Hamilton Environmental Services
ABN: 89 108 410 911

FLORA AND FAUNA ASSESSMENT REPORT – MOAMA SAND QUARRY (EAR ID No. 962)

emm GROUP

Flora and Fauna Survey Report, Moama Sand Quarry (EAR ID No. 962)

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Cover Photo: Looking north east over the existing coarse sand excavation area and southern end of the proposed Northern Area development.

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1. INTRODUCTION

The EMM Group currently extract both coarse and fine sand materials from their quarry on the 11 Mile Road Moama, and they are proposing an expansion of their sand extraction operations at this property to provide them with a wider range of material and a longer-term resource (Kane Henson pers. comm. 2016).

In May 2015, Hamilton Environmental Services (HES) was engaged to co-ordinate the development of the Environmental Impact Statement for the development proposal.

Field assessment of the site for flora and fauna was conducted on the 15th October and the 3rd December 2015 by Dr. Steve Hamilton, and on the 29th February 2016, a field inspection of the site was conducted by Office of Environment and Heritage (OEH) staff Peter Ewin and Miranda Kerr, Murray Shire Planner Llyan Goodsell, archaeologist Jo Bell (Jo Bell Heritage Services) and Andrew Hollaron (Owner EMM Group), and this report presents the findings and considerations from field assessment, field inspection and subsequent discussion, and desktop investigation.

2. BACKGROUND

2.1 Location and description

The EMM Group Property where the sand quarry is proposed is found on 11 Mile Road (off Barmah Road), 8.1 km west of Barmah, and 16 km north east of Moama (Fig. 2-1).

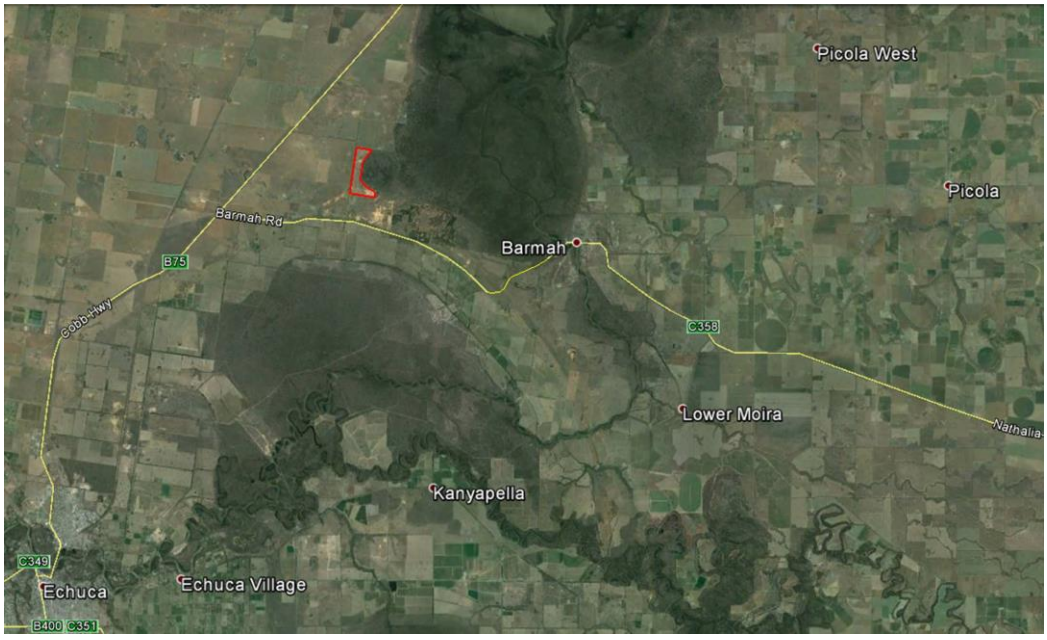

Figure 2-1 Aerial image of the general location of the property where the proposed sand quarry is located, outlined in red (Google Earth 2016).

The property is approximately 79.8 ha (Lot 97 DP751140, Murray Shire), of which around 5.23 ha is currently utilised for quarry operations, and the balance of which is used for either cropping or stock grazing. An area of approximately 24.89 ha is proposed for development at this time (Fig. 2-2).
The property has maximum dimensions of 1.67 km north-south, and 920 m east-west (along the southern boundary fence)(Fig. 2-2).

The property is bordered by the 11 Mile Road (also known as Rushy Road) on its western and northern boundary, the Murray Valley National Park on its eastern boundary, and freehold land on its southern boundary (Fig. 2-2).

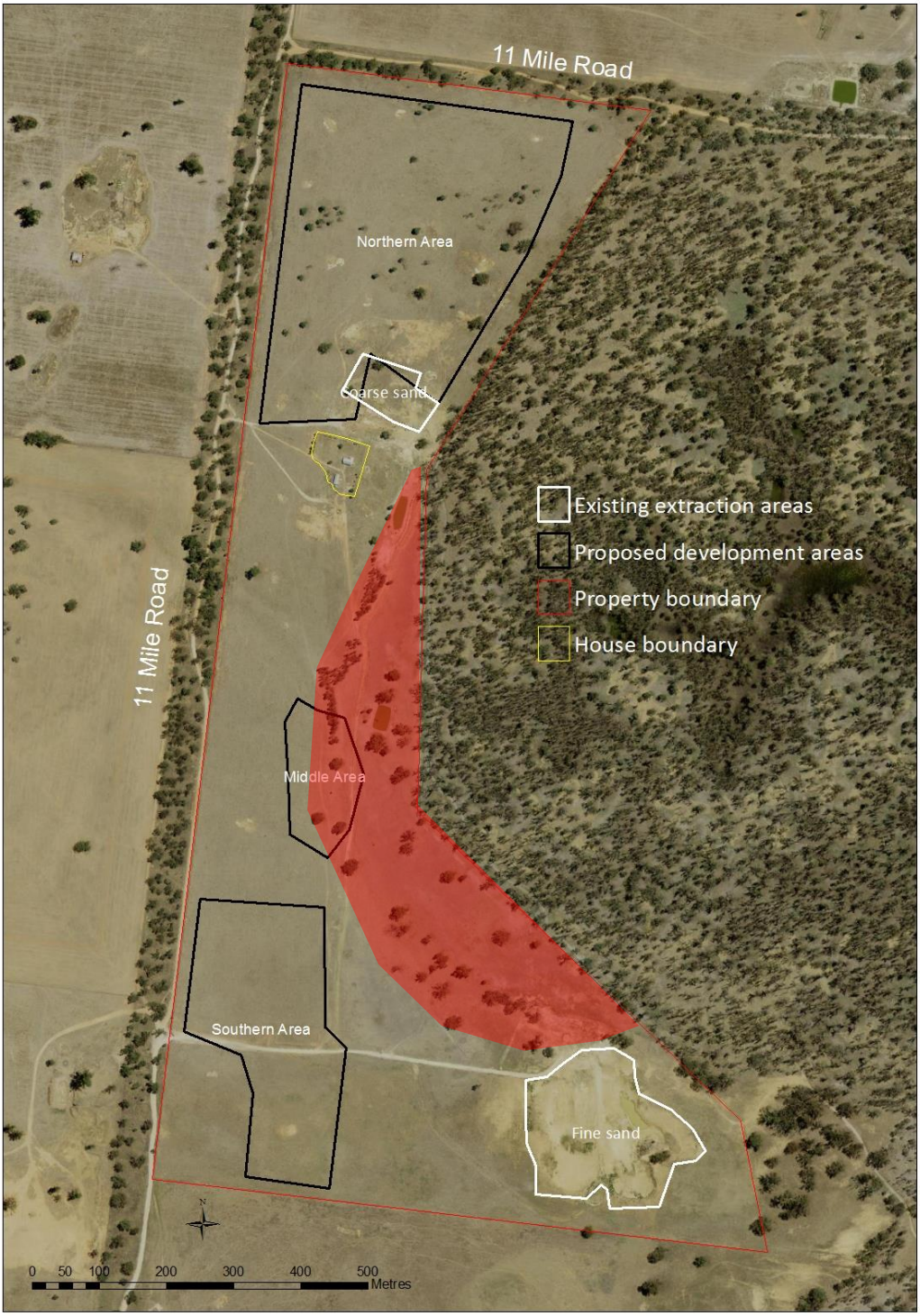

Figure 2-2 **Aerial image of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. The lower-lying section of the property that is geomorphically an extension of the wetland in the adjacent National Park is shown shaded in red (aerial imagery and base map from Land and Property Information New South Wales 2016).**

2.2 Site history

While there is little formally known about the history of the property, Jo Bell Heritage Services (2016) provides the results of title searches that suggests that the property was gazetted in 1900, and by 1914 had been leased and was being used for agriculture. Aerial imagery from 1961 and 1996 suggests that the close to the existing extent of native vegetation clearing had occurred by 1961, and the existing house on the site (see Fig. 2-2; house 'paddock' is also delineated) had been built between 1961 and 1996 (Jo Bell Heritage Services 2016).

The property was purchased by the EMM Group in 2005, and a Development Application (DA) was submitted to the Murray Shire for the purposes of "removal of sand for sale" in 2005, and this was subsequently approved by Council in mid-2006 after an iteration of seeking further information by Council in regards to a variety of issues, including cultural heritage values, groundwater issues, and a detail site development plan and rehabilitation plan.

Aerial imagery from 2009 indicates that the two existing extraction areas on the property were in production (Google Earth 2009). The current extent of these two areas is approximately 0.90 ha for the 'Coarse Sand' pit in the north of the property, and 4.33 ha for the 'Fine Sand' pit in the south west of the property. Fig. 2-2 shows the extent of these two current excavations, and views of them can be seen in Plate 2-1.

Plate 2-1 Typical views of the existing 'Coarse Sand' pit in the north of the property (left), and the 'Fine Sand' pit in the south west of the property (right).

While the extraction areas have been established in the last decade, the remainder of the property has been managed in the manner typical of the land use over the last several decades – cropping of significant areas of the property on the higher points on the sand hills, and stock grazing (Kane Henson pers. comm. 2016).

Notwithstanding the direct impact of the extraction areas, the vegetation of the majority of the remainder of the property does reflect the inferred historic land use:

- substantial tree clearing, with only scattered mature trees across the northern and central areas of the property in particular;
- no tree recruit for several decades;
- no shrub layer or shrub recruitment;
- a ground layer that is predominantly opportunistic annual introduced species-based due to the recurrent cultivation and cropping disturbance over much of the property, with indigenous ground layer vegetation only evident around the base of clumps of trees or along some of the boundary areas along the perimeter fences;

- no fallen timber.

The one area that is an exception to this is the lower-lying eastern boundary area of the property that is geomorphically an extension of the wetland feature found in the adjacent National Park area; there is significant recent River Red Gum recruitment (most likely 2011-2012 when the area was in flood) in this area (see Fig. 2-2 and Plate 2-3).

The adjacent 11 Mile Road road reserve sections to the west and north of the property contain a near continuous canopy of mostly mature indigenous trees (Western Grey Box; *Eucalyptus microcarpa*) with some younger individuals and a relatively well developed shrub layer; there is predominantly indigenous vegetation at ground level in the wider sections of this road reserve (See Plate 2-3). While a little variable in habitat condition because of the variation in road reserve width, the road reserve is in general a good quality remnant of Western Grey Box woodland.

2.3 The proposed development

The proposed maximum extent of development consists of three areas that have been selected in because of the differences in sand resource which they provide to future operations (Kane Henson pers. comm. 2016); the determination of the type and extent of the sand resource was provided by an extensive site survey and resource estimation conducted by Bell Cochrane and Associates in 2015 (Bell Cochrane and Associates 2015).

The Northern Area (of 15.91 ha extent), the Middle Area (2.00 ha) and Southern Area (6.98 ha) as defined by Bell Cochrane and Associates (2015) are shown in Fig. 2-2 and in Plate 2-2.

The Northern Area is considered of more value because of its extent and available material, followed by the Southern Area, which is potentially somewhat impacted as a resource by the presence of deeper dune sands in the eastern side of the area. The Middle Area is clearly a significantly smaller extent, and is considered the least valuable of the three proposed development sites (Kane Henson pers. comm. 2015).

It is unlikely that EMM Group would ever seek to excavate all of these areas; the total available sand resource across these three areas combined can provide over 1 million cubic metres of sand (varying grades; Bell Cochrane and Associates 2015), and given that EMM Group currently only excavate 20-30,000 cubic metres/annum to meet the demands of the Echuca-Moama market with no expansion of distribution or current activity planned or likely (Andrew Hollaron pers. comm. 2016). The existing extraction areas are likely to have 3-5 years of production remaining within their current extent, and only at the exhaustion of these resources would 'new' areas within the proposed development extent be utilised (Kane Henson pers. comm. 2016).

It is likely that only areas of up to 1 ha would be utilised for extraction at any time in each of the proposed Northern and Southern Areas when the existing extraction areas are exhausted (Andrew Hollaron pers. comm. 2016). These areas are likely to provide sufficient resource for at least a 5-10 year period given the stated current local demand (Kane Henson pers. comm. 2016), and therefore, the development footprint in the short-to-medium term across the property is likely to be < 2 ha in total of new excavation.

Following the on-site meeting with OEH and Murray Shire staff on the 29th February 2016, EMM Group have decided that there is sufficient area within the outlined development sites to avoid native vegetation loss within the proposed Stage 1 developments; native vegetation losses will be avoided in any staged developments into the future (Andrew Hollaron pers. comm. 2016).

Proposed areas for the Stage 1 development are shown in Fig. 2-3; both of these areas are around 1 ha, and have been located to avoid any native vegetation loss.

