

Biodiversity Development Assessment Report

Pacific Brook Christian School, Muswellbrook

20220696

20 September 2021



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1 INTRODUCTION

1.1 SCOPE

Kleinfelder Australia Pty Ltd (Kleinfelder) was engaged by NBRS Architecture Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) to support a State Significant Development Application (SSDA) for the proposed Pacific Brook Christian School (PBCS) development (masterplan and Stage 1 development). The proposed PBCS development is located at 72 - 74 Maitland Street, Muswellbrook New South Wales (NSW) (Lot 100/DP 1261496) (**Figure 1**).

The proposed PBCS development includes the construction of a new Kindergarten to Year 12 (K-12) school with a total enrolment of up to 656 students. The proposed PBSC development will comprise of a staged concept development application (DA) under Section 4.22 of the EP&A Act. The proposed Stage 1 development represents the establishment of the site and includes vegetation clearing, site remediation and construction of modular general learning areas, office administration, amenities and an outdoor learning area. This assessment will consider impacts to biodiversity values resulting from the construction of the overall scope of works detailed for the new PBCS (as identified in the masterplan) (summarised in **Section 1.3**). The demolition of existing nursery buildings and removal of planted vegetation immediately surrounding the structures is subject to an existing demolition DA with Muswellbrook Shire Council (see **Figure 2**).

This assessment has been undertaken in accordance with the NSW Biodiversity Assessment Method (BAM) (Department of Planning, Infrastructure and Environment [DPIE] 2020a) under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) to support the SSDA.

The following terms are used throughout this report to describe particular geographical areas (see **Figure 2**):

- **Study Area** – 72-74 Maitland Street, Muswellbrook NSW (Lot 100/DP 1261496) (2.43 hectares [ha])
- **Subject Site** - The area within the Study Area to be directly impacted by the proposed Project, i.e. the full PBCS scope development footprint (Masterplan) (**Figure 2**) (0.99 ha).
- **Locality** - Land within a 5 kilometre (km) radius of the Study Area.

1.2 SITE DESCRIPTION

The Study Area is triangular in shape, with a northwest/southeast alignment and has an area of 2.432 ha. The site is bound by Muswellbrook Golf Course along the north-eastern boundary, Maitland Street along the south-western boundary and residential properties to the south-eastern boundary (see **Figure 2**). The site address is 72-74 Maitland Street and is legally described as Lot 100 in Deposited Plan (DP) 1261496 (see **Figure 2**).

The Study Area is generally level with a slight slope to a watercourse at the north-west boundary. This watercourse flows northeast into the adjoining golf course and on to Muscle Creek via a series of dams on the golf course. Muscle Creek flows west into the Hunter River which at its closest is 1.3 km north-west of the site. Stormwater management currently on site is pit and pipe and overland flow.

72-74 Maitland Street was previously used for forestry plantation purposes and is mapped as Muswellbrook State Forest. The site is no longer used for this purpose and currently sits as an empty and underutilised site.



The main vehicular access to the site is from Maitland Street, as well as pedestrian access. Existing vehicular parking on site includes open air at grade parking spaces facing Maitland Street.

In terms of travel, Muswellbrook is approximately three (3) hours from Sydney, three hours (3) from Dubbo, two (2) hours from Tamworth and 90 minutes from Newcastle.

1.3 PROPOSED DEVELOPMENT

Pacific Brook Christian School proposes the staged construction of a new school at 72-74 Maitland Street, Muswellbrook. This will involve site preparation work (including remediation), the removal of 96 trees (7 within Stage 1), civil works, infrastructure works, landscaping, signage and construction works in stages over the next 10 years.

The masterplan will support high-quality educational outcomes to meet the needs of students within the local community as follows:

- **Administration building and Library;**
 - One (1) staff and student amenities block;
- **Junior School facilities;**
 - Ten (10) General Learning Areas (GLAs);
 - Two (2) Specialist classroom;
 - One (1) Store; and
 - Covered Outdoor Learning Area (COLA)
- **Middle School facilities;**
 - Seven (7) General Learning Areas (GLAs);
 - One (1) Science classroom; and
 - Covered Outdoor Learning Area (COLA)
- **Senior School facilities;**
 - Eight (8) General Learning Areas (GLAs);
 - One (1) Specialist classroom;
 - Three (3) TAS classrooms;
 - Two (2) Food Tech classrooms;
 - One (1) Art classroom;
 - One (1) Drama classroom;
 - Four (4) amenities block;
 - Three (3) Store; and
 - Covered Outdoor Learning Area (COLA)



- **Hope School (special needs) facilities;**
 - Four (4) General Learning Areas (GLAs);
 - One (1) Specialist classroom;
 - Four (4) Shared Withdrawal rooms;
 - One (1) Office;
 - One (1) Staff room;
 - One (1) Interview + Therapy room;
 - Three (4) amenities block;
 - Three (3) Store; and
 - Covered Outdoor Learning Area (COLA)
- Multi-Purpose Hall;
- Maximum student capacity of 656;
- Maximum 65 staff;
- Agricultural teaching facility;
- Maintenance and bus area;
- On-site Parking (67 spaces, inclusive of 1 accessible);
- Bike parking x 36;
- Internal pathways;
- Kiss and drop off areas;
- Bus stop;
- Waste Storage and collection area;
- Signage;
- Bush Chapel
- Removal of 96 trees (total);
- Landscaping (including Bush Chapel);
- Infrastructure works;
- Earthworks;
- Secondary emergency vehicle/ large vehicle access;
- Acoustic and safety fence; and
- Widening of existing vehicular access from Maitland Street

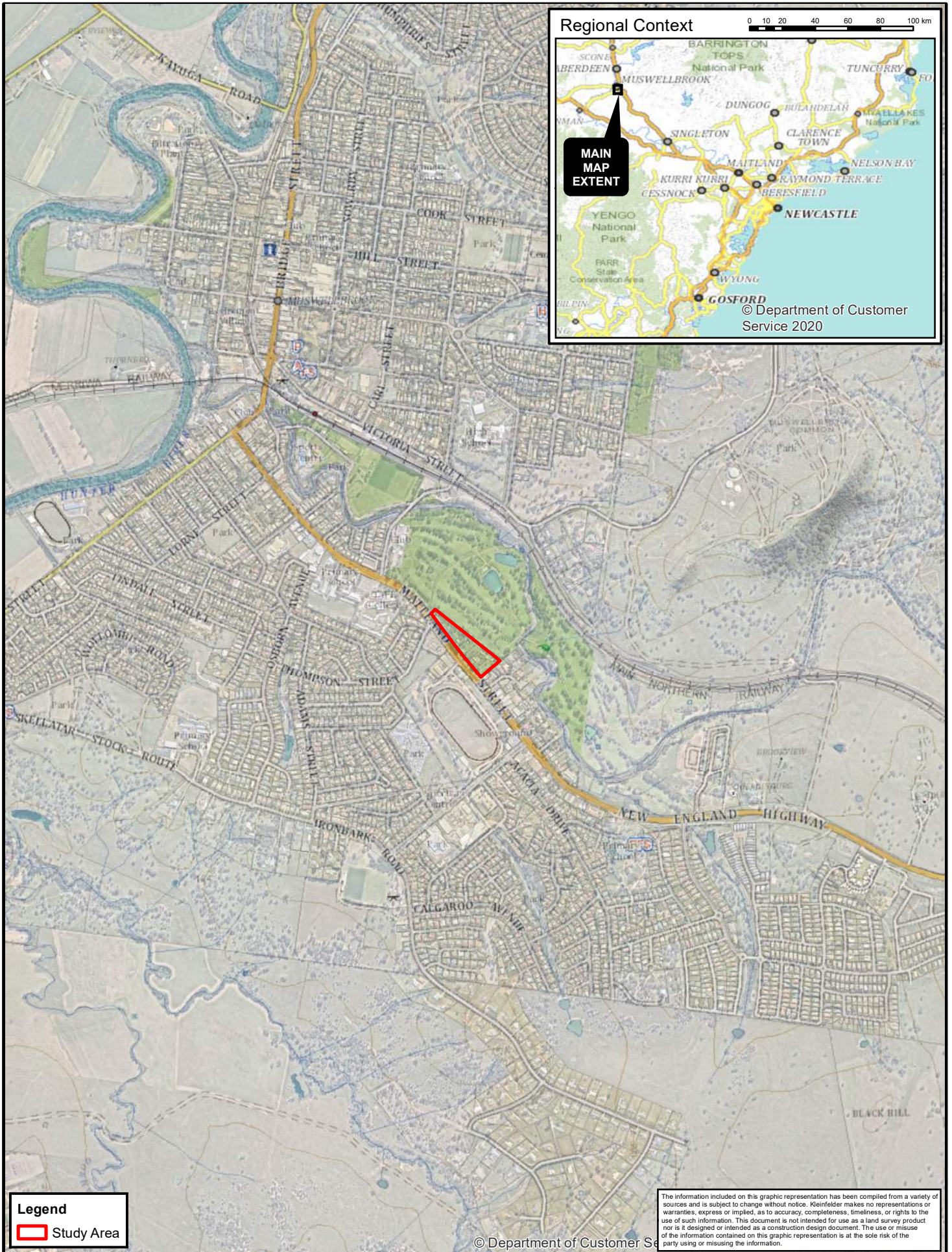
Stage 1 of the masterplan consists of:

- Site remediation;
- Removal of 7 trees;
- Facilities for a maximum of 140 students and 16 staff, including:
 - One (1) administration and staff area;
 - One (1) staff and student amenities block (including one (1) end of trip facility);
 - Five (5) General Learning Areas (GLAs);
 - One (1) Science classroom; and



- Covered Outdoor Learning Area (COLA)
- Internal pathways;
- On-site Parking (15 spaces, inclusive of 1 accessible);
- Bike parking x 6;
- Kiss and drop off areas;
- Bus stop;
- Bin storage and collection area;
- Signage;
- Infrastructure works; and
- Widening of existing vehicular access from Maitland Street.

In addition to the impacts associated with the Masterplan (inclusive of Stage 1), a number of trees have been recommended for removal by an arborist (Abel Ecology, 2020) due to tree hazard potential. These trees are located throughout the Study Area, within and outside of the Masterplan footprint. Impacts to the trees have been considered as part of this assessment.



0 0.1 0.2 0.4 0.6 0.8 1 km KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com	PROJECT REFERENCE: 20220696 DATE DRAWN: 2021/06/23 12:27 Version 1 DRAWN BY: GJoyce DATA SOURCE: NSW DFSI - 2021 Nearmap - 2021	Locality NBRS Architecture Biodiversity Development Assessment Report Pacific Brook Christian School (Lot 100/DP 1261496) 72-74 Maitland Street, Muswellbrook NSW	FIGURE: 1
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1.4 INFORMATION SOURCES

The following sources of information were used to appropriately inform the PBCS BDAR:

- The NSW DPIE, BioNet Atlas (DPIE 2021a) for previous records of threatened species, populations and ecological communities within 5 km radius of the Development Site.
- The Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) (DAWE 2021a) for Matters of National Environmental Significance (MNES) including predicted threatened species, populations and ecological communities
- The Commonwealth Department of Agriculture, Water and the Environment (DAWE) Threatened Species Profile and Threat Database (SPRAT) (DAWE 2021b).
- State Vegetation Type Map: Upper Hunter v1.0. VIS_ID 4894 (DPIE 2019) for existing regional vegetation community mapping within the Subject Site and locality.
- The NSW DPIE, BioNet Vegetation Classification Database (DPIE 2021b) for identification and allocation of Plant Community Types (PCTs) to vegetation zones on site.
- The NSW DPIE, BioNet Threatened Biodiversity Data Collection (DPIE 2021c), Threatened Species Profiles (DPIE 2021d) and Final Determinations (DPIE 2021e) for information on threatened species, populations, and ecological communities.
- Relevant published literature (see **Section 8**).

1.5 LEGISLATIVE CONTEXT

This assessment was undertaken in accordance with and/or in consideration of the following Acts and Policies:

- **New South Wales:**
 - *Biodiversity Assessment Method (BAM)* (DPIE 2020a).
 - *Biodiversity Conservation Act 2016 (NSW)* (BC Act).
 - *Biodiversity Conservation Regulation 2017 (NSW)* (BC Regulation).
 - *Biosecurity Act 2015 (NSW)*.
 - *Coastal Management Act 2016*.
 - *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act).
 - *Local Land Services Act 2013 (NSW)* (LLS Act).
 - *State Environmental Planning Policy (Koala Habitat Protection) 2021 (NSW)* (Koala SEPP).
 - *State Environmental Planning Policy (Koala Habitat Protection) 2021 (NSW)* (Koala SEPP).
 - *Water Management Act 2000 (NSW)* (WM Act).
- **Commonwealth:**
 - *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.
- **Local:**
 - *Muswellbrook Local Environmental Plan 2009*
 - *Muswellbrook Development Control Plan 2009*



1.5.1 Biodiversity Conservation Act 2016 (NSW)

The NSW Biodiversity Conservation Act 2016 (NSW BC Act), the NSW *Biodiversity Conservation Regulation 2017* (NSW BC Regulation) and amendments to the NSW *Local Land Services Act 2013* (LLS Act) commenced on 25 August 2017. The legislation aims to “maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development”. The NSW BC Act repeals several pre-existing Acts, most notably the NSW *Threatened Species Conservation Act 1995* (TSC), the NSW *Nature Conservation Trust Act 2001* and the NSW *Native Vegetation Act 2003*.

The NSW BC Act together with the NSW BC Regulation outlines the framework for addressing impacts on biodiversity from development and clearing. The framework details a pathway to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offset Scheme (The BOS).

1.5.1.1 Entry into the Biodiversity Offset Scheme

Entry into the BOS is triggered by developments, projects and activities that meet criteria or certain thresholds for significant impacts on biodiversity in accordance with Section 6.3 of the BC Act. Alternatively, the BOS can be entered into on an opt-in basis.

Criteria to which the BOS applies includes the following:

- Local Development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that triggers the BOS Threshold, or is “likely to significantly affect threatened species” (based on a test of significance pursuant to Section 7.3 of the BC Act). The BOS Threshold has two parts, and is triggered by the following:
 - Clearing of vegetation that exceeds an area threshold (based on the minimum lot size), or
 - Impacts are predicted to occur within an area mapped on the Biodiversity Values Map (the BV Map).
- State Significant Development (SSD) and State Significant Infrastructure projects (SSI), unless “the Secretary of the Department of Planning, Industry and Environment and the environment agency head determine that the project is not likely to have a significant impact”.
- Biodiversity certification proposals.
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold and does not require development consent.
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013*.
- Activities assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (generally, proposals by government entities) if proponents choose to ‘opt in’ to the Scheme.

