KIRRAWEE BRICK PIT DEVELOPMENT

Flora and Fauna Assessment

For:

HENROTH INVESTMENTS PTY LTD

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Final Report

Cumberland Ecology
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The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Approved by:	David Robertson
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INTRODUCTION

This Flora and Fauna Assessment report has been prepared in support of an application for Concept Plan approval under Part 3A of the Environmental Planning and Assessment Act at 566-594 Princes Highway Kirrawee, otherwise known as the former Kirrawee Brick Pit (Reference MP 10_0076). The application seeks approval for a mixed use development comprising residential, retail and commercial uses and building envelopes of between 5 and 15 storeys,. The proposal also involves basement car parking and includes commuter parking, landscaping, services and the provision of a major new public park. Specifically, this report addresses issue number 2 as detailed in the Director General's Requirements (DGR's) issued by the Department of Planning on 24 August 2010. The purpose of this report is to assess the ecological values and predict potential impacts on flora and fauna, of the proposed development, with particular reference to impacts on the Sydney Turpentine Ironbark Forest community and the Grey-headed Flying-fox and consideration of appropriate offsets to compensate for unavoidable impacts.

The subject site, being a former brickworks quarry, consists of largely disturbed areas of exotic grassland vegetation and grassland in the northern sector with some small areas of remnant native vegetation in the southern and southwestern sector. The remnant native vegetation surrounds the former pit, concentrated along the western and southern edges. This vegetation has previously been identified as Sydney Turpentine Ironbark Forest, which is listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act 1997, and as Critically Endangered under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (under the name Turpentine-Ironbark Forest of the Sydney Basin Bioregion).

METHODS

A literature review and relevant database searches were carried out for the desktop review component of the studies. The information was then used to determine for the subject land known or potentially occurring species listed under the Threatened Species Conservation Act 1995 and/or the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. An extensive amount of previous flora and fauna survey has been completed within the subject land across a broad temporal range, as indicated by the information from the various survey reports. These surveys were conducted over a range of seasons and conditions, ensuring that all seasonal and climactic limitations to the successful detection of flora and fauna groups were minimised. The most recent surveys were conducted in late 2008.

Overall, it is considered that the level of flora and fauna survey conducted within the Project area has been adequate to identify any likely threatened species and to assess the potential ecological impacts of the proposed development.

RESULTS

The vegetation of the subject land varies in condition from patches of open forest where the native shrub layer prevents the growth of weeds, to highly degraded areas where both the understorey and overstorey is dominated by exotic weeds. Only one native vegetation community has been recorded within the subject lands, comprising the Sydney Turpentine Ironbark Forest. The quality of this community on the subject land varies considerably depending upon location and previous land use. The various occurrences of this community on the subject lands, although highly modified and degraded to a large extent, conform to the definition of Sydney Turpentine Ironbark Forest under the Threatened Species Conservation Act. The extent of Sydney Turpentine Ironbark Forest is too small however, to conform to the definition of the Turpentine-Ironbark Forest of the Sydney Basin Bioregion under the Environmental Protection and Biodiversity Conservation Act.

No threatened plant species were recorded during the Cumberland Ecology field surveys, or during previous surveys of the site.

The primary fauna habitats located within the study area are:

- Open forest communities (Sydney Turpentine Ironbark Forest);
- Permanent water body within the former quarry;
- Exotic vegetation; and
- Derived native grassland.

The remnant patches of vegetation provide suitable open forest habitat for a number of bird species while small tree hollows present provide roosting and nesting locations for birds, bats and arboreal mammals. The water within the brick pit itself provides suitable habitat for large numbers of aquatic and semi aquatic species such as birds and amphibians.

Two threatened fauna species were recorded during the 2007 surveys by, these being the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* and the Grey-headed Flying-fox (*Pteropus poliocephalus*).

IMPACT ASSESSMENT

The majority of the subject land historically has been cleared as a result of the past brickworks landuse and the site remains highly altered, currently supporting remnant/regrowth native and exotic vegetation surrounding a large artificial water body. The primary direct impact resulting from future development will be the clearing of 0.20 ha (2,040 sq m) of vegetation within the development area, of which 0.16 ha represents the Sydney Turpentine Ironbark Forest community or highly degraded Sydney Turpentine Ironbark Forest elements The majority of this clearing is focussed on the more highly disturbed, low resilience vegetation. Approximately 65 per cent of the native vegetation will be retained as part of the proposed development as well as being enhanced and subject to ongoing maintenance to ensure its' longevity. As the direct impact of vegetation clearance within the development is relatively minor, there is limited potential for indirect impacts to adjacent vegetation such as increased edge effects, alteration to abiotic factors and increased sedimentation and erosion. With appropriate management, as prescribed in the BMP developed for the subject lands, the long-term impacts of the proposed development on the Sydney Turpentine Ironbark Forest are expected to be minimal with a positive outcome expected in the long-term.

No threatened flora species have been recorded on the subject land during these surveys and no impacts on threatened flora species are therefore expected. No significant impacts on threatened fauna species are predicted as a result of the proposed development. All tree hollows will be retained, as will the best quality foraging habitat. The water source will be removed temporarily but supplementary sources of water will be supplied during the construction period, as prescribed in the BMP. As a result however, some habitat will be lost for aquatic fauna including fish, reptiles, amphibians and aquatic bird species. It is not expected however, that the draining of the pit will result in the loss of habitat for any water dependent threatened species.

Assessments of significance according to the EPBC Act and/or Part 3A assessment guidelines have been prepared for the Sydney Turpentine Ironbark Forest and threatened fauna species where considered appropriate. These assessments concluded that no significant impacts were likely to occur on the Sydney Turpentine Ironbark Forest community or on threatened fauna species and no referral to the Department of Sustainability, Environment, Water, Population and Community would be required.

CONCLUSIONS AND RECOMMENDATIONS

The former Kirrawee Brickworks site has been highly modified and largely cleared as a result of the past land uses on the subject land. Surveys to date have not detected any threatened flora species but have detected two threatened fauna species (Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* and the Grey-headed Flying-fox (*Pteropus poliocephalus*)) and confirmed the occurrence of the Sydney Turpentine Ironbark Forest. This community is listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act 1997, and as Critically Endangered under

the Commonwealth Environmental Protection and Biodiversity Act 1999. The small extent of the community within the subject land however, precludes it from conforming to the definition of Turpentine-Ironbark Forest under the Environmental Protection and Biodiversity Act.

The two threatened fauna species detected, would be expected to forage at times on the subject lands and the Grey-headed Flying-fox is known to use the existing water body as a source of drinking water. A number of other threatened fauna species are also known to occur in the locality and may utilise the subject lands habitats to some extent.

The main impacts on flora and fauna of the subject lands arise from vegetation clearing and potentially draining of the existing water body and restructuring as a water feature. The revised development concept plan would require the removal of a total of 0.20 ha (2,040 sq m) of vegetation. Of this total, 0.16 ha represents the Sydney Turpentine Ironbark Forest community or highly degraded Sydney Turpentine Ironbark Forest elements. Approximately 65 per cent of this community, representing the better quality, more resilient habitat, to be retained and managed as an offset for the area of Sydney Turpentine Ironbark Forest to be removed.

Assessments of significance conducted under the Environmental Protection and Biodiversity Act and under Part 3A of the Environmental Planning & Assessment Act have indicated that impacts as a whole on threatened species and the Sydney Turpentine Ironbark Forest community will be minor and no species or community is likely to be placed at risk as a result of the proposed development. There is no requirement for a referral to the Department of Sustainability, Environment, Water, Population and Communities.

A range of mitigation measures are proposed to minimise impacts on the flora and fauna as much as possible. A Biodiversity Management Plan has also been prepared for the project, the main aims of which are to provide a working document for the long term protection and rehabilitation of the vegetation to be retained and to specify construction and maintenance requirements for the freshwater pond.

In addition, to compensate further for the Sydney Turpentine Ironbark Forest community to be removed, it is proposed to develop and off-site offset area to be replanted, with the objective of this vegetation developing in the long term into an ecologically functioning Sydney Turpentine Ironbark Forest community. This offset is proposed to be developed on Council land, subject to Council approval. The development of this offset is expected to enhance the occurrence of the Sydney Turpentine Ironbark Forest community in the locality and management of the on-site occurrence of the community will enhance the overall biodiversity values of the subject lands in the long term.

Chapter 1

Introduction

1.1 Purpose

Cumberland Ecology Pty Ltd has been engaged to prepare a Flora and Fauna Assessment for the development of the Kirrawee Brick Pit site (the subject land) located at the intersections of the Princess Highway, Flora Street and Oak Road, Kirrawee (refer to Figure 1.1). This Flora and Fauna Assessment report has been prepared in support of an application for Concept Plan approval under Part 3A of the Environmental Planning and Assessment Act at 566-594 Princes Highway Kirrawee, otherwise known as the former Kirrawee Brick Pit (Reference MP 10_0076). The application seeks approval for a mixed use development comprising residential, retail and commercial uses and building envelopes of between 5 and 15 storeys,. The proposal also involves basement car parking and includes commuter parking, landscaping, services and the provision of a major new public park. Specifically, this report addresses issue number 2 as detailed in the Director General's Requirements (DGR's) issued by the Department of Planning on 24 August 2010. The purpose of this report is to assess the ecological values and predict potential impacts on flora and fauna, of the proposed development, with particular reference to impacts on the Sydney Turpentine Ironbark Forest community and the Grey-headed Flying-fox and consideration of appropriate offsets to compensate for unavoidable impacts.

The specific objectives of this report are to:

- Describe and map the vegetation communities on the subject land;
- Describe fauna habitats and fauna usage of the subject land;
- Assess the likelihood of threatened species as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) occurring on the subject land;
- Formally assess the impacts of the proposed development in terms of the Director General's Requirements issued for the assessment of the project under Part 3A of the *Environmental Planning and Assessment Act (EP&A ACT) 1979*.

- Assess the ecological constraints and opportunities for development on the subject land; and
- Where relevant, suggest mitigation measures to reduce the impacts of the proposed development on flora and fauna.

1.2 Background

1.2.1 Site Description

The subject land is located between the Princes Highway, Oak Road and Flora St in Kirrawee, as shown on Figure 1.1, and is currently zoned as Zone 7 – Mixed Use and Zone 13 – Public Open Space under the Sutherland Shire Local Environmental Plan 2006. This area was previously used as a brick works, where clay was quarried for the on-site manufacture of bricks, clay pipes, etc. As a remnant of this previous land use, a large body of freshwater, representing the quarry pit which has flooded following the cessation of activities, dominates the southern portion of the site, occupying approximately 1.4 ha of the total 4.254 ha site.

The flooded pit is significantly depressed within the local topography, with steep embankments of up to 15m above the current water line. Native vegetation surrounds the pit, concentrated along the western and southern edges. This vegetation has previously been identified as Sydney Turpentine Ironbark Forest (STIF) 9ERM 2007), which is listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act 1997, and as Critically Endangered under the Commonwealth Environmental Protection and Biodiversity Act 1999 (under the name Turpentine-Ironbark Forest of the Sydney Basin Bioregion). To the north and east of the pit, vegetation is dominated by exotic species.

1.2.2 Project History

A similar residential/commercial development project was recently proposed under Part 4 of the EP&A Act at the subject site. The proposal was put forward to Sutherland Shire Council who opposed the project based upon its potential impacts to State and Commonwealth listed ecological communities and threatened species. Modifications were made to the project in an attempt to minimise impacts on the ecological matters of concern. After a deemed refusal of the project by Sutherland Shire Council court proceedings within the NSW Land and Environment Court were commenced. The court ruling indicated that the there was insufficient evidence to support the contention that significant impacts on State and Commonwealth listed EECs and threatened species would not occur and as a result could not rule in favour of approving the development.

Following a subsequent request to the Department of Planning for consideration as a Major Project under Part 3A of the EP&A Act, 1979, the Director General of the

Department of Planning has declared the proposal to be one to which Part 3A of the Act applies and has also authorised the submission of a Concept Plan for the Project. This flora and fauna assessment has thus been prepared under the draft guidelines for Threatened Species Assessment (2005) and in compliance with the following documents

- Director-General Environmental Assessment Requirements Section 75F of the *Environmental Planning and Assessment Act 1979* - MP 10_0076;
- DECCW Advice on Key Issues and Assessment Requirements Concept Plan – Mixed Use Development 566-544 Princes Highway, Kirrawee MP 10_0076; and
- Council comments on DG's requirements – Council correspondence dated 9 August 2020;

This flora and fauna assessment has also been based on the revised development plan for the subject lands.

