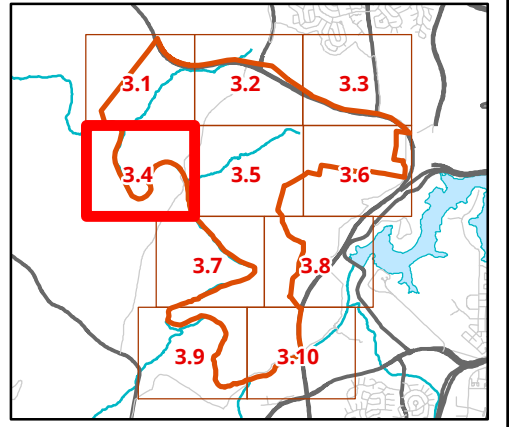
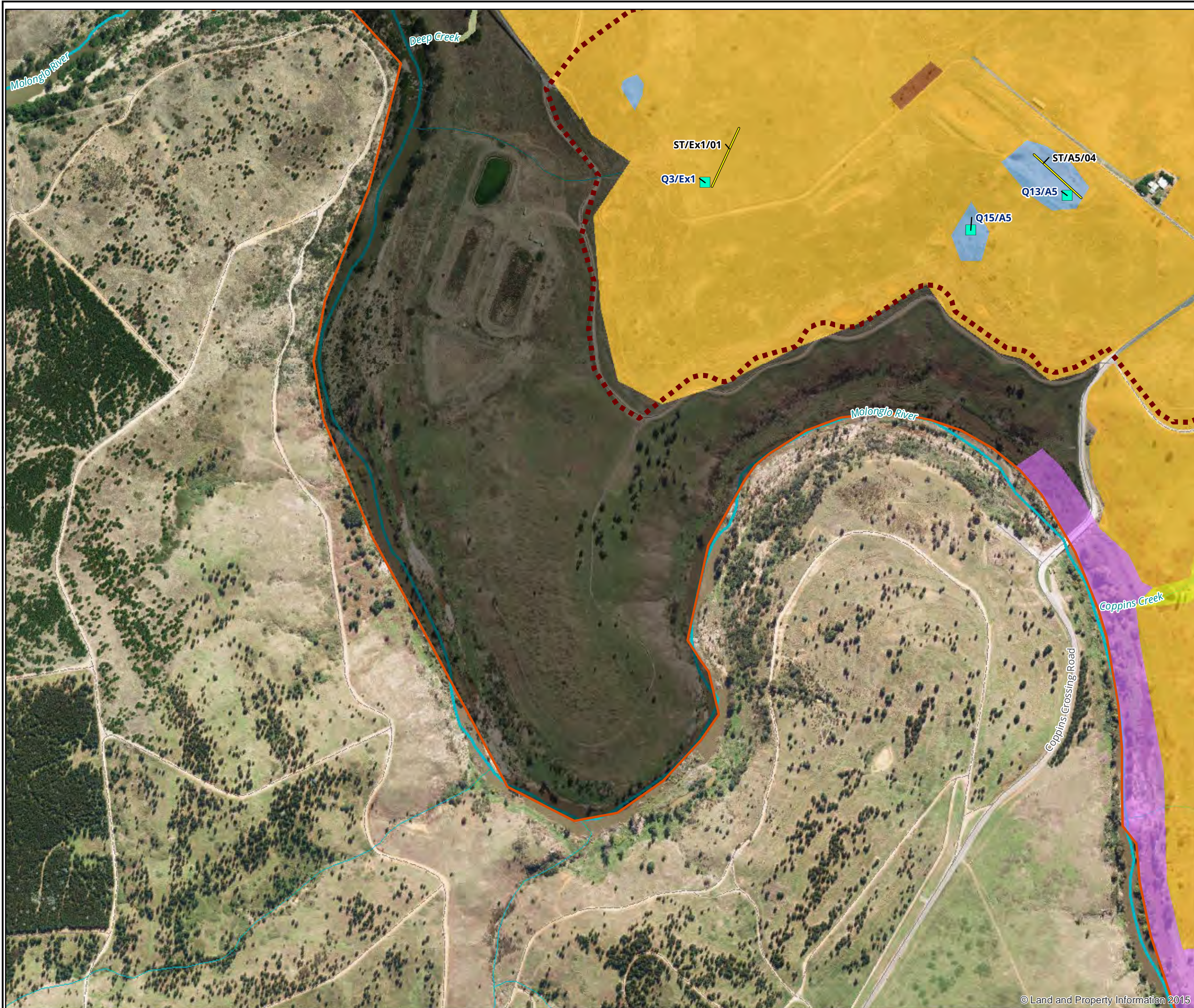
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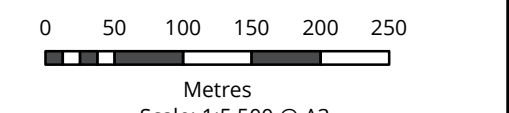
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- Legend**
- Study area
 - FUA boundary
 - + Hollow-bearing trees
 - Quadrat
 - Transect
- Vegetation community**
- Substantially Modified - Native Pasture
 - Tableland Riparian Woodland
 - Sedgeland
 - Revegetated Land
 - Exotic Trees and Shrubs
 - Exotic Pasture
- Areas not surveyed**
- No access

Figure 3.4: Vegetation communities of Molonglo 3 proposed development site, ACT - detail



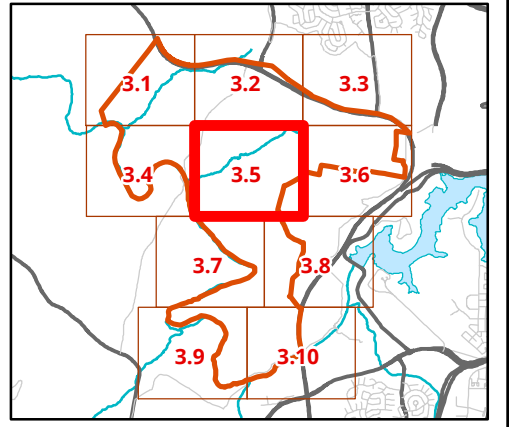
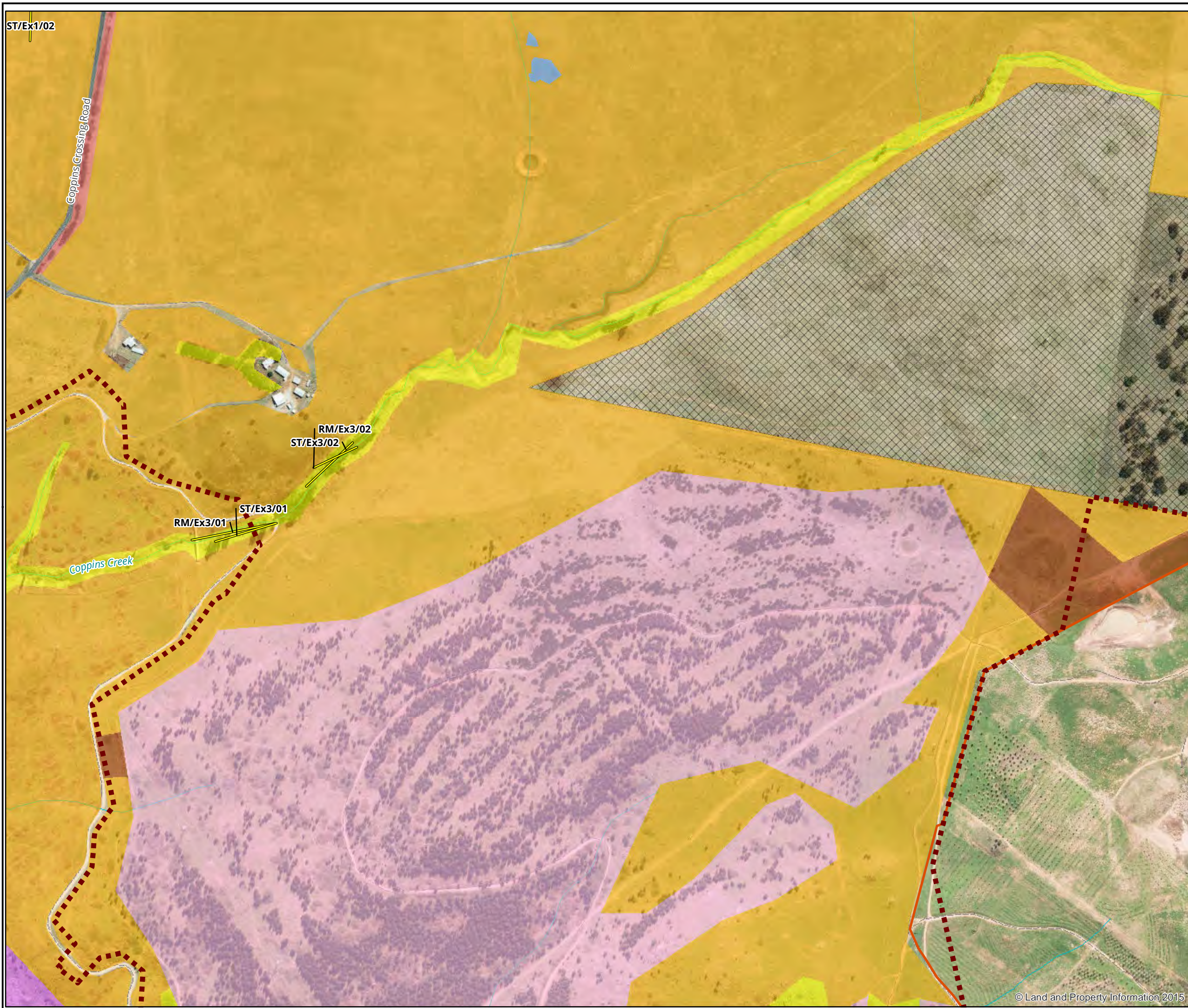
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- Legend**
- Study area
 - FUA boundary
 - + Hollow-bearing trees
 - Transect
- Vegetation community**
- Substantially Modified - Native
 - Pasture
 - Burgan Tableland Shrubland
 - Tableland Riparian Woodland
 - Pine Plantation
 - Revegetated Land
 - Exotic Trees and Shrubs
 - Exotic Pasture
- Areas not surveyed**
- Previously assessed

Figure 3.5: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

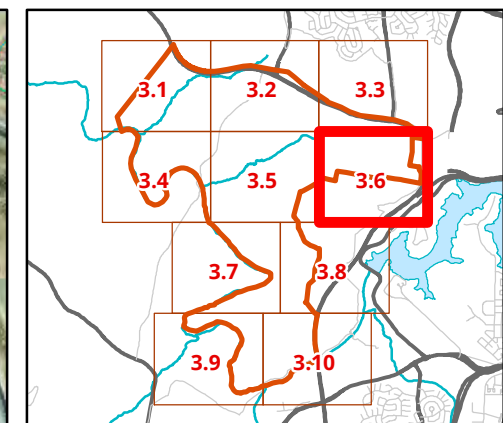
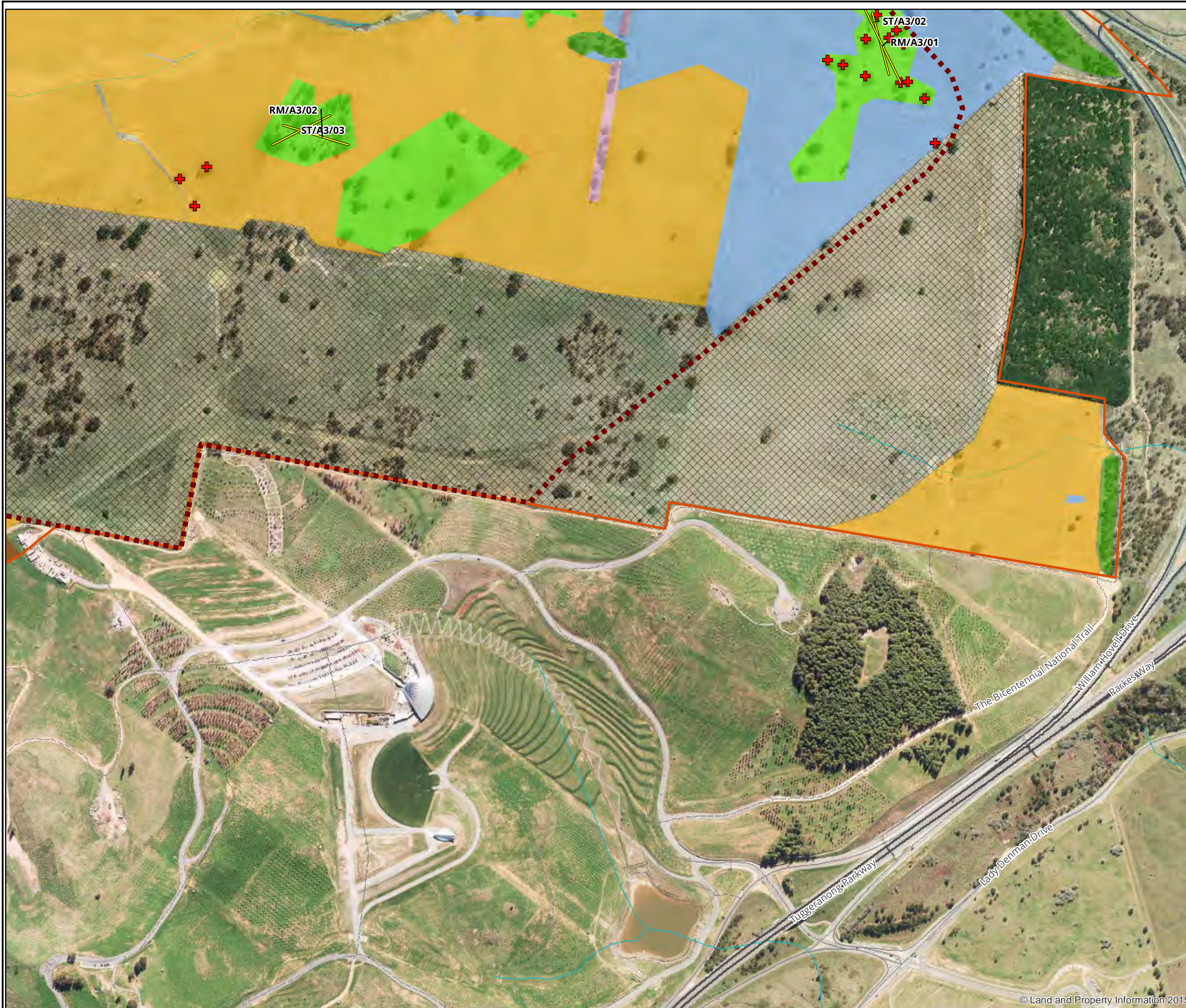
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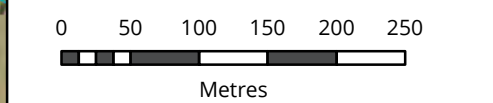
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Legend