The proposed PBCS development is a State Significant Development (SSD). The Planning Secretary’s Environmental Assessment Requirements (SEARs) (SSD-16858710) details the provision of a BDAR as a requirement of the proposed SSDA. As such, the BOS applies and a BDAR has been completed.

The Project has been assessed in accordance with the BAM (DPIE 2020a). The Biodiversity Accredited Assessor System (BAAS) Case number for the Project is 00026116/BAAS18041/21/00026117. Gilbert Whyte (Assessor Number BAAS18041) is the Biodiversity Accredited Assessor for the project.



1.5.1.2 Application of the Biodiversity Offset Scheme

The proposed development will result in the removal of 0.20 ha of native vegetation (that is consistent with plant communities within the locality), 0.21 ha of planted native/exotic vegetation (not consistent with plant communities within the locality, and 0.49 ha of exotic grassland (managed). Whilst entry into the BOS is triggered by the proposed development's status as a SSD, Section 2.2 of the BAM (DPIE 2020a) details three (3) streamlined assessment modules intended to align assessment requirements in relation to the level of biodiversity risk, enabling the preparation of a reduced assessment scope in accordance with the BAM.

These streamlined assessment modules may be used where the proposed development impacts on:

- A. Scattered trees (Appendix B of the BAM).
- B. A small area (Appendix C of the BAM).
- C. Planted native vegetation, where the planted native vegetation was planted for purposes such as street trees and other roadside plantings, windbreaks, landscaping in parks and gardens, and revegetation for environmental rehabilitation (Appendix D of the BAM).

Appendices B, C and D of the BAM set out the circumstances where each of the streamlined assessment modules can be used to assess a proposal and the specific assessment requirements. Streamlined assessment modules cannot be used to assess clearing within areas mapped by the NSW Biodiversity Values Map.

Two (2) streamlined assessment modules are applicable to this assessment: the *Streamlined Assessment Module – Small Area* (Appendix C of the BAM), and *Streamlined Assessment Module – Planted Native Vegetation* (Appendix D of the BAM).

Streamlined Assessment Module – Small Area

The streamlined assessment module for small area developments can be used to assess impacts of development according to the area clearing thresholds detailed in Appendix C and Table 12 of the BAM (DPIE 2020a). The small area module was considered applicable to the proposed development based on the clearing of 0.2 ha of native vegetation (see **Section 5.2**). For development sites with a minimum lot size less than 1 ha, the maximum area clearing limit for application of the small area development module is 1 ha. Given that the Study Area (Lot 100/DP 1261496) has a minimum lot size of 0.06ha and the proposed area of clearing is 0.2 ha, the small area development module is applicable. As such, impacts of the development on biodiversity within the Subject Site have been assessed in accordance with Appendix C of the BAM (Streamlined Assessment Module – Small Area).

Streamlined Assessment Module - Planted Native Vegetation

The decision-making key in Appendix D of the BAM (DPIE 2020a) was utilised to determine if the Streamlined Assessment Module – Planted Native Vegetation is applicable to the proposed development. The following determinations were made:

- The planted native vegetation to be impacted as a result of the proposed development cannot be reasonably assigned to a PCT (Plant Community Type) known to occur in the IBRA (Interim Biogeographic Regionalisation for Australia) subregion.
- The planted vegetation has not been planted for the purposes of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9 (2).
- The planted native vegetation is not comprised of individuals of a threatened species or other native species planted/translocated for the purposes of providing threatened species habitat.



- The planted native vegetation is planted for aesthetic purposes (i.e. landscaping).

Justification for the use of the Streamlined Module – Planted Native Vegetation is presented in **Appendix D**.

1.5.2 Koala Habitat Protection State Environmental Planning Policy (SEPP 2020)

The Koala SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

The Koala SEPP applies to each Local Government Area listed in Schedule 1 of the SEPP. Where a Koala Plan of Management (KPoM) applies to the land, Clause 8 of the Koala SEPP applies to the development. The proposed development must be consistent with the approved KPoM that applies to the land.

Muswellbrook Shire Council LGA is listed in Schedule 1 of the Koala SEPP 2021. However, as the site is currently zoned as *RU3 - Forestry* and the LGA is located outside of listed nine (9) LGAs within Metropolitan Sydney and the Central Coast, the SEPP does not apply. As such, the Koala SEPP 2020 continues to apply to the site.

An assessment of koala habitat within the site is provided within **Section 7.2**.

1.5.3 Biosecurity Act 2015

Under the *Biosecurity Act 2015* (NSW) all plants are regulated with a general biosecurity duty “to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.” Under the Act, a biosecurity impact “is an adverse effect on the economy, environment, or the community that arises, or has the potential to arise, from a biosecurity matter.” This legislation is addressed in **Section 7.3**.

1.5.4 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, an approval is required for actions that are likely to have a significant impact on MNES. An action includes a project, development, undertaking, activity or series of activities. When a person proposes to take an action they believe may need approval under the EPBC Act, they must refer the proposal to the Australian Government Minister for the Environment. The Act identifies nine MNES:

- World Heritage properties.
- National heritage places.
- Wetlands of international importance (Ramsar Convention).
- Listed threatened species and communities.
- Migratory species listed under international agreements.
- Great Barrier Reef Marine Park.
- Commonwealth marine areas.
- Nuclear actions; and
- Water resources in respect to CSG and large coal mines.

While this BDAR is not required to address MNES, the proponent is required to address the EPBC Act as part of their development application to Council.



One (1) MNES was considered potentially relevant to this assessment, “Listed threatened species and communities”. This MNES is addressed in **Section 7.1**. A likelihood of occurrence for Commonwealth listed threatened and migratory species is detailed in **Appendix A**.

1.5.5 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the WM Act. ‘Waterfront land’ is defined as the bed of any river, lake or estuary, and the land within 40 m of the river banks, lake shore or estuary mean high water mark. No mapped waterways exist within the Study Area. A fifth-order stream exists approximately 110 metres away from the Study Area at its closest point. As this is more than 40 m away from the Study Area, the proposed development does not constitute a ‘controlled activity’ as per the WM Act.



2 SITE CONTEXT

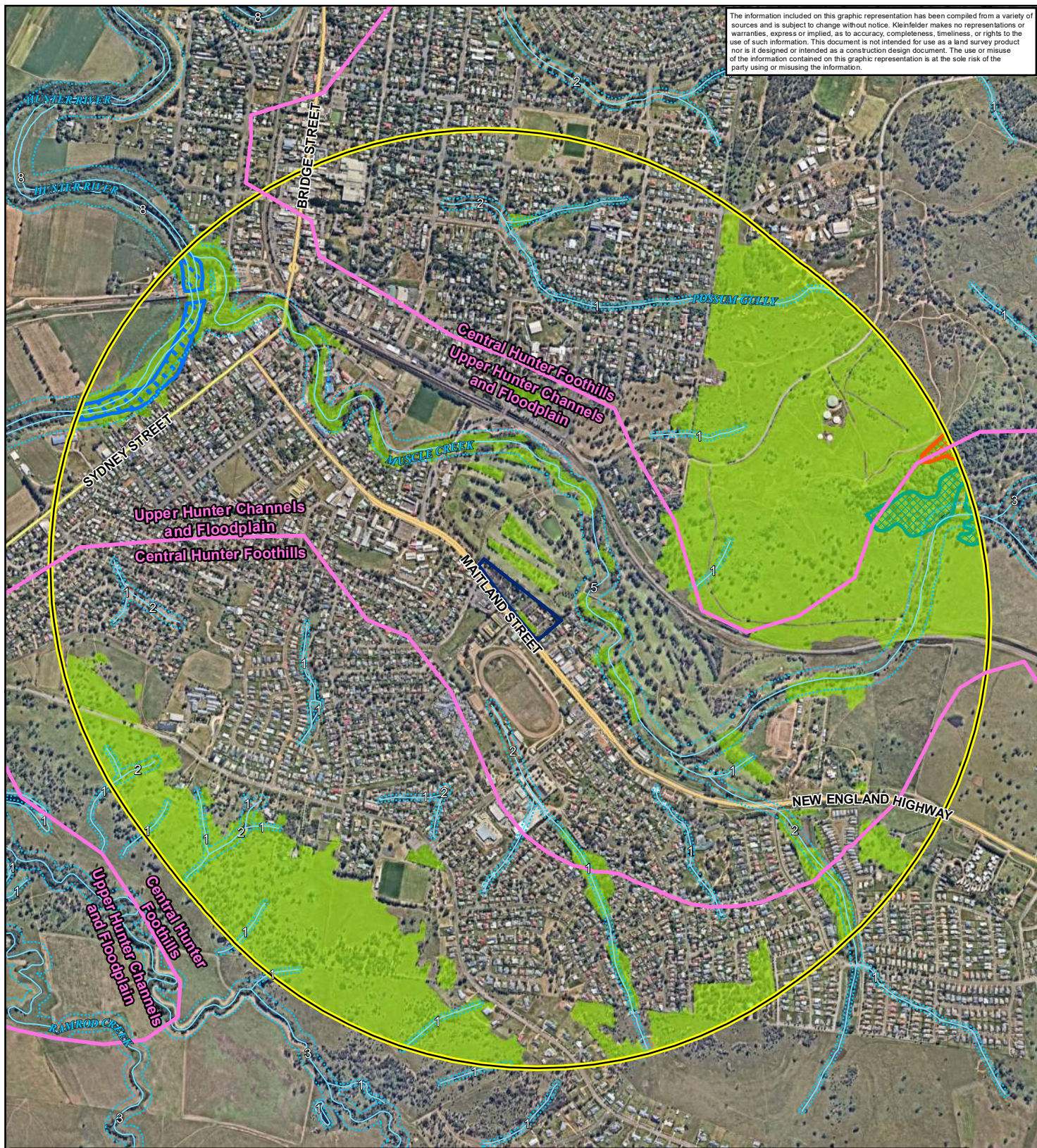
2.1 LANDSCAPE FEATURES

The landscape features detailed in Section 3 of the BAM (DPIE 2020a) and applicable to the Subject Site are described in **Table 1**. These landscape features are also shown on **Figure 3**.

Table 1: Landscape Features relevant to the Development Site.

KLF Table Heading	KLF Table Heading
IBRA Region	Sydney Basin - The Study Area occurs within the Sydney Basin IBRA Bioregion.
IBRA Sub Region	Hunter - The Study Area occurs within the Hunter IBRA Sub Region
Local Government Area (LGA)	Muswellbrook Shire Council Local Government Area
Mitchell Landscapes	Upper Hunter Channels and Floodplain (Department of Environment and Climate Change [DECC], 2002; Mitchell 2002) Channel, floodplain and terraces of the Hunter River and its tributaries upstream of Denman on Quaternary alluvium, general elevation 100 to 200m, local relief 25m. Harsh yellow brown texture-contrast soils on the third terrace, gradational sandy loam on the second terrace and loamy sand on the low terrace and floodplain. Limited areas of Tertiary river gravels on bedrock spurs. Open grassland with white box (<i>Eucalyptus albens</i>), yellow box (<i>Eucalyptus melliodora</i>), Blakely's red gum (<i>Eucalyptus blakelyi</i>), rough-barked apple (<i>Angophora floribunda</i>) and patches of swamp oak (<i>Casuarina glauca</i>) on brackish and saline flats, river oak (<i>Casuarina cunninghamiana</i>) along the streams.
Rivers, streams and estuaries	No mapped waterways exist within the Study Area. Muscle Creek, a mapped fifth order watercourse is based approximately 110m to the east of the Study Area.
Wetlands	The Coastal Wetlands and Littoral Rainforests Area Map (DPIE 2021g) does not identify any wetlands within the Study Area.
Connectivity of different areas of habitat	The vegetation on site is partially connected to scattered patches of vegetation within a golf course to the north of the site, and further to riparian vegetation along Muscle Creek and the Hunter River. The site was considered likely to only represent habitat for highly mobile threatened species (i.e. birds and bats).
Areas of geological significance and soil hazard features	There are no areas of geological significance within the Development Site or Study area.
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value mapped within the Development Site or Study Area.
Geology and Soils	Hunter (A-hu) - This soil landscape covers the floodplains of the Hunter River and its tributaries. The main soils are all formed in alluvium. They include Brown Clays and Black Earths (Ug5.34, Ug5.17) on prior stream channels and on tributary flats, with Chernozems (Uf5.1) on prior stream channels adjacent to Dartbrook and Brays Hill soil landscapes and in many of the valleys such as Martindale and Widden. Alluvial Soils (loams – Um5 and sands – Um5.52, Um6.1, Uc) occur on levees and flats adjacent to the present river channel. Red Podzolic Soils and Lateritic Podzolic Soils (Dr2.11, Db2.41) are located on old terraces, with Non-calcic Brown Soils (Db1.13) and Yellow Solodic Soils in some drainage lines
Native Vegetation Cover	Native Vegetation was assessed as per Section 3.2 of the BAM 2020 (DPIE 2020a). Native vegetation constitutes 26% (218 ha) of the projected 1,500 m site buffer (834 ha). Native Vegetation Cover therefore is classed as >10 - 30% .

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Legend

- Study
- Landscape Assessment - 1500m
- Landscape Assessment - Native
- Biodiversity Values (V11.8)**
 - Identified Rainforest
 - Protected Riparian Land
 - Threatened species or communities with potential for serious and irreversible impacts

- IBRA Sub-region Boundary (V7) - (Entire Landscape Assessment Area is Sydney Basin - Hunter)
- Mitchell Landscapes Boundary (V3)
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Primary Road
- Arterial Road

0 0.1 0.2 0.4 0.6 0.8 1 km Bright People. Right Solutions. www.kleinfelder.com	PROJECT REFERENCE: 20220696 DATE DRAWN: 2021/09/17 17:29 Version 2 DRAWN BY: GJoyce	Landscape Context FIGURE: 3	
	DATA SOURCE: NSW DFSI - 2021 NSW EOH - 2021 Nearmap - 2021		NBRS Architecture Biodiversity Development Assessment Report Pacific Brook Christian School (Lot 100/DP 1261496) 72-74 Maitland Street, Muswellbrook NSW



3 NATIVE VEGETATION

3.1 METHODOLOGY

Native vegetation at the site was assessed in accordance with Section 4 of the BAM (DPIE 2020a).

