Attachment F - Flora and Fauna Assessment

By RPS, dated April 2016

Flora and Fauna Assessment

Newcastle Urban Transformation and Transport Program
Rezoning of Surplus Rail Corridor Lands

Prepared by:

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Version / Date: Final/April 2016

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
Draft	Draft for Client Review	LV	MD	09-11-2015
Final	Submission	LV	AB	05-02-2016
V2	Submission	LV	AB	21-04-2016

Approval for Issue

Name	Signature	Date
Arne Bishop		21-04-2016

Summary

RPS Australia East Pty Ltd (RPS) was engaged by Elton Consultants on behalf of UrbanGrowth NSW to provide a Flora and Fauna Assessment to inform the Newcastle Urban Transformation and Transport Program – Rezoning of Surplus Corridor Lands from Worth Place to Watt Street Newcastle.

The objective of this assessment was to provide a description of the terrestrial and aquatic habitats available within the site for both flora and fauna, determine the likelihood of occurrence of threatened species and their habitats as well as assessing the likelihood of the proposal to have a significant impact on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act). The report recognises the relevant requirements of the Environmental Planning and Assessment Act 1979 (EP&A Act) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act).

Database searches were undertaken to identify existing records of threatened species, populations and endangered ecological communities occurring within the site and the surrounding locality. Flora and fauna surveys were undertaken across the site on 2-3 November 2015.

Flora surveys detected 26 flora species, most of which were exotic. No vegetation communities or threatened species were detected within the site.

A total of 14 fauna species were detected during surveys consisting primarily of common bird species. No threatened were fauna were detected during surveys.

Existing uses of the site as a rail corridor significantly reduce the available habitats for local flora and fauna. Only a small number of trees were found to occur within the site, and no surrounding fauna corridors are present due to the urbanised nature of the surrounding city. No aquatic habitats occur within the site.

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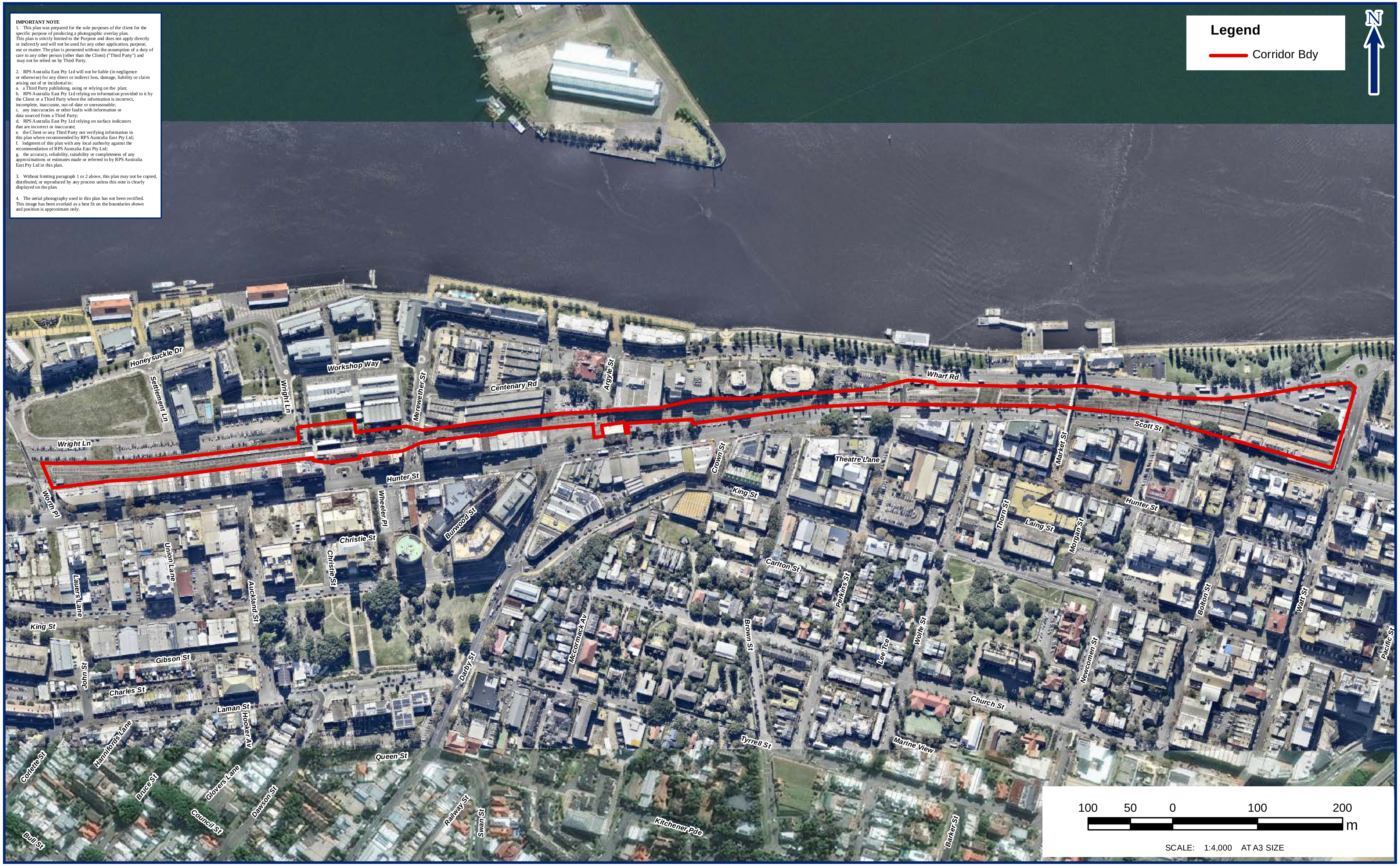
1.0 Introduction

RPS Australia East Pty Ltd (RPS) was engaged by Elton Consulting on behalf of UrbanGrowth Pty Ltd to provide a Flora and Fauna Assessment (FFA) to inform the Newcastle Urban Transformation and Transport Program – Rezoning of Surplus Corridor Lands. The corridor proposed for rezoning extends approximately 1.5 km from Worth Place to Watt Street, hereafter referred to as the 'site' (see **Figure 1**).

This assessment aims to examine the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act). The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act). Preliminary assessment was also made with regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Site Particulars

Locality	Newcastle to Civic, NSW (Refer to **Figure 1**)
LGA	Newcastle City Council
Area	The site is 4.2 hectares in total
Zoning	The land is currently zoned as Special Purpose Infrastructure (SP2)
Boundaries	The site is a disused rail corridor that dissects Newcastle from Worth Place to Watt Street, running parallel to Hunter Street. It is bordered by a combination of commercial and residential buildings and road infrastructure.
Current Land Use	The site currently supports a disused rail corridor with existing infrastructure including rail lines, over head powerlines, disused control buildings and train platforms.
Topography	The site is situated on flat land.
Hydrology	At the closest point, the site is located approximately 50 metres south of Newcastle Harbour. No hydrological features occur within the site.
Vegetation	Native vegetation within the site is highly restricted, with weeds and garden plants the dominant vegetation present.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Legend
Corridor Bdy
N
Honeysuckle Dr
Workshop Way
Settlement Ln
Wright Ln
Merewether St
Centenary Rd
Argyle St
Wharf Rd
Scott St
Theatre Lane
Crown St
Hunter St
Worth Pl
Wheeler Pl
Burwood St
Christie St
King St
Thorn St
Laing St
Morgan St
Market St
Carlton St
Union Lane
Lauers Lane
Auckland St
Perkins St
Bolton St
Watt St
Pacific St
Brown St
Lee Tce
Wolfe St
Newcomen St
McCormack Av
Darby St
Gibson St
John St
Charles St
Laman St
Hooker Av
Church St
Tyrrell St
Marine View
Queen St
Hannafords Lane
Corlette St
Bruce St
Glovers Lane
Dawson St
Council St
Bull St
Railway St
Swan St
Kitchener Pde
Barker St
100 50 0 100 200
m
SCALE: 1:4,000 AT A3 SIZE

TITLE : **FIGURE 1: SITE LOCATION**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **5/02/2016**

PURPOSE: **ECOLOGY**

VERSION (PLAN BY): A A3 (amy.obrien)

PATH: J:\JOBS\129k\129379 Newcastle Heavy Rail Corridor\10 - Drafting\Arcgis Map Documents\Eco\129379 Figure 1 Site Location A A3 20151217.mxd

CLIENT: **ELTON CONSULTING**

JOB REF: **PR129379**

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1.2 Description of the Proposal

The proposed zoning amendments applying to the rail corridor land will form part of the delivery of urban transformation, comprising a package of transport, built form and public domain improvements in and around the rail corridor lands.

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East end: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city
- West end: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Newcastle Urban Transformation and Transport Program and the objectives of NURS planning outcomes. Necessary amendments to the NLEP include:

- Amend the Land Use Zoning Map to introduce new B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones;
- Amend the Height of Building and Floor Space Ratio maps to facilitate development on select parcels of land;
- Reclassification of part of the rail surplus rail corridor to Community by amending Part 3 of Schedule 4 of the NLEP to rezone land for public open space;
- Amendment to the Land Reservation Acquisition Map to enable the proposed RE1 public open space land to be acquired by Newcastle Council; and
- Amend the key maps (as referred to in Clause 7.5 of the NLEP) to include Newcastle Railway Station Heritage building.

1.3 Scope of the Study

The scope of this flora and fauna assessment is to:

- identify vascular plant species occurring within the site, including any threatened species listed under the TSC Act and/or EPBC Act;
- identify and map the extent of vegetation communities within the site, including any Endangered Ecological Communities (EEC) listed under the TSC Act or EPBC Act;
- identify any fauna species including; threatened and migratory species, populations or their habitats, occurring within the Site and are known or likely to occur within 10 km of the site (locality);
- assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

1.4 Legislation and Policy

1.4.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as matters of National Environmental Significance (NES). Matters of NES identified in the Act include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Threatened species and communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear Actions.
- Protection of water sources from coal seam gas development.

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES require approval from the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (the Minister).

1.4.2 NSW Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) provides for the protection and management of threatened species, populations and ecological communities listed under the schedules 1, 1A and 2 of the Act. The purpose of the TSC Act is to:

- Conserve biological diversity and promote ecologically sustainable development.
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities.
- Protect the critical habitat of those species, populations and ecological communities that are endangered.
- Eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities.
- Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

1.4.3 NSW Environmental Planning and Assessment Act 1979

The proposal will be submitted for approval under Part 3 of the Environmental Planning and Assessment Act 1979 (EP&A Act), which provides an amendment to the Local Environment Plan (LEP).

1.4.4 SEPP 44 (Koala Habitat Protection)

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range, and reverse the current state trend of koala population decline. SEPP 44 applies to the Newcastle LGA.

1.5 Qualifications and Licensing

Qualifications

This report was written by Lauren Vanderwyk BSc and reviewed by Arne Bishop B. Env Sc. of RPS. The academic qualifications and professional experience of all RPS consultants involved in the project are documented in **Appendix 4**.

Licencing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2015);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2016);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2016); and

Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2017).