- Study area
- FUA boundary
- + Hollow-bearing trees
- Transect
- Vegetation community**
- Substantially Modified Yellow
- Box - Red Gum Grassy Woodland
- Severely Modified Yellow
- Box - Red Gum Grassy Woodland - Paddock Trees
- Substantially Modified - Native Pasture
- Pasture
- Pine Plantation
- Revegetated Land
- Exotic Pasture
- Areas not surveyed**
- Previously assessed

Figure 3.6: Vegetation communities of Molonglo 3 proposed development site, ACT - detail



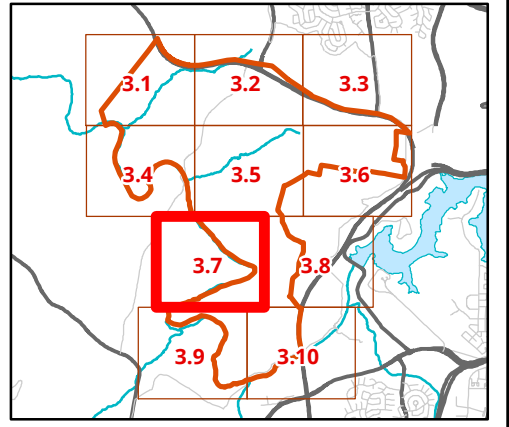
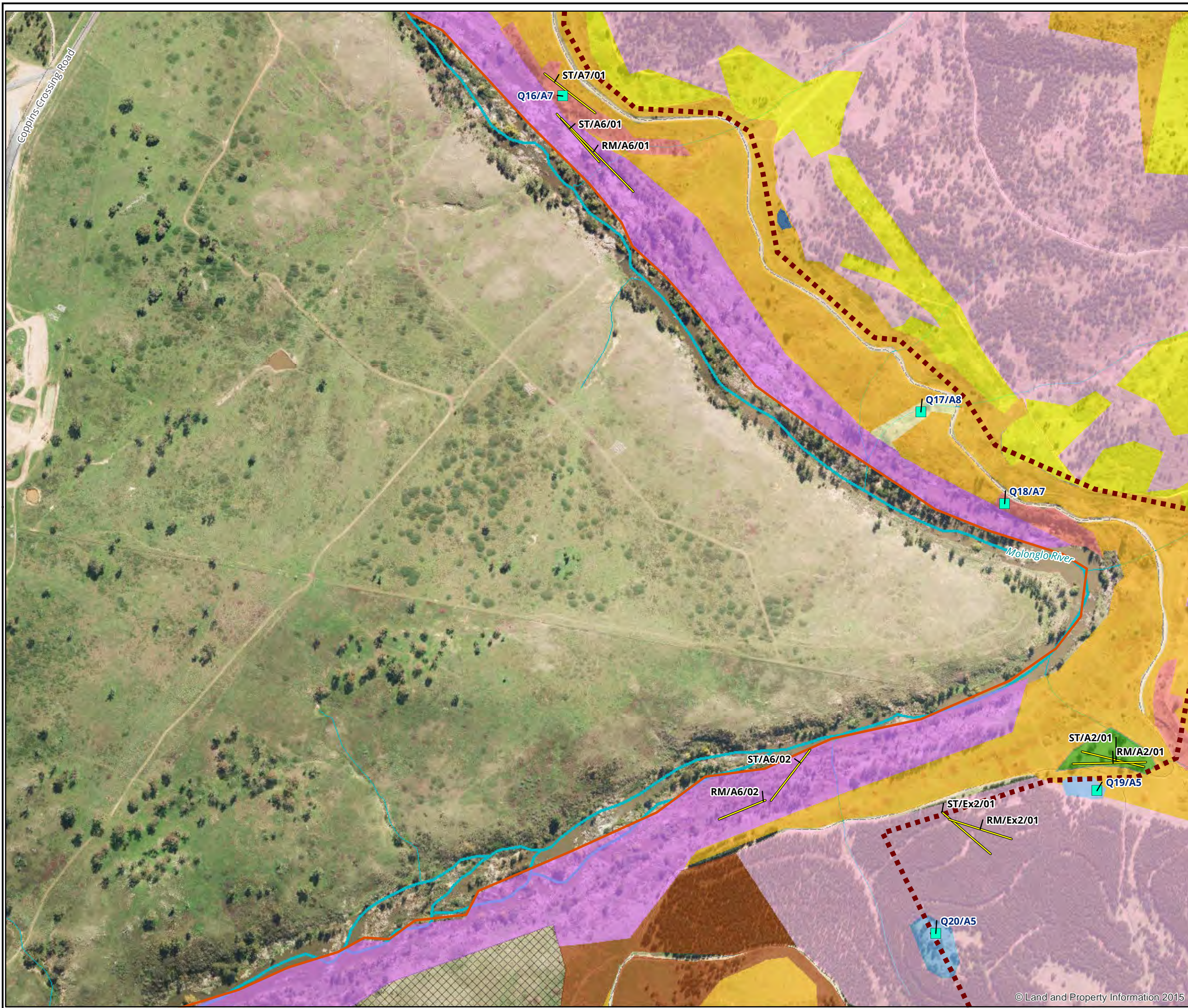
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Legend

- Study area
- FUA boundary
- + Hollow-bearing trees
- Quadrat
- Transect

Vegetation community

- Substantially Modified Yellow
- Box - Red Gum Grassy Woodland
- Moderately Modified - Natural Temperate Grassland
- Substantially Modified - Native Pasture
- Burgan Tableland Shrubland
- Tableland Riparian Woodland
- Sedgeland
- Pine Plantation
- Revegetated Land
- Exotic Trees and Shrubs
- Exotic Pasture

Areas not surveyed

- Previously assessed

Figure 3.7: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

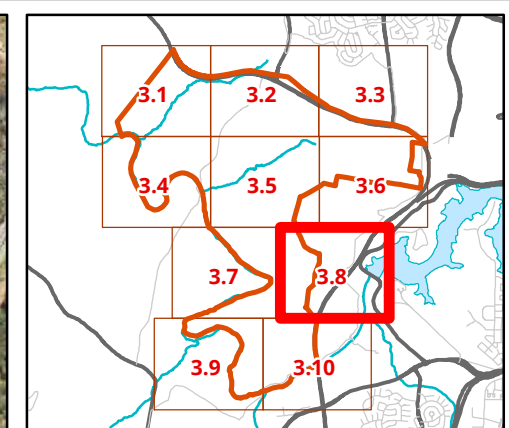
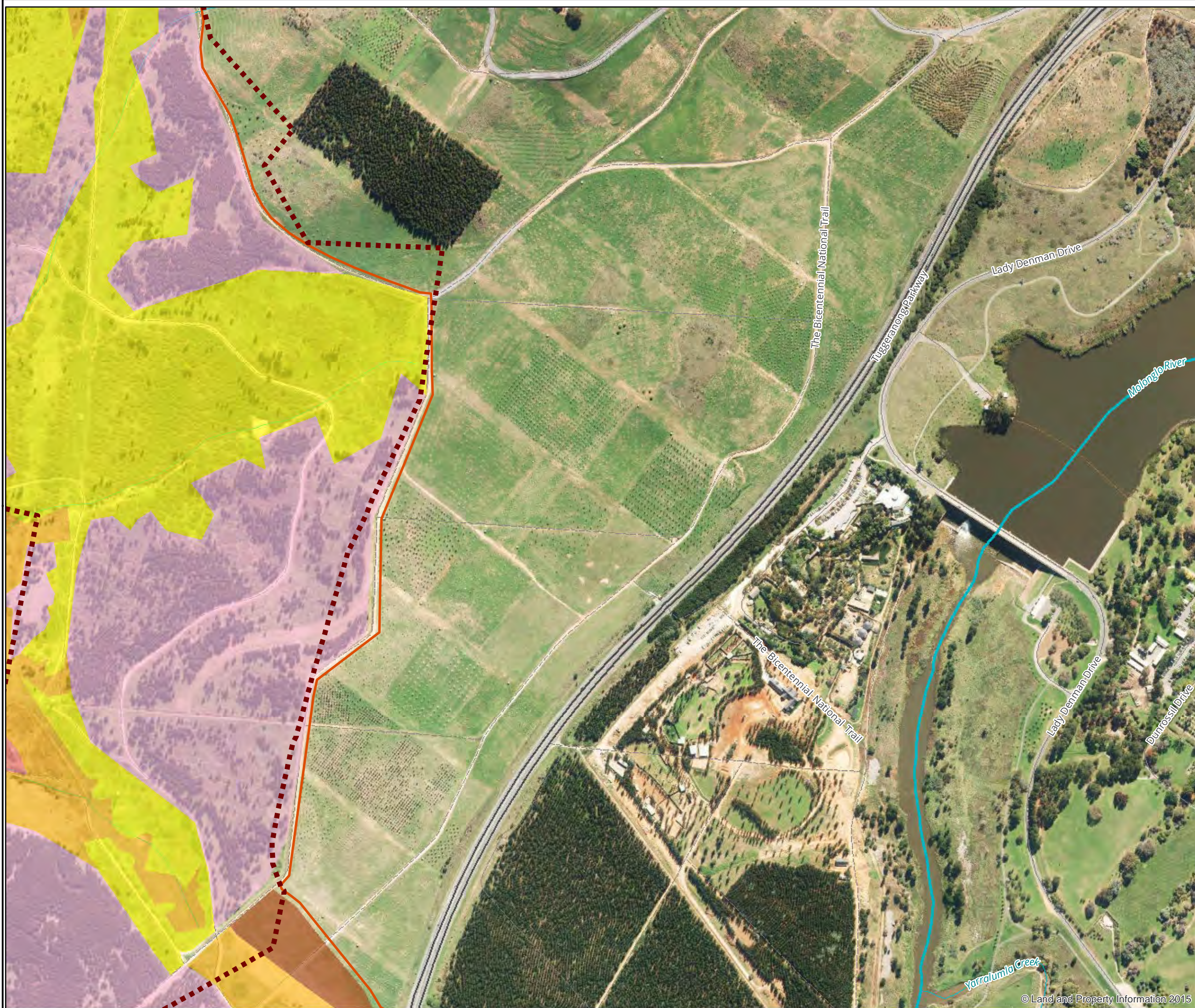
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Legend

- Study area
- FUA boundary
- + Hollow-bearing trees

Vegetation community

- Burgan Tableland Shrubland
- Pine Plantation
- Revegetated Land
- Exotic Trees and Shrubs
- Exotic Pasture

Figure 3.8: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

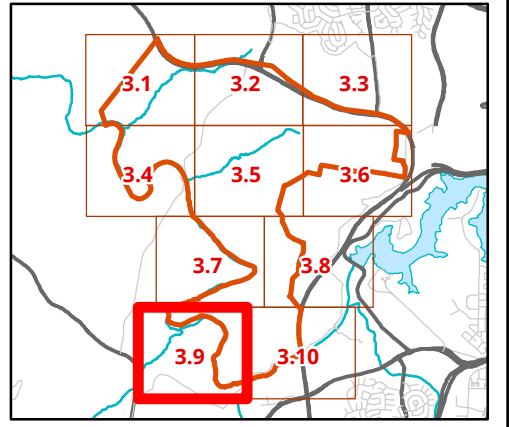
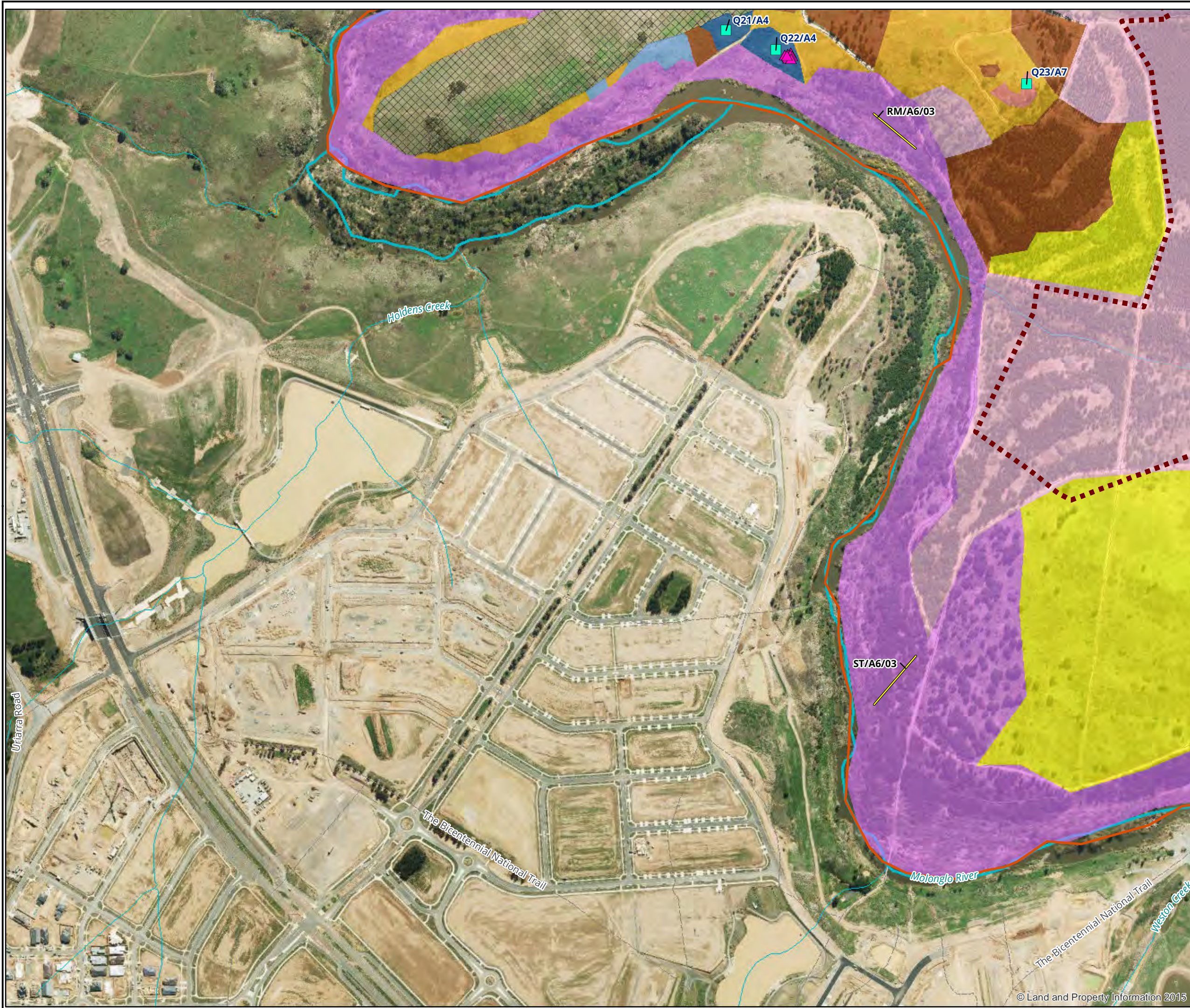
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Location: P:\21500s\21593\Mapping\21593_E3_VegComms_Detail