3.1.1 *Site Assessment*

3.1.1.1 Vegetation Mapping and Surveys

Detailed vegetation surveys were conducted across the Study Area on 1 June 2021. Areas of vegetation to be impacted by the amended development design were mapped during this period.

The boundaries of each of the identified vegetation communities within the Study Area were mapped using a combination of rapid data points (RDP) and walking transects, using the polygons produced through aerial photo interpretation (API) to assist in targeting survey effort. RDPs involved collecting waypoints over the Study Area using a handheld Trimble™ GPS unit and recording dominant species, structure and condition. Walking transects involved verifying polygons where homogenous in floristic composition and condition, as well as walking vegetation ecotones and using the recorded tracks to define vegetation community boundaries. The RDPs and survey tracks were then overlaid on an aerial photograph and used to delineate and/or clarify vegetation boundaries.

3.1.1.2 Plant Community Type and Determination

Vegetation zones were identified based on dominant flora species present within each structural layer (i.e. canopy, shrub and ground layers). Exotic or highly modified native vegetation types were defined based on structure and species composition. A review of Plant Community Types (PCTs) listed in the BioNet Vegetation Classification database (DPIE 2021b), including floristics, composition, landscape position, soil type and diagnostic features, was completed to determine the most representative PCT for vegetation on site.

The closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the plot / transect data collected from the Development Site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the site were compared to the descriptions in the database to determine the most suitable PCT. Threatened ecological communities (TECs) as defined in NSW and Commonwealth legislation were also identified if present.

3.1.1.3 Vegetation Zones

Vegetation zones were identified and delineated in the Study Area in accordance with Section 4.3 of the BAM (DPIE 2020a). A vegetation zone is defined in the BAM as a relatively homogenous area that is the same vegetation type and broad condition.

3.1.1.4 Assessing Vegetation Integrity (Site Condition)

Following stratification of the Subject Site into vegetation zones, plots/transects were undertaken to collect site condition data for the composition, structure and function attributes listed in **Table 2** in accordance with Section 4.3 of the BAM (DPIE 2020a). The location of the plots/transects were selected through stratified random sampling to provide a representative sample of the variation in vegetation composition and condition within each vegetation zone.



Table 2: Composition, Structure and Function components of vegetation integrity

Growth form groups used to assess composition (species richness) and structure (percent foliage cover)	Function attributes
• Tree (TG) • Shrub (SG) • Grass and grass-like (GG) • Forb (FG) • Fern (EG) • Other (OG)	• Number of large trees • Tree regeneration (presence/absence) • Tree stem size class (presence/absence) • Total length of fallen logs • Litter cover • High threat exotic vegetation cover (HTE) • Hollow-bearing trees (HBT)

The number of plots/transects undertaken across the Subject Site meets the minimum number of transects required for each vegetation zone area as detailed in Section 4.3.4, Table 3 of the BAM (DPIE 2020a). Two plots were undertaken within the Subject Site (see **Figure 4**).

3.1.1.5 Floristic Identification and Nomenclature

Floristic identification and nomenclature is based on classification by Royal Botanic Gardens and Domain Trust, Sydney, published on PlantNET (the NSW Plant Information Network System <http://plantnet.rbgsyd.nsw.gov.au>). For use in the BAM Calculator, native species were assigned to growth forms as per their classification in BioNet, and High Threat Weeds were classified as per the list published by The Biodiversity Conservation Division (BCD, formerly known as the Office of Environment and Heritage or OEH).



3.2 ASSESSMENT RESULTS

3.2.1 Vegetation Description

One Plant Community Type (PCT) was identified within the site; *PCT 485 - River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)*. The remainder of the Subject Site was characterised by areas of managed exotic grassland, and a mix of planted native and exotic trees and shrubs, likely the result of the site's past use as a NSW State Forests nursery.

The vegetation within the Study Area was assigned to three (3) vegetation zones based on floristics and vegetation condition, these are identified within **Figure 4**, and include the following:

- **Vegetation Zone 1:** *PCT 485 - River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)*.
- **Vegetation Zone 2:** *Planted Native/Exotic Vegetation* – Characterised by a mix of planted shrubs, *Casuarina cristata* (Belah), occasional planted *Casuarina cunninghamiana* (River Oak), and a high diversity of non-indigenous *Eucalyptus spp.*, and *Corymbia spp.* planted during the site's previous use as a State Forestry nursery (Abel Ecology, 2020).
- **Vegetation Zone 3:** *Exotic Grassland (Managed)* – Dominated by a managed lawn of *Cynodon incompletus* as well as a variety of other exotic grasses and forbs such as *Ehrharta erecta* (Panic Veldtgrass), *Bidens pilosa* (Cobbler's Pegs) and *Plantago lanceolata* (Lamb's tongues).

The Planted Native Vegetation within the Subject Site could not be reasonably assigned to a PCT occurring within the Hunter IBRA sub-region (see **Appendix D**). Therefore, the *Streamlined Assessment Module – Planted Native Vegetation* was deemed appropriate in accordance with Appendix D of the BAM (DPIE 2020a).

In accordance with Table 28 of the BAM (DPIE, 2020a) impacts to the Planted Native/Exotic Vegetation have been considered in the context of potential habitat for threatened species throughout this report *see **Section 5.2**. The removal of this vegetation from the Subject Site does not generate an ecosystem credit obligation.

A summary of vegetation communities is provided in **Table 3**. Full descriptions of each vegetation zone are provided in the following sub-sections, floristic and structural plot data is provided in **Appendix G**.

Table 3: Vegetation Communities within the Study Area

Vegetation Community	Vegetation Formation	Vegetation Class	Area (ha) within Study Area	Area (ha) within Subject Site
PCT 485 - River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion).	Forested Wetland	Eastern Riverine Forests	0.20 ha	0.20 ha
Planted Native/Exotic Vegetation	NA	NA	1.05 ha	0.21 ha (77 trees)
Exotic Grassland (managed)	NA	NA	0.77 ha	0.49 ha
Existing Infrastructure	NA	NA	0.42 ha	0.09 ha
Total			2.43 ha	0.99 ha



Legend

Study Area

Areas Subject to Demolition DA

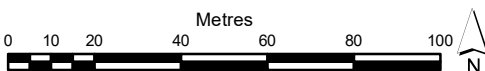
Plant Community Types and Vegetation Zones

Zone 1 - PCT 485: River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) (Planted)

Planted Native/Exotic Vegetation

Exotic Grassland (Managed)

Existing Infrastructure



PROJECT REFERENCE: 20220696

DATE DRAWN: 2021/09/17 17:30 Version 2

DRAWN BY: GJoice

DATA SOURCE:

NSW DFSI - 2021

NSW EOH - 2021

Nearmap - 2021

Vegetation Mapping

NBRS Architecture
Biodiversity Development Assessment Report
Pacific Brook Christian School (Lot 100/DP 1261496)
72-74 Maitland Street, Muswellbrook NSW

FIGURE:

4



Vegetation Zone 1



Date & Time: Tue, 01 Jun 2021, 10:45:05 AEST
Position: 56 H 301896 6426981 ($\pm 5.0\text{m}$)
Altitude: 151 m ($\pm 3.0\text{m}$)
Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
Azimuth/Bearing: 151° S29E 2684mils True ($\pm 10^\circ$)
Elevation Angle: +03.6°
Horizon Angle: -00.1°
Zoom: 1.0X
Q01 (Start)

Plate 1: PCT 485 - River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) (Planted)

PCT	Vegetation Formation
Vegetation Formation and Class	Forested Wetlands Eastern Riverine Forests
Area within Subject Site	0.20 ha [total area within Study Area: 0.20 ha]
Survey Effort	Required: 1 plot/transect Conducted: 1 plot/transect.
Floristic description	The canopy within this vegetation zone was exclusively comprised of <i>Casuarina cunninghamiana</i> (River Oak). The midstorey is largely cleared throughout this zone with select planted individuals of <i>Melaleuca bracteata</i> (Black Tea-tree). The managed groundlayer is a mix of grasses, and herbs, including <i>Cynodon incompletus</i> (Couch), <i>Einadia nutans</i> (Climbing Saltbush), <i>Dichondra repens</i> (Kidney Weed), <i>Bothriochloa macra</i> (Red Grass) and <i>Chloris truncata</i> (Windmill Grass). A high cover of exotics was recorded within the groundlayer including <i>Galenia pubescens</i> (Galenia), <i>Paspalum dilatatum</i> (Paspalum), <i>Alternanthera pungens</i> (Khaki Weed), <i>Ehrharta erecta</i> (Panic Veldtgrass) and <i>Medicago lupulina</i> (Black Medic).
Condition within Development Site	The vegetation within this zone is representative of a planted form of PCT 485 with a canopy of planted, mature <i>C. cunninghamiana</i> . The vegetation is highly managed, with a reduced “garden” midstorey, and a primarily exotic managed (mown) groundcover.



PCT	Vegetation Formation
Justification for PCT selection	The vegetation within this zone most closely resembles a Riverine Forest due to the dominance of the diagnostic canopy species <i>Casuarina cunninghamiana</i>, and its position on a floodplain with alluvial soils. Due to the dominance of <i>C cunninghamiana</i> the vegetation within this zone could reasonably be assigned to a PCT (in accordance with Appendix D of the BAM [DPIE 2020a]). As such, despite the vegetation within this community being planted (native canopy species), it is assigned to PCT 485 in accordance with the BAM.
Status	BC Act: Not listed EPBC Act: Not listed
SAII	No
PCT % Cleared	50%



Plate 2: Historical Aerial Imagery of Muswellbrook (1958) (NSW Govt. 2021). See approximate location of Study Area in yellow.



Vegetation Zone 2



Plate 3: Vegetation Zone 2 - Planted Native/Exotic Vegetation

PCT	Vegetation Formation
Vegetation Formation and Class	Not applicable
Area within Subject Site	0.21 ha (removal of 77 trees) [total area within Study Area: 1.05 ha]
Survey Effort	Required: 0 plots/transects Conducted: 0 plots/transects
Floristic description	The vegetation within this zone is characterised by a diverse planting of canopy tree species, scattered shrubs and a managed mixed native/exotic grassy groundcover. The boundaries of the site are lined with mature <i>Casuarina cristata</i> (Belah) trees, intermixed with the occasional planted <i>Casuarina cunninghamiana</i> (River Oak). The central portion of the vegetation zone is comprised of a high diversity of trees, planted during the site's previous use as a State Forestry nursery. Species include many non-indigenous (not native to the area) species such as: <i>Eucalyptus sideroxylon</i> (Mugga Ironbark), <i>Corymbia maculata</i> (Spotted Gum), <i>Eucalyptus propinqua</i> (Small-fruited Grey Gum), <i>Corymbia citriodora</i> (Lemon-scented Gum), <i>Eucalyptus albens</i> (White Box), <i>Corymbia eximia</i> (Yellow Bloodwood), <i>Eucalyptus intertexta</i> (Gum Coolibah), and <i>Eucalyptus viridis</i> (Green Mallee). Two <i>Eucalyptus camaldulensis</i> (River Red Gum) trees were identified within this vegetation zone. The specimens' inclusion within the endangered <i>Eucalyptus camaldulensis</i> (River Red Gum) Population of the Hunter Catchment cannot be disregarded based on the likelihood that they are planted alone. Justification for this determination is provided in Section 4.3. Neither tree will be impacted by the proposed development. The open shrub layer comprises of a mix of planted natives including <i>Acacia salicina</i> (Cooba), <i>Melaleuca bracteata</i> (Black Tea-tree), <i>Callistemon viminalis</i> (Weeping



PCT	Vegetation Formation
	Bottlebrush), <i>Grevillea robusta</i> (Silky Oak), and <i>Allocasuarina gymnanthera</i>. There are a number of mature <i>Acacia pendula</i> (Weeping Myall) specimens within this vegetation zone. These were considered to be planted specimens and not part of the endangered <i>Acacia pendula</i> (Weeping Myall) Population of the Hunter Catchment. Justification for this determination is provided in Section 4.3. The groundlayer retains a sparse distribution of native grasses and forbs including <i>Dichondra repens</i> (Kidney Weed) and <i>Chloris truncata</i> (Windmill Grass). Exotics within the managed groundcover include: <i>Cynodon incompletus</i>, <i>Ehrharta erecta</i> (Panic Veldtgrass), <i>Bidens pilosa</i> (Cobbler's Pegs) and <i>Plantago lanceolata</i> (Lamb's tongues).
Condition within Development Site	The vegetation within this zone is of moderate condition, characterised by a mix of planted native/exotic trees and shrubs, the majority of which are not locally indigenous.
Justification for PCT selection	Vegetation within this zone is not representative of a PCT. Justification for the status of this vegetation zone as "Planted Native Vegetation" is provided in Appendix D .
Status	BC Act: N/A EPBC Act: N/A
SAII	No
PCT % Cleared	N/A



Vegetation Zone 3



Plate 4: Exotic Grassland

PCT	Vegetation Formation
Vegetation Formation and Class	N/A
Area within Development Site	0.49 ha [total area within Study Area: 0.77 ha]
Survey Effort	Required: 1 plot/transect Conducted: 1 plot/transect.
Floristic description	Vegetation within Zone 3 is highly managed with no remaining canopy or midstratum. The understory retains a sparse distribution of native grasses and forbs including <i>Dichondra repens</i> (Kidney Weed) and <i>Chloris truncata</i> (Windmill Grass). This zone is dominated by the exotic grass <i>Cynodon incompletus</i> as well as a variety of other exotic grasses and forbs such as <i>Ehrharta erecta</i> (Panic Veldtgrass), <i>Bidens pilosa</i> (Cobbler's Pegs) and <i>Plantago lanceolata</i> (Lamb's tongues).
Condition within Development Site	Zone 3 represented highly managed low condition exotic grassland. This is based on the absence of upper and mid strata, as well as the high proportion of exotic ground cover species. Native flora is sparse and low in diversity within this zone.
Justification for PCT selection	Vegetation within this zone is not representative of a PCT.
Status	BC Act: N/A EPBC Act: N/A
SAII	No
PCT % Cleared	N/A



3.2.1.1 Assessment of Patch Size

The patch size for PCT 485 (Vegetation Zone 1) was assessed as >100 ha as the vegetation within the site is connected to larger intact areas of native vegetation extending along Muscle Creek to the north and along the Hunter River to the north-west of the site. Any gaps in the connective vegetation considered for the patch sizes are less than 100 m (appropriate for woody vegetation).