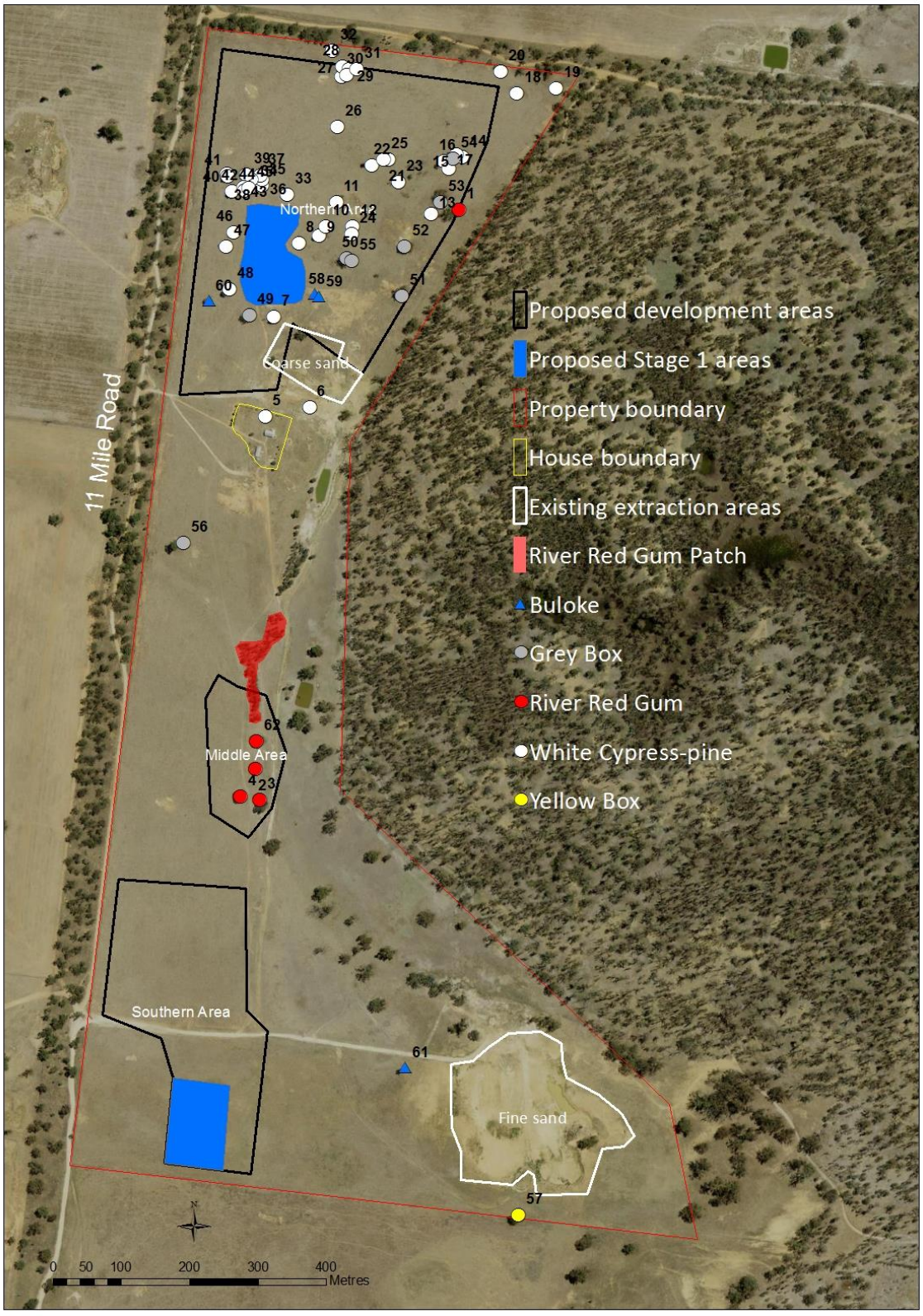

Figure 2-3 **Aerial image of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. The proposed Stage 1 extraction areas in the Northern and Southern Areas are shown shaded in blue (aerial imagery and base map from Land and Property Information New South Wales 2016).**

Plate 2-2 **Typical views of the proposed Northern Area development (top left and right), the Middle Area (bottom left), and the Southern Area (bottom right)(see Fig. 2-2).**

Plate 2-3 **Typical views of the lower-lying areas in the eastern section of the property where there has been recent River Red Gum recruitment (see Fig. 2-2).**

3. METHOD

3.1 Desktop Review

The following desktop information was gathered:

- Aerial imagery and base map from Land and Property Information New South Wales;
- Determination of a general species list for the area (Environment and Heritage 2015);
- Matters of National Significance reporting for the 20 km radius around the property (Department of Environment [DoE] 2016);
- Flora, fauna and threatened species lists, sighting records and information for the district were obtained from *BioNet – Website of the Atlas of NSW Wildlife* (Environment and Heritage 2016a).

Plate 2-3 **Typical views of the 11 Mile Road road reserve as it runs along the northern boundary of the property (top left), as it runs along the western boundary (top right), and the adjacent Murray Valley National Park (see Fig. 2-2).**

3.2 Site Assessment

On the 15th October and again on the 3rd December 2015, Dr. Steve Hamilton visited the site with to inspect the property and the adjacent road reserve.

On the day of the 15th October 2015, air temperatures were between 24 and 32°C, the sky was clear, and winds were light (Bureau of Meteorology 2015).

On the day of the 3rd December 2015, air temperatures were between 18 and 27°C, the sky was clear, and winds were between 10-15 km/h (Bureau of Meteorology 2015).

The entire site was traversed by vehicle and/or foot, and continuous active searching was conducted over a total period of 5 ½ hours (over both days), with the following assessments undertaken:

- Vascular plant species were identified and noted according to zone, with an overall cover/abundance value recorded for each species in each zone completed post-field assessment (see Table 3-1);

- The species, location, diameter, health and basic hollow characteristics of all assessed tree individuals was recorded, and an image of the tree taken;
- Opportunistic recording of any fauna;
- Digital images across the site taken.

One hundred and three (103) images were taken across the area during the assessment to facilitate identification and to provide context to the description.

Table 3-1 Modified Braun-Blanquet scale applied to assessment to each vascular plant species identified in each zone.

Visual assessment of cover/abundance	
Symbol	*Description*
+	rare, cover < 5%
1	Uncommon, cover < 5 %
2	Very common, cover < 5 % or cover 5-25 % with any number of individuals
3	Cover 25-50 % with any number of individuals
4	Cover 50-75 % with any number of individuals
5	Cover 75-100 % with any number of individuals

3.3 Taxonomy

3.3.1 Flora

Vascular plants that could not be identified in the field, specimens and images were collected for identification using the *Flora of New South Wales* (Harden 1990, 1991, 1992, 1993), and *PlantNet Flora On-line* (Royal Botanic Gardens Sydney 2016).

3.3.2 Fauna

Any fauna observed were recorded, with the nomenclature based variously on the compilations of Hero *et al.* (1991), Menkhorst (1995), Cogger (1996) and Simpson and Day (1998), utilising Triggs (1996) for identification using indirect methods, such as the presence of scats or tracks.

4. RESULTS AND DISCUSSION

4.1 Vegetation

The inventory of species noted across the area of evaluation, by Zone, is recorded in Appendix A.

A total of 37 vascular plant species were recorded across the property and roadside areas assessed; 16 of these species were introduced (Appendix A). The Paddock area (encapsulating all proposed development areas, which had a uniformity in their floras) had a total of 33 vascular species, of which 17 were indigenous and 16 were introduced, while the 11 Mile Road roadside had a total of 18 observed vascular plant species, of which 3 were introduced (Appendix A).

There were no rare or threatened species observed (after Environment and Heritage 2016).

It should be noted that at the time of assessment both areas were very dry, and probably at the annual low point in terms of detection of the full and typical indigenous (and introduced) species diversity more detectable in other seasons.

As indicated in Sec. 2, notwithstanding the direct impact of the extraction areas, the vegetation of much of the property does reflect a long-term agricultural land use:

- substantial tree clearing, with only scattered mature trees across the northern and central areas of the property in particular;
- no tree species recruit for several decades;
- no shrub layer or shrub recruitment;
- a ground layer that is predominantly opportunistic annual introduced species-based due to the recurrent cultivation and cropping disturbance over much of the property, with indigenous ground layer vegetation only evident around the base of clumps of trees or along some of the boundary areas along the perimeter fences;
- no fallen timber.

The majority of the property, particularly those areas elevated above the floodplain, has been cropped regularly for some time (including all of the proposed development areas), and the ground flora is dominated by introduced species (around 40-50 % projective foliage cover) such as Barley Grass (*Hordeum leporinum*), Wimmera Ryegrass (*Lolium rigidum*), Wild Oat (*Avena fatua*), Great Brome (*Bromus diandrus*), Hare's-foot Clover (*Trifolium arvense*) and Rat's-tail Fescue (*Vulpia myuros*). Under trees, other introduced species such as Rocket (*Sisymbriu*m spp.), Horehound (*Marrubium vulgare*), Fat Hen (*Chenopodium album*), Small-flowered Mallow (*Malva parvifolium*) and Wireweed (*Polygonum aviculare*) dominate (60-70 % projective foliage cover; Appendix A).

Some of the remnants trees are found in 'clumps' in the elevated northern section of the property (see Fig. 2-2, and Figures 4-1 to 4-3), and while these 'clumps' are dominated by introduced species at ground level, it is under these clumps that some indigenous ground layer species such as Creeping and Spiny-fruit Saltbush (*Atriplex semibaccata* and *A. spinibractea*), Small-flower Wallaby-grass (*Austrodanthonia setacea*), Climbing and Ruby Saltbush (*Einadia nutans* and *Enchylaena tomentosa*), Small-leaf Bluebush (*Maireana brevifolia*), Bottle Fissure-weed (*Maireana excavata*), Fuzzweed (*Vittadinia cuneata*), Curly Windmill Grass (*Enteropogon acicularis*) and Rough Spear-grass (*Austrostipa scabra*)(around 15-20 % projective foliage cover; Appendix A) can be found in low abundance; these species can be also be found in low abundance along some of the immediate property boundary areas adjacent to fencing.

The lower-lying eastern boundary area of the property that is geomorphically an extension of the wetland feature found in the adjacent National Park area, is in different condition to the remainder of the property, and maintains significant recent River Red Gum recruitment (most likely 2011-2012 when the area was in flood), and the ground-layer is predominantly indigenous grass in composition (especially Brown-backed Wallaby-grass and Warrego Summer Grass, *Paspalidium jubflorum*)(see Fig. 2-2 and Plate 2-3).

Also as previously indicated in Sec. 2, the adjacent 11 Mile Road road reserve sections to the west and north of the property contain a near continuous canopy of mostly mature indigenous trees (Western Grey Box; *Eucalyptus microcarpa*) with some younger individuals and a relatively well developed shrub layer; there is predominantly indigenous vegetation at ground level in the wider sections of this road reserve (See Plate 2-3). Typical indigenous species found in these road reserve areas include Creeping and Spiny-fruit Saltbush, Black Rolypoly (*Sclerolaena muricata*), Brown-backed Wallaby-grass (*Austrodanthonia duttoniana*), Climbing and Ruby Saltbush, Small-leaf Bluebush, Bottle Fissure-weed, Variable Sida (*Sida corrugata*), Fuzzweed, Curly Windmill Grass and Rough Spear-grass (around 30 % projective foliage cover of indigenous species, 30 % litter and 30 % bare earth), while introduced species such as Rocket, Horehound and Wimmera Ryegrass are found at a low abundance (< 10 % cover; Appendix A). While a little variable in condition because of the

variation in road reserve width, the road reserve is in general a good quality remnant of Western Grey Box woodland.

Based on the evidence provided by the remaining trees on the property and the vegetation of the adjacent areas, the pre-European site was a mixture of three NSW Plant Community Types (PCTs)(from Environment and Heritage 2012):

- PCT ID 7 – Inland Riverine Forests - River Red Gum-Warrego Grass-herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion. The lower-lying eastern boundary area of the property (Fig. 2-2) is a modified remnant of this PCT, while the adjacent sections of the Murray Valley National Park to this area are a more intact form of this PCT;
- PCT ID 75 – Riverine Sandhill Woodlands - Yellow Box-White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South Western Slopes Bioregion. The southern and south-western sections of the property elevated above the floodplain were likely to be this PCT, although little indigenous vegetation remains across this area on the property or the 11 Mile Road reserve;
- PCT ID 80 – Floodplain Transition Woodlands - Western Grey Box-White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion. This PCT would have covered most of the elevated north and north-western sections of the property; only tree remnants of this PCT remain on the property, while the vegetation of the 11 Mile Road reserve is a more intact representation.

The likely distribution and extent of these three PCTs across the property and adjacent areas is shown in Figures 4-1, 4-2 and 4-3.

4.2 Remnant Trees

A total of 62 indigenous tree individuals of various species were assessed across the property, and the details on these individuals can be viewed in the table in Appendix C. The location of all assessed trees can be seen in Figures 4-1 to 4-3.

Of these 62 trees, 8 trees (Trees 5, 6, 18-20, 32, 57 and 61; Table 4-1) were found to be outside the proposed development areas of 24.9 ha. Therefore, there are 54 trees found within one of the proposed development areas: 50 in the Northern Area and 4 in the Middle Area – there were no remnant trees within the boundaries of the Southern Area (Figures 4-1 to 4-3). In the Northern Area, 41 of these trees are live, and all 4 are live in the Middle Area (Table 4-1). Clearly, in the event of these areas being fully developed, these trees will be cleared.

The majority of these trees are 35 cm or greater in diameter at breast height (dbh; 1.30 m in height), with the exception of Trees 10, 15-17, 19, 29 and 32, which are all White Cypress-pines found in the Northern Area, and mostly in ‘clumps’ (Appendix C; Figures 4-1 and 4-2).

Table 4-1 The numbers of assessed trees inside and outside of the proposed development areas according to species, development areas and whether they are live or standing dead. Numbers are tree identifiers as used in the table in Appendix C, and tree locations relative to proposed development area boundaries can be seen in Figures 4-1 to 4-3.