1.3 Description of the Project

The proposed development of the subject land has again been modified and if approved will result in the construction of a mix of residential, commercial and retail developments, occupying the majority of the 4.254 ha site. The current site layout is shown in Figure 1.2. As part of the new concept plan, the existing water body will be drained, partially re-filled and re-structured. The south-western corner of the site has been proposed as public open-space. This area also includes the majority of the STIF vegetation located on the site, concentrated along the western boundary adjacent to Oak Rd. Portions of this vegetation have regenerated on the quarry pit western embankment. Additional areas of STIF have been identified along the southern boundary. The vegetation of this sector is inconsistent in composition, with some areas supporting a predominantly exotic understorey, or no remnant canopy of STIF characteristic trees. Such vegetation is considered as only a marginal representation of the historical STIF vegetation community.

The majority of the vegetation occurring in the western sector is to be retained as part of the proposed concept plan for the project, except for a small portion to be removed in the northern sector for vehicle access to parking facilities and some STIF vegetation to be removed on the quarry walls.. The majority of the vegetation along the southern boundary will be removed as part of the proposed development, except for the western end. The total area of STIF to be removed as part of the proposed action is 0.16 hectares (1641 m^2) and the total area to be retained is 0.32 ha (3125 m^2). Further details on the specific areas of STIF to be removed and retained are provided in Chapter 3 of this flora and fauna assessment.

Compensation for the areas of STIF to be removed will be provided, by enhancement and management of the areas of STIF vegetation to be retained, thus providing an on-site offset area. An additional off-site offset area is proposed to be developed on Council land

in the locality, subject to Council approval. Further details on the specific areas of STIF to be replanted are provided in Chapter 4 of this flora and fauna assessment.

The brick pit water body is occasionally used as habitat (as a fresh water source) by the Grey-headed Flying-fox (GHFF) and the Eastern Bent-wing Bat (EBWB). As a compensatory measure for the drainage of the pit, a permanent pond will be constructed in the south-western sector of the subject lands. The BMP outlines the requirements, in terms of size and shape, optimal for habitat for the GHFF and EBWB. Details of the design for the compensatory water source will be subject to a future Project Application.

Some stags (dead hollow-bearing trees) within the remnant STIF vegetation along the western boundary adjacent to Oak Rd will be removed, due to concerns for the safety of the public and property. Details of these trees are shown in the ERM report[1]. This loss of habitat will be compensated for by the instalment of nest boxes at a ratio of 2:1 for all hollows removed.

1.4 Terms and Abbreviations

This report uses the following terms and abbreviations:

Table 1.1 TERMS AND ABBREVIATIONS USED IN THIS REPORT

Term / Abbreviation	Meaning
Bioregion	Refers to the Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion which the Project area sits within; in this case the Sydney Basin Bioregion
BMP	Biodiversity Management Plan
CEEC	Critically Endangered Ecological Community listed under the TSC Act and/or EPBC Act
DECCW	NSW Department of Environment and Climate Change and Water
DEWHA	Department of Environment, Water, Heritage and the Arts
Development Area	Area in which physical development works will be undertaken
DoP	NSW Department of Planning
EEC	Endangered Ecological Community listed under the TSC Act and/or EPBC Act
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Locality	The area within 10km of Project area
STIF	Sydney Turpentine Ironbark Forest
Threatened flora and fauna	Refers to communities, populations and species listed as Vulnerable or Endangered under the EPBC and TSC Acts

Table 1.1 TERMS AND ABBREVIATIONS USED IN THIS REPORT

Term / Abbreviation	Meaning
TSC Act	*NSW Threatened Species Conservation Act 1995*

Figure 1.1 SUBJECT LAND

Figure 1.2 CONCEPT LAND

Chapter 2

Methodology

2.1 Literature Review

The subject land has been extensively studied since the 1990s. For the purposes of this report, all available literature pertaining to ecological aspects within the subject land was reviewed. This literature was then analysed in order to:

- Collate all available existing data; and
- Ascertain the likely and known threatened species issues present within the subject land.

The documents reviewed in the literature review are listed in **Table 2.1** below:

Table 2.1 DESKTOP REVIEW DOCUMENTS

Author	Year	Document Title
URS	March 2002	Flora and Fauna Survey and Assessment, Kirrawee Brickpit (Prepared for Planning NSW)
ERM	March 2008	Mixed Use Development Kirrawee Brickpit, Ecological Impact Assessment (Prepared for Kirrawee Centre Pty Ltd)
Cumberland Ecology	Revised November 2008	Ecological Impact Assessment For Mixed Use Development of Kirrawee Brick Pit Site - Sydney Turpentine Ironbark Impact Assessment
Cumberland Ecology	Revised November 2008	Biodiversity Management Plan for The Kirrawee Brick Pit Site

2.2 Database Analysis

Database analysis was conducted for the locality using the Department of Environment, Climate Change and Water (DECCW) Atlas of NSW Wildlife Database (DECCW, 2010) and DEWHA Protected Matters Search Tool (DEWHA, 2010). The Atlas search was used to generate records of threatened flora and fauna species listed under the State

Threatened Species Conservation Act 1995 (TSC Act) EPBC within a 10km radius of the subject land. The Protected Matters search generated a list of potentially occurring flora, fauna and ecological communities listed under the EPBC Act within a 10km radius of the Project area. The lists generated from these databases were initially reviewed against available knowledge of the site to ascertain the likelihood of occurrence of threatened species within the Project area. Due to the nature of the habitats within the subject land and the proximity to the coast and marine environments, the results of the database searches identified numerous oceanic and coastal species that had previously been identified within the 10km search zone around the subject land. These coastal and oceanic species have not been considered in the remainder of the document due to the obvious lack of habitat for these species within the subject land.

2.3 Vegetation Mapping

Extensive vegetation surveys have been conducted within the subject land area over several studies across a number of years. This combined survey effort has enabled the refinement of an accurate vegetation map for the subject land.

2.4 Flora Survey

An extensive amount of previous flora survey has been completed within the subject land across a broad temporal range, as indicated by the information from survey reports in **Table 2.2** below. **Table 2.2** provides a summary of the flora survey effort completed to date during all survey periods.

Table 2.2 FLORA SURVEY EFFORT

Survey	Dates	Survey Effort
URS	19 December 2001 and 22 January 2002	Four straight line transects with all species recorded.
ERM	13 August 2007	Strip surveys of native remnant areas. Random meander surveys of for threatened and non-threatened surveys.
Cumberland Ecology	16 September 2008, 30 September 2008 and 2 October 2008	Random meander flora surveys. Targeted threatened flora surveys. General vegetation condition surveys.

2.5 Fauna Survey

An extensive amount of previous fauna survey has been completed within the Project area across a broad temporal range, as indicated by the survey effort reported in **Table 2.3**.

Table 2.3 FAUNA SURVEY EFFORT

Survey	Dates	Survey Effort
URS	17 December 2001, 22 January 2002, 24 January 2002 and 7 February 2002	Random meander for scats, tracks and traces. Habitat assessments. Spotlighting. Threatened frog call playback. Anabat detection.
ERM	13 August 2007 and 30 October to 1 November 2007	Random meander for scats, tracks and traces. Habitat assessments. Spotlighting. Threatened frog call playback. Anabat detection.
Cumberland Ecology	16 September 2008, 30 September 2008 and 2 October 2008	Random meander for scats, tracks and traces. Habitat assessments.

2.6 Adequacy of Surveys

As indicated in **Table 2.2** and **Table 2.3** extensive flora and fauna surveys have been conducted throughout the subject land in an effort to determine the quality and nature of the vegetation communities, fauna habitat and the occurrence of flora and fauna species. These surveys were conducted over a range of seasons and conditions, ensuring that all seasonal and climactic limitations to the successful detection of flora and fauna groups were minimised.

Overall, it is considered that the level of flora and fauna survey conducted within the Project area is adequate to identify any likely threatened species and assess the potential ecological impacts of the proposed development.

Chapter 3

Results

3.1 Introduction

The vegetation of the subject land varies in condition from patches of open forest where the native shrub layer prevents the growth of weeds, to highly degraded areas where both the understorey and overstorey is dominated by exotic weeds. The majority of the subject land contains evidence of disturbance from edge effects and previous human disturbance with only small remnant areas in relatively good condition. A full list of flora and fauna species identified on the subject site is provided in **Appendix A** and **Appendix B** respectively.

The remnant patches of vegetation provide suitable open forest habitat for a number of bird species while the tree hollows present provide roosting and nesting locations for birds, bats and arboreal mammals. The water within the brick pit itself provides suitable habitat for large numbers of aquatic and semi aquatic species such as birds and amphibians.

3.2 Vegetation Communities

Only one native vegetation community has been recorded within the subject lands. Sydney Turpentine Ironbark Forest (STIF) is listed as an Endangered Ecological Community (EEC) under the TSC Act and as a Critically Endangered Ecological Community (CEEC) under the EPBC Act. The quality of the STIF on the subject land varies considerably depending upon location and previous land use. Table 3.1 below provides the area (in square meters) of the different qualities of STIF within the subject lands. The remainder of the vegetation within the subject land consists of different forms of exotic vegetation.

The vegetation communities within the subject land are mapped in Figure 3.1 and a description of the structure and the qualities of the vegetation is described in detail below.

Table 3.1 SUMMARY OF EXTENT OF ALTERATION OF STIF COMMUNITY ON THE SUBJECT SITE – SOUTHERN AND WESTERN SECTORS

Vegetation Category	Current Extent (m2)	Contribution to current STIF
1 - STIF on original soil	3010.81	3010.81
2 - STIF regenerating on quarry walls	1264.74	1264.74
3 - STIF trees with exotic dominated understorey	489.97	489.97
4 - Exotic shrubs and understorey	427.08	0
5 - Replanted STIF	0	0
Totals	**5192.61**	**4765.52**

3.2.1 Sydney Turpentine –Ironbark Forest

Sydney Turpentine Ironbark Forest is described as containing an overstorey dominated by Turpentine (*Syncarpia glomulifera*), White Stringybark (*Eucalypts globoidea*) Red Mahogony (*Eucalyptus resinifera*), Grey Ironbark (*Eucalyptus paniculata*), Smooth-barked Apple (*Angophora costata*) or Rough-barked Apple (*Angophora floribunda*). Understorey and ground-layer species are variable between sites, dependent on local topography, fire history, etc, however a suite of species are considered characteristic of this vegetation community. The 2008 flora survey (described in the EIA) found a total of 53 native species within the Western and Southern Zones of vegetation on the subject site. Of these, 32 are characteristic species of the STIF community.

Within the subject site, STIF vegetation is concentrated within the area between the western edge of the brick pit, and the western boundary of the study site along Oak Rd (the "Western Zone"). An additional strip of remnant STIF vegetation is located along the southern boundary of the subject site along Flora Street (the "Southern Zone"), and significant regrowth of STIF vegetation has occurred on the western wall of the brick pit ("Regenerating STIF on Quarry Walls", Figure 3.1).

Within the Western Zone of STIF, the dominant tree species are *Angophora costata* and *Eucalyptus globoidea*, with a significant stand of *Allocasuarina littoralis*. Vegetation in the portion varies in condition from poor to good. Along the fence of the western boundary invasion by Asparagus Fern (*Protasparagus aethiopicus*) and Lantana (*Lantana camara*) has occurred. This area also contains a significant amount of rubbish which has been thrown over the fence. Some central areas of this portion are relatively weed-free, and contain a diversity of native shrubs, such as *Pultenaea villosa*, *Ozothamnus diosmifolius*, *Davesia genistifolia, Pittosporum undulatum, Dodonea triquetra, Bursaria spinosa, Notolea longifolia* and *Acacia implexa*, a ground-layer of herbs such as *Dianella caerulea, Glycine clandestina, Leucopogon juniperinus, Lomandra multiflora* and grasses *Aristida ramosa, Microlaena stipoides* and *Entolasia marginata*.

Within the Southern Zone of the community the canopy is dominated by *Eucalyptus paniculata*, *Angophora paniculata* and *Eucalyptus globoidea*, with condition varying from poor to moderate (see Figure 3.1). Due to the general shape of this portion, a long, thin strip of average width approximately 5m, this vegetation has been highly disturbed by edge effects and the adjacent street. Some areas have been heavily invaded by Asparagus Fern (*Protasparagus aethiopicus*), Large-leafed Privet (*Ligustrum lucidum*) and Lantana (*Lantana camara*), with little or no native understorey remaining. In one section no native canopy remains. Other sections of the Southern Zone contain a reasonable diversity of understorey and ground-layer species, with only moderate levels of weed invasion. This heterogeneity of condition dictates that areas classified as STIF in this portion are not directly connected with the vegetation in better condition to the west within the subject lands (refer to Figure 3.1).