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Legend

N

Proposed Parcel Plan

Proposed Rezoning

- B4 - Mixed use
- RE1 - Public recreation
- SP3 - Tourist
- SP2 - Infrastructure

Parcel 01
Parcel 02
Parcel 03
Parcel 04
Parcel 05
Parcel 06
Parcel 07
Parcel 08
Parcel 09
Parcel 10
Parcel 11
Parcel 12
Parcel 13
Parcel 14
Parcel 15
Parcel 16

Honeysuckle Dr
Workshop Way
Settlement Ln
Wright Ln
Merewether St
Centenary Rd
Argyle St
Wharf Rd
Scott St
Crown St
Theatre Lane
Market St
Hunter St
Worth Pl
Wheeler Pl
Burwood St
Christie St
King St
Thorn St
Laing St
Morgan St
Union Lane
Auckland St
Carlton St
Parkins St
Bolton St
Watt St
Laurers Lane
Gibson St
John St
Charles St
Laman St
Hooker Av
Hannifords Lane
Brown St
Lee Tce
Wolfe St
Newcomen St
Church St
Cottette St
Bruce St
Glovers Lane
Dawson St
Council St
Queen St
Tyrrell St
Marine View
Railway St
Swan St
Kitchener Pde
Barker St
Pit St
Bull St
Mccormack Av
Addy St

100 50 0 100 200 m

SCALE: 1:4,000 AT A3 SIZE

TITLE : **FIGURE 2: PROPOSED REZONING**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **6/04/2016**

PURPOSE: **ECOLOGY**

VERSION (PLAN BY): D A3 (Natalie.Wood)

PATH: J:\JOBS\129k\129379 Newcastle Heavy Rail Corridor\10 - Drafting\Arcgis Map Documents\Eco\129379 Figure 2 Prop Rezoning D A3 20160406.mxd

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2.0 Methodology

Field work was undertaken on the 2-3 November 2015 by an RPS Ecologist. The survey methodology outlined below was developed in recognition of the highly disturbed nature of the site.

2.1 Desktop Assessment

2.1.1 Literature Review

A review of relevant information was undertaken to provide an understanding of ecological values occurring or potentially occurring on the site and locality (i.e. within 10km of the site). Information sources reviewed included:

- Review of fauna and flora records contained in the Office of Environment and Heritage (OEH 2015) Atlas of NSW Wildlife within a 10 km radius of the site; and
- Review of fauna and flora records contained in the Department of the Environment, (DoE 2015) Protected Matters Search within a 10 km radius of the site.

2.1.2 Weather Conditions

The prevailing weather conditions during the site survey period are presented in **Table 1** below.

Table 1 Prevailing Weather Conditions*

Date	Minimum Temperature (°C)	Maximum Temperature (°C)	Rain (mm)	Sunrise-Sunset	Moon Rise-Moon Set
2 Nov 2015	19.3	30.1	1.8	05:23-18:49	00:04-10:53
3 Nov 2015	20.0	21.5	1.6	05:23-18:50	00:50-11:49

*Sources: http://www.bom.gov.au/climate/dwo/201511/html/IDCJDW2097.201511.shtml
http://www.ga.gov.au/bin/geodesy/run/gazmap_sunrise?placename=cooranbong&placetype=0&state=0
http://www.ga.gov.au/bin/geodesy/run/gazmap_moonrise?placename=Cooranbong&placetype=0&state=0#loc

2.2 Flora Survey

2.2.1 Vegetation Mapping

Desktop analysis of regional mapping of the site and its surrounds was informed by large-scale vegetation mapping projects and aerial photography, including:

- Preliminary consultation of the Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS) Extant Vegetation of the Lower Hunter and Central Coast Map (NPWS 2003) to determine the broad categorisation of the site; and
- Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) of the site.

2.2.2 General Flora Survey

Due to the linear and highly disturbed nature of the site, the approach taken to assess flora within the site was to document the presence of weeds and remaining native species as opposed to a full botanical survey as outlined in section 3.1.19 of the draft Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004). The site was traversed by foot using the random meander technique over its entire length.

The location of the random meander is shown in **Figure 3** and a flora list is contained within **Appendix 1**.

2.3 Fauna Survey

With consideration to the disturbed nature of the site, fauna survey methods included the use of Anabats and opportunistic surveys during fieldwork.

2.3.1 Avifauna

The observation of avifauna within the site was undertaken via opportunistic census during diurnal fieldwork. Other features, such as evidence of breeding, dominant species etc. were also noted. Threatened species that have been previously recorded in the locality were specifically targeted during surveys.

2.3.2 Microchiropteran Bats

Microbat echolocation calls were recorded using Anabat II Detector and CF ZCAIM units set to remotely record for the entire night (6pm to 6am). The site had one night of sampling using two Anabat units, with emphasis placed on those areas deemed likely to provide potential roosting and flyway sites for microbats. The locations of the Anabat sites are shown in **Figure 3**.

Bat call analysis was undertaken by Dr Anna McConville of Echo Ecology who is experienced in the analysis of bat echolocation calls. Each call sequence ('pass') was assigned to one of three categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species;
- Probable - Pass identified to species level and there is a low chance of confusion with another species; or
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species.

Appendix 3 shows the Anabat reports with all results whilst **Figure 3** shows the Anabat locations.

2.3.3 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Specifically, the following indicators were sought:

- Distinctive scats left by mammals;
- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;
- Feeding scars on Eucalyptus trees made by Gliders;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Aural recognition of bird and frog calls;
- Skeletal material of vertebrate fauna; and
- Searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, and diggings).

2.4 Habitat Survey

An assessment of the relative habitat value present within the site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources in the site favoured by known

threatened species from the locality. The assessment also considered the potential value of the Site (and surrounds) for all major guilds of native flora and fauna. Habitat assessment included:

- presence, size and types of tree hollows;
- presence of rocks, logs, caves, rocky outcrops, leaf litter, overhangs and crevices;
- vegetation complexity, structure and quality;
- presence of freshwater or estuarine aquatic habitats, noting permanency;
- connectivity to adjacent areas of habitat;
- extent and types of disturbance;
- presence of foraging opportunities such as flowering eucalypts, fruits, seeds or other nectar bearing native plants; and
- presence and abundance of various potential prey species.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

2.5 Survey Limitations

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence, threatened species may be absent from some areas where potential habitat exists for extended periods and this might be the case for the above-mentioned opportunistic species. This limitation has been reduced to some extent by the large amount of survey work that has been undertaken throughout the local area, as well as local knowledge of species occurrence.

In these instances, a precautionary approach has been adopted; as such ‘assumed presence’ of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

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Legend

- Corridor Bdy
- Anabats
- Flora Transects

N

Honeysuckle Dr
Settlement Ln
Workshop Way
Wright Ln
Merewether St
Centenary Rd
Argyle St
Wharf Rd
Scott St
Market St
Wright Ln
Hunter St
Worth Pl
Wheeler Pl
Burwood St
Christie St
Crown St
Theatre Lane
King St
Thorn St
Laing St
Morgan St
Hunter St
Union Lane
Lauer's Lane
Auckland St
Carlton St
Perkins St
Bolton St
Watt St
King St
Gibson St
John St
Charles St
Laman St
Hooker Av
Darby St
McCormack Av
Brown St
Lee Tce
Wolfe St
Newcomen St
Church St
Hamilton's Lane
Tyrrell St
Marine View
Corlette St
Bruce St
Glovers Lane
Queen St
Dawson St
Council St
Railway St
Swan St
Kitchener Pde
Barker St
Buif St

100 50 0 100 200 m

SCALE: 1:4,000 AT A3 SIZE

TITLE : **FIGURE 3: FLORA AND FAUNA SURVEY LOCATIONS**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **5/02/2016**

PURPOSE: **ECOLOGY**

VERSION (PLAN BY): A A3 (amy.obrien)

PATH: J:\JOBS\129k\129379 Newcastle Heavy Rail Corridor\10 - Drafting\Arcgis Map Documents\Eco\129379 Figure 3 F& F B A3 20160205.mxd

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3.0 Results

3.1 Desktop Assessment

The results from the EPBC Protected Matters and NSW Wildlife Atlas searches identified 15 threatened flora species, 47 threatened fauna species, three ecological communities (**Table 2**) and eight terrestrial migratory species (**Table 3**) as having been recorded or having the potential to occur within a 10 km radius of the study area. A likelihood of occurrence assessment is provided in Section 5. The inclusion of marine and aquatic fauna for the purpose of this assessment is not required and therefore has not been included in the results.

Table 2 Threatened Flora and Fauna Desktop Search Results

Family	Scientific name	Common name	TSC Act	EPBC Act	Records within 10 km
Flora					
Asteraceae	*Rutidosis heterogama*	Heath Wrinklewort	V	V	11
Elaeocarpaceae	*Tetratheca juncea*	Black-eyed Susan	V	V	51
Fabaceae (Faboideae)	*Pultenaea maritima*	Coast Headland Pea	V	-	4
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Eucalypt	V	V	0
	Eucalyptus parramattensis subsp. *decadens*	Earp's Gum	V	V	3
	Melaleuca biconvexa	Biconvex Paperbark	V	V	1
	Syzygium paniculatum	Magenta Lilly Pilly	E	V	1
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V	0
	Diuris praecox	Rough Doubletail	V	V	14
	Pterostylis gibbosa	Illawarra Greenhood	E	E	0
	Phaius australis	Lesser Swamp-orchid		E	0
Polygonaceae	*Muehlenbeckia costata*	Scrambling Lignum	V	-	1
Proteaceae	*Grevillea parviflora subsp. parviflora*	Small-flower Grevillea	V	V	0
	Grevillea shiressii	-	V	V	1
Zannichelliaceae	*Zannichellia palustris*	-	E	-	23
Birds					
Anseranatidae	*Anseranas semipalmata*	Magpie Goose	V	-	7
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V	-	2
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E	-	30
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	11
Accipitridae	*Circus assimilis*	Spotted Harrier	V	-	3
	Hieraaetus morphnoides	Little Eagle	V	-	1
	Pandion cristatus	Eastern Osprey	V	M	12
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E	-	3
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V	-	19
	Haematopus longirostris	Pied Oystercatcher	E	-	27
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE, M	1,907
	Calidris tenuirostris	Great Knot	V	-	33

Family	Scientific name	Common name	TSC Act	EPBC Act	Records within 10 km
	Limicola falcinellus	Broad-billed Sandpiper	V	-	41
	Limosa limosa	Black-tailed Godwit	V	-	290
	Numenius madagascariensis	Eastern Curlew	-	CE, M	138
	Xenus cinereus	Terek Sandpiper	V	-	473
Charadriidae	*Charadrius leschenaultii*	Greater Sand-plover	V		6
	Charadrius mongolus	Lesser Sand-plover	V		178
Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	V	-	2
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	0
Pardalotidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V	-	2
	Grantiella picta	Painted Honeyeater	V	V	0
	Lathamus discolor	Swift Parrot	E	E	1
	Neophema pulchella	Turquoise Parrot	V	-	2
Strigidae	*Ninox strenua*	Powerful Owl	V	-	13
Tytonidae	*Tyto longimembris*	Eastern Grass Owl	V	-	1
	Tyto novaehollandiae	Masked Owl	V	-	1
Meliphagidae	*Epthianura albifrons*	White-fronted Chat	V	-	57
	Anthochaera phrygia	Regent Honeyeater	CE	CE	0
Frogs					
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	745
	Litoria littlejohni	Littlejohn's Tree Frog	V	V	0
Reptiles					
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Snake	E	V	0
Mammals					
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	0
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	3
Potoroidae	*Potorous tridactylus tridactylus*	Long-nosed Potoroo	-	V	0
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V	-	2
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	34
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V	-	3
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V	-	13
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V	-	1
	Myotis macropus	Southern Myotis	V	-	12
	Chalinolobus dwyeri	Large-eared Pied Bat	V	V	0
	Miniopterus australis	Little Bentwing-bat	V	-	11
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	15
	Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	10
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse	-	V	0

Family	Scientific name	Common name	TSC Act	EPBC Act	Records within 10 km
Ecological Communities					
Subtropical and Temperate Coastal Saltmarsh (EPBC)			E	V	0
Central Hunter Valley Eucalypt Forest and Woodland			E	CE	0
Lowland Rainforest of Subtropical Australia			E	CE	0

Note: V = Vulnerable
E = Endangered
CE = Critically Endangered
M = Migratory

Table 3 Potentially occurring Migratory Terrestrial Species

Scientific Name	Common Name	EPBC Act Status
Cuculus optatus	Oriental Cuckoo	M
Hirundapus caudacutus	White-throated Needletail	M
Merops ornatus	Rainbow Bee-eater	M
Monarcha melanopsis	Black-faced Monarch	M
Monarcha trivirgatus	Spectacled Monarch	M
Motacilla flava	Yellow Wagtail	M
Myiagra cyanoleuca	Satin Flycatcher	M
Rhipidura rufifrons	Rufous Fantail	M

3.2 Flora Survey

Flora surveys detected a total of 26 flora species across the site, of which 17 were exotic and nine were native species. No threatened species were detected, and due to the disturbed nature of the site, no vegetation communities exist within the site boundaries. A full inventory of recorded flora species is included in **Appendix 1**.