Species	Outside development areas	Inside development areas		
		Development area	***Live***	***Standing dead***
River Red Gum (*Eucalyptus camaldulensis*)		North	1	
		Middle	2-4, 62	
		Southern		
White Cypress-pine (*Callitris glaucophylla*)	5, 6, 18-20, 32	North	7-11, 13-17, 21-23, 25-27, 30, 31, 33, 34, 36, 38-42, 44, 47, 48	12, 24, 28, 29, 35, 37, 43, 45, 46
		Middle		
		Southern		
Western Grey Box (*E. microcarpa*)		North	49-55	
		Middle		
		Southern		
Yellow Box (*E. melliodora*)	57	North		
		Middle		
		Southern		
Buloke (*Allocasuarina luehmannii*)	61	North	58-60	
		Middle		
		Southern		

Therefore, the maximum tree loss with the full development of the three proposed areas is 54 trees, with 9 of these being standing dead trees.

In addition to this potential tree loss, in the proposed Middle Area, there is also an area of dense River Red Gum recruits, all with a dbh of < 25 cm, which would be lost with the development (see Figures 4-1 and 4-2); the area of this River Red Gum patch within the development area boundary is approximately 0.0784 ha (or 784 m^2).

As indicated in Sec. 2.3, the proposed maximum extent of development consists of a Northern Area (of 15.91 ha extent), a Middle Area (2.00 ha) and a Southern Area (6.98 ha), as defined by Bell Cochrane and Associates (2015), and which are shown in Fig. 2-2 and in Plate 2-2.

However, as also indicated in Sec. 2.3, it is unlikely that EMM Group would ever seek to excavate all of these areas given the magnitude of the available resource and the relatively low annual demand for materials (Andrew Hollaron pers. comm. 2016). The existing extraction areas are likely to have 3-5 years of production remaining within their current extent, and only at the exhaustion of these

resources would ‘new’ areas within the proposed development extent be utilised (Kane Henson pers. comm. 2016).

It is likely that only areas of up to 1 ha would be utilised for extraction at any time in each of the proposed Northern and Southern Areas when the existing extraction areas are exhausted (Andrew Hollaron pers. comm. 2016). These areas are likely to provide sufficient resource for at least a 5-10 year period given current local demand (Kane Henson pers. comm. 2016), and therefore, the development footprint in the short-to-medium term across the property is likely to be < 2 ha in total of new excavation.

Given this small development footprint, EMM Group will develop future extraction areas that avoid any native vegetation losses; proposed Stage 1 extraction sites of < 1 ha each in the Northern and Southern Areas are shown in Fig. 4-4. As a consequence of their location, there will be no loss of any remnant trees as a consequence of development in the short-to-medium term.

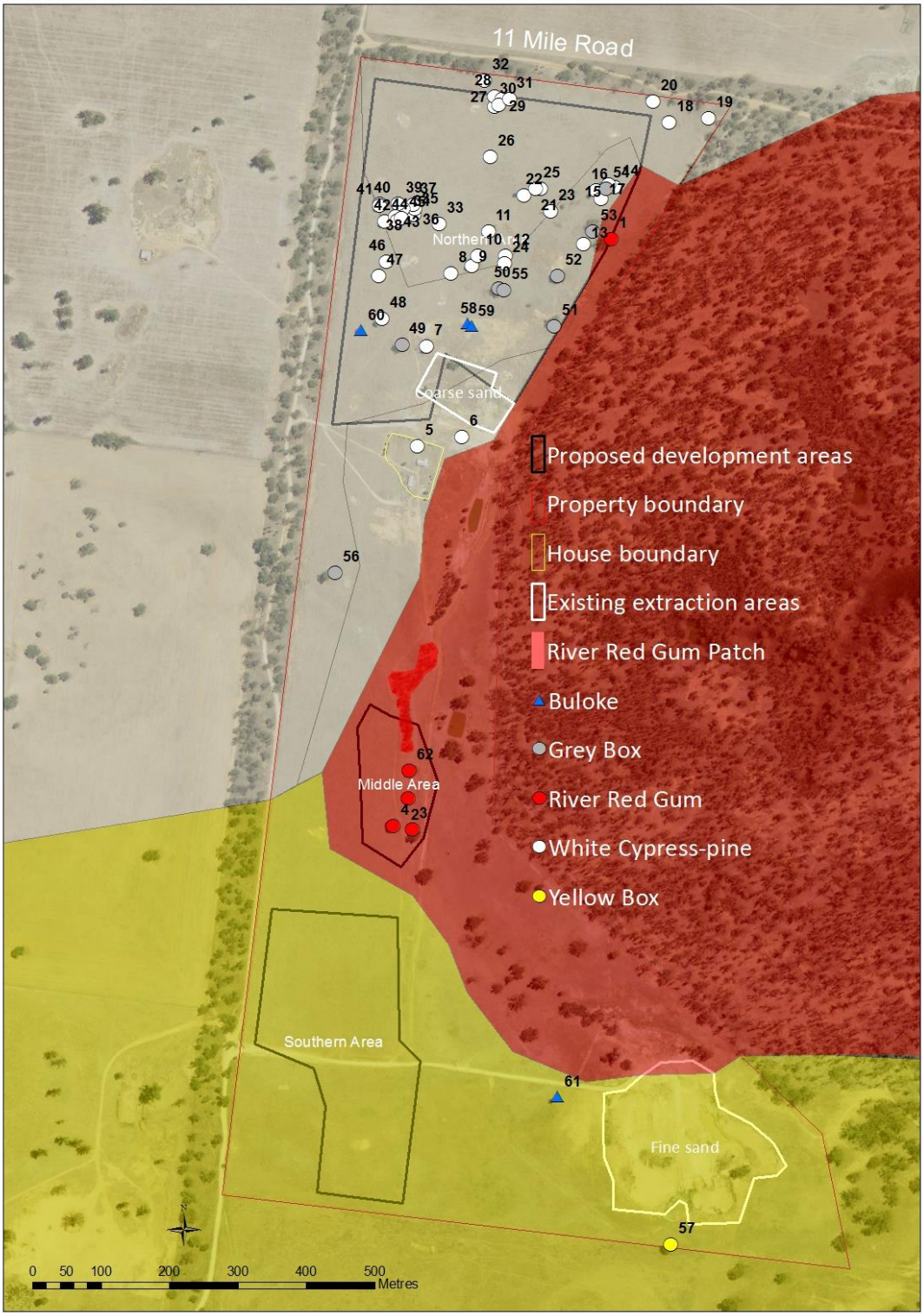

Figure 4-1 **Aerial image of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. The location and species of indigenous trees within the proposed development areas and around the existing excavated areas are also shown; numbers are tree identifiers in the table in Appendix D. Red shading indicates *Floodplain Transition Woodlands* (Plant Community Type [PCT] ID 7), white shading is *Inland Riverine Forests* (PCT ID 80), and yellow shading is *Riverine Sandhills Woodlands* (PCT ID 75); vegetation type data is from the VIS Plant Community Identification Tool (NSW Office of Environment and Heritage 2012)(aerial imagery and base map from Land and Property Information New South Wales 2016).**

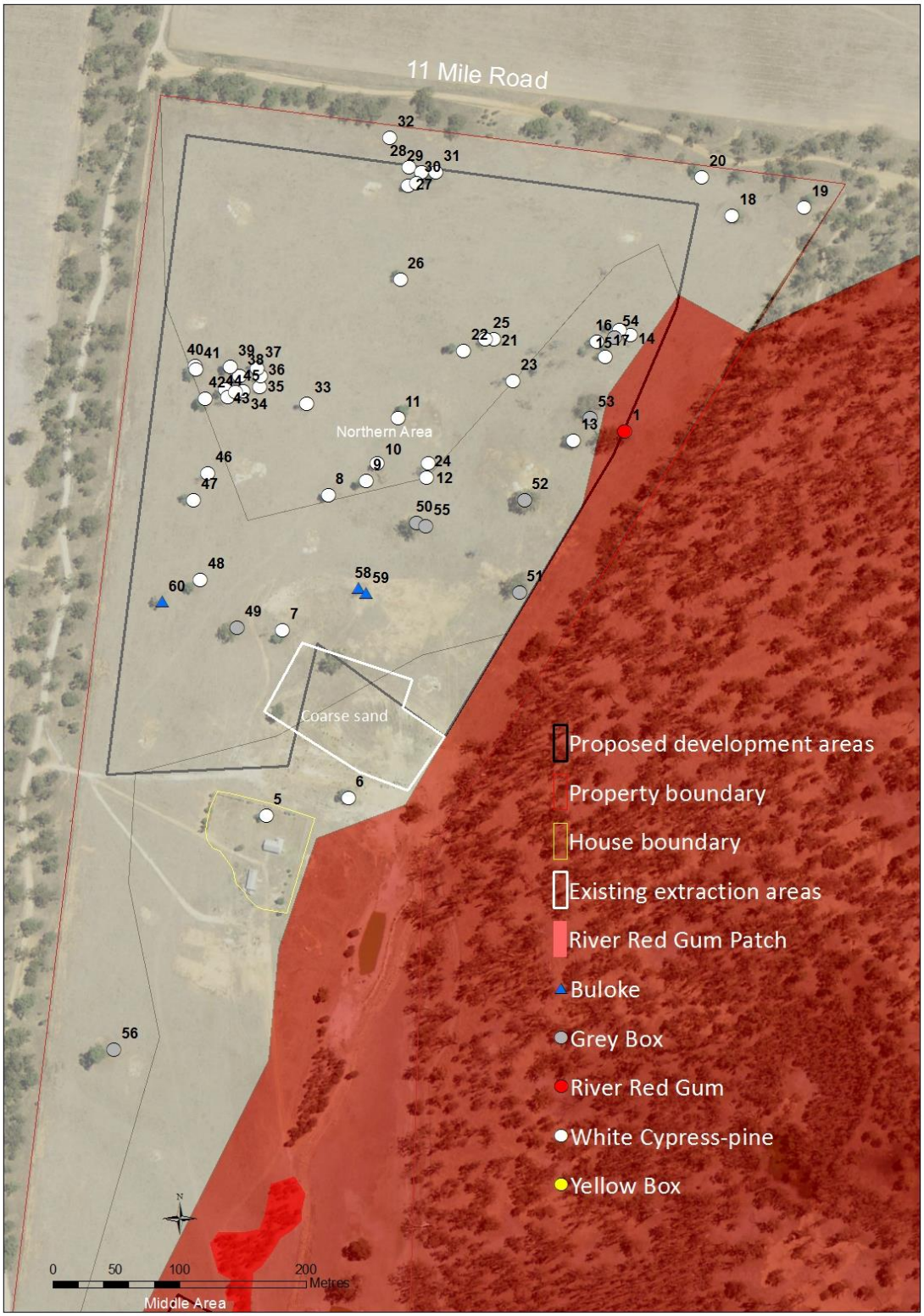

Figure 4-2 **Aerial image of the northern section of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. The location and species of indigenous trees within the proposed development areas and around the existing excavated areas are also shown; numbers are tree identifiers in the table in Appendix D. Red shading indicates *Floodplain Transition Woodlands* (Plant Community Type [PCT] ID 7), white shading is *Inland Riverine Forests* (PCT ID 80), and yellow shading is *Riverine Sandhills Woodlands* (PCT ID 75); vegetation type data is from the VIS Plant Community Identification Tool (NSW Office of Environment and Heritage 2012)(aerial imagery and base map from Land and Property Information New South Wales 2016).**

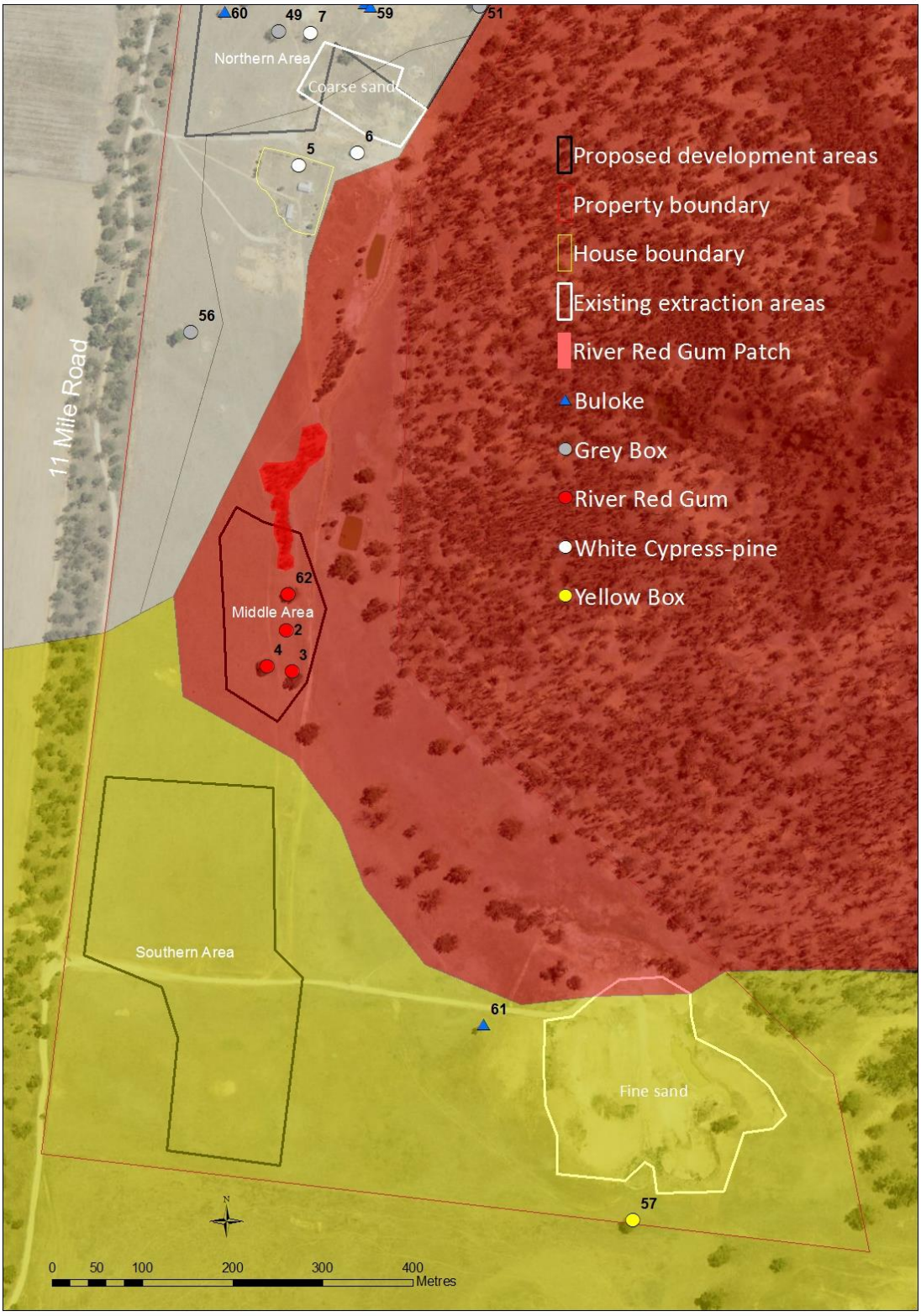

Figure 4-3 **Aerial image of the southern section of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. The location and species of indigenous trees within the proposed development areas and around the existing excavated areas are also shown; numbers are tree identifiers in the table in Appendix D. Red shading indicates *Floodplain Transition Woodlands* (Plant Community Type [PCT] ID 7), white shading is *Inland Riverine Forests* (PCT ID 80), and yellow shading is *Riverine Sandhills Woodlands* (PCT ID 75); vegetation type data is from the VIS Plant Community Identification Tool (NSW Office of Environment and Heritage 2012)(aerial imagery and base map from Land and Property Information New South Wales 2016).**

