PART LOT 402 YANGEBUP ROAD, YANGEBUP

SECTION 38 REFERRAL

Prepared for:	Catholic Archbishop of Perth
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pgv ENVIRONMENTAL

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EXECUTIVE SUMMARY

Introduction

The Catholic Education Office are proposing to develop the remainder of Part Lot 420, Yangebup Road, Yangebup (development envelope) for education development options. The development envelope encompasses 2.63ha in total and contains 2.07ha of remnant native vegetation. To facilitate the development, the proponent is proposing to clear the 2.07ha of native vegetation in the development envelope. The purpose for the clearing is to allow for the expansion of the existing school and includes buildings, an access road, carpark and recreation areas. Where possible, mature native trees will be retained in the development.

The development envelope is zoned as 'Urban Deferred' under the Perth Metropolitan Region Scheme (MRS) and 'Special Use 19' under the City of Cockburn Local Planning Scheme (LPS) No. 3. A school is allowed under this zoning.

Background and Context

The existing school development was assessed as a section 38 under the *Environmental Protection Act 1986* and approved by the Minister for the Environment through Ministerial Statement 285 (MS 285). Any further development on the remaining portion of Lot 420 is required to be referred to the Environment Protection Authority (EPA) in accordance with MS 285 Condition 4-1.

A Level 2 Flora and Vegetation survey was undertaken in accordance with Guidance Statement 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a) and EPA Technical Guidance *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016). The survey established if any Threatened Flora or Threatened/Priority Ecological Communities were present in the development envelope.

A Black Cockatoo habitat assessment (foraging, breeding and roosting) was undertaken using the criteria listed in the EPBC Act *Referral guidelines for three threatened black cockatoo species (DSEWPaC, 2012)*. The significance of any clearing proposed in the development envelope was assessed using the EPBC Act *Significant Impact Guidelines* (DoE, 2013) and *Referral guidelines for three threatened black cockatoo species (DSEWPaC, 2012).* The assessment verified the amount of foraging habitat, presence of roosting and or breeding in the development envelope.

Development for educational options can be justified in environmental and planning terms. The zoning for the Proposal area meets the requirements for a school development and there is no requirement for re-zoning under the MRS or LPS No. 3.

The remnant vegetation in the development envelope was not reserved as Park and Recreation or proposed to be protected in the Bush Forever process (Government of Western Australia, 2000). The vegetation in the development envelope was also not incorporated into the Beeliar Regional Park which abuts the site to the south and east.

Overview of the Proposal

The description of the proposal and the key elements are provided in the tables below.

Table ES 1: Proposal Summary Table

Proponent Details	
Name	Roman Catholic Archbishop of Perth
ABN	96 993 674 415
Address	PO Box 3311 East Perth WA 6892
Proponent Contact	Nicole Barnao Barnao Property Group PO Box 750 Wembley WA 6913
Consultant Contact	Belinda Heath PGV Environmental Suite 3, 67 Howe Street Osborne Park WA 6017

Physical Elements

Item	Description
Proposed Title	Part Lot 402 Yangebup Road, Yangebup School Expansion Development
Proponent Name	Roman Catholic Archbishop of Perth
Short Description	The proposal is to clear native vegetation to enable development for educational uses and expansion of the existing catholic school on Part Lot 402, Yangebup Road, Yangebup, Western Australia. The proposal includes the following: • Development Area 1 • Development Area 2 • Access road off Dunraven Drive

The key environmental factors identified from the *EPA's Statement of Environmental Principles, Factors and Objectives (EPA 2018)* for the proposal are:

- Flora and vegetation; and
- Terrestrial Fauna.

The remainder of the environmental factors were not considered to be significant in terms of the Proposal.

Table ES2: Summary of the Potential Impacts, Proposed Mitigation and Outcomes

Element	Description
Flora and Vegetation	
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Policy and Guidance	Flora and vegetation surveys to inform planning for the proposal have been conducted in accordance with the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a) and the Environmental Factor Guideline: Flora and Vegetation*
Potential Impacts	Implementing the proposal will result in clearing 2.07ha of native vegetation the impacts of which are listed below: • There are no conservation significant flora species listed under the BC Act or the EPBC Act known to occur in the development envelope; • Clearing 0.017% of the Karrakatta Complex – Central and South will not reduce the vegetation complex to below 10% of its pre-European extent; • The EPBC listed of *Tuart Woodlands and Forests of the Swan Coastal Plain TEC* and *Banksia Woodland of the Swan Coastal Plain TEC* were not found in the development envelope or in adjacent areas so the impact to regional extent of these TECs will not be reduced in size; • FCT 28 is found in a broad distribution in local and regional areas and the overall condition of the vegetation and low diversity of species is not a good representative of the FCT; • The ecological linkage between Yangebup Lake and Kogolup Lake will be reduced however the link will still be 1.2km (east west); and • The clearing will not reduce any conservation areas protected under State of Commonwealth legislation.
Mitigation	The Proponent cannot avoid clearing the 2.07ha of native vegetation, however where possible mature trees will be retained in the future development. The Proponent will prepare a Vegetation and Fauna Management Plan to guide the clearing of the development envelope for educational development options. The VFMP will include strategies to protect the surrounding bushland from the construction activity. Landscaping will include local native species.
Outcomes	The proposal will result in clearing 2.07ha of Karrakatta Complex – Central and South which is 0.017% of the remaining pre-European extent (or 0% as the area is not currently mapped as Karrakatta Complex – Central and South). The clearing will not reduce the extent of the vegetation complex to less than the 10% threshold set by the EPA. No conservation significant flora or ecological communities under the State BC Act or the Commonwealth EPBC Act will be impacted by the clearing, therefore the regional extent of these communities will not be diminished by the proposal. Implementation of the proposal is not expected to cause significant impacts to flora and vegetation therefore the EPA objective for this key environmental factor will be met.
Terrestrial Fauna	
EPA Objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

Policy and Guidance	Terrestrial fauna surveys that have informed the proposal have been conducted in accordance with the *Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA 2016) and the *Environmental Factor Guideline: Terrestrial Fauna*
Potential Impacts	Implementing the proposal will result in the clearing of 2.07ha of Good to Degraded fauna habitat from the development envelope. The clearing will impact on: • Black Cockatoos by reducing their foraging habitat and potential breeding habitat. The quality of the foraging habitat is considered good and was calculated on canopy cover to be 0.28ha; • Eight (8) trees that have potential to become future breeding trees will be cleared; • Quenda and the Black Striped Snake may be present in the development envelope; • Clearing will reduce the fauna linkage between Lake Kogolup and Yangebup Lake, however a significant link of 1.2km will be retained.
Mitigation	The Proponent will prepare a VFMP prior to any construction activities to protect the adjacent native vegetation and relocate any fauna that may reside in the development envelope. The VFMP will include the following strategies: • Clearing and boundary demarcation; • Hygiene requirements to prevent the spread of weeds and Phytophthora dieback; • Dust control; • Fauna relocation; • Waste and fire management; • Performance indicators that measure the effectiveness of avoidance and mitigation measures; • Contingency measures that will be undertaken if performance targets are not met; and • Roles and responsibilities of personnel associated with implementing avoidance and mitigation measures. Landscaping will include local native species.
Outcomes	The proposal will result in clearing 2.07ha of Good to Degraded fauna habitat. Implementing the proposal will impact on conservation significant Black Cockatoos however the significance of clearing 0.28ha of foraging habitat and five potential breeding trees is not considered significant in terms of survival of the species (PGV Environmental, 2020). The Proponent will prepare a VFMP to manage the implementation of the Proposal and will include relocation of Quenda and Black Striped Snakes if found in the development envelope. Implementation of the proposal is not expected to cause significant impacts to Terrestrial fauna therefore the EPA objective for this key environmental factor will be met.

1 INTRODUCTION

1.1 Purpose and Scope of the ERD

The Catholic Archbishop of Perth (the proponent) (in association with the Catholic Education Western Australia is proposing to clear vegetation from Part Lot 402, Yangebup Road Yangebup, Western Australia (development envelope) for educational development options. The Mater Christi School occupies the northern portion of Lot 402.

Part Lot 402 Yangebup Road, Yangebup (development envelope) is located in the City of Cockburn approximately 27 km south west of the Perth Central Business District (Figure 1). The site is bound by Yangebup Road to the north, Dunraven Drive to the west, and a portion of Beeliar Regional Park to the south and east.

The development envelope is zoned as 'Urban Deferred' under the Perth Metropolitan Region Scheme (MRS) and 'Special Use 19' under the City of Cockburn Local Planning Scheme (LPS) No. 3. A school is allowed under this zoning.

The development envelope encompasses 2.63ha in total and contains 2.07ha of remnant native vegetation. To facilitate the development, the proponent is proposing to clear the 2.07ha of native vegetation in the development envelope. The purpose for the clearing is to allow for educational development options including the expansion of the existing school buildings, an access road, carpark and recreation areas. Where possible, mature native trees will be retained in the development.

This supporting document has been prepared in accordance with Environmental Protection Authority (EPA) *Instructions on how to prepare an Environmental Review Document (EPA 2018)* to support referral of the Proposal under Section 38 of the *Environmental Protection Act 1986* (EP Act).

1.2 Proponent

Table 1: Proponent Details

Proponent Details	
Name	Roman Catholic Archbishop of Perth
ABN	96 993 674 415
Address	PO Box 3311 East Perth WA 6892
Proponent Contact	Nicole Barnao Barnao Property Group PO Box 750 Wembley WA 6913
Consultant Contact	Belinda Heath PGV Environmental Suite 3, 67 Howe Street Osborne Park WA 6017

1.3 Environmental Impact Assessment Process

This supporting document aims to provide information for the EPA to determine the level of assessment of the proposal. This includes information and level of detail on:

- The proposal;
- Potential impacts;
- Mitigation measures;
- Environmental outcomes; and
- Stakeholder consultation.

A Flora and Vegetation Survey and a Black Cockatoo Habitat Assessment have been undertaken over the Proposal area in Spring 2020. The results from the survey and assessment are provided at Appendix 1.

1.4 Other Approvals and Regulation

The development envelope is zoned 'Urban Deferred' under the Metropolitan Regional Scheme (MRS) and 'Special Use 19' under the City of Cockburn Town Planning Scheme No. 2.

The State, Local and Commonwealth approvals listed in Table 1 will be required for the intended education development options in the development envelope.

Table 1: Other Approvals

Proposed Activity	Legislation	Regulatory Body	Yes/No
MRS Zoning	*Planning and Development Act 2005*	Western Australian Planning Commission	No
TPS Zoning	*Planning and Development Act 2005*	Western Australian Planning Commission/City of Cockburn	No
Vegetation Clearing	*Environmental Protection Act 1986*	Environmental Protection Authority	No if Section 38 is approved
Vegetation Clearing	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment	Yes Referral will be required

1.4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Department of Agriculture, Water and the Environment (DAWE). The EPBC Act aims to protect and manage Matters of National Environmental Significance (MNES) throughout Australia including:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of international importance (listed under the Ramsar Convention);
- Listed threatened species and ecological communities;
- Migratory species protected under international agreements;
- Commonwealth Marine Areas;

- The Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mines).

The proposal will be referred to DAWE for assessment under the EPBC Act at the conclusion of the State assessment if the proposal is approved.

2 THE PROPOSAL

2.1 Background

The development envelope on a part of Lot 402 is an amalgamation of two older lots, Lot 6 and Lot 7. The proposal to construct a school and church on Lot 7 (the northern portion of Lot 402) and an associated oval on Lot 8 to the east was assessed by the EPA and given approval through Ministerial Statement (MS) 285 in 1992 (Appendix 2). Condition 3-1 of the MS requires the vegetation on old Lots 6 and 7 to be managed for conservation purposes. However, Condition 4-1 of the MS allows for any future proposals for development on the lots to be referred to the EPA.