Vegetation on the quarry wall has regenerated largely from seed stock derived from the Western Zone, located on the land above. The soil present is poor due to the altered soil profile associated with the construction of the quarry. Despite this, some large canopy trees and a reasonable diversity of native species occur, mostly concentrated within the southern end of the portion where the slope is most moderate. Weed invasion in this area is minimal, again concentrated towards the southern end. The remaining area on the western slope contains very few exotic species, probably due to the low nutrient levels and steep slope.

The resilience of each of these areas of vegetation is described in detail in the BMP for the project and summarised as follows:

- **Western Zone - STIF on Original Soil Profile** - resilience is moderate to high;
- **Quarry Walls – Regenerating STIF on Altered Soil Profile** - resilience is low to moderate; and
- **Southern Zone – Characteristic STIF Trees with Predominantly Exotic Understorey** - resilience in terms of the native soil seedbank is low.

The BMP applies to all vegetation stands to be retained within the land, and to areas to be replanted as STIF within the western sector of the subject lands.

Insert Figure

Figure 3.1 CLEARED AND RETAINED VEGETATION COMMUNITIES

3.3 Flora

3.3.1 Introduction

Three separate flora surveys have been conducted within various portions of the subject land over a number of years (URS, 2002; ERM 2008; Cumberland Ecology, 2008; Cumberland). A combined flora species list from these surveys is provided in **Appendix A**. More than 100 flora species have been recorded within the subject lands; with over 65 per cent of the species being native.

3.3.2 Database Review

Database searches of listed threatened flora species were undertaken over an area 10km from an approximate centre of the subject lands to provide a broad scale understanding of the threatened species with potential to occur within the subject lands. The results of the search are tabulated in **Table 3.2** with an assessment of their likelihood of occurrence of the species within the Project area.

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
Acacia bynoeana	Bynoe's Wattle	E1	V	Found in heath and woodland on sandy soils. Prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	Unlikely. Marginal habitat within the study area. Conspicuous plant but has not been detected during surveys.
Acacia pubescens	Downy Wattle	V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. Occurs in open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Acacia prominens	Gosford Wattle	E2		Grows in open situations on clayey or sandy soils.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Acacia terminalis subsp terminalis	Sunshine Wattle	E1	E	Coastal scrub and dry sclerophyll woodland on sandy soils . Habitat is	Unlikely. Marginal habitat within the study area. Not recorded

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
				generally sparse and scattered. Very limited distribution between Botany Bay to the northern foreshore of Port Jackson.	during flora surveys.
Allocasuarina glareicola		E1	E	Grows in Castlereagh woodland on lateritic soil. Found in open woodland with sclerophyllous shrubby understory.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Astrotricha crassifolia	Thick-leaf Star-hair	V	V	Occurs in dry sclerophyll woodland on sandstone	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Caesia parviflora var. minor	Small Pale Grass lily	E1		Found in damp places in open forest on sandstone.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Caladenia tessellata	Thick Lip Spider Orchid	E1	V	Generally found in grassy sclerophyll woodland on clay loam or sandy soils.	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Deyeuxia appressa		E	E	Has not been seen in over 60 years, almost nothing is known of the species' habitat and ecology.	Unlikely. May have suitable habitat within the study area. Not recorded during flora

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
				Flowers spring to summer and is mesophytic (grows in moist conditions).	
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V	Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges.	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Eucalyptus scoparia	Wallangarra White Gum	E	V	Found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops in far northern NSW. Common street tree around Sydney suburbs	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Epacris purpurascens var purpurascens		V		Found in a range of habitat types, most of which have a strong shale soil influence.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Genoplesium baueri	Bauer's Midge Orchid	V		Grows in sparse sclerophyll forest and moss gardens over sandstone.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Grevillea parviflora subsp. parviflora	Small-flowered Grevillea	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a	Unlikely. Marginal habitat within the study area. Not recorded

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
				range of vegetation types from heath and shrubby woodland to open forest.	during flora surveys.
Leucopogon exolasius	Woronora Beard-heath	V	V	The plant occurs in woodland on sandstone.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Melaleuca biconvexa	Biconvex Paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Melaleuca deanei	Deane's Melaleuca	V	V	The species grows in heath on sandstone. Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Persoonia hirsuta	Hairy Geebung	E1	E	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Persoonia nutans	Nodding Geebung	E1	E	Confined to aeolian and alluvial sediments and occurs in a range of	Unlikely. Marginal habitat within the study area. Not recorded

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
				sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland.	during flora surveys.
Pimelea curviflora var. curviflora		V	E	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Pomaderris prunifolia		E2		Occurs on a variety of soil types particularly along creeks and gullies	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Prostanthera densa	Villous Mintbush	V	V	Generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Pterostylis gibbosa	Illawarra Greenhood	E	E	Grows in open forest or woodland, on flat or gently sloping land with	Unlikely. No suitable habitat within the study area. Not

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
				poor drainage	recorded during flora surveys.
Pterostylis saxicola	Sydney Plains Greenhood Orchid	E1	E	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Pterostylis saxicola occurs are sclerophyll forest or woodland on shale/sandstone	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Pultenaea glabra	Smooth Bush Pea	V	V	Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone.	Unlikely. Marginal habitat within the study area. Not recorded during flora surveys.
Senecio spathulatus	Coast Groundsel	E1		Grows on primarily on coastal dunes	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.

Table 3.2 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FLORA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of Occurrence
Thelymitra sp. Kangaloon (D.L.Jones 18108)	Kangaloon Sun-orchid		CE	Grows in seasonally swampy sedgeland on grey silty clay loam at 600-700 m above sea level	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Thesium australe	Austral Toadflax, Toadflax	V	V	Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.
Wilsonia backhousei	Narrow-leafed Wilsonia	V		Occurs on the margins of salt marshes and lakes	Unlikely. No suitable habitat within the study area. Not recorded during flora surveys.

3.3.3 Threatened Plant Species

No threatened plant species were recorded during any of the Cumberland Ecology field surveys, or during previous surveys of the site carried out by URS (2006) or ERM (2008).

3.4 Fauna

3.4.1 Introduction

Three separate fauna surveys have been conducted within the subject land over a number of years (URS, 2002; ERM 2008; Cumberland Ecology, 2008; Cumberland). A combined fauna species list from these surveys is provided in **Appendix B**. Three amphibian species, six reptile species, 34 bird species and seven mammal species have been recorded within the Project area; with 90 per cent of the species being native.

3.4.2 Fauna Habitats

The primary fauna habitats located within the study area are:

- Open forest communities (Sydney Turpentine Ironbark Forest);
- Permanent water body within the former quarry;
- Exotic vegetation; and
- Derived native grassland.

The forest community within the study area consists of a small number of remnant old-growth trees surrounded by regenerating vegetation and provide suitable habitat for a range of fauna types including: amphibians, reptiles, birds, bats and arboreal and terrestrial mammals. Key habitat features recorded during the current study includes:

- Ground cover, leaf litter, fallen timber and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Tree hollows suitable as shelter and breeding habitat for a range of hollow-dependant fauna; and
- Blossom-producing trees suitable as foraging habitat for a range of nectarivores.

The former quarry supports a small amount of aquatic vegetation, such as *Elaeocharis sphacelata* and is therefore likely to provide limited suitable habitat for some wetland-dependant species such as wetland birds and amphibians. The water contained within the quarry provides a drinking source for terrestrial and arboreal mammals, as well as bats birds and reptiles.

Features such as bush rock, fallen logs, leaf litter and ground vegetation, which provide shelter for many of the small to medium sized terrestrial fauna species known from the wider locality, were generally limited to areas not previously cleared while cleared areas and regrowth lacked such habitat features. Generally, the types of terrestrial native species using the study area are likely to be restricted to those that are common and well-adapted to disturbed forest and urban areas.

Introduced (feral) fauna species were detected to some extent during site surveys, all species detected being considered as pest species. The only feral mammal detected was the European Rabbit (*Oryctolagus capensis*), other pest species being birds: the Common Myna (*Acridotheres tristis*), the Red-whiskered Bulbul (*Pyconotus josocus*), the House Sparrow (Passer domesticus) and the Spotted Turtle-dove (*Streptophelia chinensis*). Domestic cats and dogs would also be expected to occur on the subject lands at times.

The mature living trees and stags that remain in forest and woodland communities within the study area provide a number of small to medium-sized tree hollows for fauna species dependant on this resource as shelter and breeding habitat. However large hollows in tall trees that provide breeding and shelter habitat, particularly for large forest owls are relatively scarce throughout the study area. The scarcity of these larger hollows can be attributed to the regenerating nature of the vegetation following past agricultural uses throughout the area.

The STIF within the study area would provide suitable foraging habitat for a wide range of nectarivorous birds during blossom periods. There is potential that a number of nectar-dependant bird species would be attracted to the study area during the blossoming periods of dominant trees.

3.4.3 Database Review

Database searches of listed threatened fauna species were undertaken over an area 10km from an approximate centre of the subject lands to provide a broad scale understanding of the threatened species with potential to occur within the subject lands. The results of the search are tabulated in **Table 3.3** with an assessment of their likelihood of occurrence of the species within the Project area.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
Crinia tinnula	Wallum Froglet	V		Found in wallum swampland close to the coast.	Unlikely. No suitable habitat within the study area. Not recorded during surveys.
Heleioporus australiacus	Giant Burrowing Frog	V	V	Found in heath, woodland and open forest with sandy soils.	Unlikely. No suitable habitat within the study area. Not recorded during surveys.
Litoria aurea	Green and Golden Bell Frog	E1	V	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.).	Possible. Marginal habitat within the subject land. Likelihood not high due to poorer quality habitat and not being recorded in recent targeted surveys.
Litoria littlejohnii	Heath Frog	V	V	Found in creeks and dams within heath and associated woodland, ususally at higher altitidues.	Unlikely. No suitable habitat within the study area. Not recorded during surveys.
Litoria raniformis	Southern Bell Frog	E1	V	Inhabits swamps, dams and slow flowing streams with emergent vegetation in forest or	Unlikely. No suitable habitat within the study area. Not recorded during surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				open country.	
Mixophyes balbus	Stuttering Frog	E1	V	Inhabits flowing streams in rainforest and wet schlerophyll forest.	Unlikely. No suitable habitat within the study area. Not recorded during surveys.
Pseudophryne australis	Red-crowned Toadlet	V		Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	Unlikely. No suitable habitat within the study area. Not recorded during surveys.
Botaurus poiciloptilus	Australasian Bittern	V		Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleoacharis spp.).	Unlikely. Marginal suitable habitat within the study area. Not recorded during surveys.
Burhinus grallarius	Bush Stone-curlew	E1		Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	Unlikely. No suitable habitat within the study area. Not recorded during surveys.
Cacatua leadbeateri	Major Mitchell's Cockatoo	V		Inhabits a wide range of treed and treeless inland habitats,	Unlikely. No suitable habitat within the study area. Not

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				always within easy reach of water.	recorded during fauna surveys. Nearby records most likely an aviary escape as Sydney is not within the natural range of the species.
Callocephalon fimbriatum	Gang-gang Cockatoo	V		In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.	Possible. Nearby records of the species and suitable foraging habitat within the study area. Not recorded during fauna surveys.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (Allocasuarina littoralis), Forest She-oak (A. torulosa) or Drooping She-oak	Possible. Nearby records of the species and suitable feed trees within the study area. Not recorded during fauna surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				(A. verticillata) occur	
Circus assimilis	Spotted Harrier	V		Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys
Climacteris picumnus	Brown Treecreeper	V		Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
Daphoenositta chrysoptera	Varied Sittella	V		Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys
Ephippiorhynchus asiaticus	Black-necked Stork	E1		Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries	Unlikely. Marginal habitat within the study area. Not recorded during fauna surveys.
Epthianura albifrons	White-fronted Chat	V		Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Esacus neglectus	Beach Stone-curlew	E4A		Found exclusively along the coast, on a wide range of	Unlikely. No suitable habitat within the study area. Not

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves.	recorded during fauna surveys.
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V		Found in open forests and woodlands, particularly where there are large flowering eucalypts. Also a mallee specialist.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys. Nearby records most likely from an aviary escape as natural range does not include Sydney.
Glossopsitta pusilla	Little Lorikeet	V		Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species	Possible. Suitable habitat within the study area. Not recorded during fauna surveys.
Hieraaetus morphnoides	Little Eagle	V		Occupies open eucalypt forest, woodland or open woodland	Unlikely. Marginal habitat within study area. Not recorded during fauna surveys.
Ixobrychus flavicollis	Black Bittern	V		Inhabits both terrestrial and	Possible. Suitable habitat