4.3 Fauna

There were 14 species of fauna observed, of which only one was introduced; the European Rabbit. Details of those species noted or inferred over the assessment period are detailed in Appendix B.

There were no rare or threatened species observed at the site (Environment and Heritage 2016a).

The species that were noted are typically those observed in modified/cleared-rural environments, such as the indigenous Australian Magpie, Australian Raven, Eastern Rosella, Crested Pigeon, Long-billed Corella, Galah, Magpie-lark, Noisy Miner and Willie Wagtail (Appendix C).

The 11 Mile Road roadside and the adjacent National Park will provide a reasonable habitat surrounding this predominantly cleared site dominated by introduced species at ground level; there would be many hollows of different dimensions found within the mature trees on either side of the property, and many other habitat resources as well. Emus were observed in the adjacent National Park and on the EMM Property, and Rufous Whistlers were heard in the roadside reserve, as a reminder of the vast differences in vegetation structure and diversity and habitat opportunities on the other side of the fence.

Notwithstanding these issues, the lack of observed species diversity across the property is not surprising, given:

- the relative lack of woody vegetation across the property, with particular reference to the proposed development areas (and the commensurate depauperite and simplified structure) as a result of the substantive clearing and disturbance, would considerably limit mammal, reptile, bat and bird species residency;
- the lack of fallen timber, which would considerably limit mammal, reptile, bat and bird species residency;
- domination of the ground layer vegetation by introduced species across much of the property;
- the likely presence of feral animal populations such as foxes and feral cat, which would actively predate any ground-dwelling or near ground-dwelling species heavily.

On this basis, there are relatively few opportunities for fauna occupation of the proposed development sites, in terms of a simplified vegetation structure (i.e. little shrub or emerging tree layer, meaning fewer opportunities for food collection and shelter/protection), and a relative lack of food sources (e.g. lack of indigenous nectar producing plants and those producing fleshy fruits).

While some bird and mammal fauna may utilise the habitat resources found along the adjacent road reserve and National Park, there are limited habitat opportunities for fauna in the proposed development areas in terms of residence because of the lack of vegetation structure, on-going disturbance at the site, and the lack of structural and compositional diversity. The property and the proposed development areas will provide some limited opportunities for seasonal foraging at ground level and for hunting for some bird species that would be present in the adjacent National Park or utilising the vegetation of the road reserve; however, it is clear that these areas are not primary or even secondary habitat for these species, and usage would be casual, infrequent and opportunistic.

However, the site does provide some habitat resources, especially for hollow-dependent fauna, as a consequence of the retention of a significant number of mature trees, most of which are in the north of the property. Of the 62 assessed mature trees across the site (see Sec. 4.2), 22 of them were assessed as being without any hollows (and therefore 40 trees with at least small hollows evident), with the majority of these being White Cypress-pine (*Callitris glaucophylla*) under 40 cm diameter at breast height (dbh; 1.3 m). Further to this, of the 62 assessed trees, 10 were dead, and

all of these were White Cypress-pines < 50 cm dbh; all of these dead trees had at least small hollows evident, irrespective of their diameter.

The road reserves and adjacent National Park do provide excellent connectivity of the site to large blacks of native vegetation; however, by-and-large, except for the immediate eastern edge of the property which is not to be developed. Notwithstanding the presence of at least 40 trees with hollows on the property mostly in the northern section of the property, the site lacks the habitat resources to take full advantage of the excellent connectivity on the environs of the property; the trees with hollows would provide some connectivity in the north of the property, but because of the lack of mature trees in the central and southern sections of the property, these areas do not provide any contribution to connectivity (See Fig. 4-1).

4.4 Potential Native Vegetation Loss

The vegetation of the three proposed development areas does reflect a long-term agricultural usage (Sec. 2.2):

- substantial tree clearing, with only scattered mature trees across the northern and central areas of the property in particular;
- no tree recruit for several decades;
- no shrub layer or shrub recruitment;
- a ground layer that is predominantly opportunistic annual introduced species-based due to the recurrent cultivation and cropping disturbance over much of the property, with indigenous ground layer vegetation only evident around the base of clumps of trees or along some of the boundary areas along the perimeter fences;
- no fallen timber.

On this basis, the only native vegetation loss across the property with the proposed development would be loss of the remnant trees, the distribution of which have been described in Sec. 4.2.

As indicated in Sec. 2.3, the proposed maximum extent of development consists of three areas that have been selected in because of the differences in sand resource which they provide to future operations (Kane Henson pers. comm. 2016); the determination of the type and extent of the sand resource was provided by an extensive site survey and resource estimation conducted by Bell Cochrane and Associates in 2015 (Bell Cochrane and Associates 2015).

The Northern Area (of 15.91 ha extent), the Middle Area (2.00 ha) and Southern Area (6.98 ha) as defined by Bell Cochrane and Associates (2015) are shown in Fig. 2-2 and in Plate 2-2.

It is unlikely that EMM Group would ever seek to excavate all of these areas (Andrew Hollaron pers. comm. 2016). The existing extraction areas are likely to have 3-5 years of production remaining within their current extent, and only at the exhaustion of these resources would ‘new’ areas within the proposed development extent be utilised (Kane Henson pers. comm. 2016).

It is likely that only areas of up to 1 ha would be utilised for extraction at any time in each of the proposed Northern and Southern Areas when the existing extraction areas are exhausted (Andrew Hollaron pers. comm. 2016). These areas are likely to provide sufficient resource for at least a 5-10 year period given the stated current local demand (Kane Henson pers. comm. 2016), and therefore, the development footprint in the short-to-medium term across the property is likely to be < 2 ha in total of new excavation.

Proposed areas for the Stage 1 development are shown in Fig. 2-3 and Fig. 4-4; both of these areas are around 1 ha, and have been located to avoid any native vegetation (remnant tree) loss, either through the actual extraction sites themselves, or vehicle tracks that would be required to access

them. Any development activity would adhere to minimum distances to the extent of individual tree protection zones (TPZs) in accordance with *Australian Standard: Protection of Trees on Development Sites* (AS4970-2009) for all trees in proximity to the areas to be used as access ways and for sand excavation.

Following the on-site meeting with OEH and Murray Shire staff on the 29th February 2016, EMM Group have decided that there is sufficient area within the outlined development sites to avoid native vegetation loss beyond the proposed Stage 1 developments; native vegetation losses will be avoided in all staged developments into the future (Andrew Hollaron pers. comm. 2016).

Therefore, on this basis, there would be no native vegetation loss in the short-to-medium term as a consequence of any proposed development.

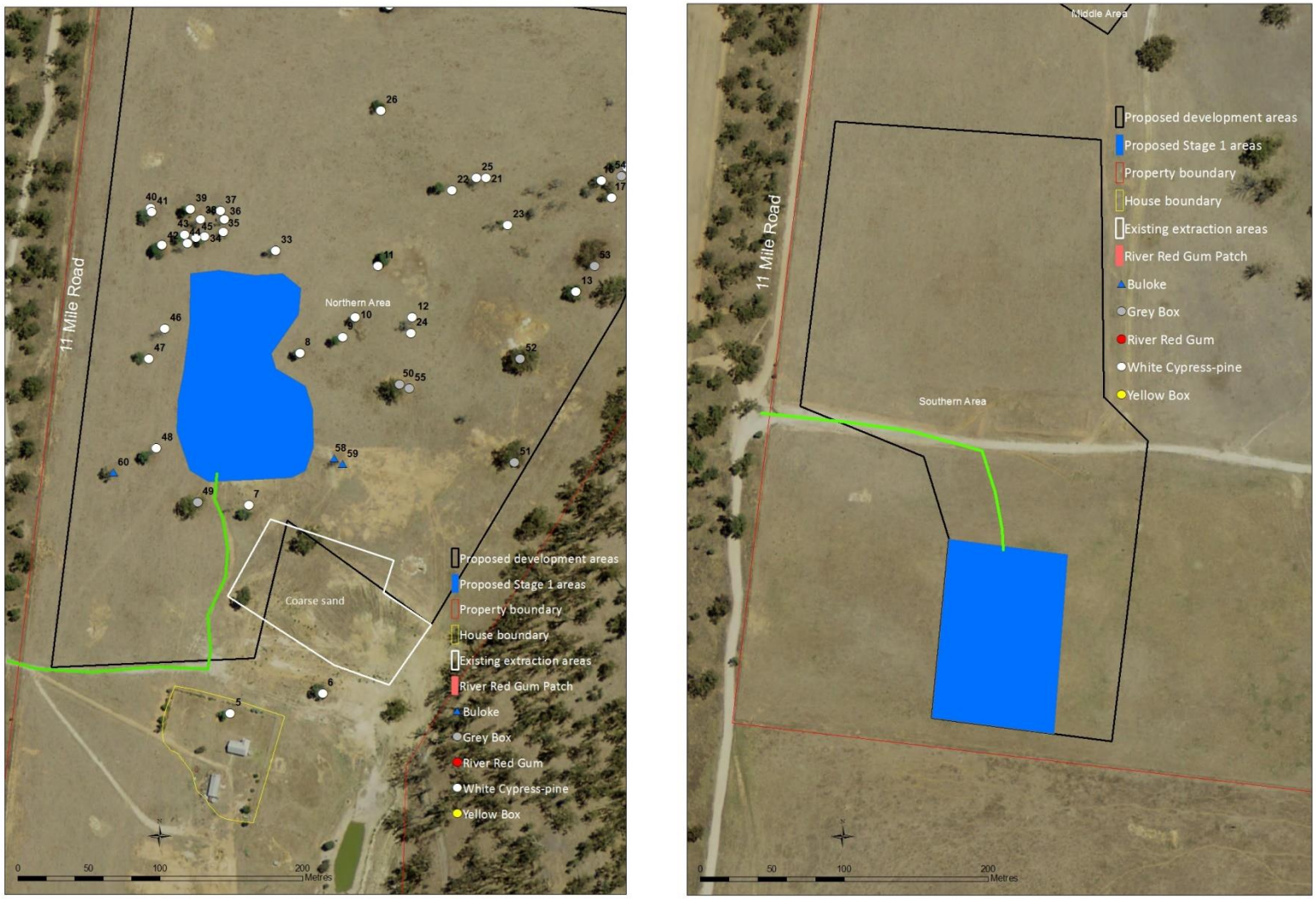

Figure 4-4 **Aerial image of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. Proposed access tracks to Stage 1 extraction areas are shown as solid green lines. The proposed Stage 1 extraction areas are shown shaded in blue; proposed northern area is shown on the left, and southern area on the right (aerial imagery and base map from Land and Property Information New South Wales 2016).**

4.5 Biodiversity Offsets

As indicated in Sec. 4.4, following the on-site meeting with OEH and Murray Shire staff on the 29th February 2016, EMM Group have decided that there is sufficient area within the outlined development sites to avoid native vegetation loss beyond the proposed Stage 1 developments; native vegetation losses will be avoided in staged developments into the future (Andrew Hollaron pers. comm. 2016).

Up until this decision was made, two potential offset options (or a combination thereof) had been considered to offset any native vegetation losses:

- All or part of the low-lying strip of River Red Gum Forest Wetland on the eastern edge of the property (of maximum extent of approximately 13.2 ha) as an existing remnant offset;
- The full or part revegetation of the 30 m width buffer strip adjacent to the 11 Mile Road reserve (of approximately 4.75 ha) with an appropriate mixture of indigenous species.

These areas can be viewed in Fig. 4-4.

However, given that there will be no native vegetation loss in the short-to-medium term as a consequence of any proposed development, the designation of any offset area is now redundant.

4.6 Impact of Development on Adjacent Land

The potential direct and indirect impacts of the proposed development will be fully considered in the Environmental Impact Assessment (EIA) document that will accompany the development proposal.

However, from a biodiversity viewpoint, given that the proposed development will be designed to avoid any native vegetation loss, it is highly unlikely that there would be any impact of the development on the flora, fauna or communities of the adjacent freehold or public land, including the 11 Mile Road reserve.