3.2.1.2 Vegetation Integrity Score

The current vegetation integrity score for native vegetation within the site (PCT 485/Vegetation Zone 1) is outlined in **Table 4**.

Table 4: Current vegetation integrity score for the vegetation zones

Zone	PCT	Condition class	Area (ha)	Condition scores (Current Score)			Vegetation integrity score
				Composi tion	Structure	Function	
1	485	Planted	0.20	9.7	80.3	50.4	34



4 THREATENED SPECIES

4.1 ASSESSING HABITAT SUITABILITY

To inform the assessment of suitable habitat for threatened species and populations within the Study Area, a database search of the NSW DPIE BioNet Atlas (DPIE 2021a) and the Commonwealth DAWE Protected Matters Search Tool (PMST) (DAWE 2021a) were conducted. Results of the database search and 'likelihood of occurrence' assessment are provided in **Appendix A**.

4.1.1 Habitat Assessment

4.1.1.1 Flora

The Subject Site is characterised by a stand of mature planted *Casuarina cunninghamiana* (River Oak) to the south-west of the existing nursery (Vegetation Zone 1), gardens and areas planted with a diverse mix of non-indigenous trees (Vegetation Zone 2), and managed exotic grassland throughout the site. Historical aerial imagery indicates the site was previously cleared of native vegetation as early as 1958 (see **Plate 2**). Furthermore, the existing vegetation and floristics within the site have been highly influenced by its long-term use as a NSW Forestry nursery, including the planting of a number of non-indigenous species and native species of non-local provenance (including species recognised as occurring as locally threatened populations).

As a result of historic vegetation clearing, long-term use as a nursery, and management of groundlayer, the site is not considered to represent suitable habitat for many locally occurring threatened flora species.

4.1.1.2 Fauna

Fauna habitat within the Study Area is characterised by open managed (mown) grassland areas, gardens of dense shrubs (i.e. *Callistemon spp.*, *Acacia spp.* and *Melaleuca spp.*) and planted 'forest' areas with cleared midstorey and a managed grassy groundcover (see **Photo 1**). The vegetation within the Study Area is partially connected to scattered patches of vegetation within a golf course to the north, and further to riparian vegetation along Muscle Creek and the Hunter River. This vegetation is likely to only constitute habitat for highly mobile threatened species (i.e. birds and bats), and locally occurring species associated with both urban/suburban and agricultural environments.

The Study Area contains a number of derelict buildings including a small dwelling, a nursery shopfront, amenities buildings and a maintenance shed (see **Photo 2**). These structures are likely to only constitute habitat for commonly occurring urban/suburban mammal species (i.e. rodents and arboreal marsupials). However, cavities within existing structures have the potential to provide roosting habitat for locally occurring microchiropteran bats.

The site contains one (1) hollow-bearing tree (one small hollow [0-5cm diameter]), and five (5) dead stags (mix of *Casuarina spp.* and *Eucalyptus spp.*). The small hollow is only likely to constitute potential nesting habitat for small common locally occurring species. The dead stags have the potential to provide roosting habitat for highly mobile bird species (i.e. birds of prey and forest owls) using the surrounding mixed cleared/forested landscape for foraging. Peeling bark on dead stags was considered potentially suitable roosting habitat for locally occurring microchiropteran bats, albeit of low suitability.

The site does not contain any water bodies, caves, rocky outcrops or other important habitat features. The site only contains a low level of fallen timber including the occasional fallen branch and



Photo 1: Mix of vegetation and habitat characteristic of the Subject Site.



Photo 2: Derelict buildings and shed in background within the Subject Site.



4.1.2 Ecosystem Credit Species

The following assessment of habitat suitability for Ecosystem Credit species was conducted in accordance with Section 6.2 of the BAM. Ecosystem credits represent threatened species that can be predicted to be present by the type and condition of vegetation at the Subject Site. Targeted survey is not required for Ecosystem Credit species.

Step 1: Identify threatened species for assessment

A list of predicted Ecosystem Credit species for the Subject Site was reviewed in the BAM calculator, ecosystem credit species are based on the presence of PCT 485 within the site. The Predicted Species Report is within **Appendix E**.

Step 2: Assessment of the habitat constraints and vagrant species on the subject land

The potential for identified Ecosystem Credit species to occur on the Subject Site was assessed according to species specific habitat requirements, as detailed in **Table 5**. Where habitat features were not present due to the degraded condition of the site vegetation, Ecosystem credit species were determined to not be predicted species and no further assessment was required within these vegetation zones.

Table 5: Assessment of ecosystem credit species within the Development Site.

Scientific name	Common name	Confirmed Predicted Species	Justification
<i>Anthochaera phrygia</i>	Regent Honeyeater	Yes	-
<i>Falco subniger</i>	Black Falcon	Yes	-
<i>Glossopsitta pusilla</i>	Little Lorikeet	Yes	-
<i>Grantiella picta</i>	Painted Honeyeater	Yes	-
<i>Hirundapus caudacutus</i>	White-throated Needletail	Yes	-
<i>Ninox connivens</i>	Barking Owl (foraging)	Yes	-

4.1.3 Species Credit Species

Step 1: Identify threatened species for assessment

A list of predicted species credit species for the Subject Site was reviewed in the BAM calculator. Species credits pertain to threatened species that cannot be predicted by the vegetation present. One threatened species associated with serious and irreversible impacts (SAII) was identified as a threatened species for assessment; Regent Honeyeater (*Anthochaera phrygia*). Two threatened populations were identified as species requiring further assessment: *Acacia pendula* – endangered population and *Eucalyptus camaldulensis* – endangered population. The inclusion of these two populations was based on requirements under Section 5.2.1 (point 6) of the BAM (DPIE 2020a). Both species were previously identified within the Study Area during surveys (Abel Ecology 2020).

A full list of predicted Species Credit species are detailed within the Candidate Species Report (**Appendix E**).



Step 2: Assessment of the habitat constraints and vagrant species on the subject land

The potential for identified Species Credit species to occur on the Subject Site was assessed according to species specific habitat requirements, as detailed in **Table 6**.

4.1.3.1 Step 3: Identify candidate species credit species for further assessment

The one identified species credit species was excluded as candidate species due to geographic/habitat constraints not being met by the Study Area, no further assessment of this species was required (**Table 6**).

Two identified species credit species were confirmed as Candidate Species due to past records within the site. Further assessments were completed for: the *Acacia pendula* – endangered population and the *Eucalyptus camaldulensis* – endangered population (**Table 6**).

Table 6: Species credit species and justification for inclusion as candidate species.

Scientific name	Common name	Confirmed Candidate Species	Justification
Flora			
<i>Acacia pendula</i> – endangered population	<i>Acacia pendula</i> population in the Hunter Catchment	Yes	Past Records within the site (Abel Ecology 2020)
<i>Eucalyptus camaldulensis</i> – endangered population	<i>Eucalyptus camaldulensis</i> population in the Hunter Catchment	Yes	Past Records within the site (Abel Ecology 2020)
Birds			
<i>Anthochaera phrygia</i>	Regent Honeyeater	No	Habitat constraint not met: As per mapped areas (Important habitat mapping, DPIE 2021f).

4.2 THREATENED SPECIES SURVEYS

Step 4: Determine presence or absence of candidate Species Credit species.

4.2.1 Candidate Flora Species

The following candidate threatened flora species (**Table 7**) were surveyed in accordance with the *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020b). As discussed above, flora surveys were conducted throughout the Study Area in order to assess indirect impacts and allow for design changes regarding the location of the Project infrastructure.

Table 7: Survey of requirements and timing conducted for candidate flora species

Scientific name	Common name	Survey Requirements	Survey Timing	Survey Effort
<i>Acacia pendula</i> – endangered population	<i>Acacia pendula</i> population in the Hunter Catchment	All Year	01/06/2021	Parallel field traverses (<20 m width in open vegetation) See Figure 5 .
<i>Eucalyptus camaldulensis</i> – endangered population	<i>Eucalyptus camaldulensis</i> population in the Hunter Catchment	All Year	01/06/2021	Parallel field traverses (<40 m width in open vegetation) See Figure 5 .

4.2.1.1 Survey Methodology

The candidate threatened flora species were surveyed in accordance with the *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020b). All surveys were conducted using systematic parallel transects. Because of the open nature of the vegetation within the site (see **Photo 3**) a field traverses were separated by 10 to 20 m for shrubs (i.e. *Acacia pendula*) and 20 to 40 m for trees (i.e. *Eucalyptus camaldulensis*).

Surveys were undertaken across the Study Area by suitably qualified ecologists. Survey tracks for targeted flora surveys are shown on **Figure 5**.

4.2.1.2 Flora Survey Results

A total of 64 flora species were identified during field surveys, 30 of these were exotic species, of which nine (9) are considered 'High Threat Exotics' and one which is a listed Priority Weed for the Hunter Local Land Services Region under the *Biosecurity Act 2015* (NSW), *Bryophyllum delagoense* (Mother of Millions).

Two species known to occur as part of a threatened population within the Hunter Catchment were identified within the site during the assessment, *Acacia pendula* (Weeping Myall) and *Eucalyptus camaldulensis* (River Red Gum). These species were recorded primarily outside of the proposed development footprint, with the exception of one River Red Gum recorded on the boundary of the Subject Site near the existing front gate. Both species were recorded within Vegetation Zone 2: Planted Native/Exotic Vegetation and were considered to be planted specimens originating from the site's past use as a State Forests nursery. See **Section 4.3** for discussion of identified *Acacia pendula* and *Eucalyptus camaldulensis* plants within the site.

A list of the flora species identified within the Study Area is provided in **Appendix B**.

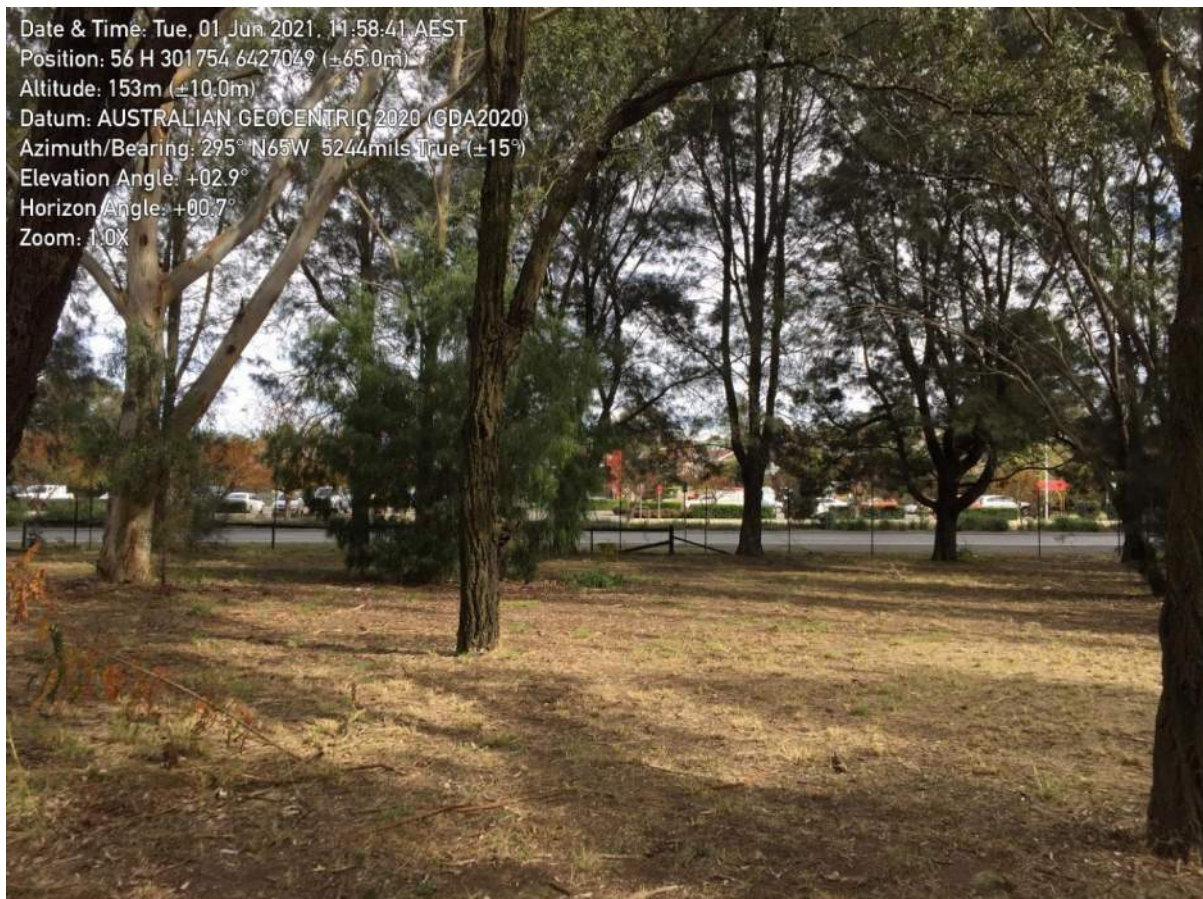


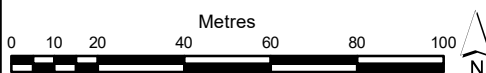
Photo 3: Nature of open vegetation within the site.

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.



Legend

- Study Area
- Plot Transect
- Threatened Flora Search
- ... Habitat Assessment
- ... Flora Meander



PROJECT REFERENCE: 20220696
 DATE DRAWN: 2021/09/17 17:31 Version 2
 DRAWN BY: GJoyce

DATA SOURCE:
 NSW DFSI - 2021
 NSW EOH - 2021
 Nearmap - 2021

Survey Effort

NBRS Architecture
 Biodiversity Development Assessment Report
 Pacific Brook Christian School (Lot 100/DP 1261496)
 72-74 Maitland Street, Muswellbrook NSW

FIGURE:

5



4.2.2 Candidate Threatened Fauna

No candidate threatened fauna species were identified as requiring surveys as part of this assessment. Opportunistic fauna surveys were undertaken across the Study Area by two suitably qualified ecologists on 1 June 2021. Survey effort is shown in **Figure 5**.