The current proposal has updated the ecological studies that were undertaken for the original assessment and approval of development as described above and approved by MS285.

A Level 2 Flora and Vegetation survey was undertaken in accordance with Guidance Statement 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a) and EPA Technical Guidance *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016). The survey established if any Threatened Flora or Threatened/Priority Ecological Communities were present in the development envelope.

A Black Cockatoo habitat assessment (foraging, breeding and roosting) was undertaken using the criteria listed in the EPBC Act *Referral guidelines for three threatened black cockatoo species (DSEWPaC, 2012)*. The significance of any clearing proposed in the development envelope was assessed using the EPBC Act *Significant Impact Guidelines* (DoE, 2013) and *Referral guidelines for three threatened black cockatoo species (DSEWPaC, 2012).* The assessment verified the amount of foraging habitat, presence of roosting and or breeding in the development envelope.

2.2 Justification

The current school on the northern part of Lot 402 is reaching capacity and is land constrained. As a result, the Catholic Education Western Australia (CEWA) is planning to clear the remainder of the development envelope for educational development options.

Expansion of the school over the development envelope can be justified in environmental and planning terms. The zoning for the Proposal area meets the requirements for a school development and there is no requirement for re-zoning under the MRS or LPS No. 3.

The remnant vegetation in the development envelope was not reserved as Park and Recreation or proposed to be protected in the Bush Forever process (Government of Western Australia, 2000). The vegetation in the development envelope was also not incorporated into the Beeliar Regional Park which abuts the site to the south and east.

The development envelope is partially cleared and contains approximately 2.07ha of remnant vegetation rated as Good with the cleared areas and tracks rated as Completely Degraded. The diversity of native species is considered low due the very weedy understorey. The development envelope is considered to have Good to Degraded fauna habitat values due to the degraded understorey.

2.3 Proposal Description

The description and key characteristics of the proposal are detailed in Tables 3 and 4 and shown on Figure 2. The school expansion over Part Lot 402 (2.63ha) will include school buildings, access road, car park and play areas.

Table 3: Summary of the Proposal

Item	Description
Proposed Title	Part Lot 402 Yangebup Road, Yangebup School Expansion Development
Proponent Name	Roman Catholic Archbishop of Perth
Short Description	The proposal is to clear native vegetation to enable the development and expansion of the existing catholic school on Part Lot 402, Yangebup Road, Yangebup, Western Australia. The proposal includes the following: • Development Area 1 • Development Area 2 • Access road off Dunraven Drive

Table 4: Location and proposed extent of physical and operational elements

Element	Location	Proposed Extent
Development Area 1	See figure 2	1.49ha
Development Area 2	See figure 2	0.9772ha
Access Road	See figure 2	0.1628ha
Total Area		**2.63ha**

2.3.1 Clearing

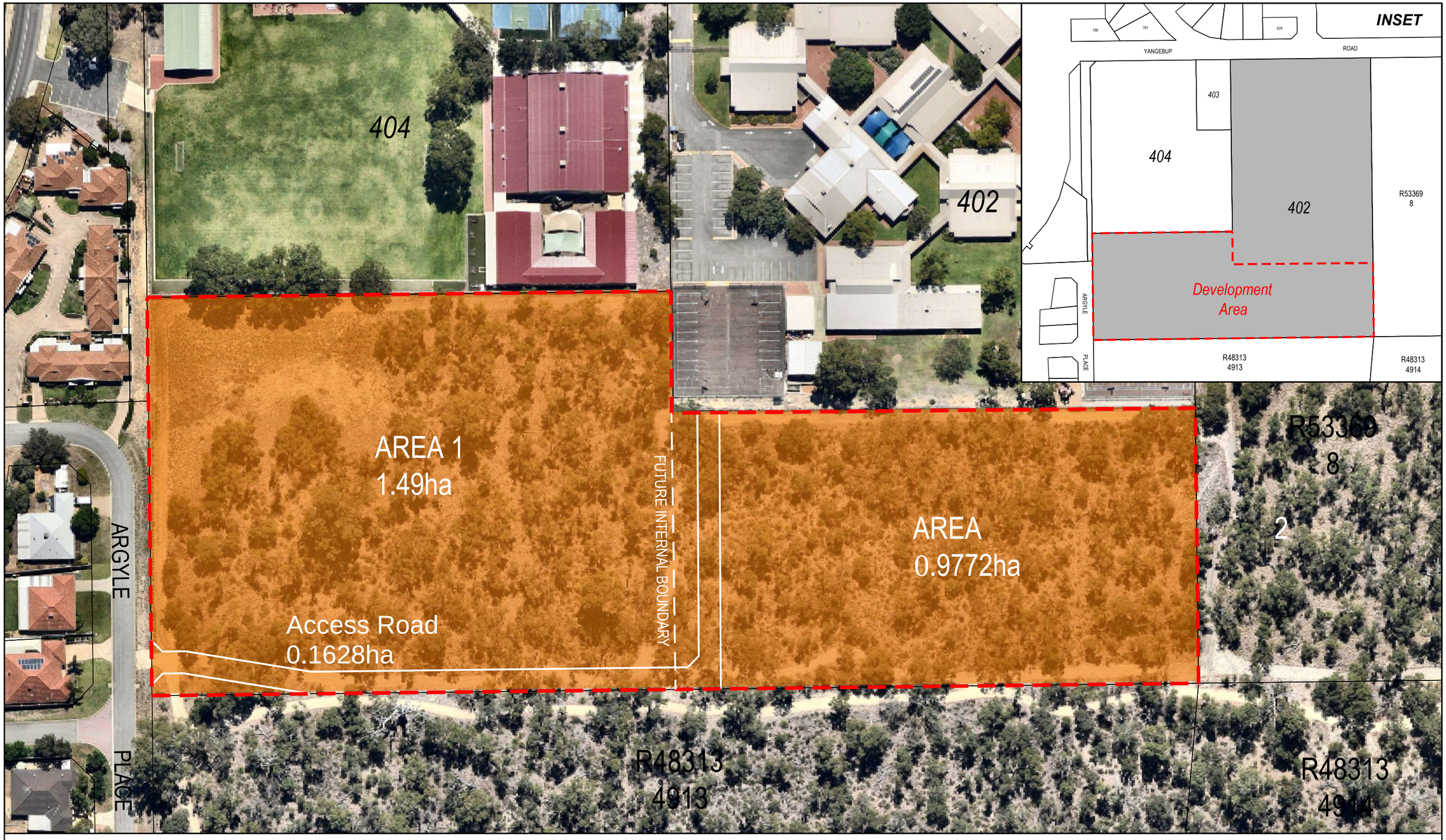
The Proposal area is 2.63ha of which 2.07ha is native remnant vegetation that will cleared to allow for the school expansion.

The native vegetation is *Eucalyptus marginata* (Jarrah) Low Woodland with some small areas containing *Eucalyptus marginata/Banksia attenuata* Low Woodland (0.2ha). The vegetation was rated at the low end of Good, with an abundance of grassy weeds in the understorey and a low native species richness.

No Threatened (Declared Rare) or Priority flora species have been recorded on the site, and the vegetation is not representative of the Banksia Woodland of the Swan Coastal Plain ecological community or the Tuart Woodlands and Forests of the Swan Coastal Plain ecological community.

The vegetation is part of an ecological linkage as it adjoins a part of Beeliar Regional Park that links native vegetation around the north-south chain of wetlands in the park. Clearing the native vegetation will result in narrowing the linkage by 100m, however a 75-120m linkage will remain.

Insert plan



0 10 20 30 40 50m

DEVELOPMENT POTENTIAL

LOT 402 YANGEBUP ROAD, YANGEBUP

NOTE:

Base Data supplied by Landgate
Areas and dimensions shown are
subject to final survey calculations.

Revision	Date	Item
1	01.04.2021	Add future internal boundary

	:	CLIENT
A3 @ 1:1000	:	SCALE
1st April 2021	:	DATE
	:	PLAN No.
	:	REVISION
C.L.	:	PLANNER
S.B.	:	DRAWN

Rise Urban
AGILE PLANNING FOR THE NEW NORMAL

2.4 Local and Regional Context

The following regional and local information has been collected from database searches and assessment of historical aerial photo.

2.4.1 Land use

Examination of historical aerial photography from 1983 (Landgate, 2021) shows the development prior to construction of the Mater Christi Primary School and church (Plate 1). Plate 2 shows the existing schools to the north of the development envelope.

Plate 1: Historical Aerial Photography from 1983 (Landgate, 2021)

Plate 2: Historical Aerial Photography from 2020 (Landgate, 2021)

The development envelope is adjacent to the Mater Christi College and Divine Mercy College to the north, residential houses to the west of Argyle Place and remnant vegetation to the south and east. The vegetation to the south and east of the development envelope is part of The Bush Forever Site No. 256 and Beeliar Regional Park which extend further east and south of Beeliar Drive.

2.4.2 Topography

The site is flat with an elevation of 35m Australian Height Datum (AHD) (Figure 2).

2.4.3 Geology and Soils

The site is mapped on the Spearwood system which contains sand dunes and plains and consists of aeolian sand and limestone over sedimentary rocks. These soils overlay Tamala limestone (Bolland, 1998).

The Spearwood soils are mapped by the Department of Primary Industries and Regional Development (DPIRD) as Spearwood S1b Phase (211Sp_S1b) described as and dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands (SLIP, 2020). The soils are highly permeable so there is very little surface water flow with stormwater being infiltrated very quickly into the soil profile.

2.4.4 Hydrology

The maximum groundwater level is around 14.5 mAHD and generally flows to the west. The depth to maximum groundwater is around 20.5m below ground level (DoW, 2021).

There are no surface expressions of water and no mapped wetlands within the development envelope.

The wetlands listed in Table 5 below are listed under the DBCA *Geomorphic Wetlands of the Swan Coastal Plain* database and are located in the vicinity of the development envelope.

Table 5: Wetlands in the Vicinity of the Development Envelope

Wetland Name and ID Number	Management Category	Distance to Development Envelope	Protected under the EPBC Act
Yangebup Lake ID 6,602	Conservation	470m to the north east	No
Kogolup Lake ID 6,526	Conservation	480m to the south east	No
Thomson Lake ID 6,608	Conservation	1900m to the south	Yes RAMSAR Listed

Native vegetation ranging from 150-450m wide separates the development envelope from the mapped edge of Yangebup Lake (Figure 6).

Clearing the development envelope will not impact any of the wetlands listed in Table 5 due to the separation distance being greater than 200m.

2.4.5 Flora and Vegetation

A search of the Parks and Wildlife Service (PaWS) Databases (Appendix 3), DBCA's Naturemap database (Appendix 4) and the EPBC Act Protected Matters Search Tool (Appendix 5) identified a

number of species listed as either Endangered, Threatened or Priority located within a 10km radius of the site.

Database searches identified 44 conservation significant flora species listed under the State *Biodiversity Conservation Act 2016* (BC Act) as potentially occurring in the vicinity of the development envelope. Thirteen of these flora species are listed under the EPBC Act. PGV Environmental (2020) determined that the habitat in the development area was only suitable for five of these species.

A search of DPaW's Threatened (TEC) and Priority Ecological Communities (PEC) database was conducted for the development envelope. There are no known occurrences of any TECs or PECs in the development envelope. A search of the EPBC Protected Matters Search Tool identified three ecological communities as potentially occurring in the development envelope as follows:

- *Banksia Woodlands of the Swan Coastal Plain ecological community*;
- *Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community*; and
- Subtropical and Temperate Coastal Saltmarsh.