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				estuarine wetlands, generally in areas of permanent water and dense vegetation	within study area. Not recorded during fauna surveys.
Lathamus discolor	Swift Parrot	E1	E	Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Possible. Suitable habitat within the study area. Not recorded during fauna surveys.
Lophoictinia isura	Square-tailed Kite	V		Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Unlikely. Marginal habitat within study area. Not recorded during fauna surveys.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V		Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts.	Unlikely. Suitable habitat within study area but only one record within 10km of the subject land. Not recorded during fauna surveys.
Neophema chrysogaster	Orange-bellied Parrot	E4A	CE	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				other tree species.	
Ninox connivens	Barking Owl	V		Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Ninox strenua	Powerful Owl	V		Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.	Unlikely. No suitable nesting habitat within the study area. Some possible foraging habitat but not recorded during fauna surveys.
Pandion haliaetus	Osprey	V		Favour coastal areas, especially the mouths of large rivers, lagoons and lakes.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Petroica boodang	Scarlet Robin	V		Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Unlikely. Marginal habitat within study area. Not recorded during fauna surveys.
Petroica phoenicea	Flame Robin	V		Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. In	Unlikely. No suitable habitat within the study area. Not recorded during fauna

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				winter, birds migrate to drier more open habitats in the lowlands.	surveys.
Petroica rodinogaster	Pink Robin	V		Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Polytelis swainsonii	Superb Parrot	V	V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Ptilinopus regina	Rose-crowned Fruit-Dove	V		Found mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Ptilinopus superbus	Superb Fruit-Dove	V		Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				forage in eucalypt or acacia woodland where there are fruit-bearing trees.	
Pyrrholaemus saggitatus	Speckled Warbler	V		A wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Rostratula australis	Australian Painted Snipe	E1	V	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber	Unlikely. Marginal habitat within the study area. No nearby records of the species and not recorded during fauna surveys.
Tyto novaehollandiae	Masked Owl	V		Lives in dry eucalypt forests and woodlands from sea level to 1100m.	Unlikely. No suitable nesting habitat within the study area. Potential foraging habitat but not recorded during fauna surveys.
Tyto tenebricosa	Sooty Owl	V		Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as	Unlikely. No suitable habitat within the study area. Not recorded during fauna

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				well as moist eucalypt forests.	surveys.
Xanthomyza phrygia	Regent Honeyeater	E1	E	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.	Possible. Suitable habitat within the study area. Not recorded during fauna surveys.
Cercartetus nanus	Eastern Pygmy-possum	V		Broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Roosts in caves (near their entrances), crevices in cliffs, old mine workings. Forage in low to mid-elevation dry open forest and woodland close to these features.	Unlikely. Marginal foraging and roosting habitat within the study area. Nearest record over 10km away. Not recorded during fauna surveys.
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows.	Unlikely. Suitable foraging habitat within the study area but not recorded in close proximity to the subject land. Not recorded during fauna surveys.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures	Present. Recorded using Anabat within the subject land (ERM, 2008).
Mormopterus norfolkensis	Eastern Freetail-bat	V		Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost	Possible. Suitable foraging habitat within the study area. Not recorded during fauna surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				under bark or in man-made structures.	
Myotis macropus	Southern Myotis	V		Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Possible. Suitable foraging habitat within the study area. Not recorded during fauna surveys.
Petaurus australis	Yellow-bellied Glider	V		Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	Occupy rocky escarpments,	Unlikely. No suitable habitat

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north.	within the study area. Not recorded during fauna surveys.
Phascolarctos cinereus	Koala	V		Inhabit eucalypt woodlands and forests.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or Melaleuca.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Pseudomys novaehollandiae	New Holland Mouse		V	Found, in low numbers, in heathland and is most common in dense, wet heath and swamps.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Present. Recorded using Anabat within the subject land (URS 2002; ERM 2008).
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Roosts in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Unlikely. Suitable foraging habitat within the study area but not recorded in close proximity to the subject land. Not recorded during fauna surveys.
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. This species usually roosts in tree hollows.	Possible. Suitable foraging habitat within the study area. Not recorded during fauna surveys.
Hoplocephalus bungaroides	Broad-headed Snake	E1		Shelters in rock crevices and under flat sandstone rocks on	Unlikely. No suitable habitat within the study area. Not

Table 3.3 LIKELIHOOD OF OCCURRENCE AND HABITAT REQUIREMENTS OF THREATENED FAUNA SPECIES RECORDED WITHIN THE LOCALITY

Scientific Name	Common Name	TSC Act Legal Status	EPBC Act Legal Status	Habitat Requirements	Likelihood of occurrence
				exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	recorded during fauna surveys.
Varanus rosenbergi	Rosenberg's Goanna	V	V	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.
Meridolum corneovirens	Cumberland Land Snail	E1		Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs.	Unlikely. No suitable habitat within the study area. Not recorded during fauna surveys.

Chapter 4

Impacts

4.1 Introduction

Impacts of the proposed development on vegetation communities, flora species, and fauna habitat and species are not likely to be significant overall. The majority of the subject land historically has been cleared as a result of the past brickworks landuse and the site remains highly altered, currently supporting remnant/regrowth native and exotic vegetation surrounding a large artificial water body, as shown in Figure 3.1. To achieve the proposed development outcome (refer to Figure 1.2), some portions of the native vegetation within the subject land are proposed to be cleared. The majority of this clearing however, is focussed on the more highly disturbed, low resilience vegetation as discussed in Section 3 and shown in Figure 3.1. Approximately 50 per cent of the native vegetation will be retained as part of the proposed development as well as being enhanced and subject to ongoing maintenance to ensure its' longevity. With appropriate management, as prescribed in the BMP developed for the subject lands, the long-term impacts of the proposed development are expected to be minimal with a positive outcome expected in the long-term.

Potential impacts to the ecological values of the subject land can be categorised as direct and indirect impacts. Potential direct impacts from future development include vegetation clearing and loss of habitat. Potential indirect impacts are the secondary processes that may occur as a result of development, such as increased edge effects along any newly cleared vegetation boundary and alteration to hydrological regimes.

4.2 Vegetation Communities

4.2.1 Direct Impacts

The primary direct impact resulting from future development will be the clearing of 0.20 ha (2,040.31 sq m) of vegetation within the development area, of which 0.16 ha represents the STIF community or highly degraded STIF elements. The development area is defined as the area in which physical works are proposed. A summary of the current occurrence of the STIF community within the subject land is provided in **Table 4.1,** whilst the extent of

direct impacts on the STIF community from the current development plan (refer to **Figure 1.2**), is shown in **Table 4.2** and **Figure 3.1.**

Table 4.1 SUMMARY OF EXTENT OF ALTERATION OF STIF COMMUNITY ON THE SUBJECT SITE – SOUTHERN AND WESTERN SECTORS

Vegetation Category	Current Extent (m2)	Extent to be Cleared	Future Extent	Contribution to current STIF	Contribution to future STIF
1 - STIF on original soil	3010.81	946.304	2064.380	3010.81	2064.380
2 - STIF regenerating on quarry walls	1264.74	269.435	995.318	1264.74	995.318
3 - STIF trees with exotic dominated understorey	489.97	425.054	64.942	489.97	64.942
4 - Exotic shrubs and understorey	427.08	399.521	27.657		
Totals	**5192.61**	**2040.31**	**3152.298**	**4765.52**	**3124.64**

4.2.2 Indirect Impacts

i. Introduction

The direct impact of vegetation clearance within the development is relatively minor and has limited potential to result in indirect impacts to adjacent vegetation such as increased edge effects along any newly cleared vegetation boundary, alteration to abiotic factors and increased sedimentation and erosion. The site is highly fragmented at present and the impacts of edge effects are obvious with weed invasion and other forms of disturbance within fringes of vegetation.

Ambient light from the proposed structures is expected increase the levels of ambient light currently occurring on the subject land but not to levels that would affect urban species. Street lighting is currently installed along the Pacific Highway, Flora Street and Oak Street and the light from the street lights penetrates though the vegetation into the subject site. The vegetation to be retained on the subject land will be a considerable distance from the proposed development and therefore is likely to be subject to a level of light penetration slightly greater to that currently on the subject lands at present. The specific extent of impacts from lighting however, will be dependent on the final lighting plans for the development and the proposed extent of public use of Zone 13.

Potential indirect impacts on existing vegetation to be retained, such as increased edge effects, weed infestations, erosion and increased fire risks, could be expected if the areas of STIF community to be retained were left unmanaged. However, short and long term management of these areas is proposed to be undertaken as prescribed in the BMP. Impacts on the retained STIF community from alteration to hydrology or sedimentation are not considered likely, based on the following factors:

- Proposed development works are downslope from the areas of the STIF community to be retained;
- Although the existing water body is to drained and restructured, the removal of water will be short term and the proposed water feature will restore water to the area adjacent to the area of the STIF community to be retained;
- The existing topography of the areas supporting the STIF community to be retained will not be modified by the proposed development works.

Further details on the mitigation and management strategies for the STIF community are provided in **Section 5.3.**

4.3 Flora

4.3.1 General Species

The proposed development will result in the clearing of a small area of native vegetation and therefore result in a minor loss of flora habitat within the subject land. The retained vegetation adjacent to the development area could potentially be indirectly impacted due to:

- Increased edge effects, any newly created clearing boundary being subject to increased exposure to weeds, wind impacts etc;
- Alteration to hydrology;
- Alteration to fire regime;
- Increased sedimentation and erosion if bare areas are exposed on ridgelines or slopes; and
- Physical damage.

Each of these indirect impacts is discussed in relation to vegetation communities and subsequently to flora species in **Section 4.2.2** above.

4.3.2 Threatened Species

Three separate targeted threatened flora surveys have been conducted within the subject land across a range of years and seasons. No threatened flora species have been recorded on the subject land during these surveys and no impacts on threatened flora species are therefore expected.

4.3.3 Wildlife Corridors

The vegetation on the subject land is entirely isolated and therefore does not form part of any wildlife corridor throughout the locality. The proposed development will therefore not impact upon any corridors across the subject land. All vegetation retained within the subject land will be enhanced as part of the proposed development under the BMP prepared for the site.

4.3.4 Threatened Species

i. Introduction

Two threatened fauna species have been recorded on the subject land in recent surveys. These species are:

- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) listed as vulnerable under the TSC Act;
- Grey-headed Flying Fox (*Pteropus poliocephalus*) listed as Vulnerable under the TSC Act and EPBC Act

Habitat assessment, combined with known records of nearby occurrences, indicate that a number of other threatened species are likely to occur adjacent to the subject land. These species therefore have the potential to occasionally utilise the small areas of suitable habitat within the development footprint (see **Table 3.1**). Potential impacts to species and likelihood of occurrence on the subject land are discussed below. According to the EPBC Act and Part 3A assessment guidelines have been prepared for certain species where considered appropriate and are provided in **Appendix C a**nd/or **Appendix D.** The results of these assessments in summary are as follows:

- The proposal is unlikely to reduce the area of occupancy of important populations of species to a significant extent;
- The proposal is unlikely to cause a long-term decrease in the size of an important population of a species
- Important populations will not be fragmented;
- No critical habitat will be affected

- There will be no adverse impacts on breeding cycles;
- The proposal will not threaten any species with extinction or hasten its decline
- The establishment of invasive species within the subject lands habitats and adversely affecting threatened species as a result of the proposal is unlikely;
- The recovery of any species is not likely to be affected by the proposed development;
- The proposal is not likely to affect the biodiversity values of any threatened fauna, but will rather enhance such values;
- The long term viability of threatened fauna species is not likely to be compromised;

4.4 Fauna

4.4.1 Terrestrial Fauna Habitat

The fauna habitat present on the subject land is limited to areas of native vegetation that will remain intact under any future development. The relatively small areas of native vegetation to be impacted provide suitable, albeit limited habitat features for a range of native fauna, including some threatened species. These habitat features provide potential foraging, nesting and shelter habitat for these species. Details of the extent of habitat to be affected directly by the proposed development are provided in **Table 4.**1. At the completion of the development, habitat to be retained will be subject to habitat enhancement procedures as prescribed in the BMP for the subject lands.

The primary areas of fauna habitat occur within the STIF community that will remain intact under future development of the subject land. Much of the fauna habitat within the remainder of the subject land has been heavily altered by clearing associated with previous industry. Potential indirect impacts on this habitat are discussed in **Section 4.2.2.** One potential indirect impact, increased lighting**,** could however have greater impacts (both positive and negative) on fauna species than on the vegetation community and plant species in the habitat to be retained. Such impacts could comprise:

- Reduced usage of edge habitats by roosting birds;
- Increased avoidance of edge areas by nocturnal fauna;
- Increased nocturnal insect activity, particularly over the water feature, potentially encouraging microbat foraging activity over the subject land.

The specific extent of impacts from lighting however, will be dependent on the final lighting plans for the development and the proposed extent of public use of Zone 13.