4.2.2.1 Fauna Survey Results

No threatened fauna species were identified within the Study Area during the site assessment.

A total of seven (7) species of fauna were detected within the Study Area during field surveys (**Appendix C**). These include seven (7) bird species common to urban/suburban environments, including the Red Wattlebird (*Anthochaera carunculata*), Australian Magpie (*Gymnorhina tibicen*), Eastern Rosella (*Platycercus eximius*), Rainbow Lorikeet (*Trichoglossus moluccanus*), Galah (*Eolophus roseicapilla*), Crested Pigeon (*Ocyphaps lophotes*), and Noisy Miner (*Manorina melanocephala*).



4.3 IDENTIFIED THREATENED SPECIES

Step 5: Determine the area or count, and location of suitable habitat for species credit species and Step 6: Determine the habitat condition within the species polygon for species assessed by area.

Two species associated with locally threatened populations were detected within the Study Area: *Eucalyptus camaldulensis* (River Red Gum) and *Acacia pendula* (Weeping Myall). The species' conservation status, and the location and condition of suitable habitat for the identified species credit species are discussed below:

***Eucalyptus camaldulensis* (River Red Gum)**

A total of two (2) *Eucalyptus camaldulensis* plants were recorded within the Study Area during the site assessment, both within Vegetation Zone 2 (Planted Native/Exotic Vegetation). One tree is within the development footprint, the other is outside. However, both trees will be retained, therefore there will be no impacts to the species as part of the proposed development (see **Figure 7**).

The two (2) individuals were considered likely to be planted as part of the site's previous land use as a State Forest nursery. Despite this the trees were considered to represent the *Eucalyptus camaldulensis* population in the Hunter catchment, listed as endangered under the NSW BC Act. This determination is based on the occurrence of a number of records for the population to the north of the site.

Mitigation measures to protect the two (2) *Eucalyptus camaldulensis* trees are detailed in **Section 5.3**.



Photo 4: *Eucalyptus camaldulensis* (River Red Gum) tree located beside the entry gate within the Study Area.

***Acacia pendula* (Weeping Myall)**

A total of 12 *Acacia pendula* plants were recorded within the Study Area, all within Vegetation Zone 2 (Planted Native/Exotic Vegetation) and are located outside of the Subject Site (the development footprint). There will be no impacts to the species as part of the proposed development. The species was also not considered to represent the *Acacia pendula* population in the Hunter catchment, listed as endangered under the NSW BC Act. This determination is based on three key aspects of the population within the site:

- **Historic vegetation clearing** – the Study Area was cleared of native vegetation prior to 1958 (see **Plate 2**).
- **Characteristics of the population** – regarding the threatened population “successful fruiting has never been observed in the Hunter, and all populations are sterile” (DPIE 2021c). However, the specimens recorded within the Study Area were observed to be fruiting at the time of the survey (1 June 2021) (see **Photo 5**).
- **Previous land use** – Bell and Driscoll (2014) consider it reasonable to assume that many of the *Acacia pendula* plants in the Hunter originate from plantings. They also highlight the importance of the State Forests nursery at Muswellbrook (the Study Area) which stocked and sold horticultural specimens of this species for “several decades” (Bell and Driscoll 2014). As such it is considered appropriate to assume that the unusually fruiting specimens of *Acacia pendula* within the Study Area are of horticultural origin and therefore do not represent the threatened population.



Photo 5: Fruiting *Acacia pendula* (Weeping Myall) trees within the Study Area.

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Legend

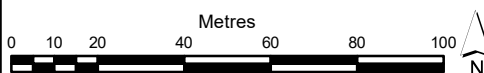
- Study Area
- Proposed Development (Masterplan)

Habitat Features

- H Dead Stag
- + Hollow-bearing Tree
- N Nest

Threatened Flora (to be retained)

- *Acacia pendula* (Weeping Myall - Planted)
- *Eucalyptus camaldulensis* (River Red Gum - Planted)



PROJECT REFERENCE: 20220696
DATE DRAWN: 2021/09/17 17:33 Version 2
DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2021
NSW EOH - 2021
Nearmap - 2021

Fauna Habitat and Threatened Species

NBRS Architecture
Biodiversity Development Assessment Report
Pacific Brook Christian School (Lot 100/DP 1261496)
72-74 Maitland Street, Muswellbrook NSW

FIGURE:

6

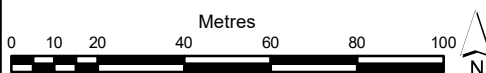


Legend

- Study Area
- Proposed Development (Masterplan)
- Areas Subject to Approved Demolition DA
- Vegetation to be removed for Proposed Development
- Planted tree to be removed (arborist recommendation)
- Planted tree to be removed (within development footprint)

Plant Community Types and Vegetation Zones

- Zone 1 - PCT 485: River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) (Planted)
- Planted Native/Exotic Vegetation
- Exotic Grassland (Managed)
- Existing Infrastructure



PROJECT REFERENCE: 20220696
DATE DRAWN: 2021/09/17 17:33 Version 2
DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2021
NSW EOH - 2021
Nearmap - 2021

Development Impacts

NBRS Architecture
Biodiversity Development Assessment Report
Pacific Brook Christian School (Lot 100/DP 1261496)
72-74 Maitland Street, Muswellbrook NSW

FIGURE:

7



5 IMPACT ASSESSMENT

5.1 AVOIDING AND MINIMISING IMPACTS

NBRS Architecture has reviewed a range of options regarding the proposed PBCS development. Avoidance and minimisation measures considered for the PBCS development are outlined in the following sections.

5.1.1 Impacts on Native Vegetation and Threatened Species Habitat

Steps to avoid, minimise and mitigate impacts to native vegetation, threatened species, populations and their habitat were considered in selecting a final proposed PBCS design with the least biodiversity impact.

Site Selection

The selection of the proposed PBCS school site is based on the need for improved/ additional school facilities within Muswellbrook is important in meeting the educational needs of the growing residential population of the Muswellbrook and Upper Hunter area. The Upper Hunter also lacks specific school facilities for assisted need schooling. The proposal will provide residents in the area and the broader school community with a new school campus that provides improved school facilities, assisted need classes and access from surrounding residential areas and the wider upper hunter area. The site is considered to be able to accommodate a development of this nature with potential land use conflicts with surrounding development (i.e. traffic impacts) minimised.

Consultation with Muswellbrook Shire Council (Council) commenced on 23 January 2020. Council recognised that there is a need for additional educational facilities such as that proposed by Pacific Brook Christian School.

Site Layout and Design

The design of the proposed PBCS development has been informed by biodiversity and arboriculture assessments (Abel Ecology 2020a, 2020b). The assessment identified the following key ecological constraints occurring within the site:

- Two species associated with locally threatened populations:
 - *Eucalyptus camaldulensis* (River Red Gum) specimens – potentially representative of the endangered *Eucalyptus camaldulensis* population in the Hunter catchment.
 - *Acacia pendula* (Weeping Myall) specimens - potentially representative of the endangered *Acacia pendula* population in the Hunter catchment.

The proposed PBCS development layout is positioned to avoid impacts to the threatened populations detailed above. As a result, no impacts to threatened species, populations or their habitat is expected to occur as part of this proposed development. Appropriate mitigation measures have been detailed in **Section 5.3** to further minimise any indirect impacts to threatened populations within the site.



5.1.2 Prescribed Biodiversity Impacts

The following are prescribed impacts which need to be considered as per section 8.3 of the BAM (DPIE 2020a).

Impacts of the development on the habitat of threatened species or ecological communities associated with significant geological features, human made structure or non-native vegetation.

The proposed development will impact 0.21 ha of Vegetation Zone 2 (Planted Native/Exotic Vegetation), in which two species associated with locally threatened populations were identified: *Eucalyptus camaldulensis* and *Acacia pendula*. Both species will be retained as part of the proposed development, mitigation measures to minimise any indirect impacts are detailed in **Section 5.3**.

Impacts of the development on the connectivity of different habitat which facilitates movement of threatened species.

The vegetation on site is partially connected to scattered patches of vegetation within a golf course to the north, and further to riparian vegetation along Muscle Creek and the Hunter River. The site was considered likely to only represent habitat for highly mobile threatened species (i.e. birds and bats).

Impact of the development on movement of threatened species that maintains their life cycle

As discussed above, the proposed development would have limited impacts on the movement of threatened species in the local area. While a small area of planted native vegetation would be removed, movement corridors within the local area would largely be maintained with the retention of a large area of planted native vegetation within the north-western corner of the site.

5.2 ASSESSMENT OF IMPACTS

5.2.1 Impacts on Native Vegetation and Habitat

5.2.1.1 Direct Impacts

The proposed development will impact approximately 0.2 ha of “native vegetation” identified within the Study Area (Vegetation Zone 1).

5.2.1.2 Indirect Impacts

The Project has the potential for edge effects on the adjoining vegetation. Potential indirect impacts include:

- Increased weed invasion and potential spread or introduction of pathogens from the site to adjacent vegetation.
- Accidental incursions during clearing.
- Reduced viability of adjoining habitats due to increased noise, dust or light spill; or
- Increase in rubbish dumping in adjoining habitats.

These potential indirect impacts may have an effect on the adjacent vegetation along the boundaries of the Development Site. Provided appropriate mitigation measures and management plans are enforced, the proposed development is unlikely to indirectly impact threatened species, ecological communities, and their habitats during construction and operational phases.



5.2.2 Prescribed Biodiversity Impacts

The Project has the potential to impact on one prescribed impact, the connectivity of habitat facilitating movement of threatened species (i.e. identified wildlife corridors). However, project layout has been informed by the findings of an initial biodiversity assessments to minimise impacts to biodiversity values and connectivity between habitats within the locality. As such, the development is not expected to have a significant impact on connectivity for threatened species within the locality.

5.3 MITIGATE AND MANAGE IMPACTS ON BIODIVERSITY VALUES

The measures outlined in **Table 8** are proposed to minimise and avoid potential impacts associated with the Project.

Table 8: Summary of mitigation and management measures for direct, prescribed and indirect impacts of the Project

Impact	Action and Outcome	Responsibility	Timing
Direct impact / prescribed impact			
Clearing of native vegetation	- Avoid and minimise clearing impacts to native vegetation where possible. - Clearly delineate the boundaries of the project footprint to prevent any unnecessary clearing beyond its extent. - Ensure vehicle and equipment parking areas and stockpile areas are identified and positioned to avoid areas containing ecological value. - Appropriate signage such as 'no go zone' or 'environmental protection area' should be installed. - Identify and communicate the location of any 'no go zones' in site inductions. - Tree protection measures will be implemented to protect retained <i>Eucalyptus camaldulensis</i> and <i>Acacia pendula</i> trees within the site during construction. Tree protection measures should consider allowances for Tree Protection Zones in accordance with AS4970 (Standards Australia, 2009).	Construction site manager	Prior to and during vegetation clearing
Removal of hollow-bearing trees / habitat trees, resulting in fauna injury and mortality	- Limit removal of trees to that required within the project footprint where possible. - A pre-clearing protocol will be implemented during clearing works, as follows: - Pre-clearance surveys will be undertaken to determine if any inhabiting fauna are present; - A suitably qualified and trained fauna handler will be present during hollow-bearing tree clearing to rescue and relocate displaced fauna. - Appropriate exclusion fencing around any trees and woodland that are to be retained within the Development Site should be erected, considering allowance for Tree Protection Zones in accordance with AS4970 (Standards Australia, 2009).	Construction site manager and suitably qualified/ Trained fauna handler	Prior to and during tree clearing



Impact	Action and Outcome	Responsibility	Timing
Impacts to surface and groundwater quality and quantity due to sediment run-off and/or contaminant runoff into adjacent watercourses	- Source controls such as sediment fences, mulching and jute matting will be utilised where appropriate. - Site-based vehicles will carry spill kits. - Erosion and sediment control will be required for the development in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) prior to commencement of construction. - Limit the use of pesticides in the project footprint where possible to avoid contamination of nearby watercourses/wetland areas.	Construction site manager	During vegetation clearing, construction and operation
Vehicle collision with fauna	Speed limits within the Development Site should be limited to 40 km/hr. This limit should be clearly signed at all entry points to site.	Construction site manager	During construction and operation
Indirect Impact			
Transfer of weeds and pathogens to and from Development Site	- The fungal pathogens <i>Phytophthora cinnamomi</i> and Myrtle Rust (<i>Puccinia psidii</i>) are known to occur in the Upper Hunter LGA however, it is unknown if they occur within the Development Site. These pathogens can have devastating impacts on native plant communities and inhabiting fauna if not properly managed. - Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival on-site and prior to departure. - Ensure soil and seed material is not transferred in accordance with measures outlined in the CEMP. - Weed infestations within the construction footprint are to be identified and mapped prior to construction.	Construction site manager	During vegetation clearing and construction
Noise, vibration, lighting, waste and air pollution impacts to adjacent sensitive habitat areas	- Increased human activity (from workers and traffic levels) directly adjacent to sensitive habitat areas may cause disturbance to flora and fauna species in adjoining habitat. - Impacts from operational activities, such as disturbance to an animal's normal behaviour patterns due to noise, vibration, lighting or dust may cause areas of previously suitable habitat to become sub-optimal and may cause fauna species to vacate areas of previously suitable habitat. - Measures to mitigate impacts on flora and fauna from noise, vibration, waste, light and air pollution such as: - Fence sensitive areas to delineate 'no go' zones. - Levels of lighting within the site will be reduced to a minimal level to reduce any adverse effects upon the essential behavioural patterns of light-sensitive fauna. - Lighting should comply with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting. - Noise minimisation practices in accordance with DPIE recommendations. - Dust control measures such as covering loads where required; amending operations under excessive wind conditions including ceasing operations if required; use of water tankers as required, to control dust; rehabilitation through vegetation of surfaces to be left unsealed; and, truck wheel washes or other dust removal measures.	Construction site manager	During construction and operation



6 IMPACT SUMMARY

6.1 SERIOUS AND IRREVERSIBLE IMPACTS

No species at risk of Serious and Irreversible Impacts (SAIIs) are to be impacted as a result of the proposed development. The *Acacia pendula* population of the Hunter Catchment is with a listed SAI entity, however the *Acacia pendula* individuals identified within the site were determined to not constitute the threatened population. Furthermore, no impacts to the species is expected under the proposed PBCS development. As such, no SAIIs were considered relevant to the proposed development.