The first two ecological communities are discussed in Section 5.4.1 and are assessed as not occurring on the site. The third potential ecological community would not be found on the site as there is no saltmarsh on site.

The vegetation is mapped as the Herdsman vegetation complex. The Herdsman complex is described as 'Sedgelands and fringing woodland of Eucalyptus rudis (Flooded Gum) – Melaleuca species' (Heddle *et al.* 1980).

The description of the Herdsman vegetation complex relates to wetland and fringing wetland vegetation and does not match the dryland vegetation on the site. PGV Environmental (2020) considers the vegetation more accurately fits in the description of the Karrakatta – Central and South vegetation complex, the boundary of which occurs only 200m to the west. The Karrakatta – Central and South vegetation complex is described as:

'Predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - Banksia species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River' (Heddle *et al.* 1980).

Substantial extents of native vegetation occur locally across several Bush Forever sites and local and regional parks including:

- Bush Forever Site No. 391 Thomson Lake Nature Reserve and Adjacent Bushland, Beeliar;
- Bush Forever Site No. 256 Yangebup and Little Rush Lakes, Yangebup;
- Bush Forever Site No. 392 Harry Waring Marsupial Reserve, Wattleup;
- Bush Forever Site No. 261 Lake Coogee and Adjacent Bushland, Munster;
- Bush Forever Site No. 254 South Lake;
- Bush Forever Site No. 244 Bibra Lake Reserve; and
- Beeliar Regional Park.

PGV Environmental undertook a Flora and Vegetation Survey and a Black Cockatoo Habitat Assessment over the development envelope in Spring 2020. The results of the survey are attached at Appendix 1.

2.4.6 Fauna

Database searched identified Seven (7) Schedule 1, one (1) Schedule 3, one (1) Schedule 4 and six (6) Priority species were listed as occurring within 5km of the site In the Nature Map Report. The EPBC Protected matters Report listed two (2) Critically Endangered, one (1) Endangered species, four (4) Vulnerable species and one (1) Migratory species as occurring within 5km of the site. The State and Commonwealth conservation codes key can be found at Appendix 6.

The conservation significant species most likely to occur in the development envelope are Forest Red-tailed Black Cockatoos, Carnaby's Black Cockatoo and Quenda.

2.4.7 Heritage

There is a large, registered heritage site ID 18937 Yangebup Lake in the DPLH Heritage Enquiry database that extends over the development envelope (SLIP, 2021). The site is listed as a Ceremonial, Historical, Mythological, Plant Resource, Water Source Type (Appendix 7).

2.4.8 Contaminated Sites

The development envelope and the surrounding area do not contain any contaminated sites registered in the Department of Water and Environmental Regulation Contaminated Site Database (SLIP, 2021).

There is a registered site (21,731) to the east of Yangebup Lake that has been remediated for restricted use. The site has been redeveloped for light industry use.

3 STAKEHOLDER ENGAGEMENT

3.1 Key Stakeholders

The key stakeholders associated with the proposal are:

- Department of Water and Environmental Regulation (DWER);
- Department of Biodiversity, Conservation and Attractions (DBCA);
- Department of Education (DoE);
- City of Cockburn (CoC); and
- Local Community

3.2 Stakeholder Engagement Process and Consultation

Stakeholder consultation undertaken so far has included preliminary discussions with DWER EPA Services regarding referral of the proposal under Section 38 of the EP Act.

As a requirement of the environmental impact assessment process, consultation with the above key stakeholders will be undertaken and submissions will be received during the public comment period, should a formal assessment of the proposal be determined.

4 ENVIRONMENTAL PRINCIPLES AND FACTORS

4.1 Environmental Principles

The EPA *Statement of Environmental Principles, Factors and Objectives (2020)* sets out how the EPA uses the environmental principles in their assessment of proposals. The Proponent has considered these principles and how they relate to the proposal (Table 6).

Table 6: EP Act Environmental Principles

Principle	Proposal Consideration
The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decision should be guided by:* *a. careful evaluation to avoid, where practicable, serious, or irreversible damage to the environment; and* *b. an assessment of the risk-weighted consequences of various options.*	The Proponent has undertaken site specific flora and vegetation surveys and fauna habitat assessments to supplement the existing environmental data for the development envelope and the wider Swan Coastal Plain. Stakeholder consultation will be undertaken as part of the Section 38 environmental assessment process, should full assessment be required. The proposal will clear approximately 2.07ha of native vegetation that does not contain Threatened/Priority Flora or Threatened/Priority Ecological Communities. The vegetation is part of the Karrakatta Complex Central and South which has above the EPA's objective of retaining at least 10% of each vegetation complex within the Perth Metropolitan Region. However, the amount of the vegetation complex in secure reserves is very low. The weedy condition and low species diversity of the vegetation in the proposal area is considered to be not a good example of the Karrakatta – Central and South vegetation complex. The vegetation is part of an ecological link as it adjacent to the Beeliar Regional Park. Clearing the 2.07ha will result in a narrower ecological link however the impact is not considered significant in terms of fauna movement as the remaining ecological link is still 75-120m wide and is reserved under the MRS. The vegetation contains approximately 0.28ha of Jarrah and some Banksia canopy that provides foraging habitat for three species of Threatened Black Cockatoos. There are no roosting or recorded breeding sites in the development envelope. Eight potential breeding habitat trees have been recorded in the development envelope. There is a significant amount of black cockatoo habitat adjacent to the development envelope and in the region that is protected under Bush Forever.

	The precautionary principle will be met as the environmental impacts of clearing the 2.07ha will not have a detrimental impact on the environment.
The principle of intergenerational equity *The present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations.*	The principle of intergenerational equity will be met through the expansion of the school that will provide for future generations of children from the local community. The school can be expanded without adversely impacting on any area of vegetation with important ecological values
The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	Biological surveys have been undertaken by the Proponent to assess the environmental values of the 2.07ha of native vegetation. The survey and assessments determined that the remnant vegetation has low species diversity and does not contain Threatened flora of Threatened ecological communities. Approximately 0.3ha of Black Cockatoo foraging habitat will be impacted, however the loss is not considered significant in terms of the survival of the species. There is considerable Black Cockatoo foraging habitat in adjacent Bush Forever sites. As such, it is considered that the proposal will satisfy this environmental principal, and there will be no net reduction in diversity or ecological integrity.
Principles relating to improved valuation, pricing and incentive mechanisms *a. Environmental factors should be included in the valuation of assets and services.* *b. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance, or abatement.* *c. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.* *Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise*	Environmental constraint avoidance and management costs will be considered in the planning and design of the educational facilities. The Proponent will be responsible for funding the cost of environmental management measures.

benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	
***The principle of waste minimisation**. All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	The proponent will minimise the generation of waste through adopting the hierarchy of waste control: avoid, minimise, reuse; recycle and safe disposal.

4.2 Environmental Factors

The EPA *Statement of Environmental Principles, Factors and Objectives (2020)* details how environmental factors and objectives are used to organise and systemise environmental impact assessment and reporting. A preliminary assessment of the environmental factors established by the EPA for the purpose of environmental impact assessment is provided in Table 7. The Sea Theme Factors are not addressed in Table 7 as the proposal area is 6.3km from the coastline.

Table 7: EPA Environmental Factors and Objectives

Theme	Environmental Factor	Environmental Objective	Significance of Impact
Land	Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	The proposal will result in the clearing of 2.07ha of native vegetation. There are no Threatened Flora or Threatened Ecological Communities in the proposal area. The impact of clearing the vegetation is not considered significant due the weedy condition and low species diversity of the vegetation in the proposal area and is considered to be not a good example of the Karrakatta – Central and South vegetation complex.
	Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	The Proposal will not have a significant impact on the any significant landforms.
	Terrestrial Fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	The Proposal will result in the clearing of 2.07ha of terrestrial fauna habitat. Approximately 0.3ha of Jarrah and Banksia woodland would provide some foraging habitat for Black Cockatoos. Quenda and other small fauna may be present in the fauna habitat. The impact on terrestrial fauna is not considered to be significant and can be managed.
	Subterranean Fauna	To maintain the quality of land and soils so that environmental values are protected.	The Proposal will not impact on Subterranean Fauna.

	Terrestrial Environmental Quality	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	Implementation of the proposal will not impact on groundwater or surface water quality and acid sulphate soils are not mapped in the development envelope. An ecological link (1.2km long (east west). between southern and northern parts of the Beeliar Wetlands will be narrowed, however the ecological link will still be 75-120m (north to south) wide.
Water	Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	The Proposal area is downstream of Yangebup Lake. The Proposal is not expected to impact on the groundwater or environmental values associated with the Lake. There are no surface water connections between the development envelope and the lake.
Air	Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	The Proposal is not expected to impact on air quality. During construction, standard dust management practices will be implemented.
	Greenhouse Gas Emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	The Proposal will result in the clearing of 2.07ha of native vegetation and diesel fuel will be consumed during construction neither of which will be a significant contributor to the States greenhouse emissions. The construction of the school buildings will have some greenhouse gas emissions.
People	Social Surroundings	To protect social surroundings from significant harm.	The Proposal will reduce the local bushland by 2.07ha which may cause some concern in the local community. The expansion of the school however will be important to local residents with school aged children now and in the futureu. The development envelope is in a large Aboriginal heritage listed site associated with Yangebup Lake. Various land development, including the adjoining schools and residential development have occurred in the heritage site in the past. Consultation with the local group will be undertaken during the assessment of the proposal.
	Human Health	To protect human health from significant harm	The proposal is not anticipated to have any impacts on human health. Emissions from the construction site will be managed through standard management practices in accordance with a construction Development Approval.

Based on the assessment the following environmental factors were viewed as key to the implementation of the Proposal:

- Flora and Vegetation (section 5); and
- Terrestrial Fauna (section 6).

The environmental factors that are not considered key to the implementation of the proposal are discussed in section 7.

5 Key Environmental Factor – Flora and Vegetation

5.1 EPA objective

The EPA's Statement of Environmental Principles, Factors and Objectives (EPA 2018b) identifies the following objective for flora and vegetation:

- To protect flora and vegetation so that biological diversity and ecological integrity are maintained.

5.2 Policy and Guidance

Flora and Vegetation surveys that have informed this assessment have been conducted in accordance with the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a) and the *Environmental Factor Guideline: Flora and Vegetation* (EPA, 2016b).

5.3 Receiving environment

5.3.1 Overview

Heddle *et al.* (1980) mapped the vegetation in the development envelope as the Herdsman Complex which is described as:

- 'Sedgelands and fringing woodland of *Eucalyptus rudis* (Flooded Gum) – Melaleuca species'.

The description of the Herdsman vegetation complex relates to wetland and fringing wetland vegetation and does not match the dryland vegetation in the development envelope. PGV Environmental considers the vegetation more accurately fits in the description of the Karrakatta – Central and South vegetation complex, the boundary of which occurs only 200m to the west in the Heddle et al. (1980) mapping. The Karrakatta – Central and South vegetation complex is described as:

- 'Predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - Banksia species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River' (Heddle *et al.* 1980).

The vegetation on the site is part of the Karrakatta Complex Central and South. There is approximately 23.49% of the Karrakatta Complex Central and South remaining on the Swan Coastal Plain based on the pre-European extent with 3.87% in secure tenure (DBCA, 2018).

Under the *State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region* and Bush Forever seeks to protect a target of at least 10% of the original extent of each vegetation complex (WAPC 2010). The vegetation complex is above the EPA's objective of retaining at least 10% of each vegetation complex within the Perth Metropolitan Region. However, the amount of the vegetation complex in secure reserves is low.