Legend

- Study area
- FUA boundary
- + Hollow-bearing trees
- ▲ Leek Orchid (*Prasophyllum* Sp.)
- Quadrat
- Transect

Vegetation community

- Moderately Modified - Natural Temperate Grassland
- Substantially Modified - Native Pasture
- Burgan Tableland Shrubland
- Tableland Riparian Woodland
- Pine Plantation
- Revegetated Land
- Exotic Trees and Shrubs
- Exotic Pasture

Areas not surveyed

- Previously assessed

Figure 3.9: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

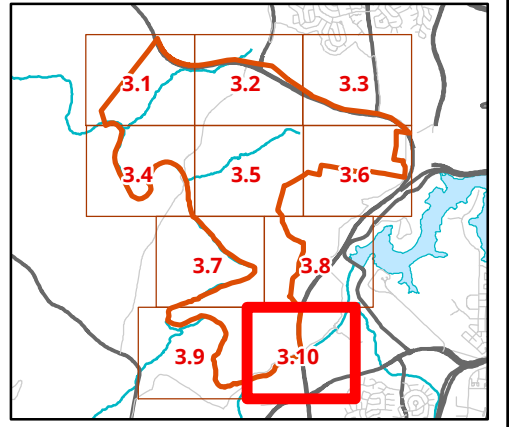
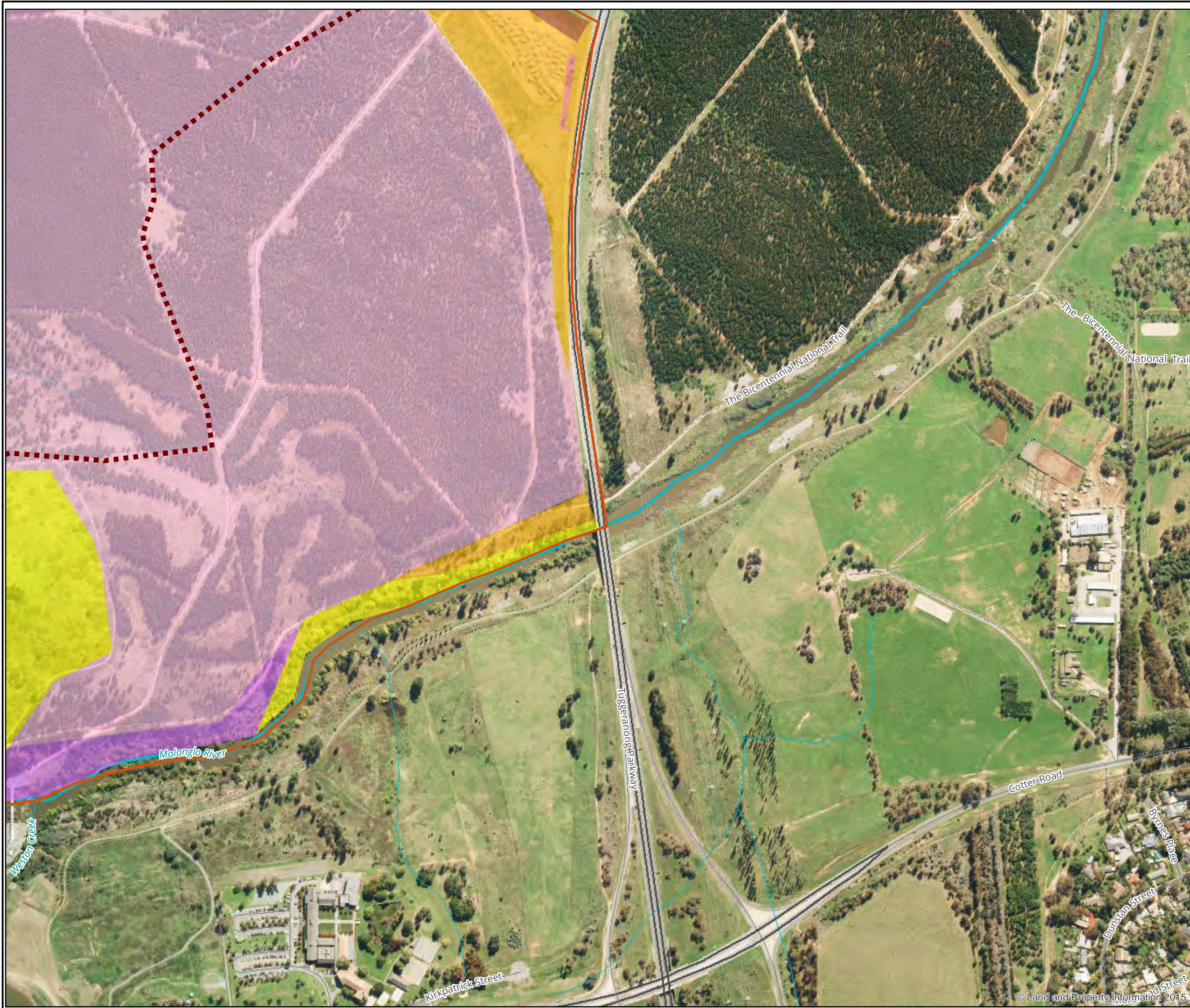
0 50 100 150 200 250
Metres
Scale: 1:5,500 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Matter: 21593
Date: 02 March 2016,
Checked by: NRT, Drawn by: JMS, Last edited by: Iharley
Location: P:\21500s\21593\Mapping\21593_E3_VegComms_Detail



- Legend**
- Study area
 - FUA boundary
 - + Hollow-bearing trees
- Vegetation community**
- Burgan Tableland Shrubland
 - Tableland Riparian Woodland
 - Pine Plantation
 - Revegetated Land
 - Exotic Trees and Shrubs
 - Exotic Pasture

Figure 3.10: Vegetation communities of Molonglo 3 proposed development site, ACT - detail

0 50 100 150 200 250
Metres
Scale: 1:5,500 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Date: 02 March 2016,
Checked by: NRT, Drawn by: JMS, Last edited by: Iharley
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4.5 Threatened biota

Threatened biota includes all flora and fauna species, populations and ecological communities listed under the EPBC Act and NC Act.

No areas of critical habitat for flora or fauna have been declared within the study area.

Two EECs, Box – Gum Woodland (NC Act) and Natural Temperate Grassland (EPBC and NC Act) were recorded in the study area and FUA boundary during the field investigation.

No threatened flora or fauna species were detected during the site investigation, although one population of a Leek Orchid which could not be identified to species level was detected within the study area but not located within the FUA boundary. Confirmation of the species of this Leek Orchid is required as it has the potential to be the threatened Tarengo Leek Orchid. A summary of all threatened flora and fauna species which have a medium or higher likelihood of occurring in the study area is provided in Table 3 below.

One Migratory species was recorded within the study area during the site investigation, being the Rainbow Bee-eater *Merops ornatus*.

Table 3 Summary of threatened biota occurring or likely to occur in the study area

Name	Status		Area of value within the subject site
	EPBC Act	NC Act	
Communities			
Yellow Box – Red Gum Grassy Woodland	CE	E	1.80 hectares of the CEEC, Box - Gum Woodland (EPBC Act and NC Act) occurs within the study area of which 0.28 hectares occurs within the FUA boundary, predominantly on a hilltop which is inaccessible to cattle in the north section of the study area.
Natural Temperate Grassland	E	E	0.75 hectares of the EEC, Natural Temperate Grassland (EPBC Act and NC Act) is present within the study area of which 0.05 hectares occurs within the FUA boundary (Section 4.3). Minimal weeds are present in the understorey strata of the Natural Temperate Grassland community and it exhibits moderate species diversity with a Flora Value score of 19. The Natural Temperate Grassland is considered to be in moderate to good condition.
Flora			
Button Wrinklewort	E	E	A total of 2.55 hectares of potential habitat for the Button Wrinklewort is present in the form of Box - Gum Woodland EEC (NC Act) and the Natural Temperate Grassland EEC patch (EPBC and NC Act) within parts of the study area inaccessible to cattle. A total of 0.34 hectares occur within the FUA boundary. It is noted however that this species is relatively conspicuous when present and it has not been recorded within the study area to date.
Hoary Sunray	E	-	A total of 2.55 hectares of potential habitat for the Hoary Sunray is present in the form of Box - Gum Woodland EEC (NC Act) and the Natural Temperate Grassland EEC (EPBC and NC Act) within parts of the study area inaccessible to cattle. A total of 0.34 hectares occur within the FUA boundary.
Small Purple-pea	E	E	A total of 2.55 hectares of potential Small Purple-pea habitat is present in the form of Box - Gum Woodland EEC (NC Act) and the Natural Temperate Grassland EEC (EPBC and NC Act) within parts of the study area

Name	Status	Area of value within the subject site	
		inaccessible to cattle. A total of 0.34 hectares occur within the FUA boundary.	
Tarengo Leek Orchid	CE	E	A total of 2.55 hectares of potential Tarengo Leek Orchid habitat is present in the form of Box - Gum Woodland EEC (NC Act) and the Natural Temperate Grassland EEC (EPBC and NC Act) within parts of the study area inaccessible to cattle. A total of 0.34 hectares occur within the FUA boundary.
Fauna			
Glossy Black Cockatoo	-	V	56.03 hectares of potential foraging habitat for the Glossy Black Cockatoo occurs within and in close proximity to the study area, none of which occurs within the FUA boundary. Habitat features for this species include riparian woodland containing Swamp She-Oak (Figure 3, Appendix 4).
Pink-tailed Worm-lizard	V	V	The Pink-tailed Worm-lizard has previously been detected within the study area and surrounds during past surveys (Osborne and Wong 2010, Umwelt 2015b). A total of 117.46 hectares of potential Pink-tailed Worm-lizard habitat is present in the form of rock outcrops of Silurian volcanic origin combined with Natural Temperate Grassland EEC (EPBC and NC Act), Box - Gum Woodland EEC (NC Act), Native Pasture and Tableland Riparian Woodland patches within the study area. A total of 36.70 hectares occur within the FUA boundary (Figure 3, Appendix 4).
Rainbow Bee-eater	M	-	One Rainbow Bee-eater was observed during the field assessment component of this vegetation mapping review. 56.03 hectares of potential Rainbow Bee-eater habitat exists in bushland overlying sandy or sandy loam soils within the vicinity of the Molonglo River and tributaries of which none occurs in the FUA boundary.
Superb Parrot	V	V	The Superb Parrot has previously been detected within the study area and surrounds during past surveys (Umwelt 2015b). A total of 26.79 hectares of potential Superb Parrot foraging, roosting and breeding habitat occurs within the study area, corresponding with the area occupied by Yellow Box - Red Gum Grassy Woodland community. A total of 12.81 hectares occur within the FUA boundary (Figure 3, Appendix 4).
Swift Parrot	E	V	The Swift Parrot has previously been detected within the study area and surrounds during past surveys (Umwelt 2015b). A total of 26.79 hectares of potential Swift Parrot foraging, roosting and breeding habitat occur within the study area, corresponding with the area occupied by Yellow Box - Red Gum Grassy Woodland. A total of 12.81 hectares occur within the FUA boundary (Figure 3, Appendix 4).
Little Eagle	-	V	947.02 hectares of foraging habitat for the Little Eagle occurs throughout the study area. Habitat features for this species include abundance of prey species such as the European Rabbit. A total of 686.04 hectares occur within the FUA boundary (Figure 3, Appendix 4).

5 Ecological impacts and recommendations

This section identifies the potential impacts of the Proposal on the ecological values of the study area and includes recommendations to assist the ACT Land Development Agency to design the Molonglo Valley Stage 3 Development Area in a manner that avoids and minimises impacts on biodiversity to the fullest extent practicable.

5.1 Ecological impacts

The principal means to reduce impacts on biodiversity values within the study area will be to minimise removal of native vegetation and associated flora and fauna habitats. Impacts were calculated using the GIS Shapefile of the FUA boundary under the Territory Plan 2016 as the outer limit of the projected impact area. Under the NES Plan, 686.03 hectares of vegetation existing within the FUA boundary of the Molonglo Valley Stage 3 Development Area is designated for removal, comprising of 40.72 hectares of native vegetation and 645.31 hectares of exotic vegetation. Native vegetation to be removed (or modified) includes:

- 12.81 hectares of Box - Gum Woodland including:
 - 0.28 hectares of the EPBC and NC Act EEC, Moderately Modified - Yellow Box – Red Gum Grassy Woodland (potential to be modified only).
 - 0.57 hectares of Substantially Modified Yellow Box – Red Gum Grassy Woodland (not meeting the listing criteria for the threatened Box – Gum Woodland community).
 - 11.96 hectares of Severely Modified Yellow Box – Red Gum Grassy Woodland – Paddock Trees (not meeting the listing criteria for the threatened Box – Gum Woodland community).
- 22.47 hectares of Natural Temperate Grassland including:
 - 0.05 hectares of the EPBC and NC Act listed EEC Moderately Modified - Natural Temperate Grassland.
 - 22.42 hectares of Substantially Modified - Native Pasture (not meeting the listing criteria for the threatened Grassland community).
- 1.40 hectares of Burgan Tableland Shrubland.
- 0.95 hectares of Sedgeland.

Initial investigation of vegetation communities and floristic composition within the FUA boundary of the Molonglo Stage 3 Development Area has been instrumental in determining the extent and location of high value conservation areas and modified areas of low value which are most suitable for development, informing the Proposal's design. The NES Plan created for the Proposal has preserved areas of high conservation value land in the study area within three conservation areas, being Kama Nature Reserve, Molonglo River Park and Block GG which are to be left in situ. These measures combined result in the conservation of approximately 687 hectares of native vegetation including Box – Gum Woodland and Native Temperate Grassland. A review of the NES Plan in addition to the results of this vegetation mapping review has determined that the current Proposal for the Molonglo Stage 3 Development Area presents minimal loss of moderate to high condition native vegetation.