6.2 IDENTIFICATION OF IMPACTS REQUIRING OFFSETS

This section provides an assessment of the impacts requiring offsetting in accordance with Section 10.1 of the BAM (DPIE 2020a).

6.2.1 Impacts on Native Vegetation

A summary of the impacts on native vegetation and the required ecosystem credit is provided in **Table 9**, and shown in **Figure 7**.

Table 9: Summary of ecosystem credit requirements

Vegetation Zone	Vegetation Zone Name	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Credits Required
1	PCT 485 – Low/Planted	0.20 ha	34	0	3
Total Credit Requirement					3

The Biodiversity Credit Report (Variations) detailing like-for-like credit retirement options is provided in **Appendix E**.

6.3 IMPACTS NOT REQUIRING OFFSETS

The proposed development will result in the following impacts (see **Figure 7**) that do not require offsets:

- **0.21 ha of Vegetation Zone 2** – Planted Native/Exotic Vegetation – Including 77 trees, 42 trees identified as being impacted by the proposed masterplan, 35 trees of which were identified as requiring removal based on an arborist report due to tree hazard potential (Abel Ecology 2020a).
- **0.49 ha of Vegetation Zone 3** – Exotic Grassland (Managed)

The prescribed impact on connectivity of habitat facilitating movement of threatened species (i.e. identified wildlife corridors) has also been considered but does not require offsetting.



7 ASSESSMENT OF BIODIVERSITY LEGISLATION

7.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

7.1.1 Assessment Requirements

The EPBC Act requires that developments or undertakings that are likely to have a significant impact on MNES be referred for a determination as to whether they are a controlled action that requires approval under the EPBC Act (Section 1.5.1).

Of the nine MNES listed under the Act, those considered relevant to the Study Area are potential impacts on listed threatened species or communities and potential impacts on migratory species listed under international agreements. The results of a search of the relevant threatened species database and an assessment of the likelihood of occurrence of threatened and migratory species is provided in **Appendix A**. No EPBC listed species were assessed as likely to occur within the Subject site, therefore, a referral to the Commonwealth Minister for the Environment is not considered necessary.

7.2 KOALA SEPP 2020

The vegetation within the site consists of a small area of planted PCT 485 (*River Oak riparian grassy tall woodland*) (Vegetation Zone 1), areas of mixed native/exotic planted vegetation (Vegetation Zone 2), and managed exotic grassland (Vegetation Zone 3). Three (3) preferred koala feed tree species as listed within Schedule 2 of the SEPP were identified within the site, including planted specimens of *Eucalyptus albens* (White Box), *Eucalyptus camaldulensis* (River Red Gum), and *Eucalyptus tereticornis* (Forest Red Gum). These trees do not constitute 15% of the total number of trees within the site. Therefore, the vegetation within the site does not meet the criteria for Core Koala Habitat or Potential Koala Habitat, as defined in Part 2 of the SEPP.

Core Koala Habitat is defined as the following:

“Core koala habitat means an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population.”

Potential Koala Habitat is defined as the following:

“Potential koala habitat means areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.”

7.3 BIOSECURITY ACT 2015

Species which require control prior to and post construction of the Project to ensure they are not spread due to works, include the high threat species listed in **Table 10**.

Table 10: Weed species requiring control within the Development Site

Family	Scientific Name	Common Name	Weeds of National Significance (WONS)	Priority weeds of the Hunter LLS (Biosecurity Act)	High Threat Weeds (BAM)
Aizoaceae	<i>Galenia pubescens</i>	Galenia	-	-	✓



Family	Scientific Name	Common Name	Weeds of National Significance (WONS)	Priority weeds of the Hunter LLS (Biosecurity Act)	High Threat Weeds (BAM)
Amaranthaceae	<i>Alternanthera pungens</i>	Khaki Weed	-	-	✓
Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena Weed	-	-	-
Arecaceae	<i>Phoenix canariensis</i>	Canary Island Date Palm	-	-	✓
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	-	-	-
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	-	-	-
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	-	-	-
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	✓	-	-
Asteraceae	<i>Soliva sessilis</i>	Bindyi	-	-	-
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	-	-	-
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	-	-	-
Caryophyllaceae	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort, Brazilian Whitlow	-	-	-
Crassulaceae	<i>Bryophyllum delagoense</i>	Mother of millions	-	✓	✓
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	-	-	✓
Fabaceae (Faboideae)	<i>Medicago lupulina</i>	Black Medic	-	-	-
Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover	-	-	-
Fabaceae (Faboideae)	<i>Trifolium subterraneum</i>	Subterranean Clover	-	-	-
Fabaceae (Mimosoideae)	<i>Acacia iteaphylla</i>	Flinders Range Wattle	-	-	-
Malvaceae	<i>Malva parviflora</i>	Small-flowered Mallow	-	-	-
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	-	-	-
Myrtaceae	<i>Corymbia citriodora</i>	Lemon-scented Gum	-	-	-
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet	-	-	✓
Oxalidaceae	<i>Oxalis latifolia</i>	-	-	-	-
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	-	-	-
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	-	-	-
Poaceae	<i>Cynodon incompletus</i>	-	-	-	-



Family	Scientific Name	Common Name	Weeds of National Significance (WONS)	Priority weeds of the Hunter LLS (Biosecurity Act)	High Threat Weeds (BAM)
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	-	-	✓
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	-	-	✓
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	-	-	✓
Poaceae	<i>Setaria parviflora</i>	-	-	-	-



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APPENDIX A – THREATENED SPECIES DATABASE SEARCH





THREATENED SPECIES DATABASE SEARCH

A list of threatened species, populations and ecological communities that have been reported or modelled to occur from within a five-kilometre radius of the Study Area was obtained from the following databases:

- NSW DPIE BioNet Atlas: (<http://www.bionet.nsw.gov.au/>); and
- Commonwealth DAWE Protected Matters search tool: (<https://www.environment.gov.au/epbc/protected-matters-search-tool>).

Further resources used to inform the threatened species database search included:

- The BAM – Calculator ([BAM Calculator \(nsw.gov.au\)](http://www.bam.nsw.gov.au/)), and
- NSW DPIE BioNet Threatened Biodiversity Profiles: ([NSW BioNet Quick Guides and Manuals | NSW Environment, Energy and Science](#)).
- DAWE (2020b). *Species Profile and Threats Database (SPRAT)*. Available at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

An assessment was then made of the likelihood of the threatened species, populations, and ecological communities reported or modelled to occur in the locality occurring within the Development Site or using the habitat within the Development Site as an essential part of a foraging range.

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the Development Site based on the habitat requirements of each species.

A brief definition of the likelihood of occurrence criteria is provided below:

- Known – species identified within the site during surveys;
- High – species known from the area (DPIE BioNet Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site;
- Moderate – species may be known from the area, potential habitat is present within the site;
- Low – species not known from the area and/or marginal habitat is present within the site; and
- Nil – habitat requirements not met for this species within the site



Table A1 'Likelihood of Occurrence' table

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
Flora								
1.	<i>Acacia pendula</i> <i>Acacia pendula</i> (Weeping Myall) population in the Hunter catchment	EP		35	BioNet	The species occurs on the western slopes, western plains and far western plains of NSW, and south into Victoria and north into Queensland. Within the Hunter catchment the species typically occurs on heavy soils, sometimes on the margins of small floodplains, but also in more undulating locations.	Low	<i>Acacia pendula</i> specimens were recorded within the site. However, these were not considered to represent the threatened population. (See Section 4.3 for justification). Individuals representing the threatened population were not recorded during the site assessment.
2.	<i>Androcalva procumbens</i>	V	V	P	PMST	This species grows in sandy sites, often along roadsides. It is often found as a pioneer species of disturbed habitats; it has been recorded colonising areas such as roadsides, the edges of quarries and gravel stockpiles and a recently cleared easement under power lines.	Nil	No suitable sandy soil habitat on site. No records within locality. Not recorded during site assessment
3.	<i>Cymbidium canaliculatum</i> Channelled Boat-Lip Orchid population in the Hunter Catchment	EP		8	BioNet	In NSW the species is restricted to the north-eastern quarter of the State, occurring chiefly in inland districts west to New Angledool and Walgett on the north western plains and north of the Hunter River, through the north western slopes, northern tablelands and north coast into south-eastern Queensland. Typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor.	Low	Broadly suitable habitat on site. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
4.	<i>Cynanchum elegans</i> White-flowered Wax Plant	E	E	P	PMST	The species occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA. Habitat for the species includes Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	Nil	No suitable habitat on site. No records within locality Not recorded during site assessment
5.	<i>Dichanthium setosum</i> Bluegrass	V	V	-	PMST	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It is associated with heavy basaltic black soils and red-brown loams with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture,	Nil	No suitable habitat on site. No records within locality Not recorded during site assessment
6.	<i>Diuris tricolor</i> Pine Donkey Orchid	V	-	249	BioNet	Tuberous, deciduous terrestrial orchid species sporadically distributed on the western slopes of NSW extending of Narrandera to the north of NSW growing on sandy soils either on flats or small rises. The species is commonly recorded in disturbed habitats. Flower stalk of the species is between 20 and 40 cm and has 2-6 flowers. Produces pleasant, sweet smelling bright yellow to orange flowers.	Moderate	Marginally suitable habitat on site. Records within the locality. Not recorded during site assessment
7.	<i>Diuris tricolor</i> Pine Donkey Orchid population in the Muswellbrook local government area	EP, V	-	249	BioNet	Tuberous, deciduous terrestrial orchid species sporadically distributed on the western slopes of NSW extending of Narrandera to the north of NSW growing on sandy soils either on flats or small rises. The species is commonly recorded in disturbed habitats. Flower stalk of the species is between 20 and 40 cm and has 2-6 flowers. Produces pleasant, sweet smelling bright yellow to orange flowers. The population of <i>Diuris tricolor</i> in the Muswellbrook LGA, in the upper Hunter Valley, comprises a number of occurrences, ranging from a few scattered individuals to a few thousand plants	Moderate	Marginally suitable habitat on site. Records within the locality. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
8.	<i>Eucalyptus camaldulensis</i> River Red Gum population in the Hunter catchment	EP		29	BioNet	The Hunter population occurs from the west at Bylong, south of Merriwa, to the east at Hinton, on the bank of the Hunter River, in the Port Stephens local government area. It has been recorded in the local government areas of Lithgow, Maitland, Mid-Western Regional, Muswellbrook, Port Stephens, Singleton and Upper Hunter. It may occur with <i>Eucalyptus tereticornis</i> , <i>Eucalyptus melliodora</i> , <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> and <i>Angophora floribunda</i> .	Known	<i>Eucalyptus camaldulensis</i> specimens were recorded within the site. Whilst likely planted, these individuals (two [2]) were considered to represent the threatened population, based on the occurrence of <i>E. camaldulensis</i> within the locality. (See Section 4.3 for justification). Individuals representing the threatened population were recorded during the site assessment.
9.	<i>Eucalyptus glaucina</i> Slaty Red Gum	V	V	4	BioNet, PMST	A medium-sized tree to 30 m tall. The bark is smooth and mottled white to slaty grey. Produces flowers that are usually white but occasionally pink. Grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Low	Marginal habitat on site. Not recorded during site assessment
10.	<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint	V	V	1	BioNet	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	Nil	Outside of known range for the species. Local occurrences of the species will only constitute planted specimens. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
11.	<i>Euphrasia arguta</i>	CE	CE	-	PMST	Euphrasia arguta was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Could be found in grassy areas near rivers at elevations up to 700 m above sea level, with an annual rainfall of 600 mm.	Nil	No suitable habitat on site. No records within locality Not recorded during site assessment
12.	<i>Pomaderris brunnea</i> Brown Pomaderris	E	V	P	PMST	Shrub growing up to 3 m tall with distinctly hairy stems. The species occurs in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. Habitat for this species includes moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Low	No suitable habitat on site. No records within locality Not recorded during site assessment
13.	<i>Prasophyllum sp.</i> <i>Wybong</i> A Leek Orchid		CE	P	PMST	The species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions. The distribution of this species overlaps with the White Box–Yellow Box–Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act-listed threatened ecological community.	Nil	No suitable habitat on site. No records within locality. Not recorded during site assessment
14.	<i>Pterostylis gibbosa</i> Illawarra Greenhood	E	E	P	PMST	This species of ground-dwelling orchid is known from a small number of populations in the Hunter region, the Illawarra region, and the Shoalhaven region in New South Wales. Habitat for this species includes open forest and woodland on flat or gently sloping land.	Low	Potential marginal habitat on site. No records within locality. Not recorded during site assessment
15.	<i>Thesium australe</i> Austral Toadflax	V	V	P	PMST	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	Low	Marginal habitat on site. No records within locality. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
Birds								
1.	<i>Anseranas semipalmata</i> Magpie Goose	V		1	BioNet	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes.	Nil	No suitable habitat on site. Not recorded during site assessment
2.	<i>Anthochaera phrygia</i> Regent Honeyeater	CE	CE	1	BioNet, PMST	In NSW the species is confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks are seen occasionally in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests. Habitat for the species includes dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	Low	Marginal foraging habitat on site (River Oak woodland). Not recorded during site assessment
3.	<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V,P		27	BioNet	A woodland dependent bird with a wide distribution and occurrence in a variety of habitats. The Tasmanian breeding population migrates north during the cooler months and can be found in southeast NSW. The species is an aerial forager and prefers woodland habitats.	Low	Marginal foraging habitat on site. Records within locality. Not recorded during site assessment.
4.	<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	6	BioNet, PMST	Large, stocky bird to 75 cm in length, widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (<i>Typha</i> spp.) and spike rushes (<i>Eleocharis</i> spp.).	Nil	No suitable habitat on site. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
5.	<i>Calyptrorhynchus lathamii</i> Glossy Black-Cockatoo	V	-	1	BioNet	Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of <i>Allocasuarina</i> species. Prefers woodland and open forests, rarely away from <i>Allocasuarina</i> . Roost in leafy canopy trees, preferably eucalypts, usually <1 km from feeding site. Nests in large (approx. 20 cm) hollows in trees, stumps or limbs, usually in Eucalypts.	Low	Marginal foraging habitat on site. No breeding habitat identified. Not recorded during site assessment
6.	<i>Chthonicola sagittata</i> Speckled Warbler	V	-	16	BioNet	Within NSW most frequently reported from the hills and tablelands of the Great Dividing Range, rarely from the coast. The species inhabits a wide range of Eucalypt-dominated communities with a grassy understorey, a sparse shrub layer, often on rocky ridges or in gullies. Sedentary and requires large, relatively undisturbed remnants to persist in an area. Forages on the ground for seeds and insects, and nests in a slight hollow in the ground or at the base of low dense plants.	Low	Marginal habitat on site. Records within the locality. Not recorded during site assessment
7.	<i>Circus assimilis</i> Spotted Harrier	V,P	-	1	BioNet	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	Low	Marginal foraging habitat on site. Only one record within locality. Not recorded during site assessment.
8.	<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V		4	BioNet	Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the great dividing range. Nests in tree or stump hollows greater than 6cm.	Low	Marginal foraging habitat on site. Records within the locality. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
9.	<i>Daphoenositta chrysoptera</i> Varied Sittella	V,P		5	BioNet	Sedentary, occurs across NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	Low	Marginal habitat on site. No records within locality Not recorded during site assessment
10.	<i>Ephippiorhynchus asiaticus</i> Black-necked Stork	E	-	1	BioNet	Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. This species breeds during summer, nesting in or near a freshwater swamp. Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat). They feed on a wide variety of animals, including fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish).	Nil	No suitable habitat on site. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
11.	<i>Erythrotriorchis radiatus</i> Red Goshawk	CE	V	-	PMST	Occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia, and frequently riverine forests. Such habitats typically support high bird numbers and biodiversity, especially medium to large species which the goshawk requires for prey. Nests in large trees, frequently the tallest in a tall stand, and nest trees are invariably within one km of permanent water. The breeding behaviour of Red Goshawks is not well known. Breeding is likely to be in spring and summer in southern Queensland and NSW. The birds lay clutches of 1-2 eggs between July and September, in a stick nest in a tall tree (>20 m tall) within 1 km of a watercourse or wetland	Low	Marginal foraging habitat in the Study Area. No records within the locality. Not recorded during site assessment
12.	<i>Falco hypoleucos</i> Grey Falcon	E	V	P	PMST	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Nil	No suitable habitat on site. No records within the locality. Not recorded during site assessment
13.	<i>Falco subniger</i> Black Falcon	V		1	BioNet	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling over hundreds of kilometres. 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.	Low	Marginal foraging habitat on site. Only one record within the locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
14.	<i>Glossopsitta pusilla</i> Little Lorikeet	V		9	BioNet	The species occurs from the coast to western slopes of the Great Dividing Range and inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands <i>Eucalyptus albens</i> and <i>E. melliodora</i> are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially <i>Eucalyptus viminalis</i> , <i>E. blakelyi</i> and <i>E. dealbata</i> . Most breeding records are from the western slopes.	Low	Marginal habitat on site. Records within the locality. Not recorded during site assessment.
15.	<i>Grantiella picta</i> Painted Honeyeater		V	P	PMST	The species is nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Habitat for the species includes Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests.	Low	Marginal foraging habitat on site. No records within locality. Not recorded during site assessment
16.	<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	V	-	4	BioNet	Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). The White-bellied Sea-Eagle most often nests in trees 30 m above the ground. It feeds mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.	Low	Marginal foraging on site. Records within the locality. Not recorded during site assessment