3.2.1 Vegetation Mapping

A review of regional mapping - 'Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS)' resulted in no vegetation communities having been mapped as occurring within the site. This was evident during the site inspection as only sporadic urban trees and weeds were identified within the site (refer to **Plates 1** and **2**).

Plate 1 Existing rail within the site

Plate 2 Infrastructure within the site, highlighting the lack of vegetation and habitat

3.3 Fauna Survey

The following sections provide the results of the fauna surveys undertaken for the Project throughout the site. Survey techniques employed to determine the composition of fauna species on site resulted in a total of 14 species being detected including; 11 bird, one reptile and two microbat species. A full list of the fauna species recorded within the site is provided in **Appendix 2**. The results for each group are discussed further below.

3.3.1 Avifauna

A total of 11 bird species were recorded during field surveys. The most commonly recorded bird was the feral Rock Dove (*Columba livia*) which was observed regularly throughout the site inspection. Native birds including the Masked Lapwing (*Vanellus miles*) and Australian Magpie (*Cracticus tibicen*) were observed, and a dead Pied Cormorant (*Phalacrocorax varius*) was detected on the tracks.

No threatened bird species were recorded on site.

An inventory of fauna species recorded on site is provided in **Appendix 2**.

3.3.2 Herpetofauna

One reptile was detected on site, specifically the Dark-flecked Garden Skink (*Lampropholis delicata*) which was seen in moderate numbers throughout the site inspection, residing in the rocky substrate of the tracks.

No threatened reptile or amphibian species were detected on site during surveys.

3.3.3 Microchiropteran Bats

A total of two microbat species were detected via the use of Anabat echo-location call recorders. Both species were common species including Gould's Wattled Bat (*Chalinolobus gouldii*) and White-striped Free-tailed Bat (*Tadarida australis*).

Refer to **Appendix 2** for a detailed list of recorded species and **Appendix 3** for the Anabat Call Recording reports.

3.4 Habitat Survey

Flora and fauna habitats are extremely limited within the site, as a result of its most recent use as an active railway corridor. A small number of individual trees were identified within the corridor, none of which were hollow bearing species. The trees do however provide foraging resources for local bird and microbat species when in flower. Flora is limited to primarily weedy ground cover, which provides limited resources for most fauna. Dark-flecked Garden Skinks were observed inhabiting the rocky substrate throughout the site, which may provide a food source for common predatory bird species.

Artificial structures including the existing platforms, bridges and buildings provide suitable habitat for numerous microbat species that are known to occur in the area and reside in man-made structures. Results detected two common microbat species, however no threatened species were detected within the site.

Habitat corridors are absent from the surrounding areas due to the urbanised nature of the surrounding city. Subsequently, use of the site by most fauna is highly limited, with only highly mobile species having access to the site.

No arboreal habitats and no aquatic habitats occur within the site.

3.5 State Environmental Planning Policy No. 44 (Koala Habitat Protection)

Assessment of potential koala habitat under SEPP 44 requires the following steps be undertaken:

(a) Identification of 'potential Koala habitat' within the proposed development area; if the total tree cover contains 15% or more of the Koala food tree species listed in Schedule 2 of SEPP 44 then it is deemed to be 'potential Koala habitat'. Identification of 'potential Koala habitat requires the determination of the presence of 'core Koala habitat';

(b) Identification of 'core Koala habitat' within the development area. 'Core Koala habitat' is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population;

(c) Identification of 'core Koala habitat' will require that a plan of management must accompany the DA application;

(d) If the rezoning of lands, other than to environmental protection, involves potential or core Koala habitat then the Director of planning may require a local environmental study be carried out.

No Koala Feed trees listed under Schedule 2 of SEPP 44 were identified within the site. The site contains almost no vegetation and is situated within a highly urbanised city environment. Therefore, the site does not contain potential or core koala habitat.

4.0 Impact Assessment

The proposal involves a zoning change from its current zoning SP2 Special Purpose Infrastructure to B4 Mixed Use, SP3 Tourist and RE1 Public Recreation zones. Although the change of zoning will permit an alternate type of development to be constructed within the site, the current nature of the site in terms of habitat availability for local flora and fauna will not be decreased. As previously discussed, habitats within the site are incredibly disturbed and in parts non-existent. Based on this, the rezoning will enhance, if anything, the current state of the available habitats by providing green space areas including trees, grass and shrubs in which local fauna can forage.

As no threatened flora and fauna were detected during surveys and their presence is considered unlikely, impacts as a result of the proposed rezoning are not expected to be significant, particularly with an improved outcome of additional green spaces.

5.0 Threatened Species and Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act 1995 and/or EPBC Act 1999) that have been gazetted and recorded within a 10 km radius of the site have been considered within this assessment. Endangered Ecological Communities (EECs) known from the broader area have also been addressed. Each species / community is considered for its potential to occur within the site.

This assessment deals with the following heads of consideration in tabulated form (refer to **Table 4** overleaf):

'Species / Community'/ Population' – Lists each threatened species / population / EEC with potential to occur within the project area. The status of each threatened species or community under the TSC Act 1995 and EPBC Act 1999 are also provided.

'Habitat Description' – Provides a brief account of the species / community / population and the preferred habitat attributes required for the existence / survival of each species / community.

'Likelihood of Occurrence within the site – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the site in terms of the aforementioned habitat description. This assessment also takes into account local habitat preferences, results of current field investigations, data gained from various sources (such as OEH Atlas of NSW Wildlife, HBOC records etc) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'**Potential for Impact'** – Assesses the potential of each species/community/population to be impacted within the site.

Table 4 Threatened Species/Communities Assessment Table

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Plants			
Rutidosis heterogama Heath Wrinklewort (V, V*)	This small herb has been recorded from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. On the coast it is located north from Wyong to Newcastle. It grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Tetratheca juncea Black-eyed Susan (V, V*)	Occurs in a variety of forested and heathy habitats. Locally found in Open Forests and Woodlands with dense, undisturbed understorey, often in association with *Angophora costata* / *Corymbia gummifera* on slopes with south-easterly aspects.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pultenaea maritima Coast Headland Pea (V)	This species occurs in NSW and QLD. In NSW it has been recorded from Newcastle north to Byron Bay. Occurs in grasslands, shrublands and heath on exposed coastal headlands and adjoining low coastal heath.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Eucalyptus camfieldii Camfield's Stringybark (V, V*)	A small/ medium sized tree with a scattered distribution from Waterfall in the south to Raymond Terrace in the north. Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone or coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of E. *oblonga* (Narrow-leaved Stringybark), *E. capitellata* (Brown Stringybark) and *E. haemastoma* (Scribbly Gum).	All canopy trees within the site were identified and this species was not detected. It is **unlikely** to occur the site	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Eucalyptus parramattensis subsp. *decadens* Earp's Gum (V, V*)	Red Gum species that grows in dry sclerophyll woodland on sandy soils, often in low damp sites. Locally this species occurs almost exclusively in association with Kurri Sand Swamp Woodland (KSSW) and ecotonal areas.	All canopy trees within the site were identified and this species was not detected. It is **unlikely** to occur within the site.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Melaleuca biconvexa Biconvex Paperbark (V, V*)	A shrub to small tree, which grows in poorly drained areas on the Central Coast with outlying populations at Jervis Bay and Port Macquarie. Records in the Hunter Region are confined to western Lake Macquarie. It may occur in dense stands adjacent to watercourses, in association with other Melaleuca species or as an understorey species in wet forest.	All canopy trees within the site were identified and this species was not detected. Additionally, suitable habitat for this species was not present. It is **unlikely** to occur within the site.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Syzygium paniculatum Magenta Lilly Pilly (E, V*)	A shrub to small tree, found in sub-tropical and littoral rainforest on sandy soils or sheltered gullies mostly near water courses. Distributed between Bulahdelah and Jervis Bay. Hunter Region records are confined to the Lake Macquarie hinterland.	All canopy trees within the site were identified and this species was not detected. Additionally, suitable rainforest habitats for this species were not present. It is **unlikely** to occur within the site.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Cryptostylis hunteriana Leafless Tongue-orchid (V, V*)	A very rare leafless, saprophytic orchid, which has a symbiotic relationship with a mycorrhizal fungi which provides the plant with all its nutrient requirements. This orchid remains underground for the majority of its lifecycle, flowering periodically, when conditions are optimal to reproduce. This species is extremely cryptic as it does not flower every year. This species is known to occur within a range of habitats including woodlands to swamp heaths. Within the Hunter region, larger populations have been typically found in woodland dominated by *Eucalyptus racemosa* (Scribbly Gum) and prefer areas with an open grassy understorey.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Diuris praecox Rough Doubletail (V, V*)	A small, terrestrial herb which grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year and produces leaves and flowers in winter. In the Hunter Valley, this species has been recorded in *Corymbia maculata* (Spotted Gum) - *Eucalyptus fibrosa* (Ironbark) open forest, *Eucalyptus pilularis* (Blackbutt) open forest, *Eucalyptus haemastoma* (Scribbly Gum) woodland, *Eucalyptus piperita* (Sydney Peppermint) - *Angophora costata* (Smooth-barked Apple) forest as well as *Eucalyptus tereticornis* (Forest Red Gum), *Melaleuca* and *Casuarina glauca* dominated riparian or swamp areas.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pterostylis gibbosa Illawarra Greenhood (V, V*)	Ground-dwelling orchid which grows in open forest or woodland on flat or gently sloping land with poor drainage. It is a deciduous orchid that is only visible above the ground between late summer and spring, only when soil moisture levels can sustain its growth. In the Hunter region, the species grows in open woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus tereticornis* (Forest Red Gum) and *Callitris endlicheri* (Black Cypress Pine). Only five locations are known for this species, one of those being located in Milbrodale in the Hunter Valley.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Phaius australis Lesser Swamp-orchid (E, E*)	This terrestrial orchid occurs in southern Queensland and northern NSW, with known populations occurring in Byron Bay, South Byron bay, South Ballina, SW Yamba, Grafton and Coffs Harbour. This species is associated with coastal wet heath/sedgeland wetlands, swampy grasslands or swampy forest.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Muehlenbeckia costata Scrambling Lignum (V)	In NSW, this species occurs from northern NSW to the Blue Mountains. It grows in coarse sandy soils and peat in heath, mallee and open eucalypt woodland on granite or acid volcanic outcrops at higher altitudes.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea (V, V*)	Occurs in light, clayey soils in woodlands. Most plants appear capable of suckering from a rootstock. Relatively widespread within the Cessnock LGA. Occurs within Werakata National Park. Much confusion surrounds the taxonomy of this species and other similar Grevillea taxa and a NPWS-funded study of the species is currently in progress.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Grevillea shiressii (V, V*)	This species is known from only two populations neat Gosford on tributaries of the lower Hawkesbury River. Both populations occur in the Gosford LGA. Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Zannichellia palustris (E)	This species is a submerged aquatic plant known from the lower Hunter and in Sydney Olympic Park. Grows in fresh or slightly saline stationary or slowly flowing waters.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Amphibians			
Litoria aurea Green and Golden Bell Frog (E, V*)	Inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. Thought to be displaced from more established study areas by other frog species, thus explaining its existence on disturbed study areas. Previously widespread within the region, but now sparsely distributed within the Lower Hunter and Central Coast areas. A relatively stable population occurs on Kooragang Island.	No aquatic habitat exists within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Litoria littlejohni Littlejohn's Tree Frog (V, V*)	A pale brown frog with dark speckles which occurs along permanent rocky creeks with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Occurs on the plateaus and eastern plains of the Great Dividing Range. Records within the Hunter Region occur from within the Watagan State Forest.	No aquatic habitat exists within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Reptiles			
Hoplocephalus bungaroides Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering in rock crevices and under flat sandstone rocks on 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.	No Hawkesbury sandstone or rocky habitat exists within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Avifauna			
Anseranas semipalmata Magpie Goose (V)	Within NSW, populations disappeared by 1880, however, since 1982 the species has been recorded in Macquarie Marshes (central NSW) and in Seaham Swamp on the Williams River (Lower Hunter Valley). Found on shallow wetlands (especially those with a dense growth of rushes or sedges), drying ephemeral swamps, wet grasslands and floodplains, often roosting in fringing Paperbarks (*Melaleuca* spp.). The diet of this species is composed of grass seeds and sedge rhizomes.	No suitable swamp or floodplain habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ptilinopus superbus Superb Fruit-Dove (V)	Occurs in rainforest and similar closed forests including, monsoon forest, regrowth, lantana thickets, woodland adjoining rainforest at all altitudes.	No rainforest habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ephippiorhynchus asiaticus Black-necked Stork (V)	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds. Within the Hunter Region it occurs spasmodically on freshwater or estuarine wetlands, along coastal and near coastal environments such as Gloucester.	No bodies of water suitable for this species occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Botaurus poiciloptilus Australasian Bittern (E, E*)	The distribution of this species ranges from south-east Queensland to south-east South Australia, Tasmania and south-west of Western Australia. Preferred habitat includes permanent and seasonal freshwater habitats. It forages in shallow water in wetlands with tall dense vegetation.	No aquatic habitat occurs within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Circus assimilis Spotted Harrier (V)	Occurs throughout the Australian mainland, except in densely forests or wooded habitats of the coast, escarpments and ranges. Individuals disperse widely in NSW and comprise a single population. 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.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Hieraaetus morphnoides Little Eagle (V)	Can be found across most of Australia, but more commonly found near coastal to inland regions in NSW and Victoria. This species is part-migratory to nomadic and dispersive in some areas.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pandion cristatus Eastern Osprey (V, M*)	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern NSW coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south eastern Australia. There are a handful of records from inland areas.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Burhinus grallarius Bush Stone-curlew (E)	Prefers open woodland, dry watercourses with fallen branches, leaf litter and sparse grass. Also occurs in coastal scrub, mangrove fringes, golf courses, rail reserves, wooded remnants on roadsides, orchards and plantations. Breeding pairs observed in near shore habitats in south-western Port Stephens and Brisbane Waters.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Haematopus fuliginosus Sooty Oystercatcher (V)	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands. This species occurs in small numbers distributed evenly along the NSW coast. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	No suitable coastal or estuarine habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Haematopus longirostris Pied Oystercatcher (E)	An unmistakable coastal black and white wader that has a bright orange-red bill, eye-ring and iris, and coral pink legs and feet. This species is found around the entire Australian coastline (and offshore). This species occurs in association with intertidal flats of inlets and bays, open beaches and sandbanks.	The site does not contain suitable aquatic environments for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Rostratula australis	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where	No suitable aquatic habitats occur within the site for	Unlikely to occur therefore it is unlikely to be impacted