Subsequent to the vegetation mapping review, it was determined that the small isolated patches of the NC Act listed EEC Yellow Box – Red Gum Grassy Woodland, comprising of 1.80 hectares in the study area, is congruent with land designated as Open Urban Space under the Territory Plan FUA. This 1.80 hectare area of Box – Gum Woodland EEC is in addition to that which has been previously mapped in the NES Plan for the Proposal, of which only 0.28 hectares falls within the FUA boundary. The potential modification of the Box – Gum Woodland EEC as a result of activities associated with the proposed rezoning as Public Open Space under the Territory FUA will result in the potential reduction in habitat availability in the region for species associated with this community, including numerous threatened flora and fauna as described in Table 3.

The proposal will also result in the removal of one of the small isolated patches of Natural Temperate Grassland comprising of 0.05 hectares of the EEC Natural Temperate Grassland (EPBC and NC Act). The removal of 0.05 hectares of the Natural Temperate Grassland EEC is additional to that already assigned to be removed under the NES Plan for the Proposal. This will result in the reduction of foraging, breeding and dispersal habitat for associated flora and fauna such as the Pink-tailed Worm-lizard. The other two patches of Natural Temperate Grassland comprising of 0.70 hectares of the EEC Natural Temperate Grassland (EPBC and NC Act) are to be conserved under the NES Plan.

A summary of the potential implications of future development of the study area and recommendations to minimise projected impacts is provided in Table 4 below.

5.2 Recommendations

Table 4 provides our recommendations to avoid, minimise and mitigate impacts associated with the Proposal on the following ecological constraints:

- Modification of 0.28 hectares of Yellow Box – Red Gum Grassy Woodland EEC (EPBC and NC Act).
- Removal of a total of 0.05 hectares of Natural Temperate Grasslands EEC (EPBC and NC Act).
- Reduction of 36.70 hectares of foraging, breeding and dispersal habitat for the Pink-tailed Worm-lizard (EPBC Act and ACT NC Act listed).
- Reduction of 12.82 hectares of potential foraging and roosting habitat for the Superb Parrot and Swift Parrot (ACT NC Act listed).
- Reduction of 0.34 hectares of potential habitat for the Hoary Sunray, Small Purple-pea, Button Wrinklewort and Tarengo Leek Orchid.
- Increased isolation of remnant patches of Yellow Box – Red Gum Grassy Woodland EEC (NC Act) and Natural Temperate Grasslands EEC (EPBC and NC Act).
- Potential removal of 17 hollow-bearing trees (Key Threatening Process listed under the EPBC Act).
- Potential for altered surface flows impacting on the nearby waterways of the Molonglo River and its tributaries.
- Potential increase in diversity, abundance and range of noxious weeds, Weeds of National Significance (WoNS), environmental weeds and garden escapes.

Table 4 Ecological values, impacts and recommendations

Ecological value (Figure 3)	Impacts	Recommendations		
		Avoid	Minimise and mitigate	Offset
Native vegetation including trees	<p>40.72 hectares of native vegetation in the form of Grassy Woodland, Native Grassland and Riparian Woodland will be cleared or modified as part of the current proposal including the following TECs:</p> <ul style="list-style-type: none"> 0.28 hectares of Box – Gum Woodland EEC (EPBC and NC Act) to be modified. 0.05 hectares of Natural Temperate Grassland EEC (EPBC and NC Act) 	<p>Risk of impacts to the EEC Box – Gum Woodland (EPBC and NC Act) and the EEC Natural Temperate Grassland (EPBC and NC Act) can be managed by implementing appropriate safeguards to avoid, mitigate or offset projected impacts associated with alterations to land use resulting from rezoning, including:</p> <ul style="list-style-type: none"> Avoid modification of Box – Gum Woodland EEC (NC Act) and clearing of Natural Temperate Grassland EEC (EPBC and NC Act) if feasible. Explore rezoning options which allow all patches of Box – Gum Woodland EEC (EPBC and NC Act) and Natural Temperate Grassland EEC (EPBC and NC Act) to be protected. 	<ul style="list-style-type: none"> Fence off patches of Box – Gum Woodland and Natural Temperate Grassland to be retained and mark as no-go zones. Minimise the extent of modification and/or clearing of Box – Gum Woodland and Natural Temperate Grassland as much as possible. Minimise impacts from vegetation clearance via revegetation using native species specific to Box – Gum Woodland and Natural Temperate Grassland of local provenance along the urban interface of all conservation areas as well as for street plantings, parklands and drainage line buffers within proposed residential areas. Ensure all staff expected to work within the study area are informed during the site induction process of the extent and location of vegetation to be retained. 	<ul style="list-style-type: none"> Conserve the entire 1.80 hectares of Box – Gum Woodland EEC (EPBC and NC Act) in the study area, located at the top of the hill. This was formerly identified as patch H during a previous assessment (Eco Logical Australia 2013) as an offset. Offset the 0.05 hectares of Natural Temperate Grassland EEC (EPBC and NC Act).
Threatened Species	<p>0.28 hectares of Box – Gum Woodland CEEC (EPBC and NC Act) within the FUA boundary is to be modified which decreases habitat</p>	<ul style="list-style-type: none"> Avoid clearing of Box – Gum Woodland EEC (EPBC and NC Act) and Natural Temperate Grassland EEC (EPBC and NC Act) 	<ul style="list-style-type: none"> Fence off the patch of Box – Gum Woodland EEC (EPBC and NC Act) and Natural Temperate Grassland EEC (EPBC and NC Act). Minimise the extent of clearing of Box – Gum 	<p>-</p>

Ecological value (Figure 3)	Impacts	Recommendations		
	<p>required for the Swift Parrot and Superb Parrot.</p> <p>22.48 hectares of native grassland including 0.05 hectares of Natural Temperate Grassland EEC (EPBC and NC Act) is to be removed which decreases habitat for the Pink-tailed Worm-lizard, and potential habitat for the Tarengo Orchid, Hoary Sunray, Button Wrinklewort and Small Purple-pea.</p>	<p>Act) if feasible.</p> <ul style="list-style-type: none"> Explore rezoning options which allow the 0.28 hectare patch of Box – Gum Woodland EEC (EPBC and NC Act) in the FUA boundary and 0.05 hectare patch of Natural Temperate Grassland EEC (EPBC and NC Act) to be retained. 	<p>Woodland EEC (EPBC and NC Act) and Natural Temperate Grassland EEC (EPBC and NC Act) as much as possible.</p> <ul style="list-style-type: none"> Minimise impacts from vegetation clearance via revegetation using native species specific to Box – Gum Woodland CEEC and Natural Temperate Grassland EEC of local provenance in all interfaces between conservation and urban areas as well as within street plantings and plantings in public areas. Relocate any individual populations of Pink-tailed Worm-lizard found within the study area. 	
Hollow-bearing trees	<p>18 hollow-bearing trees (17 within the FUA boundary), all of which are Blakely's Red Gums, containing a total of 15 small, 2 medium and 3 large hollows may potentially require removal under the Proposal.</p>	<p>Retain the hollow-bearing trees if possible by avoiding the need to clear vegetation through rezoning the area containing the majority of hollow-bearing trees as Public Open Space or similar zone</p>	<ul style="list-style-type: none"> If hollow-bearing tree removal cannot be avoided, then removal should be done during the non-breeding season. All tree clearance should occur under the supervision of a trained and qualified ecologist and employ the two-staged clearance method. 	-
Waterways (creeks, dams, etc.)	<p>Alterations to surface flow (increased sediment loads, increased velocity and volume of flow, increased erosion).</p>		<ul style="list-style-type: none"> Ensure Proposal design should be in accordance with Water Sensitive Urban Design (WSUD) guidelines. Install rain gardens, detention basins, retention basins and vegetated drainage swales in any proposed residential development plan for residential land to ensure the maximum retention and 	-

Ecological value (Figure 3)	Impacts	Recommendations		
			diversion of stormwater. <ul style="list-style-type: none"> • Ensure appropriate sediment control measures are put in place so stormwater run-off does not result in indirect impacts to waterways and native plant communities, particularly TECs. • Creek banks and drainage areas should be revegetated with vegetation diagnostic of Tableland Riparian Woodland and Tableland Wetlands associated species 	
Exotic species	Potential introduction of new exotic species and garden escapes into retained patches of Box – Gum Woodland and Natural Temperate Grassland.	<ul style="list-style-type: none"> • Prevent establishment of garden escapees by locating future residential development as far away as possible from patches of Box – Gum Woodland and Natural Temperate Grassland retained in conservation areas. 	<ul style="list-style-type: none"> • Ensure future vegetation clearance associated with the Proposal does not facilitate an increase in exotic species by minimising the extent of disturbed ground in close proximity to Box – Gum Woodland and Natural Temperate Grassland. • Ensure all weed removal is based on manual control techniques in preference to chemical or mechanical control techniques as per Best Practice Guidelines (DPIN 2003; Clewell, Rieger and Munro 2005). 	<ul style="list-style-type: none"> • If patches of Box – Gum Woodland or Natural Temperate Grassland are retained as conservation areas, conduct weed control on a regular basis.
Noxious weeds	Potential increase in range, diversity and extent of noxious weeds declared by TAMS.	Prevent the introduction of further noxious weeds by locating future residential development as far away as possible from patches of Box – Gum Woodland and Natural Temperate Grassland retained in conservation areas to	<ul style="list-style-type: none"> • Control/dispose of noxious weeds as per TAMS requirements (refer Section 4.4.4). • Ensure future vegetation clearance associated with the Proposal does not facilitate an increase in noxious weed species by removing all noxious weed green waste to the nearest Green Waste Facility, Canberra Sand and Gravel – Parkwood Yard (Parkwood Road, Holt, ACT, 2615). 	<ul style="list-style-type: none"> • If land containing patches of Box – Gum Woodland or Natural Temperate Grassland is retained as an offset, ensure all noxious weeds are treated as per the requirements of the Pest Plants and Animal Act 2005.

6 Conclusion

This vegetation classification and condition assessment has been conducted to determine the type and condition of the vegetation communities existing between the patches of previously mapped Box – Gum Woodland and Pink-tailed Worm-lizard habitat within the Molonglo Valley Stage 3 Development Area. The results of this report will inform a s.211 application for exemption from an EIS including the accompanying Preliminary Risk Assessment. This report also includes an evaluation of the potential impacts of the Proposal on biodiversity values within the study area in accordance with the EPBC Act, P&D Act and the NC Act.

The Proposal will result in the following impacts to significant biodiversity values:

- Removal of 40.72 hectares of native vegetation including 12.53 hectares of Box – Gum Woodland (non EPBC Act or NC Act listed), 0.95 hectares of Sedgeland, 1.40 hectares of Burgan Tableland Shrubland, 22.42 hectares of Natural Temperate Grassland (non EPBC Act or NC Act listed).
- Removal of 0.05 hectares of Moderately Modified - Natural Temperate Grassland (consistent with the EPBC and NC Act listing criteria for the Natural Temperate Grassland EEC).
- Modification of 0.28 hectares of Moderately Modified – Yellow Box – Red Gum Grassy Woodland (consistent with the EPBC and NC Act listing criteria for the Yellow Box – Red Gum Grassy Woodland EEC).
- Potential removal of 17 hollow-bearing trees of the 18 present within the study area.

No threatened flora or fauna species listed under the EPBC Act or ACT NC Act were detected during the field assessment component of the vegetation mapping review, although one potential threatened species, a Leek orchid *Prasophyllum* sp, was detected. These specimens require confirmation of their identification to species level. One Migratory species was detected during the field assessment, the Rainbow Bee-eater.

One of the vegetation communities mapped by Biosis within the study area is consistent with the final determination for an EPBC Act listed EEC, being *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*. A total of 0.75 hectares of the Natural Temperate Grassland EEC was identified within the study area, of which, one patch consisting of 0.05 hectares would be removed by the proposed works. Furthermore, the EPBC listed threatened species Pink-tailed Worm-lizard, Superb Parrot and Swift Parrot have been detected within the study area during past assessments (Umwelt 2015b) and the Migratory Rainbow Bee-eater was detected during this current assessment.

Two vegetation communities mapped by Biosis within the study area were consistent with the final determinations for NC Act listed EECs. A total of 1.80 hectares of Box – Gum Woodland EEC (NC Act) and a total of 0.75 hectares of Natural Temperate Grassland EEC was recorded within the study area. Of this, a total of 0.28 hectares of Box-Gum Woodland EEC will potentially be modified and 0.05 hectares of Natural Temperate Grassland is designated for removal under the Proposal. It is recommended that the patch of Box – Gum Woodland EEC (NC Act) be retained if possible. The remaining patches of Box – Gum Woodland and Natural Temperate Grassland (not consistent with the listed community definitions) are small in size, possess a high perimeter to area ratio, are subject to edge effects and are highly susceptible to ongoing disturbances. Therefore, it is determined that the removal of the remaining patches of non-listed Box – Gum Woodland (12.53 hectares) and the 22.42 hectares of non-listed Natural Temperate Grassland would not be significant.

A number of safeguards to avoid, minimise and mitigate the above impacts have been recommended in Section 5 of this report. These recommendations include detailed design recommendations, exclusion fencing and recommendations regarding appropriate hygiene protocols for vegetation clearing and machinery. Furthermore, the recommendations include safeguards specific to the removal of threatened and general fauna species habitat including supervision of habitat clearance and information on biodiversity values to be included in site inductions and pre-start meetings.