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
17.	<i>Hieraaetus morphnoides</i> Little Eagle	V,P		4	BioNet	Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	Low	Marginal foraging habitat on site. Records within the locality. Not recorded during site assessment
18.	<i>Lathamus discolor</i> Swift Parrot		CE	P	PMST	A migratory species that travels to the mainland from March to October, the species breeds in Tasmania from September to January. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. <i>Eucalyptus robusta</i> , <i>Corymbia maculata</i> and <i>C. gummifera</i> dominated coastal forests are also important habitat.	Low	Marginal foraging habitat on site. No records within the locality. Not recorded during site assessment
19.	<i>Numenius madagascariensis</i> Eastern Curlew		CE	P	PMST	The eastern curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The species takes an annual migratory flight to Russia and northeastern China to breed, arriving back home to Australia in August.	Nil	No suitable habitat on site. No records within the locality. Not recorded during site assessment
20.	<i>Polytelis swainsonii</i> Superb Parrot	V	V	P	PMST	The Superb Parrot is found throughout eastern inland NSW. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.	Low	Marginal foraging habitat on site. No records within the locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
21.	<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler	V		5	BioNet	Fairly large brown babbler with distinctive white/grey crown and brow. Live in family groups of up to 15 birds. Inhabits Box-Gum woodlands on slopes, and Box-Cypress pine and Open-Box woodlands when on Alluvial plains. Distribution along most of the eastern side of Australia, particularly the western slopes of the Great Dividing Range. Breeding occurs between July and February. Several conspicuous dome-shaped nests are built and maintained in shrubs, sapling eucalypts or lower branches of larger eucalypts. Territories are usually around 10ha, but can be up to 50ha.	Low	Marginal habitat on site. Records within locality. Not recorded during site assessment.
22.	<i>Rostratula australis</i> Australian Painted Snipe	E	E	P	PMST	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. The species nests on the ground amongst tall reed-like vegetation near water. Habitat for the species includes the fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	Nil	No suitable habitat on site. No records within the locality. Not recorded during site assessment
23.	<i>Stagonopleura guttata</i> Diamond Firetail	V,P		2	BioNet	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Groups separate into small colonies to breed, between August and January.	Low	Marginal foraging habitat on site. Only two records within locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
Mammals								
1.	<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	3	BioNet, PMST	Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features.	Low	No suitable habitat on site. Records within locality. Not recorded during site assessment.
2.	<i>Dasyurus maculatus maculatus</i> (SE mainland population) Spot-tailed Quoll	-	E	3	BioNet, PMST	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania the species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline	Low	No suitable habitat on site. Records within locality. Not recorded during site assessment.
3.	<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	V	-	5	BioNet	The species occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts include hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded).	Low	Marginal foraging habitat on site. Records within locality. Not recorded during site assessment.
4.	<i>Micronomus norfolkensis</i> Eastern Coastal Free-tailed Bat	V	-	8	BioNet	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Low	Marginal habitat on site. Records within locality. Not recorded during site assessment.
5.	<i>Miniopterus australis</i> Little Bent-winged Bat	V	-	5	BioNet	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings.	Low	Marginal habitat on site. Records within locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
6.	<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat	V	-	4	BioNet	Forages in forested habitats. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Low	No suitable habitat on site. Records within the locality. Not recorded during site assessment.
7.	<i>Myotis Macropus</i> Southern Myotis	V	-	6	BioNet	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water. The breeding period for this species is November or December.	Nil	No suitable habitat on site. Not recorded during site assessment
8.	<i>Nyctophilus corbeni</i> Corben's Long-eared Bat	V	V	P	PMST	Inhabits a variety of vegetation types, including mallee, Bulloke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	Low	No suitable habitat on site. No records within the locality. Not recorded during site assessment.
9.	<i>Petaurus norfolcensis</i> Squirrel Glider	V	-	12	BioNet	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.	Nil	No suitable habitat on site. Records within locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
10.	<i>Petauroides volans</i> Greater Glider		V	P	PMST	Prefers tall, montane, moist eucalypt forests with old growth trees and abundant hollows. The species favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Nil	No suitable habitat on site. No records within the locality. Not recorded during site assessment.
11.	<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	E	V	P	PMST	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	Nil	No suitable habitat on site. No records within the locality. Not recorded during site assessment.
12.	<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	V	-	1	BioNet	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. It also inhabits heath, swamps, rainforest and wet sclerophyll forest. The Brush-tailed Phascogale primarily feeds on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. They nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.	Low	Marginal foraging habitat on site. Only one record within the locality. Not recorded during site assessment.
13.	<i>Phascolarctos cinereus</i> (combined populations of Qld, NSW and the ACT) Koala	V	V	9	BioNet, PMST	Fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Low	Marginal habitat on site. Records within locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
14.	<i>Pseudomys novaehollandiae</i> New Holland Mouse		V	P	PMST	The species occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW it inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes. Species presence is strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
15.	<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	27	BioNet, PMST	Generally this species is found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Inhabit subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Moderate	Broadly suitable foraging habitat on site. Records within locality. No camp detected in Study Area. Not recorded during site assessment.
16.	<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V	-	5	BioNet	Migrates from tropics to SE Aus in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. It roosts in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, it flies high and fast over the forest canopy, but lower in more open country.	Low	Marginal habitat on site. Records within locality. Not recorded during site assessment.
17.	<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V	-	2	BioNet	This species occurs in a variety of habitats including rainforest, dry and wet sclerophyll forest and eucalypt woodland though it is most commonly found in tall wet forest. It usually roosts in tree hollows. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.	Low	Marginal foraging habitat on site. Records within locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
18.	<i>Vespadelus troughtoni</i> Eastern Cave Bat	V	-	5	BioNet	Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	Low	Marginal habitat on site. Records within locality. Not recorded during site assessment.

Amphibians & Reptiles

1.	<i>Aprasia parapulchella</i> Pink-tailed Worm-lizard	V	V	P	PMST	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
2.	<i>Heleioporus australiacus</i> Giant Burrowing Frog	V	V	P	PMST	The species occurs along the coast and eastern slopes of the Great Dividing Range south from Wollemi National Park, appearing to exist as 2 populations between Jervis Bay and Eden. Habitat for the species includes sandy soils supporting heath, woodland or open forest. The species breeds in ephemeral to intermittent streams with persistent pools. Only infrequently moves to breeding sites, most commonly found on ridges away from creeks, several hundred metres from water.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
3.	<i>Litoria aurea</i> Green and Golden Bell Frog	E	V	P	PMST	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (<i>Typha</i> spp.) or spike rushes (<i>Eleocharis</i> spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. <i>Gambusia holbrooki</i> is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
4.	<i>Litoria booroolongensis</i> Booroolong Frog	E	E	P	PMST	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Breeding occurs in spring and early summer.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
Migratory Birds								
1.	<i>Actitis hypoleucos</i> Common Sandpiper		M		PMST	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. Often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
2.	<i>Apus pacificus</i> Fork-tailed Swift		M	P	PMST	Forages in high open spaces over varied habitat types. Mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh.	Low	Marginal foraging habitat on site. No records within locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
3.	<i>Calidris acuminata</i> Sharp-tailed Sandpiper		M	P	PMST	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. Also occur in saltworks and sewage farms. Use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. Use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
4.	<i>Calidris ferruginea</i> Curlew Sandpiper		CE, M	P	PMST	The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales can be found mainly in intertidal mudflats of sheltered coasts.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
5.	<i>Calidris melanotos</i> Pectoral Sandpiper		M	P	PMST	Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
6.	<i>Gallinago hardwickii</i> Latham's Snipe		M	P	PMST	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
7.	<i>Hirundapus caudacutus</i> White-throated Needletail		V, M	7	BioNet, PMST	Widespread in eastern and south-eastern Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	Low	Marginal foraging habitat on site. Records within locality. Not recorded during site assessment.
8.	<i>Monarcha melanopsis</i> Black-faced Monarch		M	P	PMST	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Low	Marginal foraging habitat on site. Records within locality. Not recorded during site assessment.
9.	<i>Motacilla flava</i> Yellow Wagtail		M	P	PMST	Widespread wagtail, favouring wet meadows, marshland, grassy and muddy lakeshores. Occurs in fields and often near livestock during migration.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
10.	<i>Myiagra cyanoleuca</i> Satin Flycatcher		M	P	PMST	Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
11.	<i>Numenius madagascariensis</i> Eastern Curlew		CE, M	P	PMST	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The Eastern Curlew breeds in Russia and north-eastern China but its distribution is poorly known. It is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
12.	<i>Pandion cristatus</i> Eastern Osprey	V	M	P	PMST	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Found mostly in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
13.	<i>Rhipidura rufifrons</i> Rufous Fantail		M	P	PMST	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.
14.	<i>Tringa nebularia</i> Common Greenshank		M		PMST	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. Uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores.	Nil	No suitable habitat on site. No records of species in locality. Not recorded during site assessment.

Threatened Ecological Communities

1.	Central Hunter Valley Eucalypt Forest and Woodland		CE	P	PMST	The Central Hunter Valley eucalypt forest and woodland ecological community is an open forest or woodland—typically with a tree canopy dominated by eucalypt species; an open to sparse mid-layer of shrubs; and a ground layer of native grasses, forbs and small shrubs. It typically occurs on lower hillslopes and low ridges, or valley floors in undulating country; on soils derived from finer grained sedimentary rocks.	Absent	Vegetation on site is not representative of Threatened Ecological Community.
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	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
2.	Hunter Valley Weeping Myall Woodland	CE	CE	P	PMST	Hunter Valley Weeping Myall Woodland of the Sydney Basin bioregion is currently known from parts of the Muswellbrook and Singleton Local Government Areas but may occur elsewhere in the bioregion. This community is associated with heavy clay soils on depositional landforms in the south-western part of the Hunter River valley floor.	Low	<i>Acacia pendula</i> specimens were recorded within the site. However, these were not considered to represent the threatened population, therefore the vegetation within the site is not considered representative of this community. (See Section 4.3 for justification). Individuals representing the threatened population were not recorded during the site assessment.
3.	Lowland Rainforest of Subtropical Australia		CE	P	PMST	The Lowland Rainforest of Subtropical Australia ecological community primarily occurs from Maryborough in Queensland to the Clarence River (near Grafton) in New South Wales (NSW). The ecological community also includes isolated areas between the Clarence River and Hunter River such as the Bellinger and Hastings Valleys. The ecological community occurs on basalt and alluvial soils, including sand and old/elevated alluvial soils as well as floodplain alluvia.	Absent	Vegetation on site is not representative of Threatened Ecological Community.



	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
4.	River-flat Eucalypt Forest on Coastal Floodplains of Southern New South Wales and Eastern Victoria		CE	P	PMST	The ecological community occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans. The structure of the ecological community is generally a tall open forest to woodland, but there may be localised areas of closed forest and/or low forest, often associated with disturbance (including flooding). The structure tends to be lower and less dense in the wider floodplains, whereas taller denser forests occur in the more confined floodplains	Absent	Vegetation on site is not representative of Threatened Ecological Community.
5.	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	P	PMST	Box-Gum Woodland is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Absent	Vegetation on site is not representative of Threatened Ecological Community.