The likelihood of impact of the development on threatened species and communities, in particularly, is considered in Sec. 4.7.

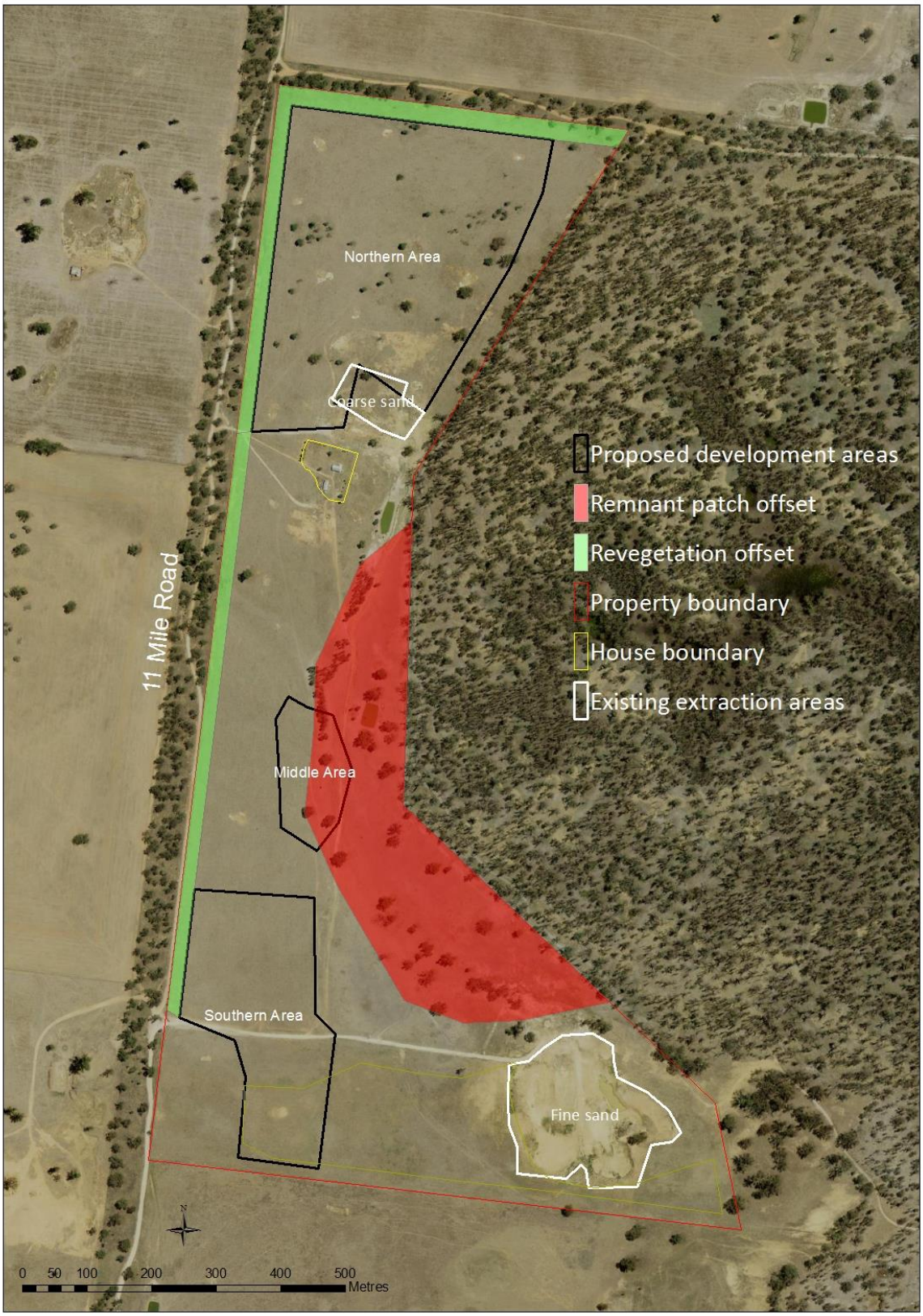

Figure 4-4 **Aerial image of the EMM Group Moama property, showing property boundary, existing and proposed extraction areas, and house boundary. Considered potential offset areas are also shown (aerial imagery and base map from Land and Property Information New South Wales 2016).**

4.7 Threatened Species and Communities

4.7.1 Threatened community likelihood

As stated previously, based on the evidence provided by the remaining trees on the property and the vegetation of the adjacent areas, the pre-European site was a mixture of three NSW Plant Community Types (PCTs)(from Environment and Heritage 2012):

- PCT ID 7 – Inland Riverine Forests - River Red Gum-Warrego Grass-herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion. The lower-lying eastern boundary area of the property, including the proposed Middle Area (Fig. 2-2), is a modified remnant of this PCT, while the adjacent sections of the Murray Valley National Park to this area are a more intact form of this PCT;
- PCT ID 75 – Riverine Sandhill Woodlands - Yellow Box-White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South Western Slopes Bioregion. The southern and south-western sections of the property elevated above the floodplain, including the proposed Southern Area and the existing 'Fine Sand' quarry, were likely to be this PCT, although little indigenous vegetation remains across this area on the property or the 11 Mile Road reserve;
- PCT ID 80 – Floodplain Transition Woodlands - Western Grey Box-White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion. This PCT would have covered most of the elevated north and north-western sections of the property, including the 11 Mile Road reserve, proposed Northern Area and the existing 'Coarse Sand' quarry; only tree remnants of this PCT remain on the property, while the vegetation of the 11 Mile Road reserve is a more intact representation.

The likely distribution and extent of these three PCTs across the property and adjacent areas is shown in Figures 4-1, 4-2 and 4-3.

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the *Threatened Species Conservation Act 1995*; *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions,* the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions,* the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions,* and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community, and *Natural Grasslands of the Murray Valley Plains* community, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, Weeping Myall Woodlands* and the *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs *Inland Grey Box Woodland in the Riverina* and/or *Sandhill Pine Woodland in the Riverina*; there were Buloke (*Allocasuarina luehmannii*) individuals found across the site, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

No Weeping Myall, White Box, or Blakely's Red Gum individuals or areas that would have been remnant grasslands, were found across the assessed areas, and these EECs were unlikely to have occurred in this district.

4.7.2 Threatened species likelihood

There were no rare or threatened species under the *Threatened Species Conservation Act 1995* observed at the property (Environment and Heritage 2016a).

The likelihood of presence for all recorded threatened species within a 20 km radius of the site has been considered (Environment and Heritage 2016a), and for those species listed in a broader search of the Threatened Species Profile for species known or predicted to occur in the Murray Catchment (DoE 2016).

BioNet – Website of the Atlas of NSW Wildlife searches revealed that there were records or predicted occurrences of twenty four (24) threatened fauna species within a 20 km radius of the site and within the catchment (Environment and Heritage 2016; Appendix D).

BioNet – Website of the Atlas of NSW Wildlife and Matters of National Environmental Significance searches revealed that there were records or predicted occurrences of seven (7) threatened flora species within a 20 km radius of the site (Environment and Heritage 2016a; Appendix D).

A map of the location of sighting records for those threatened flora and fauna species identified as occurring within a 20 km radius by the *BioNet – Website of the Atlas of NSW Wildlife* is shown as part of Appendix D.

The likelihood of the presence of these species and their likelihood of utilisation of the three proposed development areas was considered, and rated based on the prevailing habitat and habitat quality of the site, the landscape connectivity and known records for species, and the composition, abundance and structure of indigenous vegetation (Appendix D).

Of these species, all seven of the flora and twenty fauna species were not likely to occur on the proposed development areas or to utilise them because of the following issues (or combination of them):

- the lack of a suitable community/habitat type (e.g. Floating Swamp Wallaby-grass, *Austrostipa wakoolica*, Claypan Daisy, *Prasophyllum* sp. Moama, *Pterostylis despectans*, Turnip Copperburr, Slender Darling-pea, Australasian Bittern, Australian Painted Snipe, Blue-billed Duck, Curlew Sandpiper, Grey-headed Flying-fox, Plains-wanderer, Southern Bell Frog);
- the loss of connectivity through clearing of habitat (e.g. Grey-crowned Babbler, Koala, Painted Honeyeater, Plains-wanderer, Regent Honeyeater, Southern Bell Frog, Swift Parrot);
- the length of time since last sighting (e.g. Hooded Robin, Speckled Warbler);
- disturbance to, and simplification of the site (e.g. Rigid Spider-orchid, Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Flame Robin, Grey-crowned Babbler, Hooded Robin, Painted Honeyeater, Pink-tailed Worm-lizard, Regent Honeyeater, Speckled Warbler, Swift Parrot, Varied Sittella).

Four species of fauna (Barking Owl, Black Falcon, Brolga and Superb Parrot) were considered to have potential to utilise the property and the proposed development sites (Appendix D). As indicated in Sec. 4-2, the property and the proposed development areas will provide some limited opportunities for seasonal foraging at ground level and for hunting for these bird species that would be present in the adjacent National Park or utilising the vegetation of the road reserve; however, it is clear that these areas are not primary or even secondary habitat for these species, and usage would be casual, infrequent and opportunistic. Specific likelihood is considered because the property and proposed development sites (Appendix D):

- is within the range of foraging habitat for the species (Brolga and Superb Parrot)
- is likely to be contained within a hunting home range (Barking Owl and Black Falcon);
- is within close proximity to known recent locations (Barking Owl, Black Falcon, Brolga and Superb Parrot).

4.7.3 Seven Part Test

Section 5A of the *Environmental Planning and Assessment A*ct *1979* sets out seven parameters that a determining authority must consider in deciding whether an activity is likely to have a significant effect on threatened species, populations, or ecological communities, or their habitats.

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs *Inland Grey Box Woodland in the Riverina* and/or *Sandhill Pine Woodland in the Riverina*; there were Buloke (*Allocasuarina luehmannii*) individuals found across the site, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland* in the Riverina, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees. (Environment and Heritage 2016b).

Seven threatened species of flora and twenty four species of fauna have been recorded within a 20 km radius of the site (Environment and Heritage 2016b)(Sec. 4.4.2).

All seven flora species and twenty of the fauna species were considered unlikely to occur on or utilise the proposed development sites, and have been evaluated using the seven parameters, and it is considered that the proposed loss of 54 indigenous trees and 0.0784 ha of a dense regrowth patch of River Red Gum recruits would have no impact on these species and populations, or their habitats (Appendix D).

Four species of the fauna, were considered to be either likely to be present or utilise the site at some stage in their life cycle (Sec. 4.4.2). The application of the seven parameters of Section 5A of the *Environmental Planning and Assessment A*ct *1979* in the following section specifically addresses the effects of the proposed native vegetation loss on the four species.

Barking Owl

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

The Barking Owl has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for hunting is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for hunting. However, no native vegetation loss will now occur on the site as a consequence of the proposed development; no mature remnant hollow-bearing trees will therefore be lost, and therefore the impact of the development on this hollow-dependent species should be negligible.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction:

Endangered populations and species are listed in Schedule 1 of the *Threatened Species Conservation Act 1995*, while vulnerable populations and species are listed in Schedule 2 of the Act.

The Barking Owl has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for hunting is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for hunting. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development; no mature remnant hollow-bearing trees will therefore be lost, and therefore the impact of the development on this hollow-dependent species should be negligible.

The proposed development activity would not increase the risk of local extinction for this species.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the *Threatened Species Conservation Act 1995*; *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there

is therefore no risk to the local occurrence or risk of extinction to any such ecological community.

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the composition of any such ecological community or indeed any risk of local extinction of any such community.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Barking Owl has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for hunting is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for hunting. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the

proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development.

In this sense, it is believed that the proposed development will not have an adverse effect on the species because they it is either already not present on the site because of the current level of disturbance, or it can utilise adjacent areas with similar or better quality habitat readily for hunting.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised extension to the hunting territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

Potential habitat for the species will not become fragmented or isolated from equivalent or better habitat as a consequence of the development.

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

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised, low quality extension to the hunting territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

The potential habitat for the species that would be lost to the species as a consequence of development is a low quality highly modified extension to its hunting range, and its loss would not impact on the long-term survival of the species in the locality given the abundance of equivalent or better habitat in adjacent areas.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):

No critical habitat has been declared for the area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan:

The Barking Owl is listed as Vulnerable under both the NSW *Threatened Species Conservation Act 1995*; there is no species action statement for the Barking Owl as yet, and the species has been assigned to the Landscape Species stream under the *Saving our Species* program (Environment and Heritage 2016b). The following management actions have been identified for the species (from Environment and Heritage 2016b):

- Apply a mosaic pattern during fire hazard reduction to ensure the same areas are not burned too frequently;
- Protect woodland and open forest remnants, especially those containing hollow-bearing trees;
- Retain and enhance vegetation along watercourses and surrounding areas to protect important habitat of the owls and their prey;
- Maintain a buffer of undisturbed native vegetation at least 200 metres radius around known nest sites;
- Retain standing dead trees and large fallen logs;
- Fence habitat remnants and protect from heavy grazing.

The main habitat to be utilised by the species near the property will be the National Park and Murray River corridor, and this development does not impinge on the habitat quality of these areas. While the species may utilise the proposed site as an extension of its hunting range, and the loss of the development site areas would marginally reduce the available habitat for this, the freehold areas surrounding the site to the north, south and west provide comparable quality habitat, and the road reserves and National Park contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain in their current condition and with their current land use, the risk of fragmentation and any adverse effects on the life cycle of the species would be minimal.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process:

Key threatening processes are listed in Schedule 3 of the *Threatened Species Conservation Act 1995*. *Clearing of native vegetation*, *Loss of hollow-bearing trees* and *Removal of dead wood and dead trees* are all listed as Key Threatening Processes.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature living or dead remnant trees will therefore be lost or dead wood removed.

In this sense, the proposed development does not increase the impact of the three outlined Key Threatening Processes at a local level.