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Appendices

Appendix 1 Flora

A1.1 Flora species recorded from the study area

Notes to tables:

EPBC Act: CR – Critically Endangered EN – Endangered VU – Vulnerable	NC Act: (i) – extinct (ii) – extinct in the wild (iii) – critically endangered (iv) – endangered (v) – vulnerable (vi) – conservation dependent (vii) – provisional
Non-indigenous species # – native species outside natural range * – introduced species ** – declared weed species under the Pest Plants and Animals Act	Pest Plant status: Prohibited species (4) Must be contained (3) Must be suppressed (2) Notifiable (1)

Table A.1 Flora species recorded from the subject site

Status	Scientific name	Common name
# ** 4	<i>Acacia baileyana</i>	Cootamundra Wattle
	<i>Acacia binervia</i>	Coast Myall
	<i>Acacia dealbata</i>	Silver Wattle
	<i>Acacia mearnsii</i>	Black Wattle
	<i>Acacia rubida</i>	Red-stemmed Wattle
	<i>Acaena novae-zelandiae</i>	Bidgee-widgee
** 4	<i>Acer negundo</i>	Box Elder
*	<i>Acetosella vulgaris</i>	Sheep Sorrel
*	<i>Aira spp.</i>	A Hairgrass
	<i>Alternanthera nana</i>	Hairy Joyweed
	<i>Aristida ramosa</i>	Purple Wiregrass
	<i>Austrostipa bigeniculata</i>	Yanganbil
	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Speargrass
*	<i>Avena fatua</i>	Wild Oats
	<i>Bossiaea buxifolia</i>	-
	<i>Bothriochloa macra</i>	Red Grass
	<i>Brachyscome heterodonta</i>	-

Status	Scientific name	Common name
	<i>Brachyscome rigidula</i>	Hairy Cutleaf Daisy
*	<i>Briza minor</i>	Shivery Grass
*	<i>Bromus cartharticus</i>	Prairie Grass
*	<i>Bromus molliformis</i>	Soft Brome
	<i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>	Native Blackthorn
	<i>Carex appressa</i>	Tall Sedge
** 3	<i>Carthamus lanatus</i>	Saffron Thistle
	<i>Casuarina cunninghamiana</i>	River Oak
	<i>Schenkia australis</i>	Spike Centaury
*	<i>Cerastium</i> spp.	Chickweed
	<i>Chloris truncata</i>	Windmill Grass
*	<i>Chondrilla juncea</i>	Skeleton Weed
	<i>Chrysocephalum apiculatum</i>	Common Everlasting
*	<i>Cirsium vulgare</i>	Spear Thistle
*	<i>Conium maculatum</i>	Hemlock
	<i>Convolvulus erubescens</i>	Pink Bindweed
*	<i>Conyza</i> spp.	A Fleabane
** 4	<i>Cotoneaster glaucophyllus</i>	Cotoneaster
	<i>Crassula sieberiana</i>	Australian Stonecrop
** 3,4	<i>Crataegus monogyna</i>	Hawthorn
*	<i>Crepis capillaris</i>	Smooth Hawksbeard
	<i>Cynoglossum australe</i>	-
*	<i>Cyperus eragrostis</i>	Umbrella Sedge
*	<i>Dactylis glomerata</i>	Cocksfoot
	<i>Dichelachne crinita</i>	Longhair Plumegrass
	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>	Narrow-leaf Hop-bush
** 3	<i>Echium plantagineum</i>	Patterson's Curse
	<i>Einadia nutans</i>	Climbing Saltbush
	<i>Eleocharis acuta</i>	-
*	<i>Eleusine indica</i>	Crowsfoot Grass
*	<i>Eleusine tristachya</i>	Goose Grass
	<i>Elymus scaber</i>	Common Wheatgrass
	<i>Epilobium billardioreanum</i>	A Willow-herb

Status	Scientific name	Common name
** 3	<i>Eragrostis curvula</i>	African Lovegrass
	<i>Eragrostis leptostachya</i>	Paddock Lovegrass
	<i>Eryngium ovinum</i>	Blue Devil
	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
	<i>Eucalyptus bridgesiana</i>	Apple Box
	<i>Eucalyptus mannifera</i>	Brittle Gum
	<i>Eucalyptus melliodora</i>	Yellow Box
	<i>Eucalyptus pauciflora</i>	Snow Gum
	<i>Euchiton sphaericus</i>	Star Cudweed
	*	<i>Festuca elatior</i>
<i>Fimbristylis dichotoma</i>		Common Fringe-sedge
<i>Geranium solanderi</i>		Native Geranium
<i>Glycine clandestina</i>		Twining glycine
<i>Glycine tabacina</i>		Variable Glycine
<i>Gnaphalium americanum</i>		-
*	<i>Gonocarpus tetragynus</i>	Poverty Raspwort
	<i>Hardenbergia violacea</i>	False Sarsaparilla
	<i>Hirschfeldia incana</i>	Buchan Weed
	<i>Holcus lanatus</i>	Yorkshire Fog
*	<i>Hordeum leporinum</i>	Barley Grass
	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort
** 3	<i>Hypericum gramineum</i>	Small St John's Wort
	<i>Hypericum perforatum</i>	St. Johns Wort
	<i>Hypochaeris glabra</i>	Smooth Catsear
	<i>Hypochaeris radicata</i>	Catsear
	<i>Juncus australis</i>	Rush
	<i>Lachnagrostis aemula</i>	Blowngrass
	<i>Lactuca serriola</i>	Prickly Lettuce
	<i>Lepidium spp.</i>	A Peppercress
	<i>Leptospermum continentale</i>	Prickly Teatree
	<i>Lolium perenne</i>	Perennial Ryegrass
*	<i>Lomandra bracteata</i>	Mat-rush
	<i>Lomandra filiformis</i>	Wattle Matt-rush

Status	Scientific name	Common name
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
	<i>Lomandra multiflora</i>	Many-flowered Mat-rush
** 2,4	<i>Lycium ferocissimum</i>	African Boxthorn
*	<i>Malva spp.</i>	Mallow
*	<i>Marrubium vulgare</i>	White Horehound
	<i>Microlaena stipoides</i>	Weeping Grass
*	<i>Modiola caroliniana</i>	Red-flowered Mallow
** 3,4	<i>Nassella neesiana</i>	Chilean Needle Grass
*	<i>Nasturtium microphyllum</i>	Nasturtium
*	<i>Nothoscordum gracile</i>	Onion Weed
** 3	<i>Onopordum acanthium subsp. acanthium</i>	Scotch Thistle
*	<i>Oxalis corniculata</i>	Creeping Oxalis
	<i>Oxalis perennans</i>	Oxalis
	<i>Panicum effusum</i>	Hairy Panic
*	<i>Paspalum dilatatum</i>	Paspalum
*	<i>Petrorhagia nanteuillii</i>	Proliferous Pink
*	<i>Phalaris aquatica</i>	Phalaris
	<i>Phragmites australis</i>	Common Reed
	<i>Pimelea curviflora var. sericea</i>	Rice Flower
** 3	<i>Pinus radiata</i>	Radiata Pine
	<i>Plantago lanceolata</i>	Lamb's Tongues
*	<i>Plantago major</i>	Large Plantain
	<i>Poa labillardierei</i>	Tussock grass
*	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed
*	<i>Polypogon monspeliensis</i>	Annual Beardgrass
*	<i>Populus nigra</i>	Lombardy Poplar
	<i>Portulaca oleracea</i>	Pigweed
	<i>Prasophyllum spp.</i>	Leek Orchid
*	<i>Prunus spp.</i>	Apricot
	<i>Pseuderanthemum variabile</i>	Pastel Flower
** 2,4	<i>Rosa rubiginosa</i>	Sweet Briar
** 3,4	<i>Rubus fruticosus</i> sp. agg.	Blackberry complex
	<i>Rubus parvifolius</i>	Native Raspberry

Status	Scientific name	Common name
	<i>Rumex brownii</i>	Swamp Dock
*	<i>Rumex crispus</i>	Curled Dock
	<i>Rumex dumosus</i>	Wiry Dock
*	<i>Rumex obtusifolius</i>	Broadleaf Dock
	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass
** 2,4	<i>Salix fragilis</i>	Crack Willow
*	<i>Salix babylonica</i>	Weeping Willow
*	<i>Salvia verbenaca</i>	Vervain
	<i>Senecio quadridentatus</i>	Cotton Fireweed
*	<i>Sonchus oleraceus</i>	Common Sowthistle
	<i>Sorghum leiocladum</i>	Wild Sorghum
*	<i>Taraxacum officinale</i>	Dandelion
	<i>Themeda triandra</i>	Kangaroo Grass
*	<i>Tragopogon dubius</i>	Goatsbeard
*	<i>Trifolium campestre</i>	Hop Clover
*	<i>Trifolium arvense</i>	Haresfoot Clover
*	<i>Trifolium repens</i>	White Clover
	<i>Typha</i> spp.	Cumbungi
*	<i>Verbascum thapsus</i>	Blanket Weed
*	<i>Verbascum virgatum</i>	Twiggy Mullein
*	<i>Verbena bonariensis</i>	Purpletop
	<i>Vittadinia cuneata</i>	A Fuzzweed
*	<i>Vulpia myuros</i>	Rat's Tail Fescue
	<i>Wahlenbergia communis</i>	Tufted Bluebell
	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell

Appendix 2 Fauna

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

A2.1 Fauna species recorded from the study area

Below is a list of fauna species detected via incidental observation within the study area during the present assessment.

Notes to table:

EPBC Act:

EX - Extinct
 CR - Critically Endangered
 EN - Endangered
 VU - Vulnerable
 CD - Conservation dependent
 M - Migratory

NC Act:

(i) – extinct
 (ii) – extinct in the wild
 (iii) – critically endangered
 (iv) – endangered
 (v) – vulnerable
 (vi) – conservation dependent
 (vii) – provisional

* - introduced species

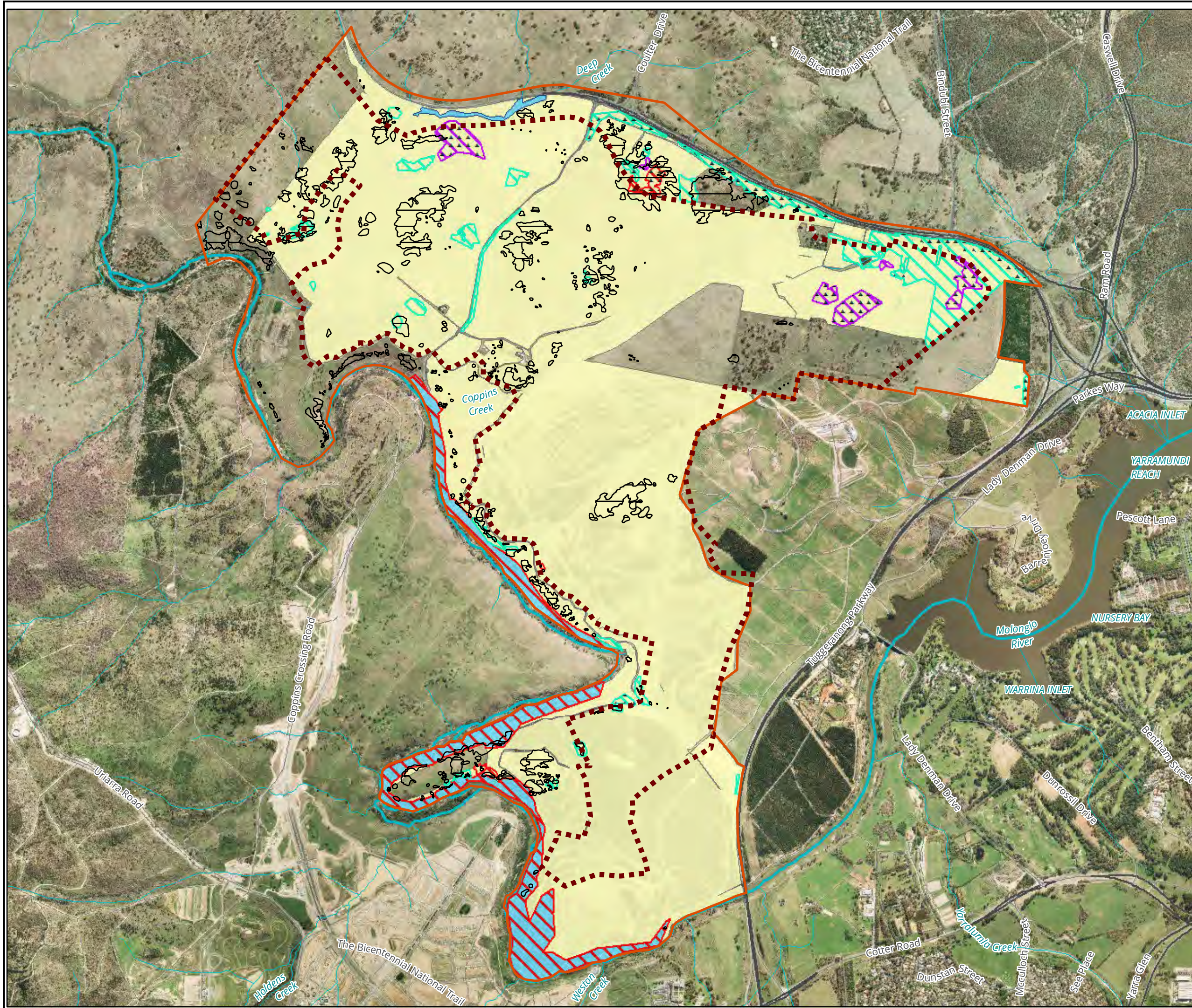
Table A.2 Vertebrate fauna recorded from the study area (current assessment)

Status	Scientific name	Common name
Birds		
	<i>Accipiter fasciatus</i>	Brown Goshawk
	<i>Anthus novaeseelandiae</i>	Australasian Pipit
	<i>Corvus bennetti</i>	Little Raven
	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
	<i>Cracticus nigrogularis</i>	Pied Butcherbird
	<i>Cracticus tibicen</i>	Australian Magpie
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
	<i>Eolophus roseicapilla</i>	Galah
	<i>Grallina cyanolaeuca</i>	Magpie Lark
M	<i>Merops ornatus</i>	Rainbow Bee-eater
	<i>Platycercus eximius</i>	Eastern Rosella
	<i>Rhipidura albiscapa</i>	Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail
Mammals		

Status	Scientific name	Common name
*	<i>Bos Taurus</i>	Cattle
*	<i>Equus caballus</i>	Horse
*	<i>Lepus capensis</i>	Brown Hare
	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
* ##	<i>Oryctolagus cuniculus</i>	European Rabbit
*	<i>Ovis aries</i>	Sheep
* ##	<i>Vulpes vulpes</i>	Fox
	<i>Wallabia bicolor</i>	Swamp Wallaby
Reptiles		
	<i>Pseudonaja textilis</i>	Eastern Brown Snake

established pest species as defined under the ACT Pest Plants and Animals Act (ACT Government 2005b).