The vegetation on the site is not considered a good example of the Karrakatta – Central and South vegetation complex in very good condition or better.

The vegetation on the site was not recognised as a Bush Forever site (Government of Western Australia 2000) and was not included in the Beeliar Regional Park.

5.3.2 Desktop Assessment

A search of the Parks and Wildlife Service (PaWS) Databases (Appendix 1), DBCA's Naturemap database (Appendix 2) and the Environment Protection and EPBC Act Protected Matters Search Tool (Appendix 3) identified a number of species listed as either Endangered, Threatened or Priority located within a 10km radius of the site. The results from these database searches are shown in Table 8.

Table 8 lists the conservation significant flora identified in the database searches as occurring within 5km of the site. Table 9 lists the likelihood that any of these species could occur on the site based on the soil types and vegetation condition.

Table 8: Conservation Significant Flora likely to occur within 10km of the Site

Scientific Name	Common Name	Conservation Status in WA	Status under EPBC Act
Caladenia huegelii	King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid	Schedule 1	Endangered
Drakaea elastica	Glossy-leafed Hammer-orchid, Praying Virgin	Schedule 1	Endangered
Diuris drummondii	Tall Donkey Orchid	Schedule 1	Vulnerable
Drakea elastica	Glossy-leaved Hammer Orchid	Schedule 1	Endangered
Synaphea sp. Fairbridge Farm	Selena's Synaphea	Schedule 1	Critically Endangered
Diuris micrantha	Dwarf Bee-orchid	Schedule 2	Vulnerable
Diuris purdiei	Purdie's Donkey-orchid	Schedule 2	Endangered
Eucalyptus x balanites	Cadda Road Mallee		Endangered
Lepidosperma rostratum	Beaked Lepidosperma	Schedule 2	Endangered
Andersonia gracilis	Slender Andersonia	Schedule 3	Endangered
Thelymitra dedmaniarum	Cinnamon Sun Orchid		Endangered
Drakaea micrantha	Dwarf Hammer-orchid	Schedule 3	Vulnerable
Eleocharis keigheryi	Keighery's Eleocharis	Schedule 3	Vulnerable
Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)		Priority 1	
Amanita quenda		Priority 1	
Hydrocotyle striata		Priority 1	
Levanhookia preissii	Preiss's Stylewort	Priority 1	
Amanita wadulawitu	Long Spored Lepidella	Priority 2	
Austrostipa mundula		Priority 2	
Thelymitra variegata	Queen of Sheba	Priority 2	
Amanita carneiphylla			
Amanita drummondii	Drummond's Grisette	Priority 3	
Amanita fibrillopes		Priority 3	
Amanita preissii	Cinnamon-ring Lepidella	Priority 3	
Amanita wadjukiorum		Priority 3	
Byblis gigantea	Rainbow Plant	Priority 3	
Jacksonia gracillima		Priority 3	
Cyathochaeta teretifolia		Priority 3	

Scientific Name	Common Name	Conservation Status in WA	Status under EPBC Act
Dampiera triloba		Priority 3	
Hibbertia spicata subsp. leptotheca		Priority 3	
Phlebocarya pilosissima subsp. pilosissima		Priority 3	
Pimelea calcicola		Priority 3	
Pithocarpa corybulosa		Priority 3	
Stylidium paludicola		Priority 3	
Styphelia fillfolia		Priority 3	
Dodonaea hackettiana	Hackett's Hopbush	Priority 4	
Grevillea olivacea	Olive Grevillea	Priority 4	
Jacksonia sericea	Waldjumi	Priority 4	
Kennedia beckxiana	Cape Arid Kennedia	Priority 4	
Microtis quadrata	South Coast Mignonette Orchid	Priority 4	
Stylidium longitubum	Jumping Jacks	Priority 4	
Tripterococcus sp. Brachylobus (A.S. George 14234)		Priority 4	
Verticordia lindleyi subsp. lindleyi		Priority 4	

Table 9: Likelihood of Identified Significant Flora Species Occurring on the Site

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Caladenia huegelii	King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid	Sand or clay loam. Does not survive in disturbed areas.	Unlikely due to overall poor site condition
Diuris drummondii	Tall Donkey Orchid	The Tall Donkey Orchid grows in low-lying depressions, swamps, in areas that contain surface water well into summer (Brown et al., 2013).	No- no suitable habitat
Drakaea elastica	Glossy-leafed Hammer-orchid, Praying Virgin	Low-lying situations adjoining winter-wet swamps. Does not survive in disturbed areas	No – no suitable habitat
Synaphea sp. Fairbridge Farm	Selena's Synaphea	Selena's Synaphea occurs in sandy soils with lateritic pebbles near winter-wet flats, in low woodland with weedy grasses.	No – no suitable habitat
Diuris micrantha	Dwarf Bee-orchid	Usually found on cleared firebreaks or open sandy patches that have been disturbed in Jarrah Banksia woodland or thickets of Spearwood (*Kunzea ericifolia*) (Williams *et al.*, 2001)	Unlikely – very little Jarrah Banksia woodlands on the site and no Spearwood

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Diuris purdiei	Purdie's Donkey-orchid	Grey-black sand, moist. Winter-wet swamps	No – not suitable habitat
Eucalyptus x balanites	Cadda Road Mallee	The Cadda Road Mallee prefers sandy soils with lateritic gravel.	No – not suitable habitat
Lepidosperma rostratum	Beaked Lepidosperma	Peaty sand, clay	No – not suitable habitat
Andersonia gracilis	Slender Andersonia	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	No – not suitable habitat
Thelymitra dedmaniarum	Cinnamon Sun Orchid	Cinnamon Sun-orchid is known from only two locations in the Gidgegannup area. It is confined to open wandoo woodland on red-brown sandy loam associated with dolerite and granite outcropping (DEC, 2012).	No – not suitable habitat
Drakaea micrantha	Dwarf Hammer-orchid	Grey sands over dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps	No – not suitable habitat
Eleocharis keigheryi	Keighery's Eleocharis	Clay, sandy loam. Emergent in freshwater: creeks, claypans.	No – not suitable habitat
Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)		Grey or black sand over clay. Swampy areas, winter wet lowlands.	No – not suitable habitat
Amanita quenda	Quenda Lepidella	Quenda lepidella are solitary or scattered, in moist sandy soil in wetland vegetation (Davidson et al., 2015).	No – not suitable habitat
Hydrocotyle striata		*Hydrocotyle striata* occurs in clay near springs.	No – not suitable habitat
Amanita wadulawitu	Long Spored Lepidella	Long-spored Lepidella occurs in sandy soil with *Corymbia calophylla, Eucalyptus marginata, E. todtiana, E. camaldulensis, Jacksonia furcellata, Banksia attenuata* and *B. menziesii*. (McGurk et al., 2016).	No – not suitable habitat
Levenhookia preissii	Preiss's Stylewort	Preiss's Stylewort occurs in Grey or black, peaty sand and swamps.	No – not suitable habitat
Austrostipa mundula		Plain. Grey sand (Western Australian Herbarium, 2001)	Unlikely – soil type Spearwood yellow sands
Thelymitra variegata	Queen of Sheba	Sandy clay, sand, laterite.	Unlikely, not suitable soil type

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Amanita carneiphylla	Miller's Pink Gilled Lepidella	Miller's Pink-Gilled Lepidella is a deeply rooting species and grows in sandy soil.	Possible
Amanita drummondii	Drummond's Grisette	Solitary to gregarious in leaf litter in association with *Agonis flexuosa, A. theiformis, Allocasuarina fraseriana, Corymbia calophylla, Eucalyptus marginata, E. patens, E. staeri, Jacksonia furcellata, Kunzea glabrescens, Melaleuca sp., Podocarpus drouynianus, Taxandria parviceps*. (Davidson et al., 2015) growing in sandy soil (Amanitaceae Org, 2015)	Possible
Amanita fibrillopes	Peach Amanita	Peach Amanita is recorded from sandy or gravelly soil in dry sclerophyll forest and Banksia woodland, or in humus rich soil in seasonally wet eucalypt and paperbark woodland, often associated with Eucalyptus marginata, E. jacksonii, Allocasuarina fraseriana, Corymbia calophylla, Melaleuca preissiana and Agonis sp. (Davison et al., 2013).	Unlikely, not suitable soil type
Amanita preissii	Cinnamon-ring Lepidella	Cinnamon-ring Lepidella is found under shrubs and Eucalyptus in West Australia (Amanitaceae Org, 2015) in sandy soil and lateritic gravel, associated with *Allocasuarina fraseriana, Acacia pulchella, Corymbia calophylla, Callitris sp., Eucalyptus gomphocephala, E. marginata, Macrozamia fraseri* and *Pinus pinaster* (Davidson et al., 2017).	Unlikely, not suitable soil type
Amanita wadjukiorum	Wadjuk Lepidella	Wadjuk Lepidella is solitary to gregarious, in sandy soil in degraded native vegetation with Allocasuarina fraseriana, *Corymbia calophylla, C. citriodora and Brachychiton sp* (Davidson et al., 2013).	Unlikely, not suitable soil type
Byblis gigantea	Rainbow Plant	The Rainbow Plant occurs in sandy-peat swamps in seasonally wet areas.	No – not suitable habitat
Jacksonia gracillima		*Jacksonia gracillima* occurs in grey and brown well-drained sand.	Unlikely, not suitable soil type
Cyathochaeta teretifolia		*Cyathochaeta teretifolia* occurs in grey sand, sandy clay on swamps, creek edges.	No – not suitable habitat

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Dampiera triloba		*Dampiera triloba* grows in loamy sand (Australian National Herbarium, 2009) in lower lying areas.	No – not suitable habitat
Hibbertia spicata subsp. leptotheca		Near-coastal limestone ridges, outcrops and cliffs.	No – not suitable habitat
Phlebocarya pilosissima subsp. pilosissima		*Phlebocarya pilosissima subsp. pilosissima* grows in white or grey sand, lateritic gravel.	No – not suitable habitat
Pimelea calcicola		Sand. Coastal limestone ridges.	Unlikely – not coastal habitat
Pithocarpa corymbulosa		*Pithocarpa corymbulosa* occurs in gravelly or sandy loam amongst granite outcrops.	No – not suitable habitat
Stylidium paludicola		Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland.	No – no suitable habitat
Styphelia filifolia		*Styphelia filifolia* occurs in sandy soils of the coastal plain (with one known occurrence from the northern Darling Scarp), usually in Banksia or Jarrah woodland and in low-lying situations (Hislop and Lelièvre, 2017).	No – not suitable habitat
Dodonaea hackettiana		Sand. Outcroping limestone.	Possible
Grevillea olivacea		White or grey sand. Coastal dunes, limestone rocks.	Unlikely – not coastal habitat
Jacksonia sericea	Waldjumi	Waldjumi grows in calcareous and sandy soils.	Possible
Kennedia beckxiana	*Cape Arid Kennedia*	Cape Arid Kennedia occurs in sand, loam on granite hills and outcrops.	No – not suitable habitat
Microtis quadrata	South Coast Mignonette Orchid	Clay based coastal flats (Brown et al., 2013)	No – not suitable habitat
Stylidium longitubum	Jumping Jacks	Sandy clay, clay. Seasonal wetlands.	No – not suitable habitat
Tripterococcus sp. Brachylobus (A.S. George 14234)		*Tripterococcus sp. Brachylobus* occurs in grey, black or peaty sand winter-wet flats	No – not suitable habitat

*sourced from Florabase, DoE SPRAT Database as well as the DBCA database searches unless otherwise indicated.

5.3.3 Field Survey

Prior to the survey a desktop study of databases and published information was conducted. The desktop study results are summarised in section 2.4.5 and provided in full in Appendix 1.