Black Falcon

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

The Black Falcon has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for hunting is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for hunting. However, no native vegetation loss will now occur on the site as a consequence of the proposed development; no mature remnant hollow-bearing trees will therefore be lost, and therefore the

impact of the development on this hollow-dependent species should be negligible.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction:

Endangered populations and species are listed in Schedule 1 of the *Threatened Species Conservation Act 1995*, while vulnerable populations and species are listed in Schedule 2 of the Act.

The Black Falcon has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for hunting is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for hunting. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development; no mature remnant hollow-bearing trees will therefore be lost, and therefore the impact of the development on this hollow-dependent species should be negligible.

The proposed development activity would not increase the risk of local extinction for this species.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found

across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the local occurrence or risk of extinction to any such ecological community.

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.
However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the composition of any such ecological community or indeed any risk of local extinction of any such community.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the

action proposed, and

The Black Falcon has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for hunting is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for hunting. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development.

In this sense, it is believed that the proposed development will not have an adverse effect on the species because they it is either already not present on the site because of the current level of disturbance, or it can utilise adjacent areas with similar or better quality habitat readily for hunting.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised extension to the hunting territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

Potential habitat for the species will not become fragmented or isolated from equivalent or better habitat as a consequence of the development.

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

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised, low quality extension to the hunting territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent hunting habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist

and with the same imposed management, and they will continue to remain available to the species.

The potential habitat for the species that would be lost to the species as a consequence of development is a low quality highly modified extension to its hunting range, and its loss would not impact on the long-term survival of the species in the locality given the abundance of equivalent or better habitat in adjacent areas.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):

No critical habitat has been declared for the area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan:

The Black Falcon is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995*; there is no species action statement for the Black Falcon as yet, and the species has been assigned to the Landscape Species stream under the *Saving our Species* program (Environment and Heritage 2016b). The following management actions have been identified for the species (from Environment and Heritage 2016b):

- Protect and monitor known nest sites;
- Protect old stick nests (e.g., those of corvids and raptors) that have the potential to be used as nest sites;
- Protect and facilitate the recruitment of large old trees, a resource that is critical for nesting and hunting;
- Protect and expand potential nesting habitat, especially riparian and floodplain woodlands;
- Identify Black Falcon nesting territories and engage landholders in the management of habitat in these areas;
- Promote the reporting of any signs of disease that are unusual or clusters of deaths in raptors or their prey to the NSW Environment Line;
- Investigate the dietary importance of terrestrial ground birds and rabbits, and the potential for agricultural activities to benefit or negatively impact on falcon populations;
- Increase community awareness of the Black Falcon through the preparation and distribution of educational material, including an identification guide.

The NSW Scientific Committee Final Determination under the *Threatened Species Conservation Act 1995* indicates that the species inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees.

The Black Falcon is usually associated with streams or wetlands, visiting them in search of prey and often using standing dead trees as lookout posts. Habitat selection is generally influenced more by prey densities than by specific aspects of habitat floristics or condition.

The main habitat to be utilised by the species near the property will be the National Park and Murray River corridor, and this development does not impinge on the habitat quality of these areas. While the species may utilise the proposed site as an extension of its hunting range, and the loss of the development site areas would marginally reduce the available habitat for this, the freehold areas surrounding the site to the north, south and west provide comparable quality habitat, and the road reserves and National Park contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain in their current condition and with their current land use, the risk of fragmentation and any

adverse effects on the life cycle of the species would be minimal.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process:

Key threatening processes are listed in Schedule 3 of the *Threatened Species Conservation Act 1995*. *Clearing of native vegetation*, *Loss of hollow-bearing trees* and *Removal of dead wood and dead trees* are all listed as Key Threatening Processes.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature living or dead remnant trees will therefore be lost or dead wood removed.

In this sense, the proposed development does not increase the impact of the three outlined Key Threatening Processes at a local level.

Brolga

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

The Brolga has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for foraging is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for foraging. However, no ground layer native vegetation will therefore be lost, and therefore the impact of the development on this foraging species should be negligible.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction:

Endangered populations and species are listed in Schedule 1 of the *Threatened Species Conservation Act 1995*, while vulnerable populations and species are listed in Schedule 2 of the Act.

The Brolga has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for foraging is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for foraging. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development, and therefore the impact of the development on this foraging species should be negligible.

The proposed development activity would not increase the risk of local extinction for this species.

c) in the case of an endangered ecological community or critically endangered ecological

community, whether the action proposed:

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the local occurrence or risk of extinction to any such ecological community.

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains*

community, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the composition of any such ecological community or indeed any risk of local extinction of any such community.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Brolga has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for foraging is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for foraging. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development.

In this sense, it is believed that the proposed development will not have an adverse effect on the species because they it is either already not present on the site because of the current level of disturbance, or it can utilise adjacent areas with similar or better quality habitat readily for foraging.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised extension to the foraging territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on

the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

Potential habitat for the species will not become fragmented or isolated from equivalent or better habitat as a consequence of the development.

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

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised, low quality extension to the foraging territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

The potential habitat for the species that would be lost to the species as a consequence of development is a low quality highly modified extension to its foraging range, and its loss would not impact on the long-term survival of the species in the locality given the abundance of equivalent or better habitat in adjacent areas.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):

No critical habitat has been declared for the area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan:

The Brolga is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995*; there is no species action statement for the Brolga as yet, and the species has been assigned to the Partnership Species stream under the *Saving our Species* program (Environment and Heritage 2016b). The following management actions have been identified for the species (from Environment and Heritage 2016b):

- Retain or reintroduce water flows to wetlands, soaks, swamps, etc.
- Educate all rural landholders about the importance of Brolgas and encourage them to retain wetland areas on their properties for these magnificent birds;
- Establish and implement a system of monitoring and reporting to identify whether Brolgas are being persecuted by landholders;
- Conduct an annual, region- or state-wide, community/volunteer/landholder-based Brolga census. Advertise and educate prior to and send out census forms for landholders to complete and send back;

- Identify at least 25 currently inhabited sites across the species range for management or recovery actions;
- Establish a comprehensive monitoring program across the 25 sites in order to determine the success or otherwise of recovery actions and to guide future actions;
- Encourage landowners to fence off stock from wetland areas (or parts of) in order to retain or restore some habitat for the Brolga;
- Encourage landowners with suitable wetlands to enter into a VCA or other form of site protection for the Brolga;
- Provide support, advice and assistance to Bushcare groups for the restoration of wetlands (through brochures, field days, funds, resources, advice on locations or species for planting, weed removal, etc.).

While Brolgas are dependent on wetlands, especially shallow swamps, where they will forage with their head entirely submerged. However, they often feed in dry grassland or ploughed paddocks or even desert clay pans adjacent to these wetlands (Environment and Heritage 2016b).

The main habitat to be utilised by the species near the property will be the wetland areas National Park and Murray River corridor when flooding has occurred, and this development does not impinge on the habitat quality of these areas. While the species may utilise the proposed site as an extension of its foraging range, and the loss of the development site areas would marginally reduce the available habitat for this, the freehold areas surrounding the site to the north, south and west provide comparable quality habitat, and the road reserves and National Park contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain in their current condition and with their current land use, the risk of fragmentation and any adverse effects on the life cycle of the species would be minimal.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process:

Key threatening processes are listed in Schedule 3 of the *Threatened Species Conservation Act 1995*. *Clearing of native vegetation*, *Loss of hollow-bearing trees* and *Removal of dead wood and dead trees* are all listed as Key Threatening Processes.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature living or dead remnant trees will therefore be lost or dead wood removed.

In this sense, the proposed development does not increase the impact of the three outlined Key Threatening Processes at a local level.

Superb Parrot

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

The Superb Parrot has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for nesting and/or foraging is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for nesting habitat, and may use the road reserve site as part of an extended area for foraging. However, no native vegetation loss will now occur on the site as a consequence of the proposed development; no mature remnant hollow-bearing trees will therefore be lost, and therefore the impact of the development on this hollow-dependent species should be negligible.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction:

Endangered populations and species are listed in Schedule 1 of the *Threatened Species Conservation Act 1995*, while vulnerable populations and species are listed in Schedule 2 of the Act.

The Superb Parrot has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by this species for nesting and/or foraging is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for foraging. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development; no mature remnant hollow-bearing trees will therefore be lost, and therefore the impact of the development on this hollow-dependent species should be negligible.

The proposed development activity would not increase the risk of local extinction for this species.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely

dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the local occurrence or risk of extinction to any such ecological community.

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

Endangered Ecological Communities (EECs) are listed in Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995; Inland *Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*, the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions*, the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions*, and *White Box Yellow Box Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (Environment and Heritage 2016b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community*, and *Natural Grasslands of the Murray Valley Plains community*, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, *Weeping Myall Woodlands and the Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within a 20 km radius of the sites (DoE 2016).

As indicated previously, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, as explained in Sec. 4-1, these communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature remnant trees will therefore be lost.

On this basis, no endangered or critically endangered ecological community is to be impacted directly or indirectly as a consequence of this proposed development, and there is therefore no risk to the composition of any such ecological community or indeed any risk of local extinction of any such community.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Superb Parrot has been recorded within 10 km of the property, and therefore is identified as potentially utilising the site; the regular/frequent use of the proposed development sites by

this species for nesting and/or foraging is unlikely given the existing modified (highly simplified) condition. The species is more likely to utilise the adjacent National Park and associated Murray River corridor for habitat, and may use the road reserve site as part of an extended area for foraging. These areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

However, no native vegetation loss, including mature trees with hollows, will now occur on the site as a consequence of the proposed development.

In this sense, it is believed that the proposed development will not have an adverse effect on the species because they it is either already not present on the site because of the current level of disturbance, or it can utilise adjacent areas with similar or better quality habitat readily for foraging and/or nesting.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised extension to the foraging territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

Potential habitat for the species will not become fragmented or isolated from equivalent or better habitat as a consequence of the development.

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

The proposed development will not result in any native vegetation loss. The development will impact on previously cultivated land that has a very low projective foliage cover of native vegetation. These development areas would have formed an infrequently utilised, low quality extension to the foraging territory of this species, and the loss of this area for this purpose will have no impact on the species, as areas adjacent to the proposed development sites on the same property, and freehold land to the north, south and west of the property, provide equivalent foraging habitat, while the adjacent road reserves of 11 Mile Road provide good habitat and a continuity in tree cover, and the National Park and associated Murray River corridor contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain as they currently exist and with the same imposed management, and they will continue to remain available to the species.

The potential habitat for the species that would be lost to the species as a consequence of development is a low quality highly modified extension to its foraging range, and its loss would not impact on the long-term survival of the species in the locality given the abundance of equivalent or better habitat in adjacent areas.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):

No critical habitat has been declared for the area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan:

The Superb Parrot is listed as Vulnerable under both the NSW *Threatened Species Conservation Act 1995* and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*. There is a National Recovery Plan for the species (DoE 2016), and a targeted strategy for the species has been developed under the *Saving our Species* program (Environment and Heritage 2016b). The following management actions have been identified for the species (from Environment and Heritage 2016b):

- Retain and protect hollow-bearing trees;
- Retain and protect woodland remnants;
- Cover grain trucks and check all openings are properly sealed;
- Report grain spills to local authorities so they can be removed;
- Report suspected illegal bird trapping, egg collection or sales to NPWS;
- Remove feral bee colonies from hollows in Superb Parrot habitat, or report them to NPWS officers.

The main habitat to be utilised by the species near the site will be the National Park and Murray River corridor for nesting, and this development does not impinge on the habitat quality of these areas. While the species may utilise the proposed site as an extension of its foraging range, and the loss of the development site areas would marginally reduce the available habitat for this, the freehold areas surrounding the property to the north, south and west provide comparable quality habitat, and the road reserves and National Park contain a better quality vegetation in terms of composition, abundance and quality compared to the proposed development sites; these areas will remain in their current condition and with their current land use, the risk of fragmentation and any adverse effects on the life cycle of the species would be minimal.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process:

Key threatening processes are listed in Schedule 3 of the *Threatened Species Conservation Act 1995*. *Clearing of native vegetation*, *Loss of hollow-bearing trees* and *Removal of dead wood and dead trees* are all listed as Key Threatening Processes.

However, no native vegetation loss will now occur on the site as a consequence of the proposed development and no mature living or dead remnant trees will therefore be lost or dead wood removed.

In this sense, the proposed development does not increase the impact of the three outlined Key Threatening Processes at a local level.

5. CONCLUSION

The EMM Group is proposing extending their sand quarrying operations at their 80 ha property on 11 Mile Road Moama; the property is a mostly cleared of the original woody vegetation, with some scattered trees in the north of the property, and is largely dominated by introduced species at ground level due to its cropping and grazing history.

In May 2015, Hamilton Environmental Services was engaged to prepare an Environmental Impact Statement (EIS) to support the development proposal to Murray Shire, and appropriate field investigations were undertaken in late 2015 to prepare a Flora and Fauna Assessment Report. Further to this and following the production of the initial version of this report, a field inspection of the site was conducted by Office of Environment and Heritage (OEH) staff Peter Ewin and Miranda Kerr, Murray Shire Planner Llyan Goodsell, archaeologist Jo Bell (Jo Bell Heritage Services) and Andrew Hollaron (Owner EMM Group).

Currently, an area of 5.2 ha across two areas are being utilised for sand extraction.

The proposed maximum extent of development consists of three areas that have been selected in because of the differences in sand resource which they provide to future; the Northern Area (of 15.91 ha maximum extent), the Middle Area (2.00 ha) and Southern Area (6.98 ha) have a combined maximum extent of 24.9 ha. If all three areas were utilised for development to the maximum extent, if approved for excavation, it would result in the loss of 54 indigenous trees (including 9 dead trees) and 0.0784 ha of a dense regrowth patch of River Red Gum recruits.