Appendix 3 Figure 4. Detailed Map of Ecological Values



Legend

- Study area
- FUA boundary
- Fauna habitat**
- Black Cockatoo
- Little Eagle
- Superb Parrot and Swift Parrot
- Pink-tailed Worm-lizard - High (by vegetation community)
- Pink-tailed Worm-lizard - Moderate (by vegetation community)
- Pink-tailed Worm-lizard - Poor (by vegetation community)
- Pink-tailed Worm-lizard (Osbourne 2010, Biosis corrected)

Figure 4: Fauna habitat - overview

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 Metres
 Scale: 1:22,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

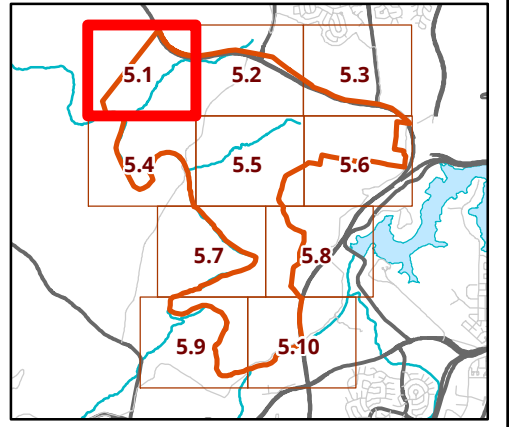
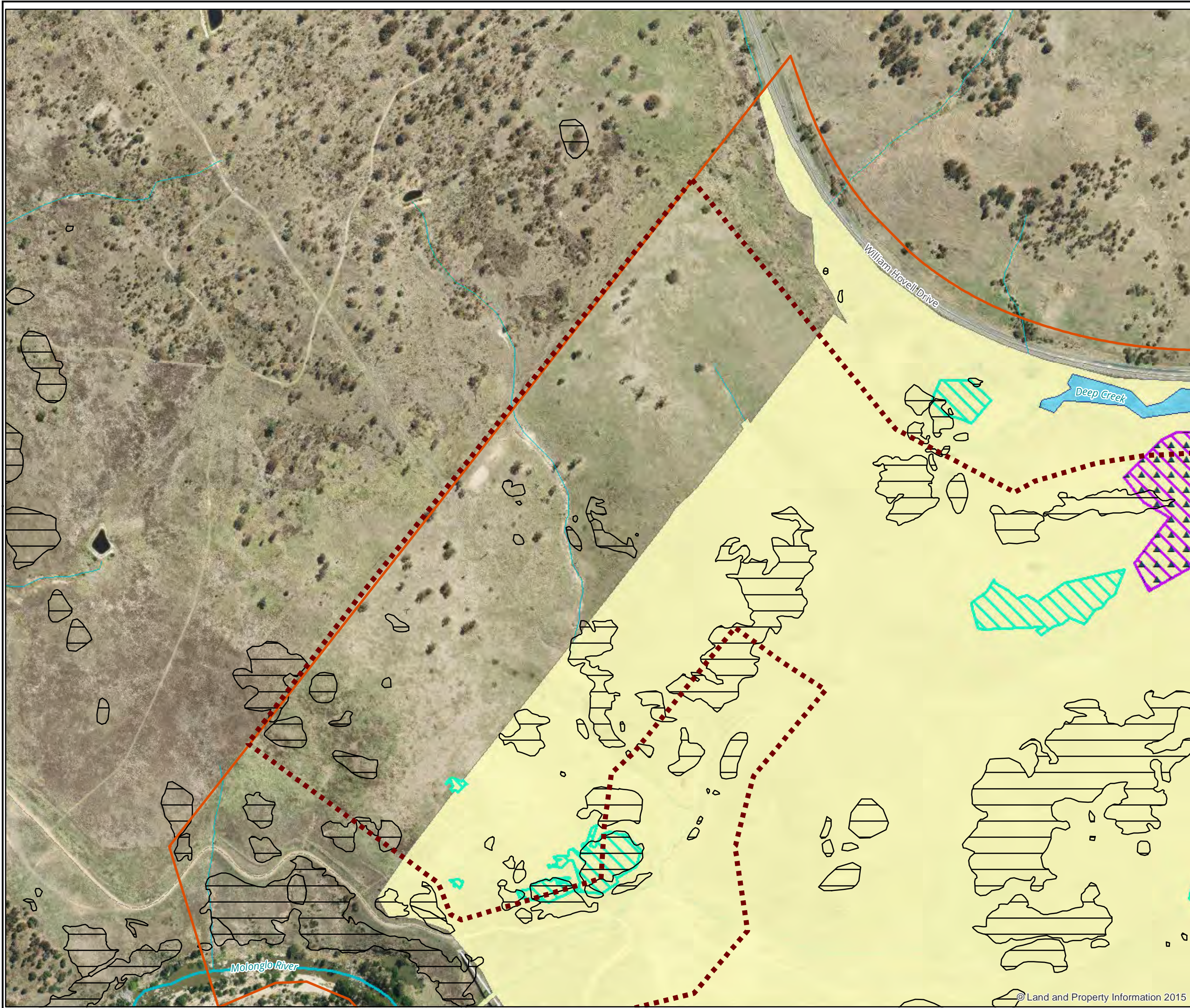


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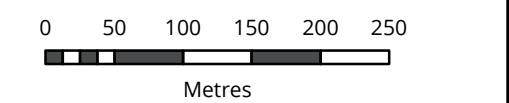
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Appendix 4 Figure 5. Detailed Map of Fauna Habitat Values



- Legend**
- Study area
 - FUA boundary
 - Fauna habitat**
 - Black Cockatoo
 - Little Eagle
 - ▲ Superb Parrot and Swift Parrot
 - Pink-tailed Worm-lizard - High (by vegetation community)
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 - Pink-tailed Worm-lizard - Poor (by vegetation community)
 - Pink-tailed Worm-lizard (Osbourne 2010, Biosis corrected)

Figure 5.1: Fauna habitat - detail



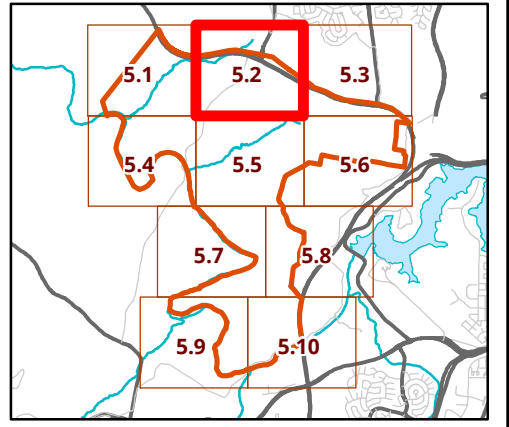
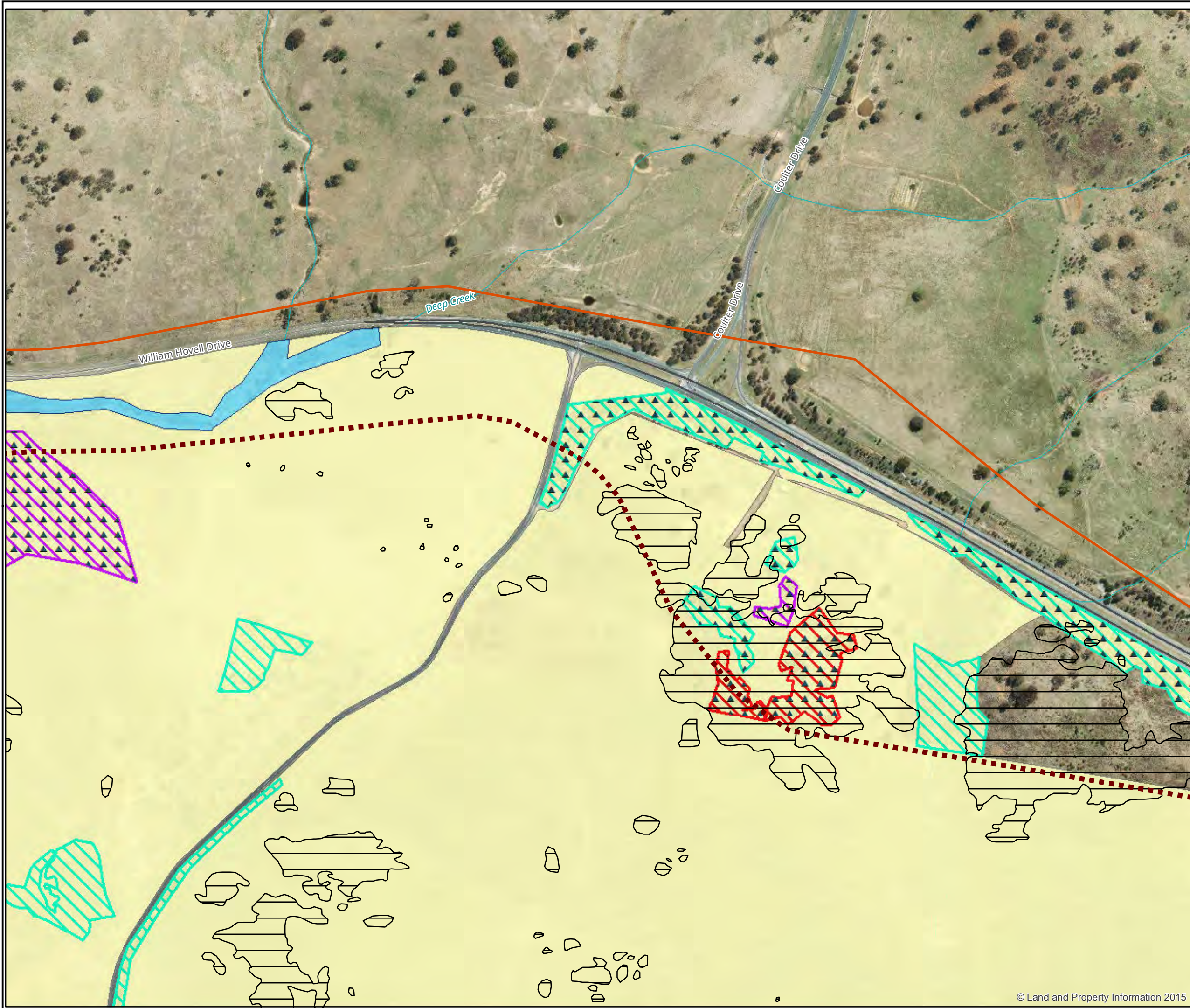
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- Legend**
- Study area
 - FUA boundary
 - Fauna habitat**
 - Black Cockatoo
 - Little Eagle
 - Superb Parrot and Swift Parrot
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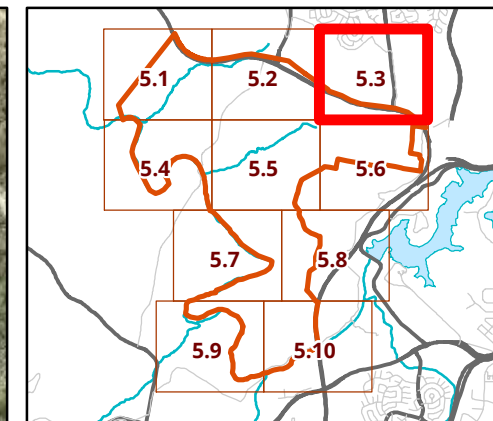
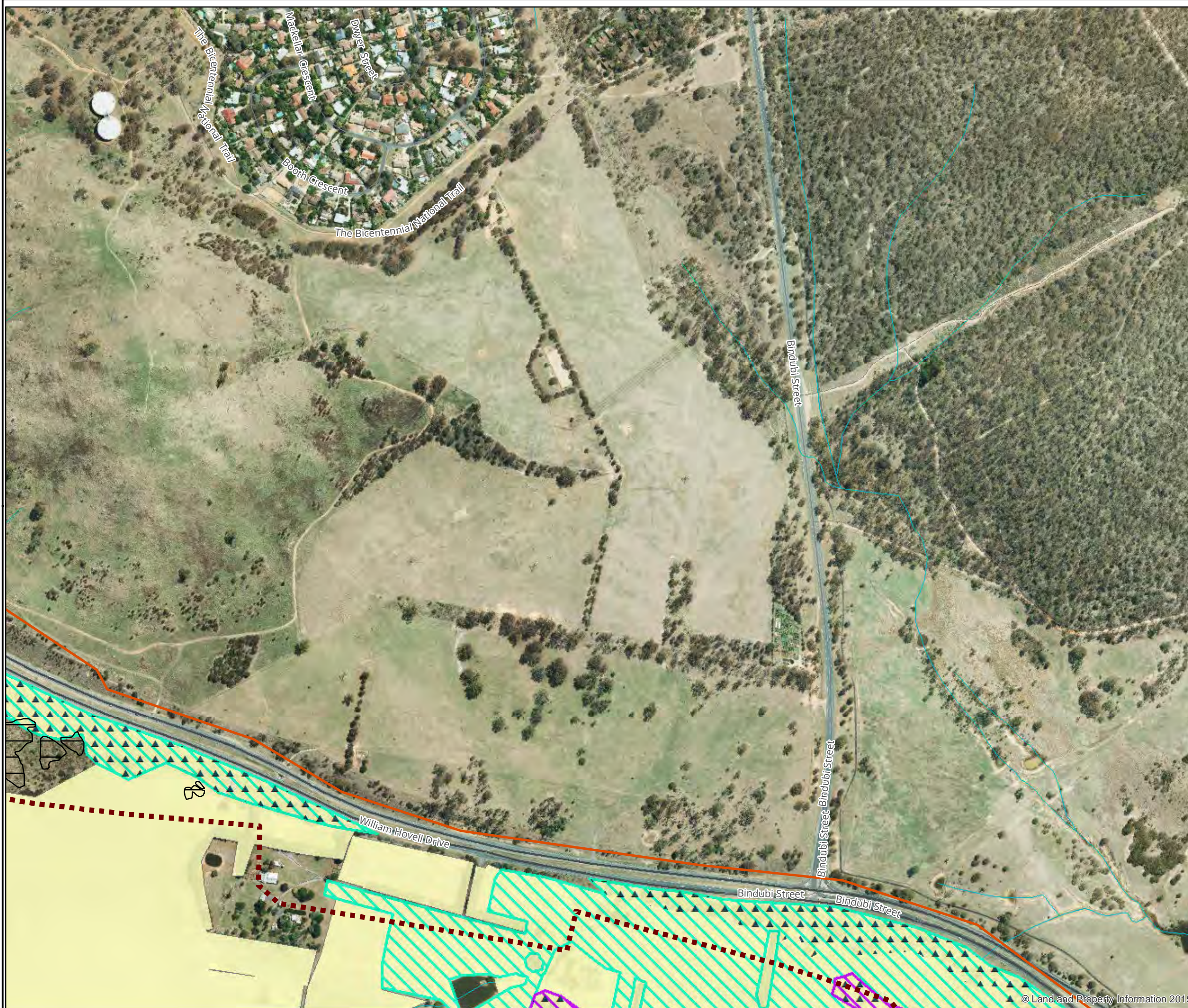
Figure 5.2: Fauna habitat - detail

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 Coordinate System: GDA 1994 MGA Zone 55



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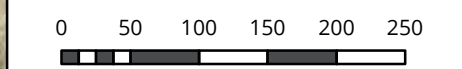
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Legend

- Study area
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- Pink-tailed Worm-lizard - Poor (by vegetation community)
- Pink-tailed Worm-lizard (Osbourne 2010, Biosis corrected)