A flora and vegetation survey of the development envelope was conducted by Dr Paul van der Moezel on 22 October 2020. The site survey included sampling from 3 non-permanent 10m x 10m quadrats as well as a thorough walk through the development envelope on parallel traverses spaced approximately 20m apart. Site coverage was high due to the small site, time spent on site and easily navigable open understorey.

The field survey was conducted according to standards set out in the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a)* to identify the vegetation and flora values on site and to confirm the presence of priority threatened and priority flora species.

Flora

A total of 86 plant species were recorded during the 2020 flora survey (Appendix 1). This total consisted of 57 native species and 29 introduced species (34%). The high percentage of introduced species reflects the overall low condition rating of the vegetation throughout the site. While the survey date of 22 October was slightly after the peak flowering period for dry, sandy sites in the Perth Metropolitan Region, it is unlikely that many additional species would have been recorded with a survey a few weeks prior. Only one species of Donkey Orchid (*Diuris*) was not able to be identified due to the flowers having finished.

The plant Families most represented on site were the Fabaceae (Wattle and Pea family – 13 species, including 10 native and 3 introduced), Asteraceae (Daisy family - 6 species, 1 native and 5 introduced) and Asparagaceae (Lily family - 5 species, 4 native and 1 introduced).

No Threatened or Priority flora species were recorded on the site.

The survey date, 22 October, was just after the usual flowering time for the Grand Spider Orchid (*Caladenia huegelii*). However, no recently dead flowering heads of any *Caladenia* species was observed on the site during the parallel traverses through the site. The vegetation contains a lot of grassy weeds which does not normally suit the growth of *Caladenia huegelii*. The nearest recorded populations of *C. huegelii* is approximately 4km to the north-west near Stock Road and 4.5km to the east near Jandakot Road.

Species richness in the three quadrats was very similar ranging from 26 – 28. The percentage of introduced species in each quadrat was high, ranging from 36-48%. The native species richness is very low compared to vegetation of this type in better condition.

Vegetation Types

Two native vegetation types were described and mapped on the site (Table 10 and Figure 3).

Table 10: Vegetation Types on the Site

Vegetation Type	Description	Photograph
Em *Eucalyptus marginata* Low Woodland over *Xanthorrhoea preissii/Macrozamia riedlei/Hibbertia hypericoides* Low Open Heath	This is the main native vegetation type on the site. Jarrah (*Eucalyptus marginata*) is the dominant tree species 6-7m high with only very occasional *Banksia attenuata* present. Most of the Jarrah trees are young trees. No seedlings of Banksia tree species were observed. The understorey is very open and low and mostly consists of grassy weeds – *Avena fatua* (Wild Oats) and *Ehrharta calycina* (Perennial Veldtgrass). Common native species include *Xanthorrhoea preissii, Hibbertia hypericoides, Macrozamia riedlei, Tetraria octandra, Conostylis aculeata, Dichopogon capillipes* and *Desmocladus flexuosus.* The soils are grey-brown sand. Quadrats MC1 and MC3 are representative of this vegetation type	
EmBa *Eucalyptus marginata/Banksia attenuata* Low Woodland over *Xanthorrhoea preissii/Hibbertia hypericoides* Low Open Heath	This vegetation type is very similar to the Em vegetation type but with *Banksia attenuata* present up to 10% cover and 4m high with the Jarrah trees. The understorey is very weedy with Wild Oats and Perennial Veldtgrass common. Native understorey species composition is very similar to the Em vegetation type with common species *Xanthorrhoea preissii, Hibbertia hypericoides, Conostylis aculeata, Dichopogon capillipes* and *Desmocladus flexuosus.* The soils are grey-brown sand. Quadrat MC2 is representative of this vegetation type	

Floristic Community Types

The FCT in the development envelope was determined using the spreadsheet method which compares the species in the quadrats to the species found in each FCT (Table 12 in Gibson *et al.* 1994). As the vegetation types were very similar, the combined species list in the three quadrats was used in the assessment.

Using the method above, the vegetation in the development envelope was found to be most similar to FCT28 'Spearwood *Banksia attenuata* or *B. attenuata* – *Eucalyptus* woodland' with a high correlation also to FCT 24 'Norther Spearwood shrublands and woodlands'. Both FCT 28 and 24 are listed as the FCT occurring in the upland areas of the nearby Bush Forever Site 391 'Thomson Lake Nature Reserve and Adjacent Bushland, Beeliar'.

Vegetation Condition

The condition of the vegetation was assessed according to the system of Keighery as described in Bush Forever (Government of Western Australia, 2000) (Table 11).

Table 11: Vegetation Condition Rating Scale

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate to it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source: Government of Western Australia, 2000

The abundance of introduced species in the development envelope has resulted in all the areas of native vegetation being rated as Good (2.07ha) with the tracks and cleared areas rated as Completely Degraded (0.3972ha) (Figure 4). No vegetation in Very Good condition or better was mapped in the development envelope.

The site survey identified twenty-nine (29) introduced species in the development envelope. Arum Lily is a Declared plant species under the State *Biosecurity and Agriculture Management Act 2007* (BAM, Act).

Table 12: Weed Species Recorded in the Development Envelope

Weed Species	Common Name
Zantedeschia aethiopica	Arum Lily
Freesia alba x leichtlinii	Freesia
Gladiolus caryophyllaceus	Wild Gladiolus
Romulea rosea	Guildford Grass
Watsonia bulbillifera	Bugle Lily
Disa bracteata	South African Weed Orchid
Avena fatua	Wild Oats
Briza maxima	Blowfly Grass
Briza minor	Shivery Grass
Ehrharta calycina	Perennial Veldt Grass
Ehrharta longiflora	Annual Veldt Grass
Carpobrotus edulis	Pig Face
Hypochaeris glabra	Smooth Cats -ear
Podolepis gracilis	Slender Podolepis
Sonchus oleraceus	Common Sowthistle
Taraxacum khatoonae	Dandelion
Urospermum picroides	False Hawkbit
Ursinia anthemoides	Ursinia
Wahlenbergia capensis	Cape Bluebell
Cerastium glomeratum	Mouse Ear Chickweed
Petrorhagia dubia	Hairy Pink
Silene gallica	French Catchfly
Euphorbia terracina	Geraldton Carnation weed
Acacia longifolia	Long Leafed Wattle
Lupinus cosentinii	Sand Plain Lupin
Trifolium campestre	Hop Clover
Pelargonium capitatum	Rose Pelargonium
Olea europaea	European Olive
Lysimachia arvensis	Pimpernel

5.3.4 Conservation Areas and Ecological Linkage

A review of the City of Cockburn actively managed conservation reserves does not show the development envelope as a managed conservation reserve. The Development Envelope is not included in Bush Forever (Gov WA 2000) and is not identified as being in the Beeliar Regional Park. Several Bush Forever Sites occur within 5km of the development envelope and are in the Beeliar Regional Park (Table 13).

Table 13: Bush Forever Sites within 5km of the development envelope

Bush Forever Site No.	Name	Area	Upland Vegetation Description	Distance and Direction from the Development Envelope
391	Thomson Lake Nature Reserve and Adjacent Bushland, Beeliar;	366.7ha includes open water	*Eucalyptus marginata* Low Open Woodland; *Banksia attenuata, B. menziesi*i Low Open Forest and Low Woodland with *Eucalyptus marginata* and *Eucalyptus todtiana;* mixed Low Heath Forest – *Banksia attenuata* and *Banksia illicifolia* Low Woodland	1.6km to the south
256	Yangebup and Little Rush Lakes, Yangebup	27.7ha Includes open water	*Eucalyptus gomphocephala, E. marginata* and *E. calophylla; E. marginata* Woodland; *Eucalyptus marginata* Open Woodland; *Banksia attenuata, B. menziesi*i Low Woodland with *Eucalyptus marginata*	0.2km to the east
392	Harry Waring Marsupial Reserve, Wattleup;	271.6 includes open water	*Eucalyptus marginata* Open Woodland; *Banksia attenuata, B. menziesi*i Low Woodland to Low Closed Forest – Banksia attenuata and Banksia illicifolia Low Woodland	4km to the south
261	Lake Coogee and Adjacent Bushland, Munster	5.4ha Includes open water	*Eucalyptus gomphocephala* Woodland; *Eucalyptus marginata* Woodland;	4.7km to the west
346	Brownman Swamp, Mt Brown Lake and Adjacent Bushland, Henderson/Naval Base	558.3 Includes open water	Mixed Open Woodland of *Eucalyptus gomphocephala, E. marginata* and *E. calophylla; E. marginata* Low Woodland over *Banksia attenuata* Low Open Woodland; *Banksia attenuata, B. menziesi*i *and B. grandis* Low Woodland to Low Open Forest; *Acacia pulchella* and *Jacksonia furcellata* Open Shrubland to Tall Open Scrub Uplands — Tamala Limestone: Tree Mallee dominated by *Eucalyptus foecunda* or *E. decipiens;* Shrublands dominated by *Acacia rostellifera* or *A. cyclops*; Tall Open Scrub to Closed Tall Scrub dominated by *Melaleuca huegelii* and/or *Dryandra sessilis* var. cygnorum; *Melaleuca systena*, *Hibbertia hypericoides* and *Acacia cochlearis* Open Heath;	4.5km to the south west

			Mixed Closed Low Heath; Open Low Heath dominated by *Grevillea vestita, Frankenia pauciflora* or *Acanthocarpus preissii; Lepidosperma gladiatum* Sedgeland	
254	South Lake	34.5ha includes open water	*Eucalyptus. marginata* and *E. calophylla Open Forest*; *Banksia attenuata, B. menziesi*i Low Woodland with *Eucalyptus marginata*	2.5 to the north
244	Bibra Lake Reserve Includes North Lake	128.2ha includes open water	*Eucalyptus marginata* Open Forest; *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Open Forest, with emergent *Eucalyptus marginata*	3.2km to the north
435	Market Garden Swamps, Spearwood Munster	38.1ha	*Eucalyptus gomphocephala* Open Forest	4.48km to the west

According to Del Marco *et al*. (2004) the importance of ecological linkage is to connect natural areas, preferably with continuous corridors of native vegetation, which assists in fauna movement between the areas to access resources and habitats.

The development envelope is within a north south ecological linkage between sections of the Beeliar Regional Park. Clearing the development envelope will reduce the connection however the linkage will still be approximately 90m wide (east west orientation) so the connection between Kogolup Lake south of the development envelope and Yangebup Lake will continue to provide for the movement of fauna between the vegetated areas. The ecological linkage is broken by Beeliar Drive so the movement of fauna between the areas is more likely to be restricted to more mobile species such as birds and bats. There is a fauna overpass connecting the two areas of bushland that is suitable for species such as possums.

5.4 Potential impacts

5.4.1 Direct Impacts

Flora

The development envelope does not contain any conservation significant flora species protected under the BC Act or the EPBC Act (PGV Environmental, 2020).

Karrakatta Complex- Central and South

Vegetation clearing in the development envelope will result in the loss of 2.07ha of remnant native vegetation across two vegetation types within the Karrakatta Complex- Central and South. There is approximately 23.49% of the Karrakatta Complex Central and South remaining on the Swan Coastal Plain based on the pre-European extent with 3.87% in secure tenure (DBCA, 2018).

Clearing of 2.07ha of native vegetation across the Development Envelope, represents 0.017% of the remaining extent of the Karrakatta Complex – Central and South. Clearing the 2.07ha Karrakatta

Complex – Central and South will not reduce the pre-European extent to 10% or less of the remaining extent.