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Australian painted Snipe (E, EM*)	there is a cover of grasses, lignum, low scrub or open timber. This species has been recorded in Pambalong N.R., Ash Island and Lenaghan's Flat.	this species. It is **unlikely** to occur.	upon as a result of the proposal. An AoS is not required for this species.
Calidris ferruginea Curlew Sandpiper (E, M*)	Curlew Sandpipers generally occur on intertidal mudflats in coastal areas such as estuaries bays inlets and lagoons. Have also been located on lakes, dams, waterholes and sewage farms. Forages in mudflats and nearby shallow waters.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Calidris tenuirostris Great Knot (V)	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps. Typically, the Great Knot roosts in large groups in open areas, often at the water's edge or in shallow water close to feeding grounds. It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature. A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia.	No suitable aquatic habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Limicola falcinellus Broad-billed Sandpiper (V, M*)	In Australia, the Broad-billed Sandpiper is most common on the north and north-west coasts and occur regularly at scattered localities in southern Australia, where they are usually seen singly. Occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Limosa limosa Black-tailed Godwit (V, M*)	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Numenius madagascariensis Eastern Curlew (CE*M*)	The Eastern Curlew is a large wader with a long neck, long legs, and a heavy bill that curves downwards. Within Australia, the Eastern Curlew has a primarily coastal distribution. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbors, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of sea grass.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Xenus cinereus Terek Sandpiper (V)	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (Halosarcia spp.). Birds are seldom near the edge of water, however, birds may wade into the water. Less often seen on sandy or shingle beaches, or on rock or coral reefs or platforms, Terek Sandpipers are occasionally sighted around drying sewage ponds and saltpans if surrounded by mudflats. The species is also found around brackish coastal swamps, lagoons and dune-lakes; and also on gravel or rocky edges of estuarine pools and freshwater river-pools. Very occasionally, birds use swampy, grassy or cultivated paddocks near the coast.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Charadrius leschenaultii Greater Sand-plover (V)	This species occurs in coastal environments of all Australian states, though greatest numbers occur in northern Australia. The habitats in Australia are non-breeding grounds and are almost entirely coastal, inhabiting littoral and estuarine habitats. Feed from the surface of wet sand or mud on open intertidal flats of sheltered embayments, lagoons and estuaries.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Charadrius mongolus Lesser Sand-plover (V)	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Irediparra gallinacea Comb-crested Jacana (V)	This distinctive water bird occurs in northern and eastern Australia, with main populations occurring across the top end. It inhabits permanent freshwater wetlands either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies or fringing and aquatic vegetation.	No suitable aquatic habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Dasyornis brachypterus Eastern Bristlebird (E, E*)	Found in dense, low vegetation including heath and open woodland with a heathy understorey; in northern NSW occurs in open forest with tussocky grass understorey.	Dense vegetation on which this species depends does not persist within the site, and the known populations of this species do not occur within 10km of the study area. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Glossopsitta pusilla Little Lorikeet (V)	The Little Lorikeet extends from Cairns to Adelaide coastally and to inland locations. Commonly found in dry, open eucalypt forests and woodlands. Can be found in roadside vegetation to woodland remnants. The Little Lorikeet feeds on abundant flowering Eucalypts, but will also take nectar from *Melaleuca* sp and Mistletoe sp. *Eucalyptus albens* (White Box) and *E. melliodora* (Yellow Box) are favoured food sources on the western slopes in NSW. On the eastern slopes and coastal areas favoured food sources are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
	Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Nesting takes place in hollow-bearing trees.		
Grantiella picta Painted Honeyeater (V, V*)	This small honeyeater is nomadic throughout its range and occurs at low densities. Almost all breeding occurs on the inland slopes of the Great Dividing Range. Occurs in Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. It specialises on the fruits of mistletoe growing in eucalypts and acacias.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Lathamus discolor Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging study areas often vary from year to year. Nests only in Tasmania, but regularly visits the Hunter Region in winter. Visits the Hunter Region when food sources are abundant or food sources are lacking in other areas. Food sources used in the Hunter include *Eucalyptus robusta* (Swamp Mahogany) on the coast, and near coastal to inland the Swift Parrot uses *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark) and *E. crebra* (Narrow-leaved Ironbark). Occasional records have come from *E. alba* (White Box) and *E. sideroxylon* (Mugga Ironbark). These food source trees have been recorded as roosting sites for Swift Parrots.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Neophema pulchella Turquoise Parrot (V)	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ninox strenua Powerful Owl (V)	Occurs in wet or dry sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas. Roosts in dense vegetation within such species as *Syncarpia glomulifera* (Turpentine), *Allocasuarina littoralis* (Black She-Oak), *Acacia melanoxylon* (Blackwood), *Angophora floribunda* (Rough-barked Apple), *Exocarpos cupressiformis* (Cherry Ballart) and *Melaleuca nodosa* (Ball Honeymyrtle). Many records across the Hunter region, a lot coastal.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate / preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well. Recorded at Medowie, Heddon Greta and the Dungog area.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Tyto longimembris Eastern Grass Owl (V)	In NSW, they are more likely to be resident in the north-east. Grass Owl numbers can fluctuate greatly, increasing especially during rodent plagues. They are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Epthianura albifrons White-fronted Chat (V)	This species is found in damp open habitats, particularly estuarine and marshy grounds, as well as wetlands containing saltmarsh, bordered by open grasslands or lightly timbered lands. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the White-fronted Chat is often observed in open grassy plains, saltlakes and saltpans that are along the margins of rivers and waterways The species is sensitive to human disturbance and is not found in built areas.	No saltmarsh habitat suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Anthochaera phrygia Regent Honeyeater (CE, E)	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Coastal swamp forests in Lower Hunter are used when more western resources fail. The main feed tree for coastal areas is *Eucalyptus robusta* (Swamp Mahogany). Hunter records are more common in near coastal areas such as Cessnock LGA. Feed trees in this region are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. crebra* (Narrow-leaved Ironbark) and various stringybark sp.. Nests mainly west of the divide, although local breeding attempts have occurred at Quorrobolong.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Mammals			
Dasyurus maculatus Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges.	No suitable habitat occurs within the site, and the site is situated in a highly developed urban area. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Phascolarctos cinereus Koala (V, V*)	Occurs in forests and woodlands where it requires suitable feed trees (particularly Eucalyptus spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Records from the Lower Hunter Region are largely confined to the greater Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains, with a small number of records from Cessnock LGA.	No feed trees listed under Schedule 2 of SEPP 44 were detected within the site. The site is highly disturbed with no canopy trees, and occurs in a highly urbanised area. It is therefore considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Potorous tridactylus tridactylus Long-nosed Potoroo (V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to *Isoodon macrourus* (Northern Brown Bandicoot). Records exist from the Karuah vicinity and the Gosford LGA.	No rainforest, wet sclerophyll forest or heathland occurs within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Petaurus norfolcensis Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. This species also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species. Widely distributed across the lower hunter region.	No suitable vegetation occurs within the site, due to its previous use as a rail corridor. The site situated in a highly urbanised environment. Therefore this species is unlikely to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	This species forages over a large area for nectar/fruits. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforests. Frequently observed to forage in flowering Eucalypts. May occur anywhere within the Hunter Region where food or roosting resources are available.	This species is known to occur within the site's locality, most likely due to surrounding fig trees in which this species feeds. Whilst this species may fly over the site, there is no suitable habitat within the site on which this species could forage or roost. Therefore, this species is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	This wide-ranging species can be found across northern and eastern Australia. In NSW this species occurs both east and west of the Great Dividing Range, but not on it. It roosts singly or in groups up to six, in tree hollows and buildings. Forages for insects above the canopy.	This species was not detected during surveys, and only three records occur within a 10km radius of the site. It is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Mormopterus norfolkensis Eastern Freetail-bat (V)	This species is distributed south of Sydney extending north into south-eastern Queensland. There are no records west of the Great Dividing Range. Most records of this species have been reported from dry Eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat for this species, It is a predominantly tree-dwelling species, roosting in hollows or behind loose bark in mature Eucalypts. Widely distributed across the Lower Hunter Region.	This species was not detected during surveys, and only 13 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of *Hirundo ariel* (Fairy Martin), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Hunter Region records for this species are largely confined to the Watagan Mountains, but it has been recorded on the southern side of Port Stephens.	No record of this species within 10km and no suitable cave structures required for roosting occur in the nearby vicinity. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows and caves. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Lower Hunter Region.	This species was not detected during surveys, and only one record occurs within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Myotis macropus Southern Myotis (V)	Usually found near bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost site. Although usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest, woodland, and swamp forest. Roosts in small colonies of between 15 and several hundred individuals in caves, mines and disused railway tunnels. A number of records from the Central Coast, with fewer numbers in the Lower Hunter Region and Central Hunter Region (RPS pers. obs.).	This species was not detected during surveys, and only 12 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Miniopterus australis Little Bentwing-bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests. Requires caves or similar structures for roosting habitat. Largely confined to more coastal areas in the Lower Hunter Region.	This species was not detected during surveys, and only 11 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Miniopterus schreibersii oceanensis Eastern Bentwing-bat (V)	This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat. Widely distributed across the Lake Macquarie and Lower Hunter Regions.	This species was not detected during surveys, and only 15 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Scoteanax rueppellii Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ecotones. This species roosts in tree hollows and is relatively widespread within the Lower Hunter Region.	This species was not detected during surveys, and only 10 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pseudomys novaehollandiae New Holland Mouse (V*)	This species has a patchy distribution within open woodlands, heathlands and in hind dune vegetation throughout Eastern Australia. In the Hunter Region the species stronghold is in the Myall Lakes region.	No suitable heathland habitat occurs within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ecological Communities			
Subtropical and Temperate Coastal Saltmarsh (EPBC) (CE*)	This vegetation community occurs in coastal areas under regular intermittent tidal influence. Generally restricted to the upper intertidal environment. Coastal Saltmarsh consists mainly of salt-tolerant vegetation including grasses, herbs, sedges, rushes and shrubs. There is often a degree of endemism at the species level.	Due to the previous activities associated with the site, no vegetation commensurate with a vegetation community exists. The site is highly disturbed and still contains infrastructure associated with the rail corridor. This EEC **does not** occur.	Does not occur therefore it is **unlikely** to be impacted upon as a result of the proposal. An AoS is not required for this species.
Central Hunter Valley Eucalypt Forest and Woodland (CE*)	This ecological community occurs in the Hunter Valley region of NSW, mainly in the Singleton and Muswellbrook LGAs. Limited occurrences have been recorded in the Cessnock, Maitland, Lake Macquarie, Newcastle and Port Stephens LGAs. The ecological community is an open forest or woodland, typically dominated by eucalypt species, with an open	Due to the previous activities associated with the site, no vegetation commensurate with a vegetation community exists. The site is highly disturbed and	Does not occur therefore it is **unlikely** to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
	to sparse mid-layer of shrubs and an understorey of graminoids and forbs. The composition of the ecological community at a particular site is influenced by the size of the site, recent rainfall, and drought conditions and by its disturbance history. Canopy is dominated by one or more of the following species: *Eucalyptus crebra* (narrow-leaved ironbark), *Corymbia maculata* (syn. *E. maculata*) (spotted gum), *E. dawsonii* (slaty gum) and *E. moluccana* (grey box). The shrub layer is likely to include *Bursaria spinosa* subsp. *spinosa* (native blackthorn). Other common species include: *Acacia amblygona*, *A. decora* (western silver/golden / showy wattle), *A. implexa* (lightwood), *A. falcata* (sickle wattle), *A. parvipinnula* (silver-stemmed wattle), *Breynia oblongifolia* (Breynia, coffee bush), *Daviesia genistifolia* (broom bitter pea), *D. ulicifolia* (gorse bitter pea), *Notelaea microcarpa* (native olive) and *Pultenaea spinosa* (spiny bush-pea). Groundcover is likely to include species such as *Cheilanthes sieberi* subsp. *sieberi* (poison rock fern), *Desmodium varians* (slender or variable tick treefoil), *Dichondra repens* (kidney weed), *Eremophila debilis* (winter apple) and *Lomandra multiflora* subsp. *multiflora* (many flowered mat rush). Grasses commonly include *Aristida ramosa* (wire-grass), *Cymbopogon refractus* (barbed wire grass) and *Microlaena stipoides* subsp. *stipoides* (weeping grass).	still contains infrastructure associated with the rail corridor. This EEC **does not** occur.	
Lowland Rainforest of Subtropical Australia (CE*)	The ecological community occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. Generally a moderately tall to tall closed forest. The canopy comprises a range of tree species but in some areas a particular species may dominate e.g. palm forest, usually dominated by *Archontophoenix cunninghamiana* (bangalow palm) or *Livistona australis* (cabbage palm); and riparian areas dominated by *Syzygium floribundum* (syn. Waterhousea floribunda) (weeping satinash/weeping lilly pilly). The canopy/subcanopy layer contains a diverse range of species. Representative species include: hoop pine, figs, *Argyrodendron trifoliolatum/Heritiera trifoliolata* (white booyong), *Castanospermum australe* (black bean), *Cryptocarya obovata* (white walnut, pepperberry *Dendrocnide excelsa* (giant stinging tree), *Diploglottis australis* (native tamarind), *Dysoxylum fraserianum* (rosewood), *Dysoxylum mollissimum* (red bean), *Elattostachys nervosa* (green tamarind), *Endiandra pubens* (hairy walnut), *Flindersia schottiana* (bumpy ash, cudgerie, silver ash), *Gmelina leichhardtii* (white beech), *Neolitsea australiensis* (bolly gum), *Neolitsea dealbata* (white bolly gum), *Sloanea australis* (maiden"s blush), *Sloanea woollsii* (yellow carabeen), *Toona ciliata* (red cedar), and epiphytes such as Platycerium spp. and *Asplenium australasicum* (bird"s nest fern). The understorey contains a sparse layer of species such as *Cordyline stricta* (narrow-leaved palm lily), *Linospadix monostachya* (walking stick palm), *Neolitsea dealbata* (white bolly gum), *Notelaea johnsonii* (veinless mock olive), *Pittosporum multiflorum* (orange thorn), *Triunia youngiana* (native honey-suckle bush), *Wilkiea austroqueenslandica* (smooth wilkiea) and *Wilkiea huegeliana* (veiny wilkiea) as well as seedlings of a variety of canopy species.	Due to the previous activities associated with the site, no vegetation commensurate with a vegetation community exists. The site is highly disturbed and still contains infrastructure associated with the rail corridor. This EEC **does not** occur.	Does not occur therefore it is **unlikely** to be impacted upon as a result of the proposal. An AoS is not required for this species.