Figure 5.3: Fauna habitat - detail



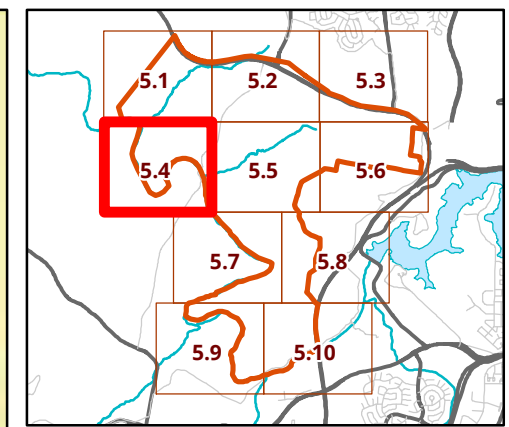
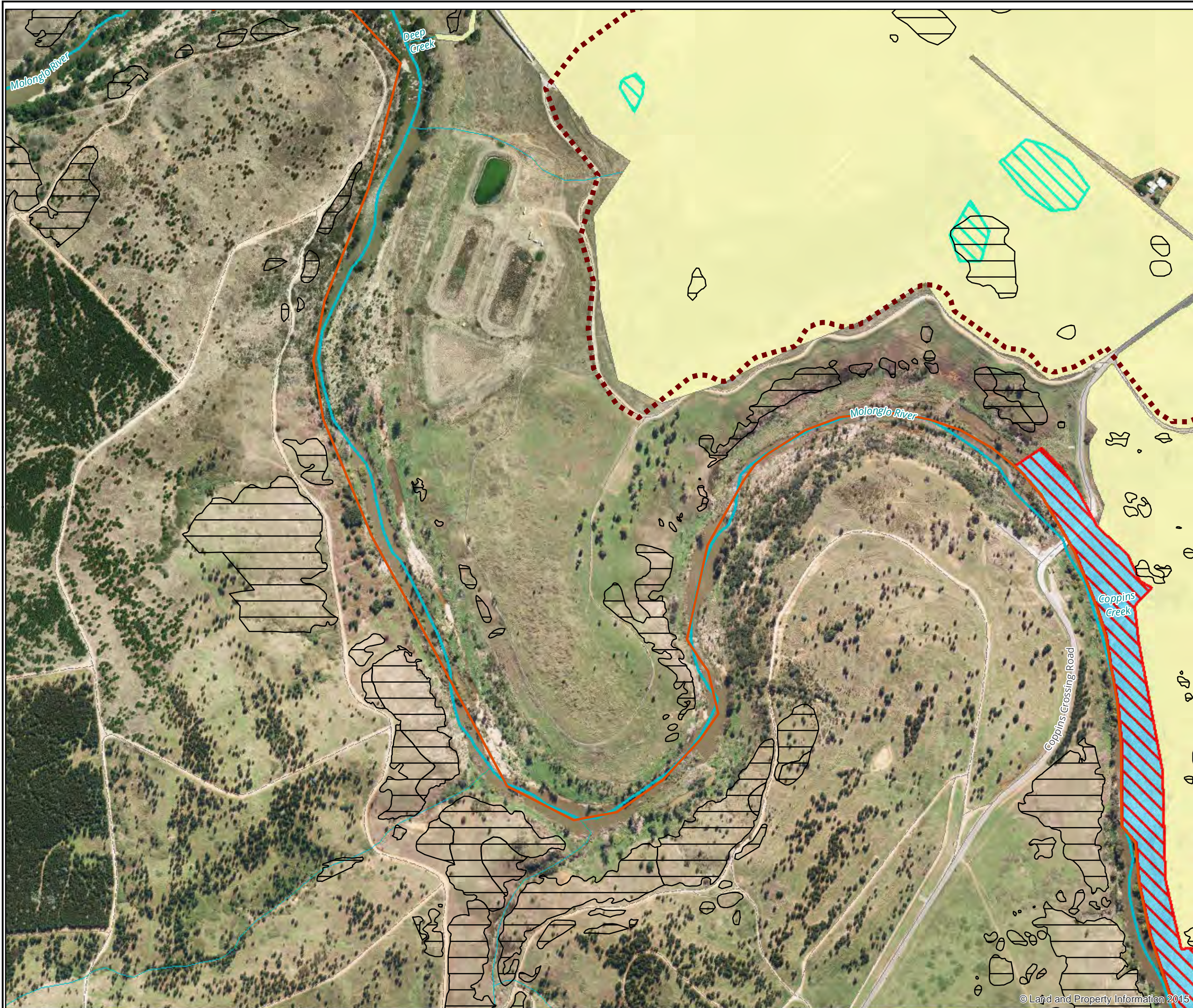
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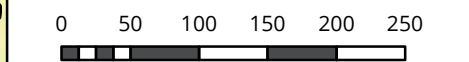
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Legend

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Figure 5.4: Fauna habitat - detail



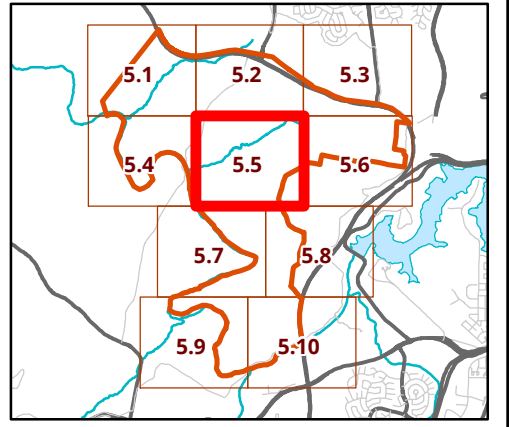
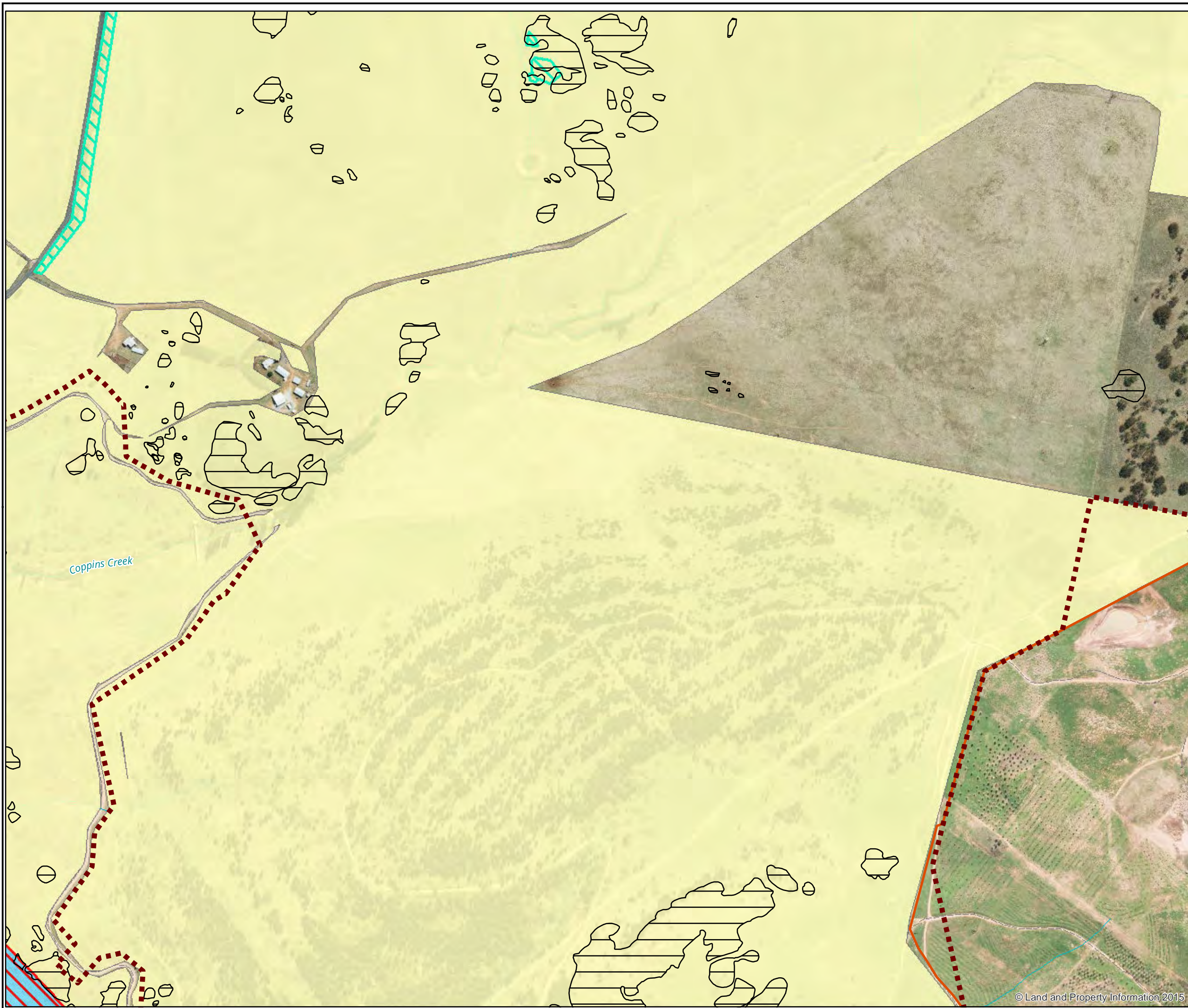
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Figure 5.5: Fauna habitat - detail

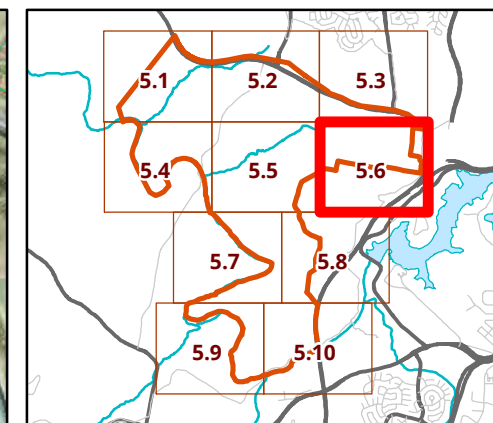
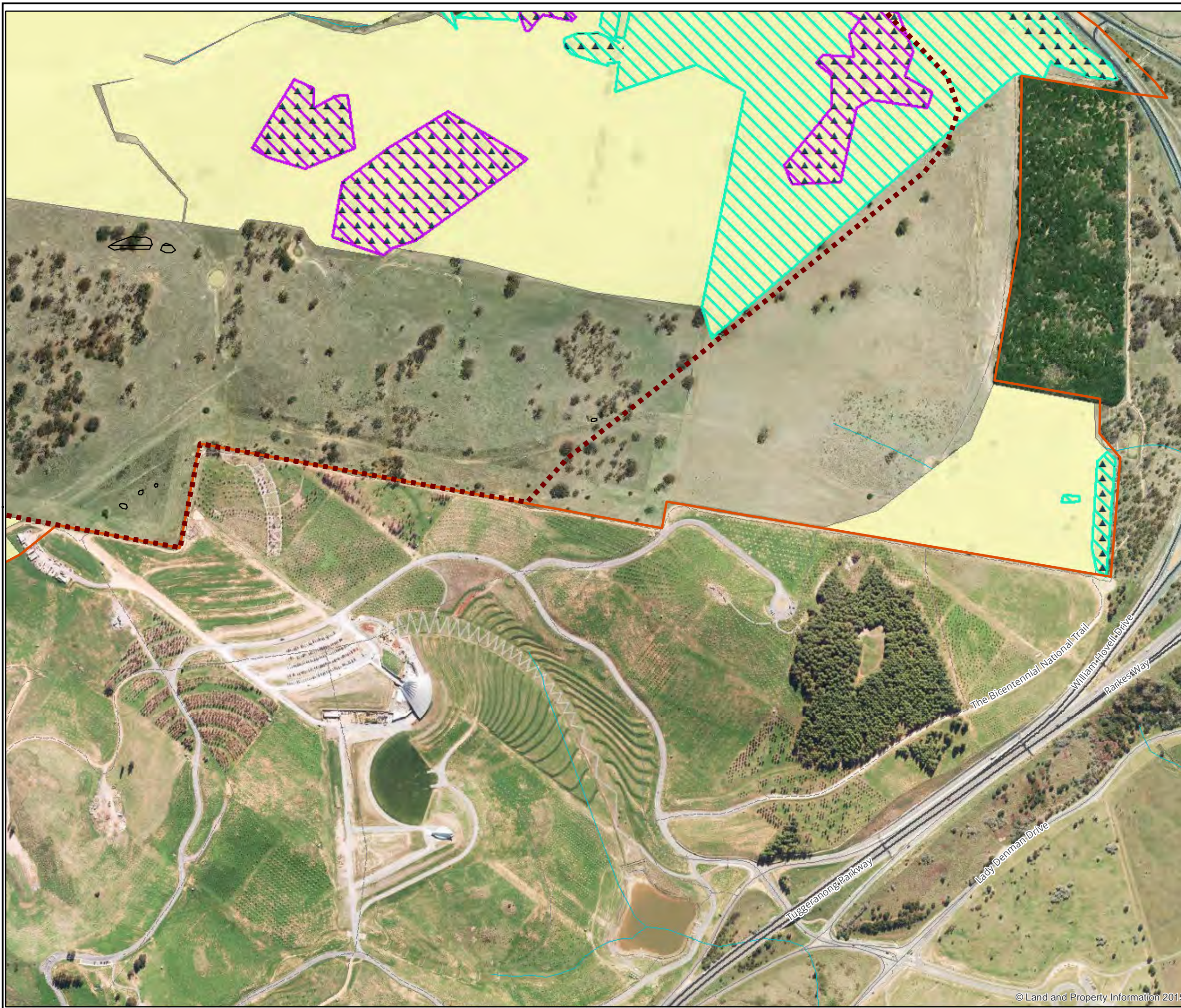
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Figure 5.6: Fauna habitat - detail