The two vegetation types mapped by PGV Environmental (2020) are:

- Em *Eucalyptus marginata* Low Woodland over *Xanthorrhoea preissii/Macrozamia riedlei/Hibbertia hypericoides* Low Open Heath; and
- EmBa *Eucalyptus marginata/Banksia attenuata* Low Woodland over *Xanthorrhoea preissii/Hibbertia hypericoides* Low Open Heath

Using Table 12 in Gibson *et al.* (1994), the vegetation in the development envelope was found to be most similar to FCT28 'Spearwood *Banksia attenuata* or *B. attenuata* – *Eucalyptus* woodland' with a high correlation also to FCT 24 'Norther Spearwood shrublands and woodlands'. FCT 28 is not a Threatened or Priority Ecological Community at State level

Both FCT 28 and 24 are listed as the FCT occurring in the upland areas of the nearby Bush Forever Site 391 'Thomson Lake Nature Reserve and Adjacent Bushland, Beeliar' which are within 5km of the development envelope.

Banksia Woodland of the Swan Coastal Plain TEC

The area of Jarrah/Banksia woodland in the development envelope is around 0.2ha and therefore is too small to be considered as the *Banksia Woodland of the Swan Coastal Plain TEC* (PGV Environmental, 2020). Vegetation in adjoining sites does not contain Banksia trees or if present are not a prominent member of the tree layer. Therefore, the small area of Jarrah/Banksia vegetation on the site is not part of a Banksia Woodland TEC on adjoining land.

Clearing the 2.07ha will not reduce the area *Banksia Woodland of the Swan Coastal Plain TEC.*

Tuart Woodlands and Forests of the Swan Coastal Plain TEC

The two Tuart trees on the site are not part of the *Tuart Woodlands and Forests of the Swan Coastal Plain TEC* due to the small size of the patch, low species richness and only one large tree in the patch (PGV Environmental, 2020).

The DBCA has broadly mapped the Tuart Woodland across the known range of the community. At a local level Tuart Woodland is mapped at North Lake, Lake Coogee, Thomson Lake and Mount Brown and Brownman Swamp. These areas are protected in Bush Forever sites.

Clearing the 2.07ha will not reduce the area of *Tuart Woodlands and Forests of the Swan Coastal Plain TEC.*

Ecological Linkage

The vegetation is part of an ecological linkage as it adjoins a part of Beeliar Regional Park that links native vegetation around the north-south chain of wetlands in the park. The ecological linkage (1.2km east west length) will be reduced in width (north south orientation) by approximately 70m on the western edge. The linkage will still retain 90m (north south orientation) along the western end of the ecological linkage.

This ecological linkage is broken by Beeliar Drive a four-lane road, so movement of mammals is somewhat restricted. The City has put in a fauna rope overpass to allow for possums to move between the bushland areas over Beeliar Drive.

Clearing the 2.07ha of native vegetation will not impact on the direct connection to native bushland around Yangebup Lake. More mobile fauna such as birds and bats will continue to have significant extents of vegetation to move between the bushland areas.

5.4.2 Indirect Impacts

Clearing and construction of the school infrastructure has the potential to impact on adjacent natural areas through erosion, dust, uncontrolled access, accidental clearing outside of the development envelope and through spread of weeds and *Phytophthora cinnamomi* (Dieback). Changes to the hydrological regime are not expected to impact on the surrounding natural area due to the lack of surface water flows and depth to groundwater.

Clearing the 2.07ha of native vegetation will reduce the width of the north south ecological linkage between Lake Kogolup and Lake Yangebup by 75m (north south orientation) on the western end. The remaining vegetation will continue to provide a direct link to Yangebup Lake approximately 1.20km long (east west).

5.4.3 Cumulative Impacts

Clearing of 2.07ha of native vegetation across the development envelope, represents 0.017% of the remaining extent of the Karrakatta Complex – Central and South. Clearing the 2.07ha Karrakatta Complex – Central and South will not reduce the pre-European extent to 10% or less of the remaining extent (DBCA, 2018).

The clearing represents 0.017% of the remaining Karrakatta Complex – Central and South will not significantly increase the cumulative impacts to the loss of this vegetation complex. However, this statistic is based on the mapped area of Karrakatta Complex – Central and South. As the vegetation in the development envelope is not mapped as Karrakatta Complex – Central and South, technically the clearing of 2.07ha will not reduce the known extent of the complex.

The clearing of 2.07ha will not increase the cumulative impacts to the *Tuart Woodlands and Forests of the Swan Coastal Plain TEC* or the *Banksia Woodland of the Swan Coastal Plain TEC* as the vegetation is not representative of the TECs (PGV Environmental, 2020).

The clearing will reduce the width of the ecological linkage (1.2km east west) between Yangebup Lake and Lake Kogolup. The ecological linkage will be reduced in width (north south orientation) by approximately 70m on the western edge. The linkage will still retain 90m in width (north south orientation) along the western end of the ecological linkage.

The remaining ecological linkage is protected under Bush Forever and is within the Beeliar Regional Park.

5.5 Assessment of impacts

Implementation of the Proposal is not anticipated to have a significant impact on Flora and Vegetation for the following reasons:

- There are no conservation significant flora species listed under the BC Act or the EPBC Act known to occur in the development envelope;
- Clearing 0.017% of the Karrakatta Complex – Central and South will not reduce the vegetation complex to below 10% of its pre-European extent;
- The EPBC listed of *Tuart Woodlands and Forests of the Swan Coastal Plain TEC* and *Banksia Woodland of the Swan Coastal Plain TEC* were not found in the development envelope or in adjacent areas so the impact to regional extent of these TECs will not be reduced in size;
- FCT 28 is found in a broad distribution in local and regional areas and the overall condition of the vegetation and low diversity of species is not a good representative of the FCT; and
- The clearing will not reduce any conservation areas protected under State of Commonwealth legislation.

5.6 Mitigation

The EPA objective for flora and vegetation is to protect flora and vegetation so that biological diversity and ecological integrity are maintained. To meet this objective the hierarchy of avoid, minimise, and rehabilitate will be applied.

5.6.1 Avoid

This proposal takes the worst-case scenario of not being able to avoid clearing the full 2.07ha as the full design requirements for the school expansion have not been finalised at the time of submitting this referral. Where possible, mature trees will be retained as was the practice for the initial construction of the school.

5.6.2 Minimise

The Proponent will prepare a Vegetation and Fauna Management Plan (VFMP) prior to any construction activities to protect the adjacent native vegetation and relocate any fauna that may reside in the development envelope. The VFMP will include the following strategies:

- Clearing and boundary demarcation;
- Hygiene requirements to prevent the spread of weeds and Phytophthora dieback;
- Dust control;
- Fauna relocation;
- Waste and fire management;
- Performance indicators that measure the effectiveness of avoidance and mitigation measures;
- Contingency measures that will be undertaken if performance targets are not met; and
- Roles and responsibilities of personnel associated with implementing avoidance and mitigation measures.

5.6.3 Rehabilitate

The Proponent will commit using local native species in landscaping and streetscaping.

5.7 Predicted outcome

The proposal will result in clearing 2.07ha of Karrakatta Complex – Central and South which is 0.017% of the remaining pre-European extent (or 0% as the area is not currently mapped as Karrakatta

Complex – Central and South). The clearing will not reduce the extent of the vegetation complex to less than the 10% threshold set by the EPA.

No conservation significant flora or ecological communities under the State BC Act or the Commonwealth EPBC Act will be impacted by the clearing, therefore the regional extent of these communities will not be diminished by the proposal.

The Proponent will prepare a VFMP to manage the implementation of the Proposal and to protect the surrounding flora and vegetation.

Implementation of the proposal is not expected to cause significant impacts to flora and vegetation therefore the EPA objective for this key environmental factor will be met.

6 Key Environmental Factor – Terrestrial Fauna

6.1 EPA Objective

The EPA's Statement of Environmental Principles, Factors and Objectives identifies the following objective for terrestrial fauna (EPA, 2018):

- To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

6.2 Policy and guidance

Fauna surveys that have informed this assessment have been conducted in accordance with the *Technical Guidance - Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA 2016a) and the *Environmental Factor Guideline: Terrestrial Fauna* (EPA 2018).

6.3 Receiving Environment

6.3.1 Overview

PGV Environmental undertook a search of the EPBC Protected Matters Database (Appendix 5) and the DBCA Nature Map (Appendix 4) to determine if any species protected under the EPBC Act and the BC Act are likely to occur in the development envelope. The results are provided in Table 14. Marine and migratory wetland species were excluded as the development envelope is located 6km from the coast and there are no surface water bodies in the development envelope.

Seven (7) Schedule 1, one (1) Schedule 3, one (1) Schedule 4 and six (6) Priority species were listed as occurring within 5km of the site In the Nature Map Report. The EPBC Protected matters Report listed two (2) Critically Endangered, one (1) Endangered species, four (4) Vulnerable species and one (1) Migratory species as occurring within 5km of the site. The State and Commonwealth conservation codes key can be found at Appendix 6.

Table 14: Conservation Significant Species that may Occur in the Vicinity of the Development Envelope

Scientific Name	Common Name	Status under Wildlife Cons. Act	Status under EPBC Act
Neopasiphae simplicor	A native bee	Schedule 1	Critically Endangered
Pseudocheirus occidentalis	Western Ringtail Possum	Schedule 1	Critically Endangered
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	Schedule 1	Endangered
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	Schedule 1	Vulnerable
Calyptorhynchus baudinii	Baudin's Black Cockatoo	Schedule 1	Vulnerable
Dasyurus geoffroii	Chuditch	Schedule 1	Vulnerable
Apus pacificus	Fork-tailed Swift	Schedule 3	Migratory
Leipoa ocellata	Malleefowl	Schedule 1	Vulnerable
Falco peregrinus	Peregrine Falcon	Schedule 4	
Throscodectes xiphos	Stylet Bush Cricket	Priority 1	
Neelaps calonotos	Black-striped Snake	Priority 3	
Leioproctus contrarius	A Short-tonged Bee	Priority 3	
Lerista lineata	Perth Slider	Priority 3	
Synemon gratiosa	Graceful Sunmoth	Priority 4	

Scientific Name	Common Name	Status under Wildlife Cons. Act	Status under EPBC Act
Isoodon obesulus fusciventer	Southern Brown Bandicoot, Quenda	Priority 5	

Fauna habitat can be assessed using several factors including; the size of the habitat, the level of habitat connectivity, availability of specific resources (eg. tree hollows) and overall vegetation quality. The habitat was assessed according to the following categories (Coffey Environments, 2009):

High Quality Fauna Habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.

Very Good Fauna Habitat - These areas show minimal signs of disturbance (eg. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally affected by disturbance.

Good Fauna Habitat – These areas showed signs of disturbance (eg. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.

Disturbed Fauna Habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.

Highly Degraded Fauna Habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.

The fauna habitat type of trees with a mixed native and non-native understorey was assessed as being Good to Disturbed Fauna Habitat due to the mostly weedy understorey, and high likelihood of feral predators such as foxes and cats for ground-dwelling fauna. There is connectivity with other fauna habitat.

6.3.2 Conservation Significant Species

Outlined in Table 15 is a short description of each of the species that were identified in the Naturmap and Protected Matters database search in Table 4 above and the likelihood of each species to be present on the site.