Notes: (V) = Vulnerable species, population or ecological community listed under the Threatened Species Conservation Act 1995.
(E) = Endangered species, population or ecological community listed under the Threatened Species Conservation Act 1995.
(CE) = Critically Endangered species, population or ecological community listed under the Threatened Species Conservation Act 1995.
(V*) = Vulnerable species, population or ecological community listed under the Commonwealth EPBC Act 1999.
(E*) = Endangered species, population or ecological community listed under the Commonwealth EPBC Act 1999.
(CE*) = Critically Endangered species, population or ecological community listed under the Commonwealth EPBC Act 1999.
(M*) = Migratory species listed under the Commonwealth EPBC Act 1999.

6.0 Matters of National Environmental Significance

Considerations have been made under the Commonwealth EPBC Act 1999. An EPBC Act 1999 Protected Matters Search was undertaken within the DoE on-line database (accessed 19 October 2015) to generate a list of those matters of National Environmental Significance (NES) from within 10 km of the site, which may have the potential to occur within the site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed within the site will have, or is likely to have a significant impact upon a matter of NES, or on the environment of Commonwealth land.

The matters of NES and site-specific responses are listed below.

World Heritage Properties

The project area is not a World Heritage Property, and is not in close proximity to any such area. Therefore, the Project will not impact upon any World Heritage Property.

National Heritage Places

The project area is not a National Heritage Place, and is not in close proximity to any such area. Therefore, the Project will not impact upon any National Heritage Place.

Wetlands of International Importance (declared Ramsar wetlands)

The Ramsar listed Hunter Estuary Wetland, which comprises Kooragang Nature Reserve and Shortland Wetlands, is located approximately 9 km north west of the project area. The proposed rezoning is not expected to have an impact on any body of water; therefore the proposal will not impact upon the Hunter Estuary Wetland.

The Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park does not occur within or adjacent to the project area, therefore, the Project will not impact upon any areas of the Great Barrier Reef Marine Park.

Commonwealth Marine Area

The project area is not a Commonwealth Marine Area, and is not in close proximity to any such area. Therefore, the Project will not impact upon any Commonwealth Marine Area.

Listed threatened Ecological Communities

Three threatened ecological communities were considered as potentially occurring within the area, including:

- Subtropical and Temperate Coastal Saltmarsh;
- Central Hunter Valley Eucalypt Forest and Woodland; and
- Lowland Rainforest of Subtropical Australia.

None of the above listed threatened communities were detected on site. Therefore, they are not likely to be impacted upon by the Project.

Nationally listed threatened species

A total of 29 threatened species (excluding marine species) listed under the EPBC Act 1999 have been recorded or have suitable habitat within a 10 km radius of the site. Refer to **Table 4** for likelihood of occurrence of threatened species listed under EPBC Act 1999 within the site.

No EPBC Act threatened species are considered as having potential to occur within the site, thus no impacts upon EPBC Act listed species is expected to occur.

Nationally listed migratory species

A total of eight migratory terrestrial species and seven migratory terrestrial species listed under the EPBC Act 1999 have been recorded or have potential suitable habitat within a 10 km radius of the site. The Project is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

7.0 Conclusion

RPS has been engaged by Elton Consulting on behalf of UrbanGrowth Pty Ltd to undertake a Flora and Fauna Assessment for the proposed rezoning of the Newcastle Surplus Rail Corridor lands.

A total of 26 flora species were identified within the site. No threatened flora species listed under the TSC Act 1995 and/or EPBC Act 1999 were detected within the site during RPS surveys.

A total of 14 fauna species were detected within the project area during surveys, all of which were common or exotic species. No threatened fauna listed under the TSC Act 1995 and/or EPBC Act 1999 were detected within the site during surveys.

Consideration was given to the potential occurrence of threatened fauna and flora species based on the available habitats within the site and species specific ecological requirements. Of those species that have been recorded within a 10km radius of the site, or that were considered as having potential to occur, none were expected to be impacted upon as a result of the proposed rezoning.

The proposed development associated with the rezoning is not expected to alter the existing nature of the site to the extent that it would negatively impact on flora or fauna. Green space areas incorporated into the proposed design will arguably provide enhanced areas of habitats for robust urban species. Subsequently, impacts upon flora and fauna are considered negligible.

8.0 Bibliography

Briggs, J. D. and Leigh, J. H. (1996) *Rare and Threatened Plants*. CSIRO Publishing, Sydney.

Churchill, S. (2008) *Australian Bats*. 2nd Edition. Allen & Unwin, Australia.

Cropper (1993) *Management of Endangered Plants*. CSIRO Publications, East Melbourne, Victoria.

Department of the Environment and Conservation (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and ctivities (working draft)*. New South Wales Department of Environmnet and Conservation, Hurstville, NSW.

Department of the Environment (DoE) (2013) *EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance.* Australian Government Department of the Environment.

Department of the Environment (DoE) (2015). *Protected Matters Search*. Accessed October 2015. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Harden, G. (ed) (2002) *Flora of New South Wales, Volume 2*. Revised Edition. University of New South Wales Press Ltd, Sydney.

Higgins, P.J and Peter, J.M (2002) *Handbook of Australian, New Zealand and Antarctic Birds* (vol. 6). Oxford University Press, Melbourne.

NPWS (2003) Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS),

Richardson. E. G. (1977) The biology and evolution of the reproductive cycle of *Miniopterus schreibersii* and *M. australis* (Chiroptera: Vespertilionidae). *Journal of Zoology*, London: 183: 353-375.

Robinson, M. (1998) *A field Guide to Frogs of Australia*. Reed New Holland, Sydney.