APPENDIX B - FLORA SPECIES LIST





Table B1 - Flora Species List

Number	Family	Scientific Name	Common Name	Form	Plot 1		Plot 2	
					Cover	Abundance	Cover	Abundance
1.	Aizoaceae	<i>Galenia pubescens</i>	Galenia	HTW	0.5	100	-	-
2.	Amaranthaceae	<i>Alternanthera pungens</i>	Khaki Weed	HTW	0.5	100	-	-
3.	Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena Weed	Exotic	-	-	-	-
4.	Arecaceae	<i>Phoenix canariensis</i>	Canary Island Date Palm	HTW - Manageable	-	-	-	-
5.	Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	Exotic	-	-	0.1	1
6.	Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	Exotic	-	-	-	-
7.	Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Exotic	-	-	-	-
8.	Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	Exotic	-	-	-	-
9.	Asteraceae	<i>Soliva sessilis</i>	Bindyi	Exotic	0.2	100	-	-
10.	Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	Exotic	-	-	-	-
11.	Asteraceae	<i>Taraxacum officinale</i>	Dandelion	Exotic	0.5	100	0.2	30
12.	Bignoniaceae	<i>Pandorea pandorana</i>	Wonga Wonga Vine	Other (OG)	-	-	-	-
13.	Caryophyllaceae	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort, Brazilian Whitlow	Exotic	0.1	100	0.1	40
14.	Casuarinaceae	<i>Allocasuarina gymnanthera</i>	-	Shrub (SG)	-	-	-	-
15.	Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-Oak	Tree (TG)	-	-	-	-
16.	Casuarinaceae	<i>Casuarina cristata</i>	Belah	Tree (TG)	-	-	-	-
17.	Casuarinaceae	<i>Casuarina cunninghamiana</i>	River Oak	Tree (TG)	40	3	-	-
18.	Chenopodiaceae	<i>Atriplex semibaccata</i>	Creeping Saltbush	Shrub (SG)	0.1	20	-	-
19.	Chenopodiaceae	<i>Einadia nutans</i>	Climbing Saltbush	Forb (FG)	0.3	100	-	-



Number	Family	Scientific Name	Common Name	Form	Plot 1		Plot 2	
					Cover	Abundance	Cover	Abundance
20.	Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	Forb (FG)	0.1	60	0.1	20
21.	Crassulaceae	<i>Bryophyllum delagoense</i>	Mother of millions	HTW	-	-	-	-
22.	Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	HTW	-	-	-	-
23.	Euphorbiaceae	<i>Chamaesyce dallachyana</i>	-	Forb (FG)	-	-	-	-
24.	Fabaceae (Faboideae)	<i>Medicago lupulina</i>	Black Medic	Exotic	0.5	100	0.1	20
25.	Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover	Exotic	-	-	0.1	30
26.	Fabaceae (Faboideae)	<i>Trifolium subterraneum</i>	Subterranean Clover	Exotic	0.1	100	0.2	50
27.	Fabaceae (Mimosoideae)	<i>Acacia iteaphylla</i>	Flinders Range Wattle	Exotic	-	-	-	-
28.	Fabaceae (Mimosoideae)	<i>Acacia pendula</i>	Acacia pendula population in the Hunter catchment	Tree (TG)	-	-	-	-
29.	Fabaceae (Mimosoideae)	<i>Acacia salicina</i>	Cooba	Tree (TG)	-	-	-	-
30.	Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Grass & grasslike (GG)	-	-	-	-
31.	Loranthaceae	<i>Dendrophthoe vitellina</i>	-	Other (OG)	-	-	-	-
32.	Malvaceae	<i>Malva parviflora</i>	Small-flowered Mallow	Exotic	0.2	200	0.1	40
33.	Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	Exotic	-	-	-	-
34.	Myrtaceae	<i>Callistemon citrinus</i>	Crimson Bottlebrush	Shrub (SG)	-	-	-	-
35.	Myrtaceae	<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	Shrub (SG)	-	-	-	-
36.	Myrtaceae	<i>Callistemon viminalis</i>	Weeping Bottlebrush	Tree (TG)	-	-	-	-
37.	Myrtaceae	<i>Corymbia citriodora</i>	Lemon-scented Gum	Exotic	-	-	-	-



Number	Family	Scientific Name	Common Name	Form	Plot 1		Plot 2	
					Cover	Abundance	Cover	Abundance
38.	Myrtaceae	<i>Corymbia eximia</i>	Yellow Bloodwood	Tree (TG)	-	-	-	-
39.	Myrtaceae	<i>Eucalyptus albens</i>	White Box	Tree (TG)	-	-	-	-
40.	Myrtaceae	<i>Eucalyptus camaldulensis</i>	Eucalyptus camaldulensis population in the Hunter catchment	Tree (TG)	-	-	-	-
41.	Myrtaceae	<i>Eucalyptus conspicua</i>	-	Tree (TG)	-	-	-	-
42.	Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Tree (TG)	-	-	-	-
43.	Myrtaceae	<i>Eucalyptus intertexta</i>	Gum Coolibah	Tree (TG)	-	-	-	-
44.	Myrtaceae	<i>Eucalyptus propinqua</i>	Small-fruited Grey Gum	Tree (TG)	-	-	-	-
45.	Myrtaceae	<i>Eucalyptus sideroxylon</i>	Mugga Ironbark	Tree (TG)	-	-	-	-
46.	Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum	Tree (TG)	-	-	-	-
47.	Myrtaceae	<i>Eucalyptus viridis</i>	Green Mallee	Tree (TG)	-	-	1	0
48.	Myrtaceae	<i>Melaleuca bracteata</i>	Black Tea-tree	Shrub (SG)	0.1	1	-	-
49.	Myrtaceae	<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	Shrub (SG)	-	-	-	-
50.	Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Tree (TG)	-	-	-	-
51.	Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	Shrub (SG)	-	-	-	-
52.	Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet	HTW	-	-	-	-
53.	Oxalidaceae	<i>Oxalis latifolia</i>	-	Exotic	-	-	-	-
54.	Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	Exotic	0.5	200	0.5	30
55.	Poaceae	<i>Bothriochloa macra</i>	Red Grass	Grass & grasslike (GG)	10	100	-	-



Number	Family	Scientific Name	Common Name	Form	Plot 1		Plot 2	
					Cover	Abundance	Cover	Abundance
56.	Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	Exotic	15	500	1	40
57.	Poaceae	<i>Chloris truncata</i>	Windmill Grass	Grass & grasslike (GG)	30	500	10	500
58.	Poaceae	<i>Cynodon incompletus</i>	-	Exotic	10	200	75	1000
59.	Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	HTW	-	-	10	50
60.	Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	HTW	-	-	-	-
61.	Poaceae	<i>Paspalum dilatatum</i>	Paspalum	HTW	10	500	-	-
62.	Poaceae	<i>Setaria parviflora</i>	-	Exotic	-	-	0.5	50
63.	Proteaceae	<i>Grevillea robusta</i>	Silky Oak	Tree (TG)	-	-	-	-
64.	Sapindaceae	<i>Dodonaea viscosa</i>	Sticky Hop-bush	Shrub (SG)	-	-	-	-



APPENDIX C – FAUNA SPECIES LIST





Table C1 Fauna Species List

No.	Scientific Name	Common Name	Status		Observation Type*	General Abundance within Subject Site**
			BC	EPBC		
16.	<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet	-	-	O	C
17.	<i>Platycercus eximius</i>	Eastern Rosella	-	-	O	UC
18.	<i>Anthochaera carunculata</i>	Red Wattlebird	-	-	O	UC
19.	<i>Gymnorhina tibicen</i>	Australian Magpie	-	-	O	UC
20.	<i>Eolophus roseicapilla</i>	Galah	-	-	O	C
21.	<i>Manorina melanocephala</i>	Noisy Miner	-	-	O	C
22.	<i>Ocyphaps lophotes</i>	Crested Pigeon	-	-	O	UC



APPENDIX D – PLANTED NATIVE VEGETATION DETERMINATION



Appendix D-1: Planted Native Vegetation Determination

The decision key below details the assessment of Planted Native Vegetation in accordance with Appendix D of the BAM (DPIE 2020a).

Vegetation Zone 2 – Planted Native/Exotic Vegetation.



Table D-1-1: Planted Native Vegetation Determination – In accordance with Planted Native Vegetation decision-making key in Appendix D of the BAM (DPIE 2020a). – Vegetation Zone 2 – Planted Native/Exotic Vegetation

Decision Key Criteria	Answer	Justification
1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal? (i). Yes - The planted native vegetation must be allocated to the best-fit PCT and the BAM must be applied. (ii). No - Go to 2.	No	The vegetation within this zone is characterised by a mix of planted native and exotic species. A PCT could not be allocated to the vegetation onsite with the assemblage of species present within the development footprint.
2. Is the planted native vegetation: a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	No	The planted vegetation present onsite does not constitute rehabilitation or regeneration of a plant community type. The vegetation was cleared prior to 1958 (see Plate 5). The existing floristics within this vegetation zone is dominated by non-indigenous native



Decision Key Criteria	Answer	Justification
(i). Yes - <i>The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.</i> (ii) No - Go to 3.		species planted as part of the site's previous landuse as a nursery.
3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following: a. <i>a species recovery project</i> b. <i>Saving our Species project</i> c. <i>other types of government funded restoration project</i> d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)? (i). Yes - <i>The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.</i> (ii) No - Go to 4.	No	The native vegetation within the Subject Site was not planted/translocated for the purposes listed in Decision Criteria 3.
4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation? (i). Yes - <i>Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).</i> (ii) No - Go to 5.	No	The native vegetation within the Subject Site was not planted for the purposes of revegetation, environmental rehabilitation or restoration.
5. <i>Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?</i> (i). Yes - <i>Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).</i> (ii) No - Go to 6.	Yes	The native vegetation present onsite has been planted for aesthetic purposes (i.e. landscaping).

Decision Key Criteria	Answer	Justification
6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)? (i). Yes - Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied). (ii) No - There may be other types of occurrences of planted native vegetation that do not easily fit into the decision-making key above. Assessors should contact the BAM Support mailbox at bam.support@environment.nsw.gov.au for further advice on using the BAM to assess other types of occurrences of planted native vegetation.	N/A	N/A



Plate 5: Historical Aerial Imagery of Muswellbrook (1958) (NSW Govt. 2021). See approximate location of Study Area in yellow.



APPENDIX E – PREDICTED AND CANDIDATE SPECIES REPORTS



BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026116/BAAS18041/21/00026117	Pacific Brook Christian School	10/06/2021
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	20/09/2021	45
Assessor Number	Assessment Type	BAM Case Status
BAAS18041	Part 4 Developments (Small Area)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
0	BOS Threshold: Area clearing threshold	20/09/2021

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)
Black Falcon	Falco subniger	485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)
Little Lorikeet	Glossopsitta pusilla	485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)
Painted Honeyeater	Grantiella picta	485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)
Regent Honeyeater	Anthochaera phrygia	485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)
White-throated Needletail	Hirundapus caudacutus	485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)



BAM Predicted Species Report

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
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BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026116/BAAS18041/21/00026117	Pacific Brook Christian School	10/06/2021
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	20/09/2021	45
Assessor Number	Assessment Type	BAM Case Status
BAAS18041	Part 4 Developments (Small Area)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
0	20/09/2021	BOS Threshold: Area clearing threshold

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

List of Species Requiring Survey

Name	Presence	Survey Months
<i>Acacia pendula</i> - endangered population Acacia pendula population in the Hunter catchment	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☒ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Eucalyptus camaldulensis</i> - endangered population Eucalyptus camaldulensis population in the Hunter catchment	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☒ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Regent Honeyeater	Anthochaera phrygia	Habitat constraints



APPENDIX F – BIODIVERSITY CREDIT REPORTS





BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026116/BAAS18041/21/00026117	Pacific Brook Christian School	10/06/2021
Assessor Name	Assessor Number	BAM Data version *
Gilbert Whyte	BAAS18041	45
Proponent Names	Report Created	BAM Case Status
Vivian Go	20/09/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (Small Area)	20/09/2021
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BOS Threshold: Area clearing threshold		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

Assessment Id	Proposal Name
00026116/BAAS18041/21/00026117	Pacific Brook Christian School

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	Not a TEC	0.2	3	0	3



BAM Biodiversity Credit Report (Like for like)

485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Eastern Riverine Forests This includes PCT's: 42, 85, 485, 1106, 1108, 1318, 1714, 1761	Eastern Riverine Forests >=50% and <70%	485_Planted	Yes	3	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00026116/BAAS18041/21/00026117

Assessor Name

Gilbert Whyte

Proponent Name(s)

Vivian Go

Assessment Revision

0

BOS entry trigger

BOS Threshold: Area clearing threshold

Proposal Name

Pacific Brook Christian School

Assessor Number

BAAS18041

Report Created

20/09/2021

Assessment Type

Part 4 Developments (Small Area)

BAM data last updated *

10/06/2021

BAM Data version *

45

BAM Case Status

Finalised

Date Finalised

20/09/2021

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	Not a TEC	0.2	3	0	3.00

485-River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Eastern Riverine Forests This includes PCT's: 42, 85, 485, 1106, 1108, 1318, 1714, 1761	Eastern Riverine Forests >=50% and <70%	485_Planted	Yes	3	Hunter, Ellerton, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Forested Wetlands	Tier 3 or higher threat status	485_Planted	Yes (including artificial)	3	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data



BAM Biodiversity Credit Report (Variations)

Credit Retirement Options Like-for-like options



APPENDIX G – BAM PLOT DATASHEETS





APPENDIX H – STAFF CONTRIBUTIONS

The following staff were involved in the compilation of this report.

Table G1 Staff Contributions

Name	Qualification	Title/Experience	Contribution
David Martin	MSc	Ecologist (Botanist)	Report Author, BAM Calculations, Flora and Fauna surveys, Vegetation Mapping and PCT Allocation.
James Baldry	MConsBio	Ecologist	Field surveys, Reporting
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	GIS and figure preparation
Dr. Daniel O'Brien	BEnvSc & Mgt (Hons), PhD	Senior Ecologist	Report Review
Gilbert Whyte	BSc (Hons), PhD BAM Assessor (BAAS18041)	Senior Ecologist	Accredited BAM Assessor



APPENDIX I – LICENSING

Kleinfelder employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL100730, Expiry: 31 March 2022) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.