4.4.2 Aquatic Fauna Habitat

As part of the proposed development the former Brick Pit within the development land will be drained and replaced with a smaller water feature to suit the ecological needs of the site. As a result, some habitat will be lost for aquatic fauna including fish, reptiles, amphibians and aquatic bird species. It is not expected however, that the draining of the pit will result in the loss of habitat for any water dependent threatened species. The draining of the pit will require the appropriate management and relocation of the aquatic fauna within the subject land, as prescribed in the BMP prepared for the project and a detailed sub-plan for the translocation of native species to be prepared prior to construction works (as prescribed in the BMP) .

4.4.3 Wildlife Corridors

The vegetation on the subject land is entirely isolated and therefore does not form part of any wildlife corridor throughout the locality. The proposed development will therefore not impact upon any corridors across the subject land. All vegetation retained within the subject land will be enhanced as part of the proposed development under the BMP prepared for the site.

4.4.4 Threatened Species

i. Introduction

Two threatened fauna species have been recorded on the subject land in recent surveys. These species are:

- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) listed as vulnerable under the TSC Act;
- Grey-headed Flying Fox (*Pteropus poliocephalus*) listed as Vulnerable under the TSC Act and EPBC Act

Habitat assessment, combined with known records of nearby occurrences, indicate that a number of other threatened species are likely, to occur adjacent to the subject land. These species therefore have the potential to occasionally utilise the small areas of suitable habitat, comprising the STIF community, within the development footprint (see **Table 3.1**). Potential impacts to species and likelihood of occurrence on the subject land are discussed below. Assessments of significance have been prepared for certain species where considered appropriate and are provided in **Appendix C** and/or **Appendix D.**

ii. Potential Threatened Fauna Species Occurrences

Green and Golden Bell Frog (*Litoria aurea*)

The Green and Golden Bell Frog is listed as Endangered under the TSC Act and as Vulnerable under the EPBC Act. This species was formerly widely distributed along the NSW and Victorian coastline but its' known occurrences have become widely separated and isolated. Large populations in NSW however, are located around the metropolitan areas of Sydney, Shoalhaven and mid north. The Green and Golden Bell Frog inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.), with optimum habitat including water-bodies that are unshaded, are free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and have diurnal shelter sites. The species is also known to occur in highly disturbed areas in the Greater Sydney region.

There are 476 records of the Green and Golden Bell Frog within the locality of the subject land (DECCW, 2010). The existing water body on the site provides some suitable habitat for the species, although the extent of fringing aquatic vegetation is limited. The species has not been detected during any of the previous fauna surveys of the site despite targeted searches and no verified records of the species have been recorded within the site. Given the extensive knowledge of the Green and Golden Bell Frog of this species throughout suburban Sydney it is unlikely the species would be present but the habitat is appropriate and therefore there is some potential the species would occur.

Regent Honey-eater (*Xanthomyza phrygia*)

The Regent Honeyeater (*Xanthomyza phrygia)* is listed as Endangered under both the TSC Act and the EPBC Act. The species can undertake large-scale movements in the order of hundreds of kilometres. The species is nomadic and will move to areas where food is abundant; however the exact nature of these movements is still poorly understood. The Regent Honeyeater has specific requirements for breeding habitat, typically using low-lying river flats within heavily vegetated valleys. These honeyeaters are known to congregate to core breeding sites on a yearly basis then disperse across south eastern NSW to forage on flowering eucalypts.

There are five records of Regent Honeyeater within the locality of the subject land (DECCW, 2010). The subject land contains suitable feed trees for this species providing a food source during flowering periods. It is therefore considered possible that the Regent Honeyeater may forage across the subject land during the flowering periods of dominant canopy species. Considering the small size of the area of potential foraging habitat proposed for removal as part of the proposed development, it is not expected that there will be a significant impact on this species. The species is highly nomadic and significant stands of suitable foraging habitat are available throughout the locality for this species. In the longer term, better quality habitat will also be provided by the proposed STIF community enhancement on-site, as well as proposed additional off-site offsets in the locality.

Swift Parrot (*Lathamus discolour*)

The Swift Parrot (*Lathamas discolor*) is listed as Endangered under both the TSC Act and the EPBC Act. The species undertakes a yearly winter migration from breeding grounds in

Tasmania to the eastern mainland of Australia, often extending as far north as Queensland, depending upon the availability of nectar producing trees during the migration. Migration typically takes place between March and October. The species is known to return to some foraging sites on a cyclic basis depending on food availability.

There are six records of Swift Parrot within the locality of the subject land (DECCW, 2010). The subject land contains suitable winter flowering feed trees for this species providing a food source during migration periods. It is therefore considered possible that the Swift Parrot may forage across the subject land during the flowering periods of dominant canopy species. Considering the small size of the area of potential foraging habitat proposed for removal as part of the proposed development, it is not expected that there will be a significant impact on this species. The species is migratory and the species would only use the subject land opportunistically. Also, significant stands of suitable foraging habitat are available throughout the locality for this species. In the longer term, better quality habitat will also be provided by the proposed STIF community enhancement on-site, as well as proposed additional off-site offsets in the locality.

Gang-gang Cockatoo (Callocephalon fimbriatum)

The Gang-gang Cockatoo (*Callocephalon fimbriatum*) is listed as vulnerable under the TSC Act. The species undertakes a seasonal, altitudinal migration and during summer is typically found in tall mountain forests and woodlands. During winter the species has bee known to occur at lower altitudes in drier habitats and is often found in urban and coastal areas. . This species occurs in a variety of forest and woodland habitats and occasionally in more open areas in southeastern New South Wales (NSW Scientific Committee, 2001).

Suitable foraging habitat for the Gang-gang Cockatoo is contained within the subject lands. Suitable nesting habitat does not occur with in the subject land for this species due to the lack of trees bearing large hollows suitable for this species. It is considered possible however that the Gang-gang Cockatoo could forage opportunistically across the subject site on rare occasions. Considering the small size of the area of potential foraging habitat proposed for removal as part of the proposed development, it is not expected that there will be a significant impact on this species. The habitat within the subject land is marginal and the species would not be expected to rely on the habitat for survival. Significant stands of suitable foraging habitat are available throughout the locality for this species. In the longer term, better quality habitat will also be provided by the proposed STIF community enhancement on-site, as well as proposed additional off-site offsets in the locality.

Glossy-black Cockatoo (Calyptorhynchus lathami)

The Glossy-black Cockatoo is listed as vulnerable under the TSC Act. Suitable foraging habitat is present for this species but is limited to the small number of *Allocasuarina*

littoralis (Black She-oak) that exist on the subject lands. Nesting habitat is not present due to the lack of large hollows and the scarcity of suitable feed trees in the locality. No signs of this species were recorded on the site during targeted surveys. Targeted survey methods used included visual searches for the species, listening for calls and searching for signs of foraging on *Allocasuarina littoralis* cones. The species have a distinct method of chewing the cones which would indicate if the species uses the site. No evidence of this species using the site was uncovered using this method.

Despite there being a limited area of vegetation within the site for this species to forage across, it is considered possible that this species could forage at the site on occasions. The removal of the small area of foraging habitat as part of the proposed development is not expected to cause a significant impact on this species. Considering however, the very limited extent of potential foraging habitat proposed for removal as part of the proposed development, it is not expected that there will be a significant impact on this species. The habitat within the subject land is marginal and the species would not be expected to rely on the habitat for survival. Significant stands of better quality foraging habitat are available throughout the locality for this species. . In the longer term, there is potential for additional foraging habitat to be provided as part of the process of STIF community habitat enhancement.

Little Lorikeet (Glossopsitta pusilla)

The Little Lorikeet is listed as Vulnerable under the TSC Act. The species is a nectar feeder, nomadically following the richest sources of nectar that occurs across NSW. The species nests within tree-hollows and has a preference for smooth-barked trees. Suitable, albeit limited, foraging habitat is present in the form of flowering canopy tree species across the subject land and potential breeding habitat in the form of hollow bearing trees.

Only one record of this species occurs within the locality of the subject land, however, given the relative abundance of this species around Western Sydney, and its recent listing as a threatened species it is considered possible that the species could forage across the subject lands during times of flowering of canopy trees. Considering however, the small size of the area of potential foraging habitat proposed for removal as part of the proposed development, it is not expected that there will be a significant impact on this species. The habitat within the subject land is marginal and the species would not be expected to rely on the habitat for survival. Significant stands of suitable foraging habitat are available throughout the locality for this species. There is potential for this species to breed on the site but it is considered unlikely. In the long term, better quality habitat will be provided by the proposed STIF community enhancement on-site, as well as proposed additional off-site offsets in the locality.

Black Bittern (Ixobrychus flavicollis)

The Black Bittern is listed as Vulnerable under the TSC Act. This species inhabits wetlands with permanent bodies of water and adjacent areas of low dense vegetation. It

often inhabits wetlands with adjacent areas of woodland. The species has been recorded in the locality and potential foraging and breeding habitat exists for it within the subject lands.

This species is not expected to experience significant impacts as a result of the proposed project. The proposed project will result in the loss of a small area of marginal habitat for this species. It is considered possible that the species would utilise the subject land but the likelihood is low based on the quality of the habitat and the proximity to urban areas. The area is not likely to be a location at which the species would be resident or breed, but rather would represent a possible resting location associate with movements of individuals during the breeding season. The subject land will hold a similar habitat value for this species at the conclusion of the project though the conservation of the STIF and the proposed water feature at the western end of the property. Areas of far more suitable habitat are available throughout the wider locality, particularly within nearby National Parks.

Grey-headed Flying-fox (Pteropus poliocephalus)

The Grey-headed Flying-fox (*Pteropus poliocephalus)* is listed as Vulnerable under the TSC Act and EPBC Act. The species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas.

The Grey-headed Flying-fox roosts in colonies known as “camps”. Flying-foxes have a high site fidelity and the bats disperse between camps depending on the availability of food. There are a number of camps in the Sydney area, including camps at: Ku-ring-gai Flying-fox Reserve at Gordon adjacent to Garigal National Park, the Royal Botanic Gardens, and Cabramatta Creek Flying-fox Reserve at Cabramatta and at Botany. There is no camp known in the immediate vicinity of the subject lands but there is a large camp of approximately 7,000-10,000 individuals, at Kareela approximately 1.5 km distant. The species flies long distances to forage and there have been many sightings of the Grey-headed Flying-fox throughout the Sutherland Shire (DECCW, 2010).

The subject site supports a number of tree species that represent suitable food sources for the Grey-headed Flying-fox and the species has been observed using the water in the former Brick Pit as a drinking location (ERM 2008). Suitable feed trees include trees from the Fabaceae, Myrtaceae, Sterculiaceae, Moraceae, and Pittosporaceae families. Whilst the subject land provides suitable foraging habitat for this species, no camps were observed or are known to occur.

A small area of foraging habitat for the Grey-headed Flying-fox will be removed in the form of flowering canopy species and drinking habitat within the subject land will be removed temporarily as a result of the proposed development. Considering however, the small size of the area of potential foraging habitat proposed for removal as part of the proposed development, it is not expected that there will be a significant impact on this species.

The habitat within the subject land would be used as an occasional foraging/drinking location. The species would not be expected to rely on the habitat for survival. Significant stands of suitable foraging and drinking habitat are available throughout the locality for this species and supplementary sources of water will be supplied during the water feature reconstruction period, as prescribed in the BMP prepared for the project. The loss of habitat will also be offset in the long term by habitat enhancement of the STIF community, as well as the development of an off-site offset in the locality and the construction of water features as outlined in the BMP.

Microchiropteran Bats

The subject land provides known foraging habitat for the Eastern Bentwing-bat (listed as Vulnerable under the TSC Act); however it does not provide any suitable roosting or breeding habitat for this cave-dependant species. Other threatened microchiropteran bats that could potentially utilise the subject land include Eastern Freetail Bat (*Mormopterus norfolkensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Large-footed Myotis (*Myotis adversus*).

The subject land provides appropriate habitat for those species that roost in hollows while roosting habitat for cave dependent species are not present. An area of foraging and drinking habitat for the Eastern Bentwing-bat and other threatened microchiropteran bats will be removed as part of the future development. However, this species is likely to continue foraging across the subject land at the conclusion of the development within areas of native vegetation conserved and will continue to drink at water features supplied within the project areas.

No significant impacts on these species are predicted as a result of the proposed development. All tree hollows will be retained, as will the best quality foraging habitat. The water source will be temporarily removed but supplementary sources of water will be supplied during these times, as prescribed in the BMP. The loss of foraging habitat will be replaced within the areas of site that are to have the STIF enhanced. In addition, the habitat enhancement measures in the long term would be expected to enhance habitat for insect populations on the subject lands, which would therefore provide additional foraging potential for the microchiropteran bat species.