Simpson. K, and Day. N. (2010) *Field Guide to the Birds of Australia*. Penguin Group, Australia.

Wilson. S, and Swan. G. (2003) A Complete Guide to Reptiles of Australia. Reed New Holland, Sydney.

Appendix 1

Flora Species List

Appendix Key: * = introduced species
(V) = listed as Vulnerable in NSW.
(V*) = Species listed under the Commonwealth EPBC Act as Vulnerable

Family	Scientific Name	Common Name
Papaveraceae	*Argemone ochroleuca* subsp. *ochroleuca**	Mexican Poppy
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Proteaceae	*Banksia marginata*	Silver Banksia
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Poaceae	*Bromus cartharticus**	Prairie Grass
Poaceae	*Cenchrus echinatus**	Mossman River Grass
Poaceae	*Chloris gayana**	Rhodes Grass
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge
Phormiaceae	*Dianella* spp.	
Poaceae	*Echinochloa esculenta**	Japanese Millet
Moraceae	*Ficus macrophylla*	Moreton Bay Fig
Araliaceae	*Hedera helix**	English Ivy
Asteraceae	*Hypochaeris radicata**	Flatweed
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Poaceae	*Panicum* sp.	-
Apocynaceae	*Plumeria obtusa* (Cultivar)*	Frangipani
Polygonaceae	*Polygonum aviculare**	Wire Weed
Euphorbiaceae	*Ricinus communis**	Castor Oil Plant
Fabaceae/faboideae	*Trifolium arvense**	Haresfoot Clover
Fabaceae/faboideae	*Trifolium repens**	White Clover
Plantaginaceae	*Veronica* spp.*	

Appendix 2

Fauna Species List

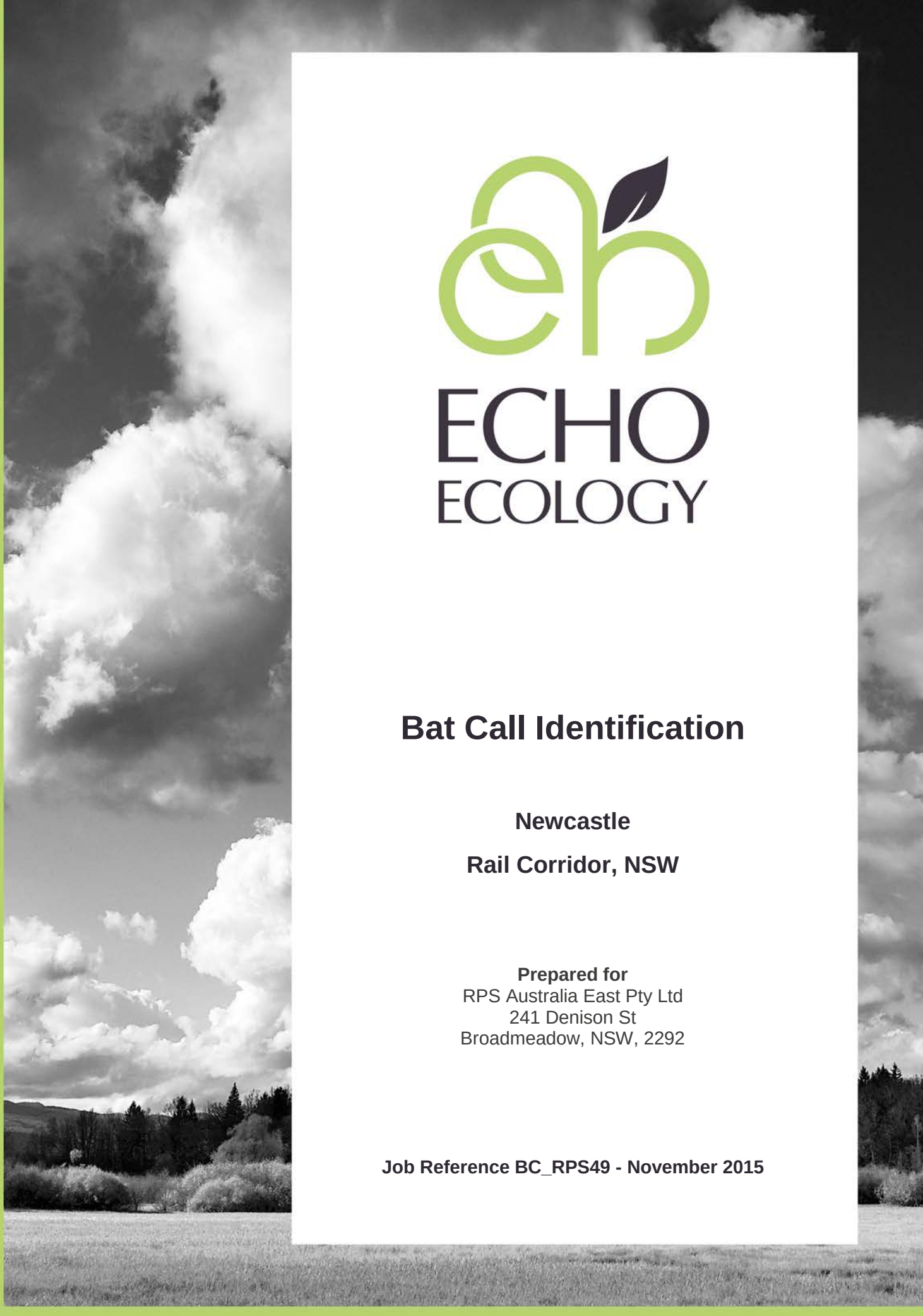
Appendix Key:

* = introduced species
(C) = listed as CAMBA species
(J) = listed as JAMBA species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(V*) = Species listed under the Commonwealth EPBC Act as Vulnerable
(E*) = Species listed under the Commonwealth EPBC Act as Endangered
(M) = Species listed under the Commonwealth EPBC Act as Migratory
Species indicated in **BOLD** font are those threatened species recorded from within the site.

Family	Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
Birds				
Columbidae	*Columba livia**	Rock Dove	-	-
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	-	-
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	-	-
Charadriidae	*Vanellus miles*	Masked Lapwing	-	-
Cuculidae	*Eudynamys orientalis*	Eastern Koel	-	-
Meliphagidae	*Manorina melanocephala*	Noisy Miner	-	-
Artamidae	*Cracticus tibicen*	Australian Magpie	-	-
Corvidae	*Corvus coronoides*	Australian Raven	-	-
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	-	-
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	-	-
Sturnidae	*Sturnus tristis**	Common Myna	-	-
Reptiles				
Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	-	-
Mammals				
Molossidae	*Tadarida australis*	White-striped Freetail-bat	-	-
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	-	-

Appendix 3

Anabat Report



ECHO ECOLOGY

Bat Call Identification

Newcastle

Rail Corridor, NSW

Prepared for
RPS Australia East Pty Ltd
241 Denison St
Broadmeadow, NSW, 2292

Job Reference BC_RPS49 - November 2015

Echo Ecology Pty Ltd ABN 73 162 118 710 • PO Box 4132 Crescent Head, NSW 2440 Australia • **P:** 0423 801 779 • **E:** info@echoecology.com.au • **W:** echoecology.com.au

This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

Dr Anna McConville
PhD, B.Env.Sc.

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1.0 INTRODUCTION

This report has been commissioned by RPS Australia East Pty Ltd to analyse bat echolocation call data (Anabat and Anabat Express, Titley Electronics) collected from the Newcastle rail corridor, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Version 4.1t, Chris Corben) software. The identification of calls was undertaken with reference to Pennay *et al*. (2004) and through the comparison of recorded reference calls from north-eastern NSW and the Sydney Basin. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Such comparisons are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

2.1 Characteristics Used to Differentiate Species

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Tadarida australis was differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 308 call sequences were recorded, of which three call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, three call sequences (100 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Chalinolobus gouldii* (Gould's wattled bat)
- *Tadarida australis* (White-striped free-tailed bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

Table 3-1: Results of bat call analysis (number of passes per site per night)

IDENTIFICATION	Anabat 4 1/11/2015	Anabat 4 2/11/2015	Anabat Express 2/11/2015
DEFINITE			
Chalinolobus gouldii	-	-	1
Tadarida australis	-	-	1
PROBABLE			
Chalinolobus gouldii	-	-	1
UNKNOWN			
'Noise' files	88	212	5
TOTAL	**88**	**212**	**8**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

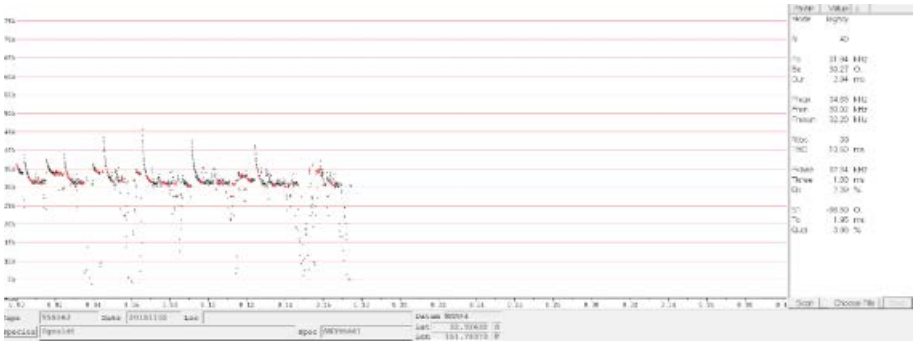

Figure 4-1: *Chalinolobus gouldii* definite call

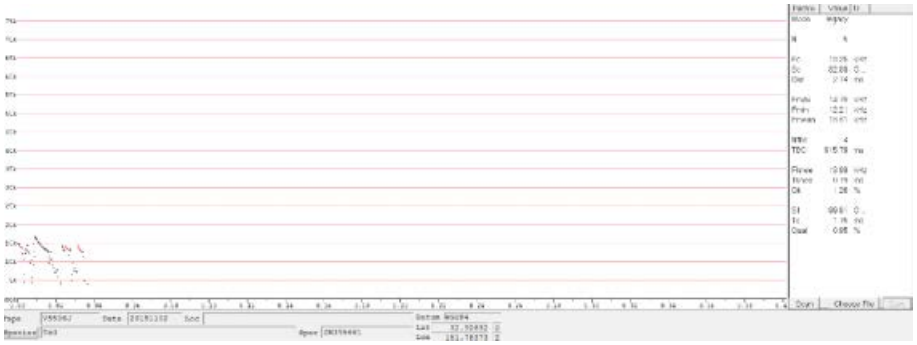

Figure 4-2: *Tadarida australis* definite call

5.0 REFERENCES

Adams, M., Reardon, T.R., Baverstock, P.R. and Watts, C.H.S. (1988). Electrophoretic resolution of species boundaries in Australian Microchiroptera. IV. The Molossidae (Chiroptera). *Australian Journal of Biological Sciences* 41: 315-326.

Australasian Bat Society Incorporated (undated) *Standards for reporting bat detector surveys*, http://batcall.csu.edu.au/abs/issues/ABS_Anabat_survey_standards.pdf

Churchill, S. (2008). *Australian Bats.* Second Edition Allen & Unwin; Crows Nest, NSW.

Hoye, G.A, Law, B.S. and Lumsden, L.F. (2008). Eastern Free-tailed Bat Mormopterus sp. Pp. 493-495 in *The Mammals of Australia*: Third Edition (S. van Dyck and R. Strahan, Eds.); New Holland; Sydney.

Law, B.S., Turbill, C. and Parnaby, H. (2008). Eastern Forest Bat Vespadelus pumilus. Pp. 567-568 in *The Mammals of Australia*: Third Edition (S. van Dyck & R. Strahan; Eds.); New Holland; Sydney.

Law, B.S., Reinhold, L. and Pennay, M. (2002). Geographic variation in the echolocation calls of Vespadelus spp. (Vespertilionidae) from New South Wale and Queensland, Australia. *Acta Chiropterologica* 4: 201-215.