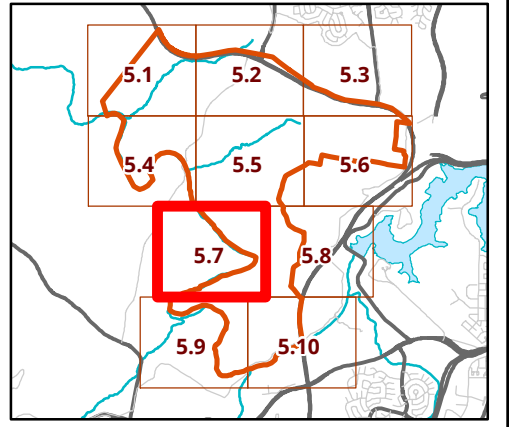
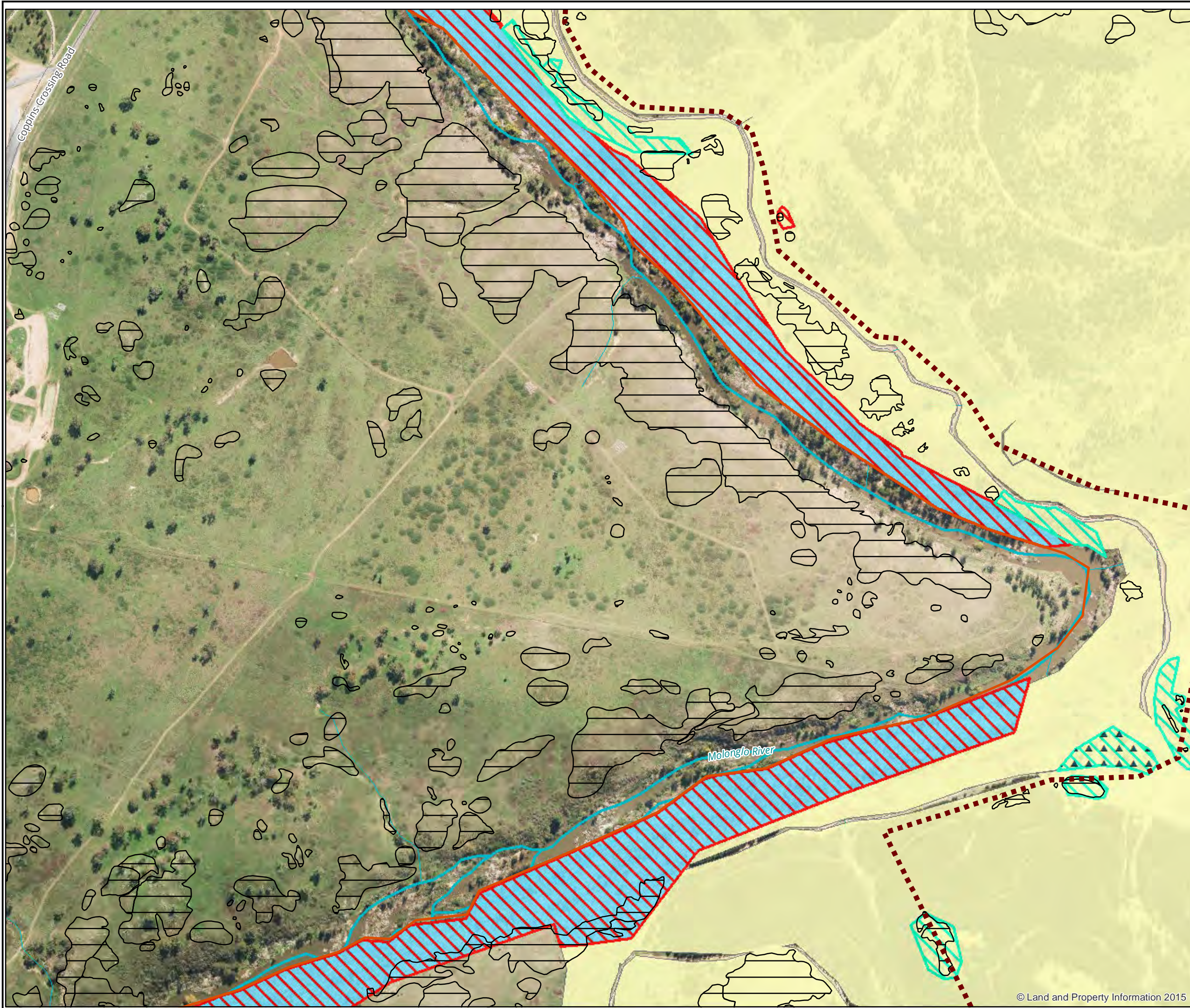
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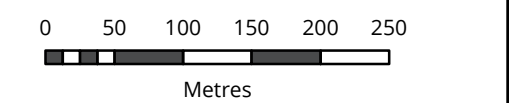
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Figure 5.7: Fauna habitat - detail



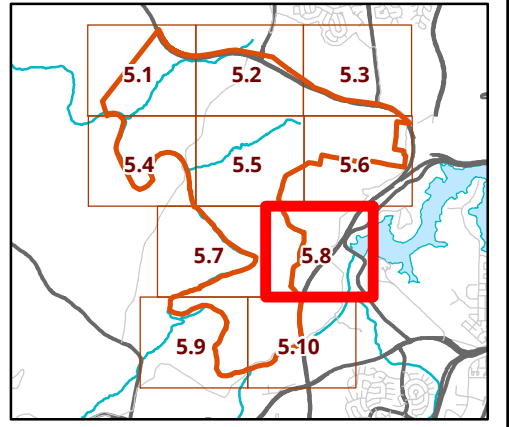
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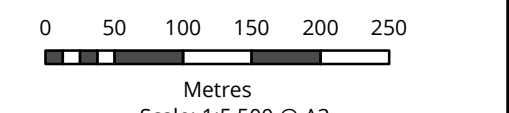
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Figure 5.8: Fauna habitat - detail



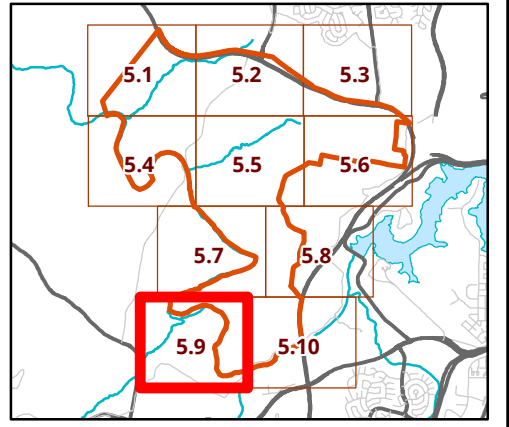
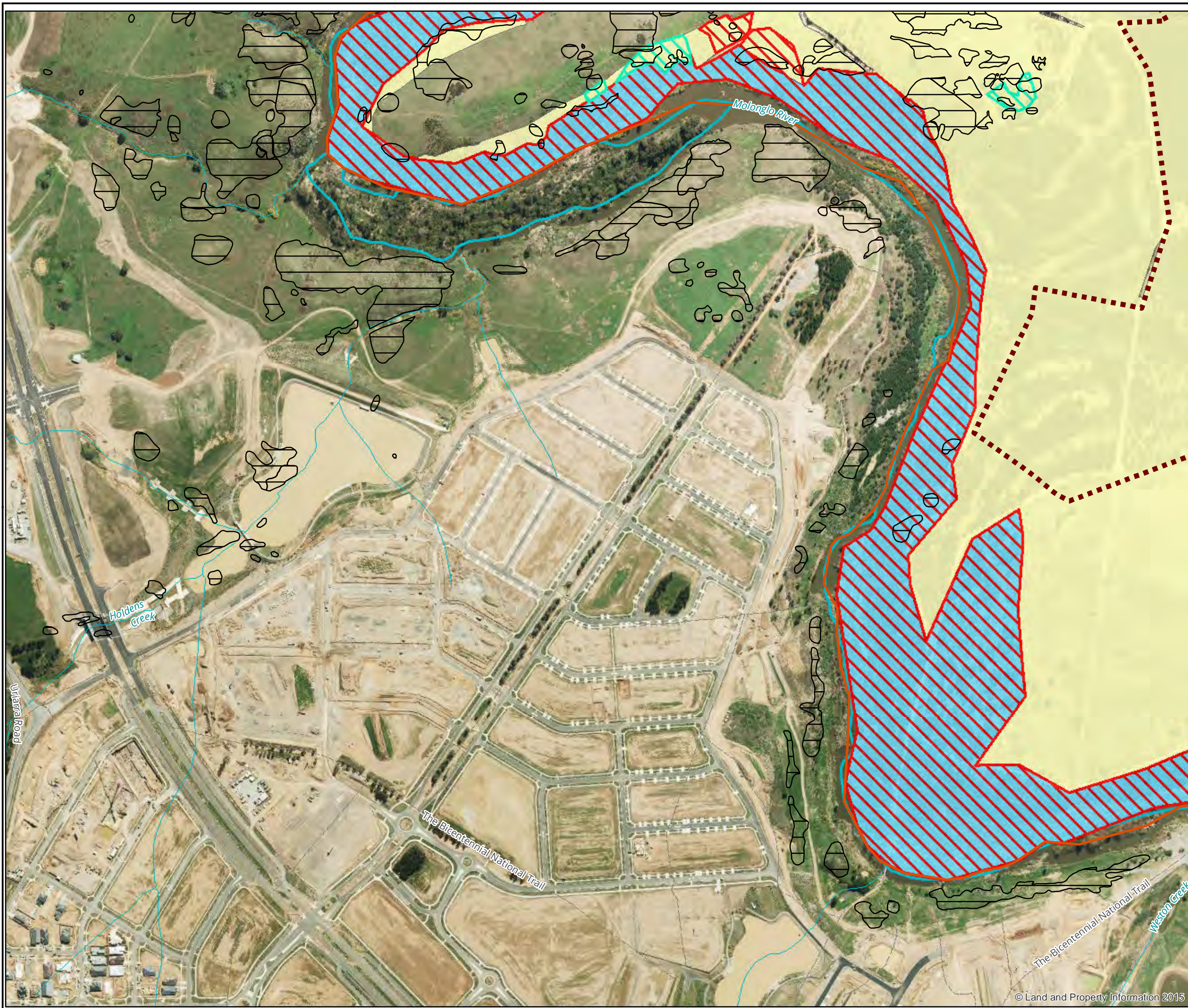
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 - Pink-tailed Worm-lizard - Poor (by vegetation community)
 - Pink-tailed Worm-lizard (Osbourne 2010, Biosis corrected)

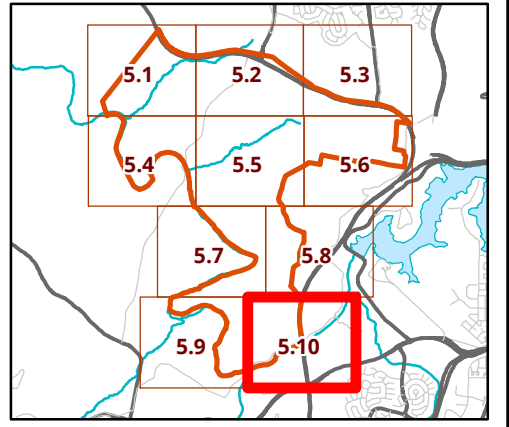
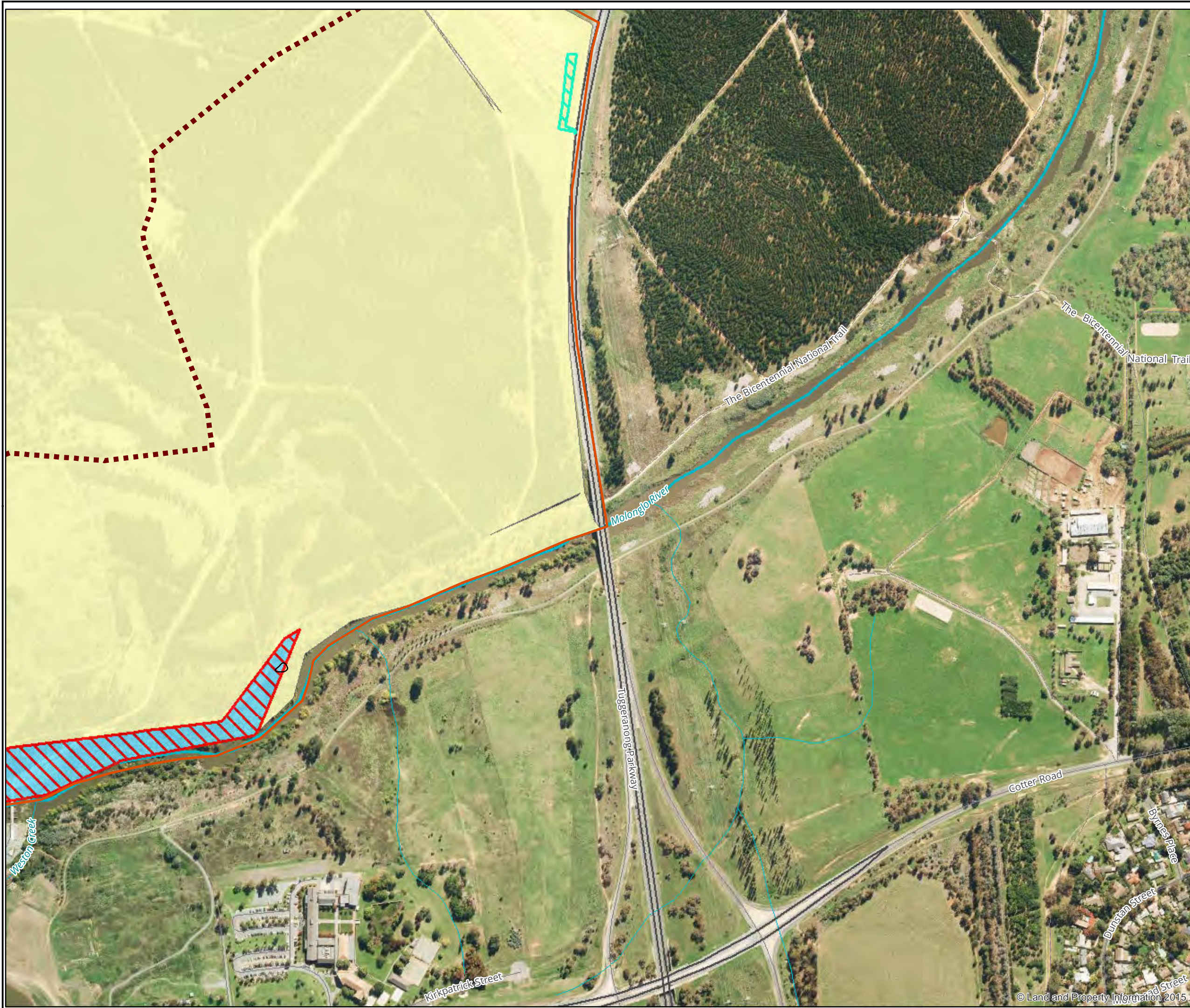
Figure 5.9: Fauna habitat - detail

0 50 100 150 200 250
Metres
Scale: 1:5,500 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Matter: 21593
Date: 26 February 2016,
Checked by: NRT, Drawn by: LH, Last edited by: Iharley
Location: P:\21500s\21593\Mapping\21593_F5_FaunaHabitat_Detail



- Legend**
- Study area
 - FUA boundary
 - Fauna habitat**
 - Little Eagle
 - Black Cockatoo
 - Superb Parrot and Swift Parrot
 - Pink-tailed Worm-lizard - High (by vegetation community)
 - Pink-tailed Worm-lizard - Moderate (by vegetation community)
 - Pink-tailed Worm-lizard - Poor (by vegetation community)
 - Pink-tailed Worm-lizard (Osbourne 2010, Biosis corrected)

Figure 5.10: Fauna habitat - detail

0 50 100 150 200 250
Metres
Scale: 1:5,500 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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