However, it is highly unlikely that EMM Group would ever seek to excavate all of these areas. The existing extraction areas are likely to have 3-5 years of production remaining within their current extent, and only at the exhaustion of these resources would 'new' areas within the proposed development extent be utilised.

It is likely that only areas of up to 1 ha would be utilised for extraction at any time in each of the proposed Northern and Southern Areas when the existing extraction areas are exhausted. These areas are likely to provide sufficient resource for at least a 5-10 year period given the stated current local demand, and therefore, the development footprint in the short-to-medium term across the property is likely to be < 2 ha in total of new excavation.

Proposed areas for the Stage 1 development have been located to avoid any native vegetation (remnant tree) loss, either through the actual extraction sites themselves, or vehicle tracks that would be required to access them. Any development activity would adhere to minimum distances to the extent of individual tree protection zones (TPZs) in accordance with Australian Standard: Protection of Trees on Development Sites (AS4970-2009) for all trees in proximity to the areas to be used as access ways and for sand excavation.

Following the on-site meeting with OEH and Murray Shire staff on the 29th February 2016, EMM Group have decided that there is sufficient area within the outlined development sites to avoid native vegetation loss with the proposed Stage 1 developments, and native vegetation losses will be avoided in staged developments into the future.

Therefore, on this basis, there would be no native vegetation loss in the short-to-medium term as a consequence of any proposed development.

There were no rare or threatened species under the *Threatened Species Conservation Act 1995* observed at the site. Notwithstanding, it is highly likely that significant sections of the property were a combination of EECs Inland *Grey Box Woodland in the Riverina* and/or Sandhill Pine Woodland in the Riverina; there are Buloke (*Allocasuarina luehmannii*) individuals found across the site, however, it would seem likely that Buloke was a non-dominant species in *Sandhill Pine Woodland in the Riverina*, with Yellow Box (*Eucalyptus melliodora*) the likely dominant species. However, these

communities have been heavily modified on the property, with no effective indigenous shrub or ground layer, and only scattered mature remnant trees.

The likelihood of presence for all recorded NSW threatened species within a 20 km radius of the site has been considered. Searches revealed that there were records of seven (7) threatened flora species and twenty four (24) threatened fauna species within a 20 km radius of the site.

The likelihood of the presence of these species or the usage of the proposed development was considered and rated based on the prevailing habitat and habitat quality of the site, known threatened species records, the landscape connectivity, and the composition, abundance and structure of indigenous vegetation. Of these species, all seven of the flora and twenty fauna species were considered not likely to occur on the site because of a lack of a suitable community/habitat type, the length of time since the last sighting, and the disturbance to the site.

Four species of fauna - Barking Owl, Black Falcon, Brolga, and Superb Parrot - were considered to have some potential to utilise the site. The property and the proposed development areas do provide some limited opportunities for seasonal foraging at ground level and for hunting for these species that would be present in the adjacent National Park or utilising the vegetation of the road reserve; however, it is apparent that the property and proposed development areas are not primary or even secondary habitat for these species, and usage would be casual, infrequent and opportunistic. The loss of the small areas of cultivated and highly modified vegetation for the development will not affect the viability of any of these species, as the areas immediately adjacent to the site remain suitable for such a purpose.

Further to this, three of these species - Barking Owl, Black Falcon, and Superb Parrot – are hollow-dependent fauna, and the loss of any hollow-bearing remnant trees could have led to an impact on these species. However, the decision to avoid all native vegetation, including all remnant trees, with the development, has obviated any potential impact on these species by the retention of all available tree hollows.

It is considered highly unlikely that the proposed development would have any impact on any flora, fauna or ecological communities on the property or any adjacent freehold or public land.

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APPENDIX A FLORA INVENTORY OF MOAMA PROPERTY AND 11 MILE ROAD ROADSIDE

Recorded vascular plant species for the EMM Moama property and the adjacent roadside. Vascular flora have been recorded for presence using a cover-abundance scale that is outlined in Table 3-1. An asterisk denotes an introduced species.

Common name	Scientific name	Lifeform[#]	Roadside	Paddock
Buloke	*Allocasuarina luehmanni*	T	+	1
Creeping Saltbush	*Atriplex semibaccata*	MS	1	+
Spiny-fruit Saltbush	*Atriplex spinibractea*	SS	1	+
Brown-backed Wallaby-grass	*Austrodanthonia duttoniana*	MTG	1	
Small-flower Wallaby-grass	*Austrodanthonia setacea*	MTG		+
Rough Spear-grass	*Austrostipa scabra*	MTG	1	1
Wild Oat	*Avena fatua**	LNG		2
Great Brome	*Bromus diandrus**	LNG		2
Soft Brome	*Bromus mollis**	LNG		1
White Cypress-pine	*Callitris glaucophylla*	T		2
Shepherd's Purse	*Capsella bursa-pastoris*	LH		
Fat Hen	*Chenopodium album**	MH		+
Water Buttons	*Cotula coronopifolia**	SH		2
Climbing Saltbush	*Einadia nutans*	SS	2	+
Ruby Saltbush	*Enchylaena tomentosa*	MS	2	+
Curly Windmill Grass	*Enteropogon acicularis*	MNG	1	+
Common Crow's-foot	*Erodium cicutarium**	MS		1
River Red Gum	*Eucalyptus camaldulensis*	T		2
Yellow Box	*Eucalyptus melliodora*	T	2	+
Grey Box	*Eucalyptus microcarpa*	T	3	2
Barley Grass	*Hordeum leporinum**	MNG	2	4
Wimmera Ryegrass	*Lolium rigidum**	MNG	2	3
Small-leaf Bluebush	*Maireana brevifolia*	MS	2	+
Bottle Fissure-weed	*Maireana excavata*	SS	2	+
Small-flowered Mallow	*Malva parviflora**	MH		1
Horehound	*Marrubium vulgare**	MS		1
Burr Medic	*Medicago polymorpha**	MH		2
Warrego Summer Grass	*Paspalidium jubiflorum*	LTG		1
Wireweed	*Polygonum aviculare**	MH		1
Black Rolypoly	*Sclerolaena muricata*	MS	2	+
Variable Sida	*Sida corrugata*	SH	+	
Rocket	*Sisymbrium* spp.*	MH	2	2
Hare's-foot Clover	*Trifolium arvense**	MH		2
Strawberry Clover	*Trifolium fragiferum**	MH		1
Rat's-tail Fescue	*Vulpia myuros**	MNG		1
Fuzzweed	*Vittadinia cuneata*	MH	+	+

[#] abbreviations for lifeform for indigenous species are T = tree, MS = medium shrub, SS = small shrub, LH = large herb, MH = medium herb, SH = small herb, LTG = large tufted graminoid, MTG = medium tufted graminoid, STG = small tufted graminoid, MNG = medium non-tufted graminoids.

APPENDIX B OBSERVED FAUNA OF MOAMA PROPERTY AND 11 MILE ROAD ROADSIDE

Observed or inferred fauna at the sites and surrounds between 9.30 am and 1.00 pm on the 15th October 2015 and between 9.00 am and 12 pm on the 3rd December 2015.

Common name	Scientific name	Mode of observation[1]
Birds		
Australian Magpie	*Gymnorhina tibicen*	
Australian Raven	*Corvus coronoides*	A,V
Crested Pigeon	*Ocyphaps lophotes*	A,V
Eastern Rosella	*Platycercus eximius*	A,V
Emu	*Dromaius novaehollandiae*	V
Galah	*Eolophus roseicapillus*	A,V
Long-billed Corella	*Cacatua tenuirostris*	A,V
Magpie-lark	*Grallina cyanoleuca*	A,V
Noisy Miner	*Manorina melanocephala*	A,V
Rufous Whistler	*Pachycephala rufiventris*	A
White-throated Treecreeper	*Cormobates leucophaea*	A,V
Willie Wagtail	*Rhipidura leucophrys*	A,V
Yellow Thornbill	*Acanthiza nana*	A,V
Mammals		
European Rabbit	*Oryctolagus cuniculus**	V

1. Identification method: A = audible call; V = visual; N = distinctive nest; S = scat

APPENDIX C ASSESSED TREES

Tree number	Species[1]	DBH[2]	Tree location[3]		Health[4]	Hollows[5]	Image number[6]
			Easting	*Northing*			
1	River Red Gum	105	308717	6015141	4	S,L	407L3
2	River Red Gum	22	308420	6014323	4	A	416L2
3	River Red Gum	110	308426	6014278	4	S,L	416L3
4	River Red Gum	115	308398	6014283	4	S	416L4
5	White Cypress-pine	45	308434	6014838	4	S	413
6	White Cypress-pine	75	308499	6014852	4	S	414
7	White Cypress-pine	40	308447	6014984	4	A	398L1
8	White Cypress-pine	30	308483	6015091	4	A	400
9	White Cypress-pine	35	308513	6015102	4	S,L	401L2
10	White Cypress-pine	30	308522	6015116	4	A	401L1
11	White Cypress-pine	50	308538	6015152	4	S	402
12	White Cypress-pine	40	308562	6015116	0	S,L	403
13	White Cypress-pine	75	308677	6015134	4	S	407L2
14	White Cypress-pine	45	308722	6015217	2	S,L	412L2
15	White Cypress-pine	30	308713	6015221	4	A	412L1
16	White Cypress-pine	30	308695	6015212	4	A	412L5
17	White Cypress-pine	32	308702	6015200	3	A	412L4
18	White Cypress-pine	55	308802	6015311	3	S,L	388
19	White Cypress-pine	28	308859	6015318	4	A	386
20	White Cypress-pine	60	308778	6015342	4	S,L	387
21	White Cypress-pine	35	308614	6015214	4	A	410
22	White Cypress-pine	55	308590	6015205	4	S	411
23	White Cypress-pine	68	308629	6015181	1	S,L	408
24	White Cypress-pine	50	308561	6015105	0	S,L	404
25	White Cypress-pine	46	308607	6015214	1	S	409
26	White Cypress-pine	45/45	308540	6015261	4	S	391
27	White Cypress-pine	35	308546	6015335	4	A	389L1
28	White Cypress-pine	35	308547	6015350	0	S	389L2
29	White Cypress-pine	30	308557	6015346	0	S	389L3
30	White Cypress-pine	35	308553	6015337	3	A	389L4
31	White Cypress-pine	35	308568	6015346	4	A	389L5
32	White Cypress-pine	25	308532	6015373	0	A	390
33	White Cypress-pine	58	308466	6015163	3	S	392
34	White Cypress-pine	35	308416	6015173	3	A	394L1
35	White Cypress-pine	35	308429	6015176	0	S	394L2
36	White Cypress-pine	38	308430	6015185	3	A	394L3
37	White Cypress-pine	30	308427	6015191	0	A	394L4
38	White Cypress-pine	35	308413	6015185	2	A	394L5
39	White Cypress-pine	45	308406	6015192	2	S	394L6
40	White Cypress-pine	40	308378	6015193	3	S	395L2
41	White Cypress-pine	25	308379	6015190	3	A	395L1
42	White Cypress-pine	55	308386	6015167	4	S	393L1
43	White Cypress-pine	40	308402	6015174	0	S	393L2
44	White Cypress-pine	40	308404	6015168	2	S	393L3

Tree number	Species[1]	DBH[2]	Tree location[3]		Health[4]	Hollows[5]	Image number[6]
			Easting	*Northing*			
45	White Cypress-pine	20	308410	6015172	0	A	393L4
46	White Cypress-pine	45	308388	6015108	0	S	396L1
47	White Cypress-pine	35	308377	6015087	3	A	396L2
48	White Cypress-pine	60	308382	6015024	4	S	397L1
49	Grey Box	105	308411	6014986	3	S,L	398L2
51	Grey Box	70	308634	6015014	3	S,L	405
52	Grey Box	100	308638	6015087	4	S	406
53	Grey Box	60	308690	6015152	4	S,L	407L1
54	Grey Box	50	308709	6015215	3	S,L	412L3
55	Grey Box	75	308560	6015066	4	S,L	404
56	Grey Box	95	308314	6014653	4	S,L	415
57	Yellow Box	135	308804	6013670	4	S,L	419
58	Buloke	35	308507	6015017	1	A	399
60	Buloke	40	308352	6015007	3	A	397L2
61	Buloke	65	308639	6013886	3	S	418
62	River Red Gum	60	308427	6014356	4	S	416L1

1. River Red Gum is *Eucalyptus camaldulensis*, Grey Box is *E. microcarpa*, Yellow Box is *E. melliodora*, White Cypress-pine is *Callitris glaucophylla* and Buloke is *Allocasuarina luehmanni*;
2. DBH is diameter at breast height over bark in cm (at 1.30 m above ground);
3. Location data are northings and eastings of MGAz55 coordinates;
4. Health: Dead; 1 = 1-20 % projective foliage cover (pfc); 2 = 21-40 % pfc; 3 = 41-60 % pfc; 4 - 61-80 % pfc; 5 = 81-100 % pfc;
5. Hollows: A = absent; S = small hollows present; L = large hollows present;
6. Image numbers of individual trees or clumps of trees, L = left, and number refers to position from the left.

APPENDIX D NSW THREATENED SPECIES AND LIKELIHOOD OF OCCURRENCE

The likelihood of threatened species recorded or predicted to occur being present across the proposed development sites at the EMM Group property on 11 Mile Road (Environment and Heritage 2016a).