Table 15: Likelihood of Conservation Significant Species occurring in the Development Envelope

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Neopasiphae simplicor	A native bee	The Short-tongued Bee species is restricted in range, thought to only occur in a single location within the bushland of the Forrestdale Lake Nature Reserve adjacent to Forrestdale Lake and the Armadale Golf Course, with a previous population known from Cannington. It has been collected at flowers of *Goodenia filiformis, Lobelia tenuior, Angianthus preissianus* and *Velleia* sp. It occurs in two TECs, Type 8 and Type 10a. Males roost overnight in flowers of Asteraceae.	Highly unlikely – outside of known distribution range
Pseudocheirus occidentalis	Western Ringtail Possum	The Western Ringtail Possum is a medium sized nocturnal marsupial. This species occurs in and near coastal Peppermint Tree (*Agonis flexuosa*) forest and Tuart (*Eucalyptus gomphocephala*) dominated forest with a Peppermint Tree understorey.	No - suitable habitat
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	Forest Red-tailed Black Cockatoos frequent the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (SEWPaC, 2012). It nests in tree hollows with a depth of 1-5m, that are predominately Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) and Karri (*E. diversicolor*) and it feeds primarily on the seeds of Marri (SEWPaC, 2012).	Possible breeding habitat (five trees). Some foraging habitat available.
Calyptorhynchus baudinii	Baudin's Black Cockatoo	Baudin's Black-Cockatoo mainly occurs in eucalypt forests, especially Jarrah (*E. marginata*), Marri (*Corymbia calophylla*), also Karri (*E. diversicolor*) forest, often feeding in the understorey on proteaceous trees and shrubs, especially banksias (SEWPaC, 2012).	Possible breeding habitat (five trees). Some foraging habitat available.
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	Carnaby's Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of *Banksia, Dryandra, Hakea, Eucalyptus, Grevillea, Pinus* and *Allocasuarina* spp. It is nomadic often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell) (SEWPaC, 2012).	Possible breeding habitat (five trees). Some foraging habitat available.
Dasyurus geoffroii	Chuditch, Western Quoll	The Chuditch have been known to occupy a wide range of habitats including woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. They are opportunistic feeders, and forage on the ground at night, feeding on invertebrates, small mammals, birds and reptiles (DoE, 2014).	Highly unlikely – no recent records, disturbed site conditions and feral and domestic predators

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Leipoa ocellata	Malleefowl	Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards in mallee bushland (DoE, 2014).	No - suitable habitat present and no Malleefowl nests were observed
Apus pacificus	Fork-tailed Swift	The Fork-tailed Swift is almost exclusively aerial and is not known to breed in Australia. They are seen in inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities (DoE, 2014).	Possible aerial visitor
Lerista lineata	Perth Slider	The Lined Skink is a burrowing species that occurs in pale sandy soils with coastal heath and shrubland areas in isolated populations in the south-west and mid-west coast of Western Australia. It feeds on termites and other small insects (AROD, 2014).	Highly unlikely – habitat not suitable
Falco peregrinus	Peregrine Falcon	The Peregrine Falcon is found in a variety of habitats but nests on high cliff ledges or artificial structures. It feeds primarily on small-medium sized birds, but occasionally taking insects, such as moths, cicadas and locusts (Birdlife Australia, 2012).	Possible intermittent visitor
Neelaps calonotos	Black-striped Snake	The Black-striped snake has a limited distribution, inhabiting areas with sandy soils that support heathlands and Banksia/Eucalypt Woodlands (Nevill, 2005) on the Swan Coastal Plain generally in the lower west coast from Lancelin to Mandurah (Storr et al, 1999).	Possible
Throscodectes xiphos	Stylet Bush Cricket	The Throscodectes xiphos species of cricket was described in the Jandakot region in *Melaleuca* dominated vegetation (ENV, 2009).	No suitable habitat
Leioproctus contrarius	A Short-tonged Bee	The short-tongued bee species is only known from three locations within the Perth metropolitan area ranging from Cannington to Forrestdale. Specimens have been collected on two plant species, *Goodenia filiformis* and *Anthotium junciforme* (TSSC, 2013).	Highly unlikely – outside of known distribution range
Synemon gratiosa	Graceful Sunmoth	The Graceful Sun-moth is a diurnal moth with dull coloured brown to black forewings and brightly coloured orange hind wings. The larvae burrow into the rhizomes of *Lomandra maritima* and *Lomandra hermaphrodita* exclusively and therefore require the presence of one or both of these species to be present in an area (Bishop *et al*., 2011).	No suitable habitat. *Lomandra hermaphrodita* or *L. maritima* not recorded during the flora survey
Isoodon fusciventer	Southern Brown Bandicoot, Quenda	Southern Brown Bandicoots are small grey marsupials that prefer dense scrub (up to one metre high). Their diet includes invertebrates (including earthworms, adult beetles and their larvae), underground fungi, subterranean plant material, and very occasionally, small vertebrates (DEC, 2012).	Possible

6.3.3 Black Cockatoo Habitat Assessment

PGV Environmental undertook a Black Cockatoo Habitat Assessment in accordance with the *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered)*

Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) and the methodology that is outlined in the SPRAT Database for each of the Black Cockatoo species for Black Cockatoo Habitat Assessments.

A site visit was undertaken by PGV Environmental on 22 October 2020. The site was traversed on foot and information on Black Cockatoo foraging, roosting, and breeding habitat was assessed. The report is attached at Appendix 1 and the results are summarized below.

The quality of the vegetation was determined in the context of foraging habitat for Black Cockatoos. During the site visit a search for feeding signs or feeding debris such as 'chewed' Jarrah nuts and Banksia cones was undertaken.

The site was also searched for evidence of roosting including areas of droppings, moulted feathers, feather down or clippings from branches under trees.

Breeding habitat is defined in the Black Cockatoo Referral Guidelines as trees of species known to support breeding within the range of the Black Cockatoo species which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow.

Foraging Habitat

'Foraging habitat' for Black Cockatoos is determined from the plant species that are present on the site and evidence of feeding such as direct observation of birds or by chewed nuts and cones.

There were five native species recorded on the site that are recognised as foraging habitat for Carnaby's Black Cockatoos (Valentine and Stock, 2008; Groom, 2011). These are listed in Table 16. Jarrah is the only species that provide foraging habitat for Forest Red-tailed Black Cockatoos.

Table 16: Foraging Species for Carnaby's Black Cockatoos Recorded on the Site

Species	Common Name
Eucalyptus marginata	Jarrah
Eucalyptus gomphocephala	Tuart
Banksia attenuata	Candlestick Banksia
Banksia grandis (one plant)	Bull Banksia
Xanthorrhoea preissii	Grass Tree

There was no evidence of any foraging by Black Cockatoos in the development envelope.

Xanthorrhoea preissii is known as foraging habitat for Carnaby's Black Cockatoo, however the foraging value is considered to be very low. The foraging value is thought to be approximately 10% of good quality foraging habitat.

The total amount of native vegetation in the development envelope is 2.07ha. The area of good quality foraging habitat is estimated to be around 0.28ha which was calculated as the canopy cover of tree species at a conservative estimate of 15% (the maximum tree canopy cover recorded in the quadrats).

Roosting

The development envelope does not contain a known roosting site for Carnaby's Black Cockatoos and the nearest roosting sites are approximately 1.3km and 6km away from the development envelope to the east and north-west respectively (Figure 6) (DoP, 2011). No evidence of the development envelope being utilised as roosting habitat by Black Cockatoos was observed during the site visit.

Breeding

Black Cockatoos are known to breed in hollows of large eucalypts. The development envelope is not known as a breeding site for Carnaby's Black Cockatoos (DoP, 2011) or the other two species. The closest known breeding site is 40km to the north east in the Darling Ranges Foothills (SLIP, 2021). DBCA have mapped the breeding areas for Carnaby's Black Cockatoos and the closest area is 17km to the east in the foothills of the Darling Ranges (SLIP, 2021)

No evidence of breeding by Black Cockatoos was observed in the development envelope by PGV Environmental during the site visit.

The Black Cockatoo Referral Guidelines define trees of certain species with a DBH of 500mm or greater as breeding habitat regardless of the presence or not of hollows. The theory behind this definition is the concept that while the trees may not currently contain hollows, they are mature enough that in the next 50 years or so a hollow might form and be of use to Black Cockatoos for the purposes of breeding.

PGV Environmental recorded a total of 8 trees with a trunk diameter greater than 500mm at breast height including seven Jarrah (*Eucalyptus marginata*) and one Tuart (*Eucalyptus gomphocephala*).

The details of the significant trees are in Table 17 and are shown on Figure 5.

None of the trees had hollows large enough for Black Cockatoos to breed in. As a result, no evidence of breeding in spring 2020 or past breeding was observed on the site.

Table 17: Significant Trees Recorded on the Site

Species	Height (m)	dbh (cm)	Health	Hollows
Jarrah	7	170	healthy	none
Jarrah	7	60,40	healthy	none
Jarrah	8	100	healthy	small hollows
Jarrah	8	76	healthy	none
Tuart	9	82	healthy	none
Jarrah	10	120	healthy	small hollows
Jarrah	7	60	unhealthy, dead top, bees at base	none
Jarrah	8	53,50,20,20	healthy	none

Local and Regional Context

DBCA have mapped the potential breeding habitat for Carnaby's Black Cockatoo on the Swan Coastal Plain with the caveat that the foraging habitat requires further investigation. Figure 6 shows the black cockatoo habitat protected in Bush Forever sites within a 10km radius of the site.

Spatial analysis on the DBCA foraging habitat and Bush Forever sites shows that there is approximately 2,322ha and 7,691.3ha of potential foraging habitat protected in Bush Forever Sites within 5km and 10km respectively (SLIP, 2021). There is a further 1,350ha and 5946ha of foraging habitat within 5km and 10km respectively outside of the Bush Forever Sites.

The Bush Forever Sites within 5km of the development envelope are listed Table 13. These sites all have foraging habitat and open water to provide drinking water for Black Cockatoos. The development envelope does not have a water source for drinking.

6.3.4 Other Conservation Significant Species

The fauna habitat in the development envelope may support four other conservation significant species listed in Table 15:

- *Neelaps calonotos* (Black-striped Snake) (Priority 3);
- *Isoodon fusciventer* (Southern Brown Bandicoot, Quenda) (Priority 5);
- *Apus pacificus* (Fork-tailed Swift) (Migratory); and
- *Falco peregrinus* (Peregrine Falcon) (Migratory).

The Fork Tailed Swift and Peregrine Falcon may be occasional aerial visitors to the development envelope.

Quenda and the Black Striped Snake may be in the development envelope. Adjoining vegetation in the Beeliar Regional Park also provides potential habitat for these species. The Proponent will undertake a fauna relocation survey prior to any clearing works in accordance with a VFMP.

6.3.5 Ecological Linkages

As previously discussed, the development envelope is part of a north-south ecological linkage (1.2km long) between Yangebup Lake and Lake Kogolup. The ecological linkage is separated by the four lane Beeliar Drive which limits the movement of ground-based fauna. The City of Cockburn has provided a rope fauna overpass for possums to move between the woodland areas.

The ecological linkage will be reduced in width (north south orientation) by approximately 70m on the western edge. The linkage will still retain 90m (north south orientation) along the western end of the ecological linkage. More mobile fauna such as Birds and Bats will continue to have significant extents of vegetation to move between the bushland areas.

6.4 Potential impacts

6.4.1 Direct Impacts

Implementing the proposal will result in the clearing of 2.07ha of Good to Degraded fauna habitat from the development envelope. The clearing will impact on Black Cockatoos by reducing their foraging habitat and potential breeding habitat. The quality of the foraging habitat is considered good and was calculated on canopy cover to be 0.28ha (based on quadrat information). PGV Environmental (2020) mapped eight (8) trees that have the potential to become future breeding trees.

Clearing the 2.07ha of fauna habitat may also impact on Quenda and the Black Striped Snake if present in the development envelope. Clearing may impact on fauna linkages within the Beeliar Regional Park.