Pennay, M., Law, B. and Reinhold, L. (2004). *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats*. NSW Department of Environment and Conservation, Hurstville.

Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001a). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Queensland Department of Natural Resources and Mines, State Forests of New South Wales, University of Southern Queensland, and New South Wales National Parks and Wildlife Service, Australia.

Reinhold, L., Herr, A., Lumsden, L., Reardon, T., Corben, C., Law, B., Prevett, P., Ford, G., Conole, L., Kutt, A., Milne, D. and Hoye, G. (2001b). Geographic variation in the echolocation calls of Gould's wattled bat *Chalinolobus gouldii*. *Australian Zoologist* 31: 618-624.

Richards, G.C., Ford, G.I. and Pennay, M. (2008). Inland Free-tailed Bat Mormopterus sp. Pp. 494-495 in *The Mammals of Australia*: Third Edition (S. van Dyck and R. Strahan, Eds.); New Holland; Sydney.

Thomas, D.W., Bell, G.P. and Fenton, M.B. (1987). Variation in echolocation call frequencies recorded from North American vespertilionid bats: a cautionary note. *Journal of Mammalogy* 68: 842-847.

Van Dyck, S. and Strahan, R. (Eds.) (2008). *The Mammals of Australia: Third Edition*. New Holland; Sydney.

Appendix 4

Staff Qualifications

Curriculum Vitae

ARNE BISHOP

Ecology Manager

Newcastle, NSW

Bachelor of Environmental Science, University of Canberra, 2009

Bachelor of Landscape Architecture, University of Canberra, 2009

Cert IV Horticulture (Landscape), Canberra Institute of Technology, 2003

Cert II Australian Land Conservation and Restoration, Conservation Volunteers Australia, 2001

Accredited Biobanking Assessor

AREAS OF EXPERTISE:

Arne has over 16 years experience in the environmental sector. In his position as Ecology Manager, Arne manages the Newcastle environment department including the day to day running of projects, verification of reports and other outputs and ensures clients are well informed of project progress and key findings.

Arne's current and previous roles have provided him with an extensive knowledge of a plethora of exotic and endemic NSW flora, fauna, ecological communities and migratory species. He conducts ecological assessments on a daily basis, which aim to identify the likelihood for threatened entities such as threatened flora, fauna, populations and communities listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Threatened Species Conservation Act 1995* (TSC Act) to occur within a specified area.

Arne is an accredited BioBanking Assessor and has conducted BioBanking assessments for Major Projects (State Significant Infrastructure and State Significant Developments) under the Framework for Biodiversity Assessment (OEH 2014) and assessments for smaller developments under the *BioBanking Assessment Methodology* (OEH 2014). He has also conducted EPBC offset calculations under the *EPBC Act Environmental Offsets Policy* (SEWPAC 2012).

During his career, Arne has project managed and/or participated in numerous large-scale land development, mining, energy and infrastructure projects. He subsequently possesses a firm understanding and working knowledge of local, state and federal government legislation and policies that underpin environmental assessments, environmental mitigation, management and offsetting techniques.

SELECTED PROJECT EXPERIENCE:

Mining & Energy

- **Springvale Temperate Highland Peat Swamp (THPSS) Monitoring, Centennial Coal** – Ecological field surveys and associated monitoring report preparation for Springvale underground mine on the Newnes Plateau project.
- **Angus Place and Springvale Extension Projects, Centennial Coal** – Ecological surveys were undertaken over a period of 1.5 years to aid in the production of a Flora and Fauna Report for both the Angus Place and Springvale underground mines. The project role included flora and fauna field surveys and assistance with associated reporting. Conducted notional BioBanking calculations for Springvale Extension Project to quantify biodiversity impacts and potential offset requirements.
- **Gunnedah Basin, Santos** – Conducted multiple projects over approximately two years. These projects included; ecological works for Santos within the Gunnedah Basin covering gas exploration and provision of infrastructure, including, gas pipelines and access tracks. Works included field survey, preparation of advice, impact assessments, EPBC referrals, preparation and implementation of well lease rehabilitation plans, liaison and negotiations with regulators and agencies.

- **Bulga Mine Annual Fauna Monitoring, Glencore** – Conducted and project managed an annual monitoring program for the past four years. The program spans two operations and involves seasonal bird surveys, habitat assessments, and the full spectrum of fauna monitoring methodologies, provides technical input and document review.
- **Airly Coal Mine Flora and Fauna Surveys and Assessment, Centennial Coal** – A range of flora and fauna surveys were undertaken to inform both the Airly Baseline Survey Report and the Airly Flora and Fauna Report. Project tasks included; review of specialist reports, interpretation of legislative requirements, targeted field survey, assessment of fauna habitat quality and value to threatened species, identification of project impacts and measures to avoid or mitigate potential impacts.
- **Mandalong Mine Extension Project, Centennial Coal** – Project tasks included preliminary desktop assessment, interpretation of legislative requirements, targeted field survey, assessment of fauna habitat quality and value to threatened species, identification of project impacts and measures to avoid or mitigate potential impacts. Conducted notional BioBanking calculations to quantify biodiversity impacts and potential offset requirements
- **Mandalong South Powerline Relocation - Flora and Fauna Impact Assessment, Centennial Coal** – Conducted targeted threatened seasonal threatened species surveys, client liaison and report development. Conducted notional BioBanking calculations to quantify biodiversity impacts and potential offset requirements.
- **Beltana Underground Mine Bat Impact Assessment and Monitoring, Glencore** – Conducted extensive fieldwork to identify potential habitat, assessed habitat using night vision technology and developed reporting.

Urban Growth

- **Subdivision and Urban Development at Windmill Downs Tamworth, Combined Development Group** – Conducted detailed floristic surveys to determine the condition and extent of the EPBC Act Critically Endangered Ecological Community - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland).
- **Lower Hunter Lands subdivision, Coal and Allied** – Preparation of a detailed Part 3A ecological inventory and impact assessment for a proposed residential subdivision including extensive flora, fauna and habitat surveys over approximately 3,800 hectares. Ongoing liaison, negotiations and presentations were made to authorities and community forums. The project involved significant offsets that helped to secure regional corridors and conservation initiatives long sought after in the region.
- **Catherine Hill Bay and Gwandalan, Rose Group** – Preparation of detailed Part 3A ecological impact assessment for a proposed residential development over two sites in Catherine Hill Bay and Gwandalan. The project also involved negotiating approval under the EPBC Act including preparation Preliminary Information.
- **Huntlee Ecological works, LWP Property Group** – Undertook Ecology works to inform Major Project Approval and negotiations under the EPBC Act for the new Hunter Valley town at Huntlee. This project involved critically endangered species, offsets and presentations to stakeholder groups.
- **Subdivision and Urban Development at Hills Plain Tamworth, Marloelle** – Conducted detailed floristic surveys to determine the condition and extent of the EPBC Act Critically Endangered Ecological Community - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland).
- **Reticulated Water, Sewer and Recycled Water (Huntlee new town and Cooranbong), Flow Systems** - RPS has prepared a number of REF's to enable licences to be sought by the client for the provision of reticulated water, sewer and recycled water across large urban release areas in accordance with the *Water Industry Competition Act 2006*. Conducted notional BioBanking calculations to quantify biodiversity impacts and potential offset requirements.

Infrastructure

- **Bells Line of Road Corridor – Chifley Rd Upgrade, RMS** – Conducted targeted threatened species filed surveys and assisted in the preparation of a biodiversity assessment for the proposed Chifley Road upgrade located on the Bells Line of Road between Bell and Scenic Hill.
- **Westmead Hospital Upgrade, Price Waterhouse Coopers and Johnstaff** – Ecological surveys and reporting. Ecological opportunities and constraints were assessed in relation to the relevant state and federal legislation to inform the concept design.

PREVIOUS EXPERIENCE:

Environmental Consultant – Ecological Australia **2008 - 2010**

Arne completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects.

Field Assistant / Consultant – Alison Rowell **1999 - 2010**

This role included working on flora and fauna surveys, and habitat / vegetation assessment and mapping.

Green Corps Traineeship – Conservation Volunteers Australia (CVA) **2001**

Arne received accredited practical and theoretical training in; First Aid (Level 2, St Johns); Occupational Health and Safety and Environmental Concepts. This training contributed to Certificate II in Australian Land Conservation and Restoration.

MEMBERSHIPS & ACHIEVEMENTS:

- Accredited BioBanking Assessor (accreditation number 161)
- Snake and Spider Safety Awareness for Employees (SSSafe)Training
- Four Wheel Drive Training and Certification
- First Aid Certification
- Member – Ecological Consultants Association
- Member – Royal Zoological Society NSW
- Member – Birds Australia
- OH&S Induction Training (White Card)
- Award for Excellence for First Place in Conservation Biology and Genetics, University of Canberra

Curriculum Vitae

LAUREN VANDERWYK

Ecologist

Newcastle, NSW

Bachelor of Science, University of Newcastle

AREAS OF EXPERTISE:

During the six years Lauren has been working as an Ecologist, she has gained a broad range of ecological field experience and experience in Ecological Assessment and management reporting in accordance with relevant State and Commonwealth government legislative frameworks. In addition, Lauren has developed numerous Bushfire Threat Assessments and Bushfire Attack Level certificates informed by field surveys and desktop assessments in accordance with Planning for Bushfire Purposes (2006). Her experience within the consulting industry has primarily included a wide range of flora and fauna assessment disciplines as required by a wide range of public and private clients including Centennial Coal, Santos and NSW Roads and Maritime Services. Lauren's knowledge of the Central Coast, Hunter, Greater Lithgow and Liverpool Plains regions has expanded extensively since the commencement of her career.

SELECTED PROJECT EXPERIENCE:

Environment

- Flora and fauna identification and habitat assessment
- Targeted threatened flora and fauna surveys
- Delineation and mapping of vegetation communities
- Endangered Ecological Community (EEC) assessment
- Conducting Field Surveys for Flora, Fauna and Habitat Identification
- Report Preparation including Fauna & Flora Assessments
- Ecological Monitoring and Reporting
- Bushfire Threat Assessment & Management reporting
- Understanding of environmental and bushfire legislation

Ecology

- Northern Beaches Hospital Connectivity and Network Enhancements Project (SMEC) – Preparation of a flora and fauna memorandum for two sites proposed to be developed for the Project. Project tasks included preliminary desktop assessment, interpretation of legislative requirements, targeted field surveys, and assessment of fauna habitat quality and value to threatened species.
- Bulga Mine Annual Fauna Monitoring – Lauren has been involved in an annual monitoring program that spans two operations and involves seasonal bird surveys, habitat assessments and the full spectrum of fauna monitoring methodologies targeting threatened species as well as comprising an overall species list, and providing technical input and annual report writing
- Angus Place Longwalls 900 and 910 Flora and Fauna Monitoring (Centennial Coal Angus Place) – Pre and postmining baseline surveys were undertaken by Lauren including flora and fauna species diversity surveys, vegetation condition assessments and nest box erection. Monitoring of multiple sites provides a comparable data set to display any notable changes as a result of longwall mining within this mining lease area. Swamp vegetation monitoring was a separate component of this project which required a memorandum to

comment on overall swamp health and potential impacts as a result of surrounding mining activities. This project is ongoing.

- Pacific Highway Upgrade-Oxley Highway to Kempsey (NSW Roads and Maritime Services)

  Implementation of the Microchiropteran Bat Management Plan prepared for the 37km upgrade of the Pacific Highway between the Oxley Highway and Kempsey on the NSW Mid-north coast. For this project Lauren was involved in the installation of 158 bat roost boxes and the provision of GIS data to inform future monitoring activities.