Chapter 5

Mitigation

5.1 Introduction

Future development will utilise avoidance and mitigation measures to minimise any potential impacts to the ecological values of the subject land as well as adjoining vegetation that may be indirectly impacted by the project. The hierarchy of impact minimisation as recommended by the draft Guidelines for Threatened Species Assessments (DEC and DPI 2005) is as follows:

- Avoid: to the extent possible, developments should be designed to avoid or minimise ecological impacts; and,
- Mitigate: where certain impacts are unavoidable through design changes, mitigation measures should be introduced to ameliorate the ecological impacts of the future development.

Where avoidance and mitigation measures do not minimise impacts sufficiently, compensatory/offset measures should be considered.

This chapter provides an assessment of the avoidance measures and recommended mitigation measures for the proposed project, as well as a discussion of offset options.

5.2 Avoidance Measures

The portion of the site supporting the STIF community to be retained, encompassing 3,152 m^2, is proposed to be zoned as E2 Environmental Conservation. Any future development will avoid this portion of the site. The higher quality, more resilient representations of the STIF community will thus be protected and managed.

Within the remainder of the site, the proponent has planned the future development around the important ecological features of the site. A drinking resource of the Grey-headed Flying-fox and threatened microbats will be retained within the project area, though not in its current form. Habitat for these species will be improved as part of the future development due to retention of hollow bearing trees and the planting of feed trees for the Grey-headed Flying-fox. These trees will also attract insects, representing additional food resources for the microchiropteran bats. In short, where practically

possible, all impacts on ecologically important areas have been minimised in the concept plan.

5.3 Recommended Mitigation Measures

5.3.1 Introduction

A number of mitigation measures are recommended to be utilised for the proposed project. These mitigation measures include those to be undertaken during the construction, operational and post-operational phases of the proposed project. It is proposed that mitigation measures be incorporated into the conditions of consent.

5.3.2 Construction and Operational Phases

During the construction and operational phases there is the potential for a number of direct and indirect impacts to ecological values. Potential impacts to flora and fauna occurring in these phases that can be managed include: unnecessary vegetation removal, runoff, sedimentation, erosion and pollution. As some of the subject land is located on sloped land, it is recommended that precautions be taken to minimise the impacts further down the slope. Recommended mitigation measures to be undertaken within the construction and operational phase are detailed below.

i. Access, signage and demarcation

Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of any sensitive vegetation. Access to adjoining vegetation should only be granted if conducting or overseeing mitigation measures.

The development footprint should be clearly demarcated and signed, where appropriate, to ensure no vegetation beyond these boundaries is removed. Temporary fencing can be erected to ensure construction and operational activities are contained within the development footprint.

ii. Erosion, Sediment and Pollution Control

During the construction and operational phases, precautions should be taken to ensure that no sediment or pollution enters adjoining vegetation. To reduce sedimentation on the construction site, erosion control measures need to be implemented. This may involve minimising the amount of exposed soils on the site at any given time. Silt traps should be established to prevent the impacts of sedimentation on the adjoining vegetation. During development, precautions should be taken to ensure that no pollution escapes the construction site. Pollution traps and efficient removal of pollution to an off site location will help to minimise pollution impacts.

Increased pollutant and nutrient loads from storm water run-off, can be mitigated appropriately through measures such as rainwater tanks, gross pollutant traps, bioretention systems, ponds and other small scale storm water management measures.

iii. Water Management

To prevent excess runoff flowing off the building site, barriers should be established to divert the flow of water away from the adjoining vegetation and into appropriate drainage systems. Filters within the barriers will minimise the amount of sedimentation entering the waterways. Permission must be gained from the appropriate government and approval bodies to drain the water from the Brick Pit and careful controls must be kept over the flow and water quality being drained from the quarry.

iv. Habitat Retention

Where possible, the following habitat features should be retained:

- Mature native trees to provide feeding and potential nesting habitat;
- Hollow-bearing trees to provide nesting and roosting habitat for fauna species; and
- Riparian areas, to allow for the persistence of riparian habitats within the subject land.

v. Pre-clearance Surveys

Pre-clearance surveys are required prior to vegetation removal and the draining of the pit to ensure that no threatened flora or fauna are present within the development area immediately prior to clearing. A suitably qualified person with flora and fauna handling skills should be present while the clearing of vegetation and draining of the dam are being undertaken. Such a person is required to attempt to minimise impacts to terrestrial and aquatic fauna during the initial impact phase. All aquatic or semi aquatic fauna will be required to be translocated as a result of the draining of the Brick Pit. Therefore all appropriate translocation sites and permits should be established prior to the commencement of the draining of the site.

5.3.3 Post-operational Phase

i. Retention and Management of STIF On-site

The STIF within the areas that are to be conserved should be managed and rehabilitated to encourage the development of a community composition and structure reminiscent of the original forms of the community from which they area derived. Weed removal should

be the initial focus and the propagation and replanting of local native seed is recommended to hasten community recovery. The site will be subject to ongoing management as prescribed under the BMP to improve and maintain the quality of the vegetation across the subject site post-development. The enhancement of the STIF community to be retained will entail ongoing weed control and monitoring procedures and these are also prescribed in the BMP.

ii. Enhancement and recreation of STIF – Off-site Biodiversity Offsets

To compensate further for the losses of the STIF as a result of the proposed development it is recommended that the STIF vegetation community be recreated to conform to one in an ecologically functioning state. It is proposed that this be undertaken on an area of Council land in the locality, subject to Council approval. If possible, connectivity between the developing STIF elements and any nearby STIF community will be enhanced. Where possible, all planted species should be sourced from locally indigenous native seed and tube stock and planting and maintenance procedures to be carried out as prescribed in the BMP.

The total area proposed as an off-site offset area is to be determined but important attributes for such an area comprise:

- Use of appropriate key STIF community species in the replanting process;
- Appropriate spacing of tree species to reflect natural densities;
- Connectivity with other STIF community or other vegetation to enhance plant and animal colonisation from adjacent habitats; and
- Suitability of the area to practical long term management.

The overall aims of the development of the off-set areas will be to increase and enhance the occurrence of the STIF community in the locality and to enhance the long term biodiversity values of the subject lands.

Chapter 6

Conclusion

The former Kirrawee Brickworks site has been highly modified and largely cleared as a result of the past land uses on the subject land. A number of flora and fauna surveys and assessments have not detected any threatened flora species but have detected two threatened fauna species and have confirmed the occurrence of the Sydney Turpentine Ironbark Forest. This community is listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act 1997, and as Critically Endangered (as Turpentine-Ironbark Forest of the Sydney Basin Bioregion) under the Commonwealth Environmental Protection and Biodiversity Act 1999. The small extent of the community within the subject land however, precludes it from conforming to the definition of Turpentine-Ironbark Forest under the Environmental Protection and Biodiversity Act.

The two threatened fauna species detected, the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* and the Grey-headed Flying-fox (*Pteropus poliocephalus*), would be expected to forage at times on the subject lands and the Grey-headed Flying-fox is known to use the existing water body for drinking. A number of other threatened fauna species, primarily forest birds and microchiropteran bat species are known to occur in the locality and may utilise the subject lands habitats to some extent.

The main impacts on flora and fauna of the subject lands arise from vegetation clearing and potentially draining of the existing water body and restructuring as a water feature. The revised development concept plan would require the removal of portions of the native vegetation within the southern and western sectors of the site, with a total of 0.20 ha (2,040 sq m) of vegetation to be removed within the portions comprising part of the development area. Of this total, 0.16 ha represents the STIF community or highly degraded STIF elements, with approximately 65 per cent of the existing STIF community to be retained. The vegetation to be retained represents the better quality, more resilient representations of the STIF community.

Assessments of significance conducted under the EPBC Act 1999 and under Part 3A of the EP&A Act (1979) have indicated that impacts as a whole on threatened species and the STIF community will be minor and no species or community is likely to be placed at risk as a result of the proposed development. With regard to the EPBC listed species, there is no requirement for a referral to the Department of Sustainability, Environment, Water, Population and Communities.

A range of mitigation measures are proposed to minimise impacts on the flora and fauna as much as possible, these measures including pre-clearing surveys, installation of nest boxes, construction of a temporary pond, weed control, habitat enhancement and

sedimentation controls. A Biodiversity Management Plan has also been prepared for the project, the main aims of which are to provide a working document for the long term protection and rehabilitation of the vegetation to be retained and to specify construction and maintenance requirements for the freshwater pond.

In addition, to compensate further for the Sydney Turpentine Ironbark Forest community to be removed, it is proposed to develop and off-site offset area to be replanted, the objective being for this vegetation to develop in the long term into an ecologically functioning Sydney Turpentine Ironbark Forest community. This offset is proposed to be developed on Council land, subject to Council approval. The development of this offset is expected to enhance the occurrence of the Sydney Turpentine Ironbark Forest community in the locality and management of the on-site occurrence of the community will enhance the overall biodiversity values of the subject lands in the long term.

Appendix A

Flora species recorded on the subject lands

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Appendix B

Fauna species recorded on the subject lands

[Click here to start typing]

Appendix C

Commonwealth Impact Assessment of Matters of National Environmental Significance

C.1 EPBC Assessment Terminology

A *'population of a* species' is defined under the EPBC Act *as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:*

- A geographically distinct regional population, or collection of local populations; or
- A population, or collection of local populations, that occurs within a particular bioregion.

An 'invasive species' is an introduced species, including an introduced [translocated] native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary for activities such as foraging, breeding, roosting, or dispersal;

- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development, or;
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the specie.

C.2 Critically Endangered/Endangered Species

The assessment of impact requirements for EPBC Act-listed Critically Endangered or Endangered species (DEH, 2006a) require certain criteria to be considered in the process of determining the significance of an impact caused by a proposed action. *An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will:*

- Lead to a long-term decrease in the size of a population;
- Reduce the area of occupancy of a species;
- Fragment an existing population into two or more populations;

- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of a population;
- Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Critically Endangered or Endangered species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere with the recovery of the species.

Each of these criteria has been addressed for the following species listed under the EPBC Act and known to occur or considered to have some potential to occur on the subject site":

- Swift Parrot (Lathamus discolour)
- Regent Honeyeater (Xanthomyza phrygia)

C.2.1 Swift Parrot (Lathamus discolour)

The Swift Parrot (*Lathamas discolor*) is listed as Endangered under the EPBC Act. The species undertakes a yearly winter migration from breeding grounds in Tasmania to the eastern mainland of Australia, often extending as far north as Queensland, depending upon the availability of nectar producing trees during the migration. Migration typically takes place between March and October. The species is known to return to some foraging sites on a cyclic basis depending on food availability.

There are six records of Swift Parrot within the locality of the subject land (DECCW, 2010) , but the species to date has not been detected within the subject lands. The subject land contains suitable winter flowering feed trees for this species providing a food source during migration periods. It is therefore considered possible that the Swift Parrot may forage across the subject land during the flowering periods of dominant canopy species.

- Is *there a real chance or a possibility that the action lead to a long-term decrease in the size of a population;*

It is unlikely that the proposed action will lead to a long-term decrease in the size of populations of the Swift Parrot owing to the following factors:

- the species has a variable range and variable habitat requirements within that range meaning the proposed action area is not considered important or critical habitat to these species;
- the very small size of the area of potential foraging habitat for the species, with only 0.16 ha of such habitat to be removed;
- the occurrence of more extensive suitable habitat for the species in the wider locality; and

- the retention of the higher quality habitat within the subject lands and the long term maintenance and enhancement of this vegetation as prescribed by the Biodiversity Management Plan prepared for the project.

- *Is there a real chance or a possibility that the action will reduce the area of occupancy of a species*;

Given that the Swift Parrot is likely to occur within the proposed action area only while occasionally foraging throughout the wider locality, the proposed action is unlikely to result in a reduced area of occupancy for this species.

- *Is there a real chance or a possibility that the action will fragment an existing population into two or more populations*;

The Swift Parrot is wide-ranging and a nomadic/migratory species. It is therefore unlikely that the proposed action will fragment existing populations of this species.

- *Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species;*

It is considered unlikely that the proposed action will adversely affect habitat critical to the survival of the Swift Parrot owing to the following:

- the species has a variable range and variable habitat requirements within that range meaning the proposed action area is not considered important or critical habitat to this species;
- the lack of records to date for this species within the subject lands or immediate vicinity, despite a number of field surveys;
- the occurrence of more extensive suitable habitat for the species in the wider locality; and
- the retention of the higher quality habitat within the subject lands and the long term maintenance and enhancement of this vegetation as prescribed by the Biodiversity Management Plan prepared for the project.