6.4.2 Indirect Impacts

Clearing and construction of the school infrastructure has the potential to impact on adjacent natural areas through erosion, dust, uncontrolled access, accidental clearing outside of the development envelope and through spread of weeds and Phytophthora cinnamomi (Dieback). Changes to the hydrological regime are not expected to impact on the surrounding natural area due to the lack of surface water flows and depth to groundwater.

Clearing the 2.07ha of native vegetation will reduce the width of the north south ecological linkage between Lake Kogolup and Lake Yangebup by 75m (north south orientation) on the western end. The remaining vegetation will continue to provide a direct link to Yangebup Lake approximately 1.20km long (east west).

6.4.3 Cumulative Impacts

The cumulative impacts from implementing the proposal are not considered to be significant in terms of loss of regional foraging habitat (0.28ha) for Black Cockatoos. The development envelope is located a long way from the known breeding sites and the DBCA mapped breeding areas in the Darling Ranges so loss of the habitat is not considered significant in regional terms as the Cockatoos largely forage within 12km of their nest site (DSEWPaC, 2012).

On a more local scale there is 2,322ha (Bush Forever) and 1,349ha (other) of Black Cockatoo habitat within 5km of the development envelope, the closest being less than 100m in distance.

6.5 Assessment of impacts

Implementing the proposal will result in the clearing of 2.07ha of Good to Degraded fauna habitat which includes 0.28ha of good quality Black Cockatoo foraging habitat and eight potential breeding trees. Additionally, the clearing of 2.07ha of fauna habitat may impact on Quenda and the Black Striped Snake.

The ecological linkage that the vegetation in the development footprint is a part of will be reduced but will still be 75-120m wide and will still function as a linkage for fauna including Quenda and the Black Striped Snake should they occur in the area.

6.6 Mitigation

The environmental objective for terrestrial fauna will be met through the implementation of the impact mitigation hierarchy (avoid, minimise, rehabilitate). These mitigation measures are discussed below.

6.6.1 Avoid

This proposal takes the worst-case scenario of not being able to avoid clearing the full 2.07ha as the full design requirements for the school expansion have not been finalised at the time of submitting this referral. Where possible mature trees will be retained as was the practice for the initial construction of the school.

6.6.2 Minimise

The Proponent will prepare a Vegetation and Fauna Management Plan (VFMP) prior to any construction activities to protect the adjacent native vegetation and relocate any fauna that may reside in the development envelope. The VFMP will include the following strategies:

- Clearing and boundary demarcation;
- Hygiene requirements to prevent the spread of weeds and Phytophthora dieback;
- Dust control;
- Fauna relocation;
- Waste and fire management;
- Performance indicators that measure the effectiveness of avoidance and mitigation measures;
- Contingency measures that will be undertaken if performance targets are not met; and
- Roles and responsibilities of personnel associated with implementing avoidance and mitigation measures.

6.6.3 Rehabilitate

The Proponent will commit to using local native species in landscaping and streetscaping and will retain mature trees where possible.

6.7 Predicted outcome

The proposal will result in clearing 2.07ha of Good to Degraded fauna habitat.

Implementing the proposal will impact on conservation significant Black Cockatoos however the significance of clearing 0.28ha of foraging habitat and five potential breeding trees is not considered significant in terms of resources available on a local and regional scale and survival of the species (PGV Environmental, 2020).

The Proponent will prepare a VFMP to manage the implementation of the Proposal and will include relocation of Quenda and Black Striped Snakes if found in the development envelope.

Implementation of the proposal is not expected to cause significant impacts to Terrestrial fauna therefore the EPA objective for this key environmental factor will be met.

7 OTHER ENVIRONMENTAL FACTORS OR MATTERS

No other environmental factors or matters were identified within the development envelope that were significant. Table 18 discusses the relevance or significance of the other environmental factors noting that the Sea Theme is not included as the development envelope is 6km inland from the coast.

Table 18: Other Environmental Factors

Theme	Environmental Factor	Environmental Objective	Significance of Impact
Land	Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	There are no significant landforms associated with the proposal.
	Subterranean Fauna	To maintain the quality of land and soils so that environmental values are protected.	The Proposal will not impact on Subterranean Fauna.
	Terrestrial Environmental Quality	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	The proposal will not significantly impact on terrestrial environmental quality. Topography and soils are not a constraint to the proposed development. A search of the Swan Coastal Plain Acid Sulphate Soils risk map (SLIP, 2021) indicates that there is no known risk of Acid Sulfate Soils (ASS) occurring within 3 m of the natural soil surface across the Development Envelope. The nearest high to moderate ASS disturbance risk within 3 m of the natural soils surface is located approximately 210 m to the east of the Development Envelope. ASS is not considered a constraint to development. It is expected that the EPA's objective for Terrestrial Environmental Quality will be met.
Water	Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	Groundwater is estimated to be encountered approximately 20.5 m below ground level (DoW, 2021, thus appropriate separation from the construction to groundwater is anticipated. No natural surface water expressions or geomorphic wetlands are present on site, or located adjacent to the development envelope. The development envelope is downstream of Yangebup Lake. The Proposal is not expected to impact on the groundwater or environmental values associated with the Lake. There are no declared Ramsar wetland

			present within the development envelope or within 5 km of the site (Slip, 2021). Due to the separation distance to groundwater and that there are no surface expressions of water in the development envelope the potential for impacts to inland waters in limited. Dewatering is not anticipated as part of the proposed development. Any potential impacts associated with construction will be managed through the planning and development approval process. The hydrological regime and water quality of the development envelope will be maintained, and will be required to be demonstrated through the preparation of an Urban Water Management Plan (UWMP) as part of the standard planning and development process. It is expected that the EPA objective for inland waters will be met.
Air	Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	Implementing the proposal is not expected to impact on air quality. Air emissions will be addressed in the standard planning and development process. It is expected that the EPA objective for Inland Waters will be met.
	Greenhouse Gas Emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	Implementing the proposal will result in some very minor greenhouse gas emissions. Scope 1 emissions will be from vegetation clearing (2.07ha) and use of diesel fuel in earthmoving equipment and site vehicles. Scope 2 emissions will largely be confined to use of electricity in the school buildings. Neither the scope 1 nor scope 2 emissions will exceed the 100,000 CO^2-e threshold per annum and will not be a significant contributor to the States greenhouse emissions. It is expected that the EPA objective for Greenhouse Gas Emissions will be met.
People	Social Surroundings	To protect social surroundings from significant harm.	Implementing the proposal will reduce the local bushland by 2.07ha which may cause some concern in the local community, however there will still be significant areas of bushland remaining for recreational and amenity. Construction impacts are not expected to indirectly impact on local residents as the development envelope is largely surrounded by vegetation and the existing schools. There will be an increase in traffic during construction

			times that will be managed through the planning and development process. Air emissions will be addressed in the standard planning and development process. The expansion of the school is an important asset to the local community. The development envelope is in a large aboriginal heritage listed site associated with Yangebup Lake. Various land uses have occurred in the heritage site in the past. Consultation with the local group will be undertaken during the assessment of the proposal. The proposal is not expected to cause a significant impact to social surrounds due to the following: • consultation with local aboriginal group will ensure that any potential heritage issues associated with the development envelope will be considered; • all anticipated impacts will be managed and mitigated through the implementation of appropriate construction controls under the planning and development process; and • landscaping and streetscaping will include native vegetation where possible to maintain and enhance the visual amenity of the area It is expected that the EPA's objective for social surrounds will be met.
	Human Health	To protect human health from significant harm	Implementing the proposal is not anticipated to have any impacts on human health. Emissions from the construction site will be managed through standard management practices in accordance with the Development Approval.

8 OFFSETS

The Proponent is not anticipating that offsets will be required for clearing 2.07ha native vegetation from the development envelope.

9 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The Matters of National Environmental Significance (MNES) Significant Impact Guidelines 1.1 define s MNES as follows (DoE 2013):

- World Heritage Properties;
- National Heritage places;
- Wetlands of international importance (Ramsar Wetlands);
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- Water resources in relation to coal seam gas development and large coal mining development

The development envelope contains the following MNES that are protected under the EPBC Act:

- Carnaby's Black Cockatoo (Threatened); and
- Forest Red-tailed Black Cockatoos (Vulnerable).

The *EPBC Act Significant Impact Guidelines 1.1* (DoE, 2013) are statutory guidelines to determine the significance of an impact on Matters of National Environmental Significance listed under the EPBC Act. The level of significance depends on the sensitivity, value and quality of the environment and the intensity, duration, magnitude and geographic extent of the impacts.

The significance of impact of implementing the proposal will reduce the regional Black Cockatoo foraging habitat by 0.28ha and will result in the loss of eight potential future breeding trees. The impact is not considered significant in terms of the species survival. A detailed assessment of the impact is provided in Appendix 1.

The *EPBC Act Significant Impact Guidelines 1.1* are statutory guidelines to be considered by the Commonwealth agency when making a decision on a proposal. With regards to Black Cockatoos in Western Australia there are also non-statutory guidelines: The *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines).

The Black Cockatoo Referral Guidelines contain several steps to determine whether or not a referral may be required. These steps are:

1. The definition of habitat (breeding, roosting and foraging – Table 1 in the Black Cockatoo Referral Guidelines);
2. A description of the type of action that may have a high or low risk of being a significant impact and therefore require referral (Table 3 in the Black Cockatoo Referral Guidelines);
3. Formulation of a mitigation strategy to reduce the scale of impact; and
4. A flowchart to assist in decision making on whether or not an action should be referred.

Based on the Referral guidelines clearing more than 1ha of foraging habitat and clearing of 1 potential future breeding tree is the threshold for requiring a referral.

Implementing the proposal will result in clearing less than 1ha of foraging habitat (0.28ha) but will result in the clearing of eight potential breeding habitat trees, therefore a referral under the EPBC Act may be required.

10 HOLISTIC IMPACT ASSESSMENT

The EPA guidance statement for Section 38 referrals requests that proponents (EPA, 2020):

> *provide a holistic assessment of the impacts of the Proposal on the whole environment. This should describe the connections and interactions between the parts of the environment (environmental factors) and discuss predicted outcomes in relation to the environmental principles and the EPA's environmental objectives*.

The proposal to develop the remainder of the development envelope for education development options will provide for the future education of children in the local area. At the local and regional level this will have significant benefits to the local community from both a social and environmental perspective. If the school is not able to expand, children will be required to travel further distances which has a social and economic costs to families and the environment.

Implementing the proposal will result in the loss of 2.07ha of native vegetation from the Karrakatta Vegetation Complex – Central and South which has more than 10% of the complex remaining on the Swan Coastal Plain. The development envelope does include any known conservation significant flora or threatened ecological communities. The vegetation condition is Good however native species density is low and the understorey is depleted and contains largely weedy species.

The development envelope contains 0.28ha of good quality Black Cockatoo foraging habitat and eight potential breeding trees. Considering the local and regional extent of Black Cockatoo Habitat the impact of implementing the proposal will not have a significant impact on the species or their future survival.

A direct impact to flora and vegetation will occur from clearing 2.07ha. This also represents potential fauna habitat. Surveys have shown that all flora and fauna species, vegetation types and habitat are well represented outside of the development envelope and thus the Proposal satisfies the EPA's objectives for these environmental factors:

- Flora and vegetation: To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
- Fauna: To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

Implementing the proposal will not have a significant impact on any of the EPA's Environmental factors as indicated in Section 7. Any potential impacts from construction of the school can be managed through the planning and development process.

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FIGURES

APPENDIX 1

APPENDIX 2

APPENDIX 3

APPENDIX 4

APPENDIX 5

APPENDIX 6

APPENDIX 7