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Threatened flora					
Amphibromus fluitans	Floating Swamp Wallaby-grass	v	V	Wetland/riparian plant. There are many historic collections in the City of Greater Albury. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve, East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria. There is a recent record of this species near Laggan in Upper Lachlan Shire. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Austrostipa wakoolica	A spear-grass	e	E	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; and open Cypress Pine forest on low sandy range. Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Brachyscome muelleroides	Claypan Daisy	v	V	A small annual herb that occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). It occurs in seasonally wet depressions, and relies on seasonal inundation. The species is now restricted to only 10 known populations, the closest of which is over 30 km away. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Prasophyllum sp. Moama		ce		*A species* of forb-rich natural grasslands on flat alluvial plains. *Prasophyllum* sp. Moama is known in NSW from only one locality, discovered in 2005, 6.4 km west of the proposed development areas. The species is not endemic to New South Wales, occurring also in Victoria in small to moderate-sized populations within 50 km of Echuca. The Moama site is currently managed, under short-term funding, as a high conservation value area on a Travelling Stock Reserve (TSR), but remains subject to discretionary grazing. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. **Likelihood: Highly unlikely to be present**	N
Pterostylis despectans		ce	E	In New South Wales the species is known only from a single population discovered in 2005, 6.4 km west of the proposed development areas. Several surveys of Riverina grassland and regional Travelling Stock Reserves did not record *P. despectans* and it seems likely that the species is extremely rare in New South Wales. The species also occurs as very small fragmented populations in central Victoria and in South Australia. The total estimated number of individuals in the Victorian and South Australian populations is less than 1,500. The Moama population has been assessed as comprising between 20 and 60 individual plants. All plants known to date occur within an area of about one hectare, within an apparently suitable habitat patch of about 20 ha. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. **Likelihood: Highly unlikely to be present**	N
Sclerolaena napiformis	Turnip Copperburr	e	E	Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of *Austrostipa nodosa* and *Chloris truncata*, in grey cracking clay to red-brown loamy clay. Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves; the closest record of the species to the proposed development is 4.5 km to the west, and there are a cluster of recent records from 6.8 km to the south west along these road reserves. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. **Likelihood: Highly unlikely to be present**	N

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Swainsona murrayana	Slender Darling-pea	v	V	The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No records of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Threatened fauna					
Australasian Bittern	*Botaurus poiciloptilus*	e	E	Wetland/riparian species. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Australian Painted Snipe	*Rostratula australis*	e	E	Wetland/riparian species. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Barking Owl	*Ninox connivens connivens*	v		Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats due to the higher density of prey on these fertile soils. Some areas of the sites may be suitable habitat, with there still being good landscape connectivity with the adjacent National Park and roadside vegetation. Site could act as suitable habitat. Recent records within 2 km east (in the National Park), and 3.5 and 6.8 km south of the proposed development. **Likelihood: May be present**	Y
Black-chinned Honeyeater	*Melithripterus gularis gularis*	v		Occurs in intact woodlands, and adjacent agricultural land. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Three recent records for the species - 2 are within 1 .5 km of the proposed development to the east (within the National Park), and one 6 km to the south. **Likelihood: Unlikely to be present**	N

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Black Falcon	*Falco subniger*	v		The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees. The Black Falcon is usually associated with streams or wetlands, visiting them in search of prey and often using standing dead trees as lookout posts. Site could act as suitable habitat, with there still being good landscape connectivity with the adjacent National Park and roadside vegetation. Recent records within 800 m south and 8 km north west of the proposed development. **Likelihood: May be present**	Y
Blue-billed Duck	*Oxyura australis*	v		The Blue-billed Duck inhabits fresh to saline, deep permanent open wetlands and deep, densely vegetated lakes. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Two recent records of the species - 6.5 and 7.4 km north north west of the proposed development. **Likelihood: Unlikely to be present**	N
Brolga	*Grus rubicunda*	v		The Brolga inhabits large open wetlands, grassy plains, coastal mudflats and irrigated croplands and, less frequently, mangrove-studded creeks and estuaries. It is less common in arid and semi-arid regions, but will occur close to water. While the development site does not contain primary habitat, the species is known to forage in pastures and cropping areas adjacent to wetlands, such as the adjacent National Park contains; has been sighted five times all north within 10 km of the site. **Likelihood: May be present**	Y
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	v		Occurs in intact woodlands, and adjacent agricultural land. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Many recent records for the species - to the north and east (within the National Park) and south, including one sighting within 1 km **Likelihood: Unlikely to be present**	N
Curlew Sandpiper	*Calidris ferruginea*	e	CE	Wetland/riparian species. While the lower lying areas of the property adjacent to the National Park and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. One recent sighting of the species 6.5 km north east of the site in the National Park. **Likelihood: Highly unlikely to be present**	N

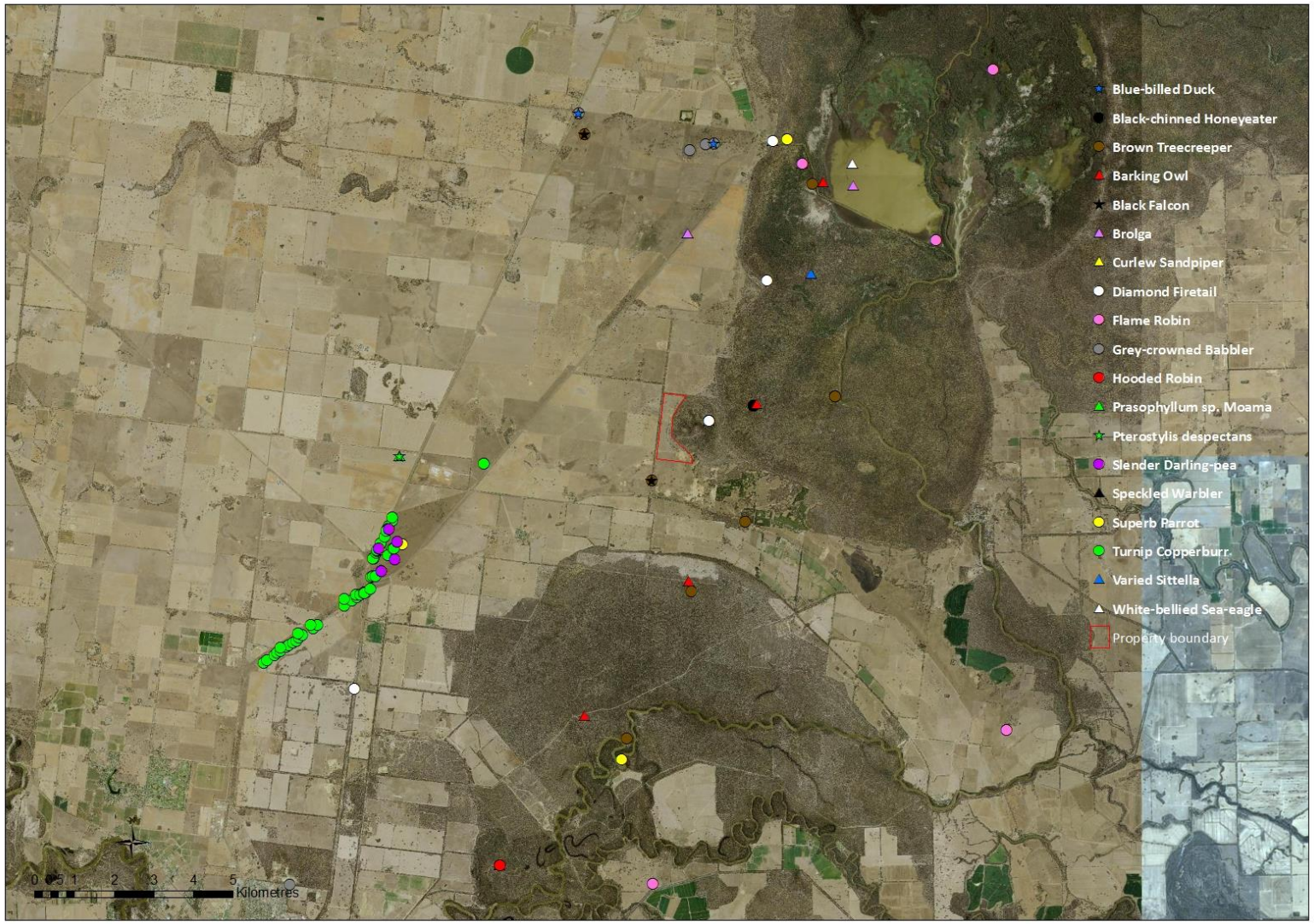
Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Diamond Firetail	*Stagonopleura guttata*	v		Occurs in woodlands, and adjacent agricultural land. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Four recent records for the species - to the north and east (within the National Park) and around 7 km to the south west. **Likelihood: Unlikely to be present**	N
Flame Robin	*Petroica phoenicea*	v		Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Many recent records for the species within 10 km - to the north and north east (within the National Park), the south west, south east and west. **Likelihood: Unlikely to be present**	N
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	v		Prefers extensive intact woodlands with significant shrub and litter layers. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Five recent records for the species within 10 km - 4 of these are around 6 km to the north west, and 14 km to the south south west. **Likelihood: Unlikely to be present**	N
Grey-headed Flying-fox	*Pteropus poliocephalus*	v	V	Australia's only endemic flying-fox and occurs in a coastal belt from south-eastern Queensland to Melbourne, Victoria. It is a canopy-feeding frugivore and nectivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. Development site is not suitable habitat. No records within 20 km of either site. **Likelihood: Highly unlikely to be present**	N

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Growling Grass Frog (Southern Bell Frog)	*Litoria raniformis*	e	V	The species is usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. A once widespread species now known to exist in NSW only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria; a few yet unconfirmed records have also been made in the Murray Irrigation Area in recent years. While sections of the property and areas within the adjacent National Park may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Hooded Robin	*Melanodryas cucullata cucullata*	v		Occurs in intact woodlands, and adjacent agricultural land. They occupy a wide range of Eucalypt woodlands, Acacia shrublands and open forests. In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. One record for the species in 1995 11 km south of the proposed development. **Likelihood: Unlikely to be present**	N
Koala	*Phascolarctos cinereus*	v	V	Inhabit eucalypt woodlands and forests. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. The site and adjacent lands does contain suitable indigenous mature trees of River Red Gum; however, there are many open areas across the proposed development area. No records within 20 km. **Likelihood: Highly unlikely to be present**	N
Painted Honeyeater	*Grantiella picta*	v		The Painted Honeyeater is found in dry open forests and woodlands, and is strongly associated with mistletoe. It may also be found along rivers, on plains with scattered trees and on farmland with remnant vegetation. It has been seen in urban parks and gardens where large eucalypts are available. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No records for the species within 20 km. **Likelihood: Unlikely to be present**	N

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Pink-tailed Worm-lizard	*Aprasia parapulchella*	v	V	Occurs in intact high quality and undisturbed grassy woodlands and grasslands. While sections of the property and areas within the adjacent National Park and freehold land may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Plains-wanderer	*Pedionomus torquatus*	e	CE	Occurs in extensive quality riparian grasslands and plains woodlands, and adjacent agricultural land. While sections of the property and areas within the adjacent National Park and freehold land may have once been suitable habitat, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No record of the species within 20 km. **Likelihood: Highly unlikely to be present**	N
Regent Honeyeater	*Anthochaera phrygia*	ce	CE	Occurs in woodlands, and adjacent agricultural land. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification, unsuitable habitat and a lack of connectivity with current known locations. No records within 20 km of either site. **Likelihood: Unlikely to be present**	N
South-eastern Long-eared Bat	*Nyctophilus corbeni*	v	V	Occurs in intact Buloak, mallee, Cypress-pine, ironbark and box woodlands and forests, and adjacent agricultural land. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. No records for the species within 20 km. **Likelihood: Unlikely to be present**	N
Speckled Warbler	*Chthonicola sagittatus*	v		Patchy distribution on and inland of the Great Dividing Range, from level with Mackay in Queensland, to the Grampians National Park in Victoria. Lives in dry sclerophyll forests and woodlands dominated by eucalypts. It is mostly seen on the grassy ground layer, when it is foraging. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. One record for the species in 1995 11 km south of the proposed development. **Likelihood: Unlikely to be present**	N
Superb Parrot	*Polytelis swainsonii*	v	V	Occurs in riparian woodlands and forest, and adjacent woodlands and agricultural land. While the development site does not contain primary habitat, the species is known to forage in woodland vegetation and scattered trees (such as is found on the property and the adjacent roadside) that is adjacent to wetlands, such as the adjacent National Park contains; has been sighted three times all within 10 km of the site to the north, west and south. **Likelihood: May be present**	Y

Scientific name	Common Name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Seven Part Test[4]
Swift Parrot	*Lathamus discolor*	v	E	Occurs in open forests and woodlands, and adjacent agricultural land. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification, unsuitable habitat and lack of connectivity to known locations. No records for the species within 20 km. **Likelihood: Unlikely to be present**	N
Varied Sittella	*Daphoenositta chrysoptera*	v		The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. It inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sections of the property and areas within the adjacent National Park and road reserve are suitable habitat; however, it is unlikely the species would be found in the proposed development areas because of the extent of modification and unsuitable habitat. Three recent records for the species - 6.3 and 4.4 km to the north and 1.5 km east - all within the National Park. **Likelihood: Unlikely to be present**	N

1. NSW conservation status under the *Threatened Species Conservation Act 1995* – v = vulnerable, e = endangered, ce = critically endangered (Environment and Heritage 2016);
2. Commonwealth conservation status under the *Environment Protection and Biodiversity Conservation Act 1999* – V = vulnerable, E = endangered, CE = critically endangered (DoE 2016);
3. Information derived from various sources, including Environment and Heritage (2016b), DoE (2016), Harden (1990), (1991), (1992) and (1993), Royal Botanic Gardens (2016), and Simpson and Day (1998);
4. Section 5A of the *Environmental Planning and Assessment Act 1979* sets out seven parameters that a determining authority must consider in deciding whether an activity is likely to have a significant effect on threatened species, populations, or ecological communities, or their habitats. Threatened species identified as occurring or having the potential to occur within a 20 km radius of the site have been evaluated on their likelihood of occurrence, followed by the response for each species using the seven parameters. Threatened species where there is likely to be no effect on threatened species and populations are indicted (N), while those where some impact is possible have been identified (Y).



Location of records for those threatened flora and fauna species identified as occurring within a 20 km radius by the *BioNet – Website of the Atlas of NSW Wildlife (Environment and Heritage 2016b).*