The habitat within the proposed action area is also not critical to the survival of this endangered species based on the following;

- the proposed action area does not provide habitat suitable for breeding, roosting or dispersing. The foraging habitat to undergo clearing is also far from optimal and therefore not considered critical to the survival of this species;
- the area of potential foraging habitat for the species to be removed comprises only 0.16 ha of highly modified/regenerating forest;
- the proposed action area is not considered necessary for the long-term maintenance of this species as the species is migratory and nomadic and therefore not limited to the habitat within the proposed action area;
- the proposed action area is not considered necessary to maintain genetic diversity and long term evolutionary development of this species as the species is migratory and nomadic and therefore is not limited to the habitat within the proposed action area; and
- the proposed action area is not considered necessary for the reintroduction of populations or recovery of this species as the species is migratory and nomadic and therefore is not limited to the habitat within the proposed action area.

- *Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population;*

Swift Parrots are winter migrants that do not breed in the locality. It is therefore not likely that the proposed action will result in disruption to the breeding cycle of populations of these species.

- *Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*

The proposed action will remove only 0.16 ha of suitable potential foraging habitat for this species. This habitat is not considered likely to be important to the survival of the Swift Parrot and removal of this habitat is not considered likely to cause this species to decline owing to the following factors;

- the very small size of the area of potential foraging habitat for the species, with only 0.16 ha of such habitat to be removed;
- the species has a variable range and variable habitat requirements within that range meaning the proposed action area is not considered important or critical habitat to this species;
- the lack of records to date for this species within the subject lands or immediate vicinity, despite a number of field surveys within the subject lands;
- the occurrence of more extensive suitable habitat for the species in the wider locality; and
- the retention of the higher quality habitat within the subject lands and the long term maintenance and enhancement of this vegetation as prescribed by the Biodiversity Management Plan prepared for the project.

- *Is there a real chance or a possibility that the action will result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Critically Endangered or Endangered species' habitat;*

The proposed action is not expected to result in the introduction or increase in abundance of invasive species that will have a significant impact on the Swift Parrot. The area is highly modified and any invasive species with potential to impact upon these species, such as the Common Myna, are already well established in the region.

- *Is there a real chance or a possibility that the action will Introduce disease that may cause the species to decline; or*

The proposed action is unlikely to result in the introduction of disease that may cause the decline of the Swift Parrot.

- *Is there a real chance or a possibility that the action will interfere with the recovery of the species.*

Based on the factors outlined above, it is considered unlikely that the proposed action will interfere with the recovery of the Swift Parrot.

No referral to the Department of Sustainability, Environment, Water, Population and Community would therefore be required.

C.2.2 Regent Honeyeater (Xanthomyza phrygia)

The Regent Honeyeater (*Xanthomyza phrygia)* can undertake large-scale movements in the order of hundreds of kilometres. The species is nomadic and will move to areas where food is abundant; however the exact nature of these movements is still poorly understood. The Regent Honeyeater has specific requirements for breeding habitat, typically using low-lying river flats within heavily vegetated valleys. These honeyeaters are known to congregate to core breeding sites on a yearly basis then disperse across south eastern NSW to forage on flowering eucalypts.

There are five records of Regent Honeyeater within the locality of the subject land (DECCW, 2010). The subject land contains suitable feed trees for this species providing a food source during flowering periods. It is therefore considered possible that the Regent Honeyeater may forage across the subject land during the flowering periods of dominant canopy species.

- Is *there a real chance or a possibility that the action lead to a long-term decrease in the size of a population;*

It is unlikely that the proposed action will lead to a long-term decrease in the size of populations of the Regent Honeyeater owing to the following factors:

  - the species has a variable range and variable habitat requirements within that range meaning the proposed action area is not considered important or critical habitat to these species;
  - the very small size of the area of potential foraging habitat for the species, with only 0.16 ha of such habitat to be removed;
  - the occurrence of more extensive suitable habitat for the species in the wider locality; and
  - the retention of the higher quality habitat within the subject lands and the long term maintenance and enhancement of this vegetation as prescribed by the Biodiversity Management Plan prepared for the project.

- *Is there a real chance or a possibility that the action will reduce the area of occupancy of a species*;

Given that the Regent Honeyeater is likely to occur within the proposed action area only whilst occasionally foraging throughout the wider locality and the area of potential foraging habitat to be removed is very small, the proposed action is unlikely to result in a reduced area of occupancy for this species.

- *Is there a real chance or a possibility that the action will fragment an existing population into two or more populations*;

The Regent Honeyeater is wide-ranging and a nomadic/migratory species. It is therefore unlikely that the proposed action will fragment existing populations of this species.

- *Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species;*

It is considered unlikely that the proposed action will adversely affect habitat critical to the survival of the Regent Honeyeater owing to the following:

- the species has a variable range and variable habitat requirements within that range meaning the proposed action area is not considered important or critical habitat to this species;
- the lack of records to date for this species within the subject lands or immediate vicinity, despite a number of field surveys;
- the occurrence of more extensive suitable habitat for the species in the wider locality; and
- the retention of the higher quality habitat within the subject lands and the long term maintenance and enhancement of this vegetation as prescribed by the Biodiversity Management Plan prepared for the project.

The habitat within the proposed action area is also not critical to the survival of this endangered species based on the following;

- the proposed action area does not provide habitat suitable for breeding, roosting or dispersing. The foraging habitat to undergo clearing is also far from optimal and therefore not considered critical to the survival of this species;
- the area of potential foraging habitat for the species to be removed comprises only 0.16 ha of highly modified/regenerating forest;
- the proposed action area is not considered necessary for the long-term maintenance of this species as the species is migratory and nomadic and therefore not limited to the habitat within the proposed action area;
- the proposed action area is not considered necessary to maintain genetic diversity and long term evolutionary development of this species as the species is migratory and nomadic and therefore is not limited to the habitat within the proposed action area; and
- the proposed action area is not considered necessary for the reintroduction of populations or recovery of this species as the species is migratory and nomadic and therefore is not limited to the habitat within the proposed action area.

- *Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population;*

Regent Honeyeaters recorded in the locality disperse from core breeding areas in valleys on the western side of the Blue Mountains. The removal of a very small area of potential foraging habitat distant form the breeding area will therefore not affect the breeding cycle of a population.

- *Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*

The proposed action will remove only 0.16 ha of suitable potential foraging habitat for this species. This habitat is not considered likely to be important to this species' survival and removal of this habitat is not considered likely to cause these species to decline owing to the following factors;

- the very small size of the area of potential foraging habitat for the species, with only 0.16 ha of such habitat to be removed;
- the species has a variable range and variable habitat requirements within that range meaning the proposed action area is not considered important or critical habitat to this species;
- the lack of records to date for this species within the subject lands or immediate vicinity, despite a number of field surveys within the subject lands;
- the occurrence of more extensive suitable habitat for the species in the wider locality; and
- the retention of the higher quality habitat within the subject lands and the long term maintenance and enhancement of this vegetation as prescribed by the Biodiversity Management Plan prepared for the project.

- *Is there a real chance or a possibility that the action will result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Critically Endangered or Endangered species' habitat;*

The proposed action is not expected to result in the introduction or increase in abundance of invasive species that will have a significant impact on the Regent Honeyeater. The subject lands habitats are highly modified and any invasive species with potential to impact upon these species, such as the Common Myna, are already well established in the region.

- *Is there a real chance or a possibility that the action will Introduce disease that may cause the species to decline; or*

The proposed action is unlikely to result in the introduction of disease that may cause the decline of the Regent Honeyeater.

- *Is there a real chance or a possibility that the action will interfere with the recovery of the species.*

Based on the factors outlined above, it is considered unlikely that the proposed action will interfere with the recovery of the Regent Honeyeater.

No referral to the Department of Sustainability, Environment, Water, Population and Community would therefore be required.

C.3 Vulnerable Species

The assessment of impact requirements for EPBC Act-listed vulnerable species (DEH, 2006a) require certain criteria to be considered in the process of determining the significance of an impact caused by a proposed action. A significant impact on an EPBC listed vulnerable species is considered to have occurred if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population of the species;
- Reduce the area of occupancy of an important population;
- Fragment an existing important population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of an important population;
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- Introduce disease that may cause the species to decline; or interfere substantially with the recovery of the species'.

Each of these criteria has been addressed for the following species listed under the EPBC Act and known to occur or considered to have some potential to occur on the subject site":

- Grey-headed Flying-fox (*Pteropus poliocephalus*)

For the purposes of this assessment, the Significant Impact Criteria for Vulnerable species as listed in the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Significance (DEH, 2006) defines an 'Important Population' as a population that is necessary for the species' long-term survival and recovery. This may include populations identified as such in recovery plans and/or that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/ or
- Populations that are near the limit of the species range.

The local populations of the Grey-headed Flying-fox are not considered to be 'Important Populations' of these species as defined by the EPBC Significant Impact Guidelines for the following reasons:

- The local populations are not considered likely to be dependent on the subject lands, the site habitats representing marginal foraging habitat for the Grey-headed Flying-fox;
- Both species are well represented in the locality; and
- Better quality habitats are represented in the locality.

C.3.1 Grey-headed Flying-fox (Pteropus poliocephalus)

The Grey-headed Flying-fox (*Pteropus poliocephalus)* is listed as Vulnerable under the EPBC Act. The species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. The subject site supports a number of species which are suitable feed trees for the Grey-headed Flying-fox. These include trees from the Fabaceae, Myrtaceae, Proteaceae, Sterculiaceae, Moraceae, Pittosporaceae and Lauraceae families. Whilst the subject land provides suitable foraging habitat for this species no camps were observed or are known to occur.

The Grey-headed Flying-fox roosts in colonies known as “camps”. Camps have a high site fidelity and bats disperse between camps depending on the availability of food. In the Sydney area, there are a number of camp locations including at Ku-ring-gai Flying-fox Reserve at Gordon adjacent to Garigal National Park, the Royal Botanic Gardens, Cabramatta Creek Flying-fox Reserve at Cabramatta and at Botany. There is no camp known in the immediate vicinity of the subject lands, but there is a large camp of approximately 7,000-10,000 individuals, at Kareela approximately 1.5 km distant. T he species flies long distances to forage. There are 128 records of the species within the locality of the subject lands. The Grey-headed Flying-fox was not recorded by Cumberland Ecology during surveys in 2008 but was detected drinking from the existing water body during previous studies of the site (ERM 2008).

A significant impact on an EPBC listed vulnerable species is considered to have occurred if there is a real chance or possibility that it will:

- *Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species;*

  The GHFF recorded on the subject site are most likely to have travelled from the Flying-fox camp at Botany. Flying-foxes are known to forage for food distances of up to 50 km, so it is also possible that the bats originated from one of the other colonies in the Sydney area. Flying-foxes that utilise the subject lands would be expected to form part of an important population that is necessary for the species’ long-term survival and recovery. The few individuals however, that would utilise the site would not however, constitute an important population as such that would be dependent on the site habitats. The subject lands provide a very small amount of suitable foraging habitat for the species which will be reduced in size by16 ha under the proposed development concept plan. Large expanses of better quality

foraging habitat are available in the locality and there are also a variety of alternative drinking resources. Therefore it is highly unlikely that the loss of 0.16 ha of vegetation on the subject lands will lead to a long-term decrease in the population size of the species.

- *Is there a real chance or a possibility that the action will significantly reduce the area of occupancy of important populations of the species*;

  The removal of 0.16 ha of potential foraging habitat and modification of the 1.4 ha of water body used for drinking purposes by the species will not significantly reduce the area of occupancy of the Grey-headed Flying-fox. Temporary pond facilities will be provided for the species during the reconstruction of the water body. The better quality habitat supporting potential feed trees is to be retained and enhanced and the site would only be expected to be utilised by a very small proportion of the local population. The species is known to forage over an area of up to 50km and suitable feed trees for the species are also present throughout the adjacent urbanised areas. The loss of habitat will therefore be very minor to te species as a whole The proposed development therefore would not be expected to result in a significant reduction in available habitat to the species, and hence will not significantly reduce the area of occupancy of important Grey-headed Flying-fox populations.

- *Is there a real chance or a possibility that the action* will *fragment the existing important populations into two or more populations*;

  The species is highly mobile and known to forage large distances across urban areas. The proposed development would therefore not fragment any important populations of Grey-headed Flying-fox into two or more populations as the connectivity of habitat for this species would be maintained.

- *Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species;*

  No known Grey-headed Flying-fox camps have been identified of the subject lands, therefore the proposed development will not impact on this type of habitat which is critical to the species. The subject land provides only a very small area of suitable foraging habitat for the Grey-headed Flying-fox and a permanent water source. The proposed development will result in the removal of only 0.16 ha of potential foraging habitat and modification of the 1.4 ha of water body. A similar amount of habitat of better quality will be retained on the site and enhanced. The species is known to forage over an area of up to 50km, allowing access to large tracts of native bushland in nearby National Parks containing suitable feed trees throughout. Suitable feed trees for the species are also present throughout the adjacent urbanised areas. Habitat to be removed on the subject lands is thus in no way critical to the survival of the Grey-headed Flying-fox.

- *Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population*; only a very small area of

  There are no maternal camps for the Grey-headed Flying-fox occurring on the subject land. Therefore the proposed development will not disrupt the breeding cycle of an important population.

- *Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*

  The site provides only a very small area of suitable foraging habitat to the Grey-headed Flying-fox and a permanent source of drinking water. The proposed development will result in the removal of only 0.16 ha of potential foraging habitat and modification of the 1.4 ha of water body. The extent of habitat removal or modification is expected to be very minor in terms of impacts on the local population of the species and no habitat will be isolated as a result of the development. An alternative water supply will be provided for the species, both during construction and as a permanent feature of the site. The foraging potential of the subject lands is very minor and the proposed development would not be predicted to have any significant impacts on the Grey-headed Flying-fox in terms of habitat modification, removal, isolation or decrease in availability such that the species would be likely to decline.

- *Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;* or

  The proposed development will not result in invasive species that are harmful to the Grey-headed Flying-fox becoming established in the habitat on the subject land. Any invasive weeds that may result in the reduced success of feed tree species growth will be managed under the BMP prepared for the subject site (refer to **Appendix C**.).

- *Is there a real chance or a possibility that the action will* i*nterfere substantially with the recovery of the species.*

  The removal of 0.16 ha of suitable foraging habitat and modification of the 1.4 ha of water body from the subject land will not interfere substantially with the recovery of the Grey-headed Flying-fox. The extent of foraging habitat is very small and is not expected to be of high significance to the local population. Additionally, the better quality habitat on the subject lands is to be retained and proposed enhancement planting of food trees would be expected to increase the extent of potential habitat in the long term. The subject lands will also continue to provide a source of drinking water, both during and post construction. These measures are prescribed in the BMP for the site.

In assessing the criteria above it can be considered there will be no significant impact on the Grey-headed Flying-fox at a local or regional scale due to the removal of foraging habitat or the modification of the water body on the subject site.

No referral to the Department of Sustainability, Environment, Water, Population and Community would therefore be required.

Appendix D

Assessments of Significance (Seven Part Tests)

The Part 3A Guidelines of the EP&A Act (DEC & DPI 2005) set out a number of Key Thresholds which need to be addressed to justify the impacts of the Proposal on threatened species, populations or ecological communities. These key thresholds comprise the following:

- Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values;
- Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community;
- Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction;
- Whether or not the Proposal will adversely affect critical habitat.

The following community/species are known to occur or are considered to have the potential to occur on the subject lands:

Endangered Ecological Community

- Sydney Turpentine-Ironbark Forest

Threatened Fauna

- Regent Honeyeater (*Xanthomyza phrygia*);
- Swift Parrot (*Lathamas discolor*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-cockatoo (*Callocephalon lathami*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Black Bittern (*Ixobrychus flavicollis)*
- Eastern Free-tail Bat (*Mormopterus norfolkensis*);
- Southern Myotis (*Myotis macropus*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)

The following Assessments of Significance applies to the community/species listed above.

Endangered Ecological Community

Sydney Turpentine-Ironbark Forest (STIF)

Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values

The proposal will remove 0.16 ha of the STIF community, retaining 0.32 ha of the community and encompassing the better quality representation of the community on the subject lands. The BMP for the project prescribes ongoing management and enhancement procedures for this retained vegetation. Additionally, a further offset area is proposed to be replanted off-site on Council land, subject to Council approval. The combination of these measures is expected to maintain and enhance the biiodiversity values of the of the STIF community within the subject lands

Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community

The combination of the measures described above is expected to maintain and enhance the viability of the STIF community within the subject lands and the proposal is therefore not predicted to decrease the viability of the local occurrence of the STIF community.

Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction

The Proposal incorporates a BMP that prescribes long term management and enhancement procedures for the better quality representations of the STIF community to be retained on the subject lands. The removal of the community is restricted to only 0.16 ha and it is proposed to replant an additional area off-site with the aim of developing an ecologically functioning STIF community. Based on these considerations, the proposal is not considered likely to place the STIF community at risk of extinction or cause any acceleration in its decline.

Whether or not the Proposal will adversely affect critical habitat

The proposal will only affect highly modified and degraded representations of the STIF community and will not affect critical habitat.

Conclusion

The subject land supports small areas of the STIF community, less than half of which will be cleared and the areas to be retained will be protected and enhanced as prescribed in the BMP for the project. The local occurrence of this community is predicted to remain viable as the better representation of the community on the subject land will remain and the STIF community is also proposed to be expanded off-site in the locality through offset

plantings on Council land. The STIF community overall is therefore not considered to be adversely affected by the future development.

Threatened Fauna

The **Swift Parrot** (*Lathamas discolor*) is listed as Endangered under the TSC Act. The species undertakes a yearly winter migration from breeding grounds in Tasmania to the eastern mainland of Australia, often extending as far north as Queensland, depending upon the availability of nectar producing trees during the migration. Migration typically takes place between March and October. The species is known to return to some foraging sites on a cyclic basis depending on food availability.

There are six records of the Swift Parrot within the locality of the subject land (DECCW, 2010), but the species to date has not been detected within the subject lands. The subject land contains suitable winter flowering feed trees for this species providing a food source during migration periods. It is therefore considered possible that the Swift Parrot may forage across the subject land during the flowering periods of dominant canopy species.

The **Regent Honeyeater** (*Xanthomyza phrygia)* is listed as Endangered under the TSC Act. This species can undertake large-scale movements in the order of hundreds of kilometres. The species is nomadic and will move to areas where food is abundant; however the exact nature of these movements is still poorly understood. The Regent Honeyeater has specific requirements for breeding habitat, typically using low-lying river flats within heavily vegetated valleys. These honeyeaters are known to congregate to core breeding sites on a yearly basis then disperse across south eastern NSW to forage on flowering eucalypts.

There are five records of Regent Honeyeater within the locality of the subject land (DECCW, 2010). The subject land contains suitable feed trees for this species providing a food source during flowering periods. It is therefore considered possible that the Regent Honeyeater may forage across the subject land during the flowering periods of dominant canopy species.

The **Gang-Gang Cockatoo** (*Callocephalon fimbriatum*) is found from southern Victoria through south- and central-eastern New South Wales being recorded as far north as Coffs Harbour and as far west as Mudgee. The species undertakes a seasonal, altitudinal migration from tall mountain forests and woodlands preferring heavily timbered and mature wet sclerophyll forests in summer to drier more open eucalypt forests and woodlands in winter. The Gang-gang Cockatoo is listed as Vulnerable on Schedule 2 of the TSC Act while the Endangered Populations of this species are listed under Part 2 of Schedule 1 of the TSC Act. The subject land contains suitable feed trees for this species providing a food source during fruiting/seed development periods. It is therefore considered possible that the Gang-Gang Cockatoo may forage opportunistically across the subject land during periods when the seeds of eucalypts and other species such as wattles are available.

The **Glossy Black Cockatoo** (*Callocephalon lathami*) is listed as vulnerable under the TSC Act. It has a widespread but disjunct distribution in the state determined by the presence of suitable *Allocasuarina*/*Casuarina* food trees. The species also has a high fidelity to specific food trees. Suitable foraging habitat is present for this species but is limited to the small number of *Allocasuarina littoralis* (Black She-oak) that exist on the subject lands. Nesting habitat is not present due to the lack of large hollows and the scarcity of suitable feed trees in the locality. No signs of this species were recorded on the site during targeted surveys. Targeted survey methods used included visual searches for the species, listening for calls and searching for signs of foraging on *Allocasuarina littoralis* cones. The species have a distinct method of chewing the cones which would indicate if the species uses the site. No evidence of this species using the site was uncovered using this method.

In NSW **Little Lorikeets (***Glossopsitta pusilla*) are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands and have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. The Little Lorikeet is listed as Vulnerable on Schedule 2 of the TSC Act. The subject land contains suitable feed trees for this species providing a food source during flowering periods. It is therefore considered possible that the Little Lorikeet may forage across the subject land during the flowering periods of dominant canopy species.

The **Black Bittern** (Ixobrychus flavicollis) is listed as Vulnerable under the TSC Act. This species inhabits wetlands with permanent bodies of water and adjacent areas of low dense vegetation. It often inhabits wetlands with adjacent areas of woodland. The species has been recorded in the locality and potential foraging and breeding habitat exists for it within the subject lands. The species has not been detected within the subject lands.

The **Eastern Free-tail Bat** (Mormopterus norfolkensis), **Southern Myotis** (Myotis macropus) and **Greater Broad-nosed Bat** (Scoteanax rueppellii) are all listed as Vulnerable under the TSC Act and all represent insectivorous microchiropteran bats that typically roost and breed in tree hollows. There is potential foraging habitat for these species but none of the species has not been detected to date within the subject lands.

The **Grey-headed Flying-fox** (Pteropus poliocephalus) is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large “camps” which are generally within 20km of a food source. The Grey-headed Flying-fox is listed as Vulnerable on Schedule 2 of the TSC Act and under the EPBC Act. This species has been detected utilising the existing water body on the site for drinking purposes (ERM 2008).

The **Eastern Bentwing-bat** (Miniopterus schreibersii oceanensis) occurs along the east and north west coasts of Australia. It roosts in caves, derelict mines, storm water tunnels, buildings and other man made structures. It forages above the canopy in forested areas. This species also can potentially roost in some rock crevices and overhangs. The Eastern Bentwing-bat forms maternity colonies in caves and populations usually centre on such caves. The Eastern Bentwing-bat is listed as Vulnerable on Schedule 2 of the TSC Act. The species was detected within the subject lands during Anabat surveys (ERM 2008).

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Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values

Known or potential habitat for the various species outlined above occurs on the subject land, primarily in the form of foraging habitat. Tree hollows recorded on the subject land also provide limited potential nesting habitat for the Little Lorikeet and potential roosting habitat for the Eastern Bentwing-bat Eastern Free-tail Bat, Southern Myotis and the Greater Broad-nosed Bat, although the Eastern Bentwing-bat primarily roosts in caves. The existing water body also represents a known drinking resource for the Grey-headed Flying-fox and a potential resource for other fauna species.

Only a very small portion of available foraging habitat (0.20 ha) will be removed from the subject land and the higher quality habitat will be retained. Hollow-bearing trees are also to be retained that could be used as temporary roosts. The proposed development will result in the temporary removal and modification of the 1.4 ha of water body. An alternative water supply however, will be provided for the species, both during construction and as a permanent feature of the site. The habitat potential of the subject lands overall is very minor and the proposed development would not be predicted to have any significant impacts on the subject species in terms of biodiversity values.

A range of mitigation measures are also proposed to minimise impacts on fauna and fauna habitats as much as possible, these measures including pre-clearing surveys, installation of nest boxes, construction of a temporary pond, weed control, habitat enhancement and sedimentation controls. A Biodiversity Management Plan has also been prepared for the project, the main aims of which are to provide a working document for the long term protection and rehabilitation of the on-site vegetation to be retained and to specify construction and maintenance requirements for the freshwater pond. In addition, to compensate further for the STIF community to be removed, it is proposed to replant an additional area on Council land within the locality, subject to Council approval, with the objective being for this vegetation to develop in the long term into an ecologically functioning STIF community.

As a whole therefore, the Proposal is expected to maintain the biodiversity values of the site and enhance these values substantially over time.

Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction

The Proposal incorporates a BMP that prescribes long term management and enhancement procedures for the fauna habitats occurring on the subject lands. The removal of habitat is restricted to only 0.16 ha of modified forest and it is proposed to replant an additional area as an off-site offset, the aim being to develop an ecologically functioning STIF community, with associated development of fauna habitat values. The proposed development will result in the temporary removal and modification of the 1.4 ha of water body but an alternative water supply, will be provided for the Grey-headed Flying-fox, both during construction and as a permanent feature of the site. Based on these considerations, the proposal is not considered likely to place any of the threatened fauna species known to, or potentially occurring on the subject lands at risk of extinction, or cause any acceleration to their decline.

Whether or not the Proposal will adversely affect critical habitat

The proposal will only affect highly modified and low to moderate value habitat for all subject species and will not affect critical habitat. The value of the existing water body as a drinking resource for the Grey-headed Flying-fox will also be retained, both during construction and in the long term.

Conclusion

The subject land contain potential habitat for the Varied Sittella, Little Lorikeet, Gang-gang Cockatoo, Powerful Owl, Barking Owl, Grey-headed Flying-fox and Eastern Bentwing-bat. Potential local populations of these species are predicted to remain viable within the locality as suitable habitat will remain on the subject land. Local populations of these species are not considered to be adversely affected by the future development.