- Neubeck Open Cut Coal Mine (Centennial Coal) – Flora and fauna field surveys over a three year period and the production of the Flora and Fauna Assessment as part of an overiding Environmental Impact Statement were undertaken for the proposed Neubeck open cut coal mine
- Airly Coal Mine Flora and Fauna Surveys (Centennial Coal) – A range of flora and fauna surveys were undertaken to inform both the Airly Baseline Survey Report and the Airly Flora and Fauna Report
- Lidsdale Siding Biodiversity Management Plan (Centennial Ivanhoe)– Ecological assessments primarliy undertaken for Lidsdale Siding Flora and Fauna Report informed the production of the Lidsdale Siding Biodiversity Management Plan, both of which Lauren was involved in. The BMP outlined areas of ecological importance and ecological issues on site with associated management actions
- Coal Seam Gas Exploration (Santos)- On site supervisor for coal seam gas exploration and clearing activities in the Gunnedah region. Lauren ensured that all contractors and staff on site complied with the Review of Environmental Factors with environmental protection a prioirty during clearing on site

PREVIOUS EXPERIENCE:

Environmental Scientist - Ecobiological (2011)
Primary roles included bush regeneration and the identification of a wide range of native and non-native plant species for rehabilitation of various sites throughout the Hunter and Central Coast regions. Some ecological surveys and Ecological Assessment reporting was carried out during Lauren's time with Ecobiological

Trainee Ecologist - Pygmy Possum Ecological Consulting (2008-2010)
Undertaking ecological field surveys was the primary role at Pygmy Possum Ecological Consulting. Fauna surveys were carried out across the Central Coast, Lake Macquarie and into the Hunter region. Basic reporting and data entry were undertaken throughout Lauren's time with Pygmy Possum Ecological Consulting

VOLUNTEER EXPERIENCE:

- Bush regeneration at Trig Shepards Hill, Bar Beach with Newcastle Landcare (2013);
- Regent Honeyeater habitat restoration in the Capertee region with Birdlife Australia (2012);
- Amphibian (*Litoria citropa*) acoustic research in the Watagan Mountains, NSW with Carl Gerhardt (2012);
- Biodiversity research for independent researchers and Australian Geographic in East Kimberley (2011);
- Amphibian (*Litoria subglandulosa* and *Mixophyes balbus*) research at the New England Tablelands with Marion Anstis, Simon Clulow and Carl Gerhardt (two separate occasions 2010);
- Bandicoot Research in Manly with the Australian Wildlife Conservancy (2010);
- Microbat dietary surveys and tracking at Empire Bay with Leroy Gonsalves (2010);
- Green and Golden Bell frog research at the Sydney Olympic Park (2010);
- Bush-stone Curlew surveys at Empire Bay on the Central Coast undertaking call play back methods (2010).
- Bush regeneration at Wamberal Lagoon Nature Reserve with National Parks and Wildlife Services primarily restoring Littoral Rainforest (EEC) (2007-2010); and

- Fauna research including pit trapping, Elliot trapping, triangulation (for amphibians) and spotlighting for the Watagans fauna database (2007).

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Driver's Licence (Class C)
- OH&S Induction Training (White Card)
- 4WD course
- ChemCert II certification
- Landscape Function Analysis Training
- Member of the Ecological Society of Australia (ESA)
- Member of Birdlife Australia
- Member of the Australian Mammal Society (AMS)

CONFERENCES:

- Australasian Raptor Conference, Adelaide SA (Attendee) 2013
- National Koala Conference, Port Macquarie NSW (Attendee) 2013
- Society for Conservation Biology Conference - Oceania, Darwin NT (Attendee) 2012

Attachment G - Visual Impact Statement

By Moir Landscape Architecture, dated 7 June 2016

Proposed Rezoning of Newcastle Surplus Railway Corridor

Gateway Visual Impact Statement

Revision: B | Project: 1319 | Date: 7th June 2016

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1.0 Introduction

1.1 Introduction

Moir Landscape Architecture have been commissioned by Urban Growth to undertake a Pre-gateway Visual Impact Statement (VIS) in regards to the proposed rezoning of the Newcastle Surplus Railway Corridor (refer to ***Figure 1***).

This Preliminary VIS has been based on the Urban Design Analysis prepared by Hassell in April 2016. The purpose of this report is to identify the existing visual character of the study area and provide a preliminary assessment of the potential visual impacts relating to the proposed zoning and indicative locations and potential building heights.

Survey work was undertaken in April 2016 using key viewpoints and locations with potential views towards the site. The report details the results of the field work, documents the assessment of the landscape character and visual setting, and assesses potential visual impacts associated with the proposal.

2.0 The Proposal

2.1 The Site

Newcastle is the second largest city in NSW and is the economic and social heart of the Hunter Region. Regionally significant infrastructure – including transport, government, health and education services – are located in Newcastle city centre.

Newcastle city centre is the core of this regional city and provides a range of functions including commercial, retail, entertainment, cultural, educational and transport services. The rezoning site is located in Newcastle city centre and comprises a collection of land holdings within the surplus rail corridor lands. The site is approximately 2.1km in length generally bounded by Wharf Road to the north, Watt Street to the east, Hunter and Scott Streets to the south and Worth Street to the west. The site includes Civic and Newcastle Stations.

The site area subject to the rezoning is shown in ***Figure 1*** and the Site Parcel Areas are provided in ***Figure 2***.

2.2 Project Overview

The Newcastle Urban Transformation and Transport Program (‘Program’) has been established to deliver on NSW Government’s more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The NSW Government has made a number of announcements relating to the transformation of Newcastle, including:

- A new multi-modal transport interchange at Wickham
- Light rail between the Wickham interchange and Pacific Park
- The activation of Hunter and Scott Streets linked to the delivery of light rail
- The revitalisation of land in the heavy rail corridor, the delivery of housing, and the delivery of improved public domain, including parks, entertainment precincts and public spaces

This Visual Impact Statement has been prepared with reference to the Master Plan developed by Hassell in the Preliminary Urban Design Analysis, April 2016 (Refer to ***Figure 2***). Proposed maximum building heights, floor space ratios and rezoning figures upon which this report has been assessed have been included in the Appendix.

Figure 1. Site Locality Plan (Source: Sixmaps)

2.0 The Proposal

Figure 2. The Site Parcel Areas and Preliminary Master Plan (Image Source: Hassell 2016)

3.0 Study Method

3.1 Visual Impact Statement (VIS)

The purpose of a Visual Impact Statement (VIS) is to identify and determine the value, significance and sensitivity of the visual landscape and assess the potential visual impact on the character as a result of the proposed development.

The assessment was undertaken in stages as noted below:

- Objective assessment of the relative aesthetic value of the existing visual character, defined as visual quality and expressed as high, medium or low. This assessment generally relates to variety, uniqueness, prominence and naturalness of the landform, vegetation and water forms within each character type.
- Identification of key view corridors and landmark features throughout the Study Area.
- An assessment of viewer sensitivity to change. This includes how different groups of people view the landscape (for example, a resident as opposed to a tourist), and how many people are viewing and from how far.
- The undertaking of a viewpoint analysis to identify areas likely to be affected by development of the site and a photographic survey using a digital camera and a handheld GPS unit to record position and altitude.
- An assessment of visual impacts.

The purpose of the above methodology is to reduce the amount of subjectivity entering into the visual impact assessment and to provide sufficient data to allow for third party verification of results.

3.2 Definitions

Definitions for terms used throughout the VIA are included in this section of the report.

3.2.1 Landscape Values

Landscape values are the cultural attributes (social, indigenous, artistic and environmental) as well as the aesthetics of a place, as shown in ***Figure 3***.

Figure 3. Landscape Values

3.2.2 Visual Quality

Visual quality of an area is essentially an assessment of how viewers may respond to designated scenery. Scenes of high visual quality are those which are valued by a community for the enjoyment and improved amenity they can create. Conversely, scenes of low visual quality are of little value to the community with a preference that they be changed and improved, often through the introduction of landscape treatments.

As visual quality relates to aesthetics its assessment is largely subjective. There is evidence to suggest that certain landscapes are constantly preferred over others with preferences related to the presence or absence of certain elements. The rating of visual quality for this study has been based on scenic quality ratings and on the following generally accepted assumptions arising from scientific research (DOP, 1988):

- Visual quality increases as relative relief and topographic ruggedness increases;
- Visual quality increases as vegetation pattern variations increase;
- Visual quality increases due to the presence of natural and/or agricultural landscapes;
- Visual quality increases owing to the presence of water forms (without becoming too common) and related to water quality and associated activity; and
- Visual quality increases with increases in land use compatibility.
- In addition to the above, cultural items may also endow a distinct character to an area and therefore contribute to its visual quality due to nostalgic associations and the desire to preserve items of heritage significance.

3.0 Study Method

3.2.3 Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposal. (EDAW, 2000).

For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally the following principles apply:

- Visual sensitivity decreases as the viewer distance increases.
- Visual sensitivity decreases as the viewing time decreases.
- Visual sensitivity can also be related to viewer activity (eg. a person viewing an affected site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination).

Sensitivity ratings are defined as high, moderate or low and are shown in the table below (Adapted from EDAW, 2000).

VISUAL SENSITIVITY					
LAND USE	DISTANCE ZONES				
	FOREGROUND		MIDDLE GROUND		BACKGROUND
	0-1	1-2km	2-4.5	4.5-7	> 7kms
Tourist / Recreation	High	High	High	Mod	Low
Residential: Rural or Urban	High	High	High	Mod	Low
Main Travel Corridor	Mod	Mod	Low	Low	Low
Minor / Local Roads	Mod	Mod	Low	Low	Low
Railway Line (Freight)	Low	Low	Low	Low	Low
Industrial Areas	Low	Low	Low	Low	Low

TABLE 1: Visual Sensitivity Table.

3.3.4 Visual Effect

Visual effect is the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposal against its setting or background in which it is viewed.

Low visual effect: occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening often using a combination of landform and landscaping.

Moderate visual effect: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (eg. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).

High visual effect: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

3.3.5 Visual Impact

Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect will result in high, moderate and low overall visual impacts as suggested in the below table (URBIS, 2009).

VISUAL IMPACT				
		VISUAL EFFECT ZONES		
		HIGH	MODERATE	LOW
VISUAL SENSITIVITY LEVELS	HIGH	High Impact	High Impact	Moderate Impact
	MODERATE	High Impact	Moderate Impact	Low Impact
	LOW	Moderate Impact	Low Impact	Low Impact

TABLE 2: Visual Impact Table.

4.0 Visual Character Assessment

4.1 Existing Landscape Character

Newcastle City is located on a peninsula between the Pacific Ocean and the Hunter River. The western and central parts of the city centre are largely built upon the floodplain of the Hunter River and Cottage Creek and consequently are relatively flat. By contrast, the eastern end of the city around Newcastle Station and toward the beach is located on two steep hills, providing a scenic backdrop to the city centre when viewed from the foreshore of the Hunter River.

Land use within the study area is generally commercial in the east and industrial to the west. The city centre contains a rich collection of historic and significant civic buildings which give the city a distinct character, particularly along Hunter Street and the eastern end of the City.

The topography of the city centre and the gridded street network permit views from the city centre to the harbour. A number of north - south running streets have strong view corridors towards the harbour (including: Brown Street, Perkins Street, Wolfe Street, Newcomen Street and Watt Street). From the harbour, the steep topography allows views back to the city where the cathedral at the crown of the hill is a recognisable landmark. In addition to the Christ Church Cathedral a number of buildings provide landmark features within the city, for example Customs House, Queens Wharf Tower and St Andrews Church. Visual axis between these key buildings and the harbour appear to have been diminished by built form overtime.

Large areas of open space adjoin the harbour providing a significant recreation facility within close proximity to the city centre, running between Nobbys Beach and Honeysuckle Precinct.

Image 1. Central Promenade

Image 3. View corridor towards harbour

Image 4. Christ Church Cathedral

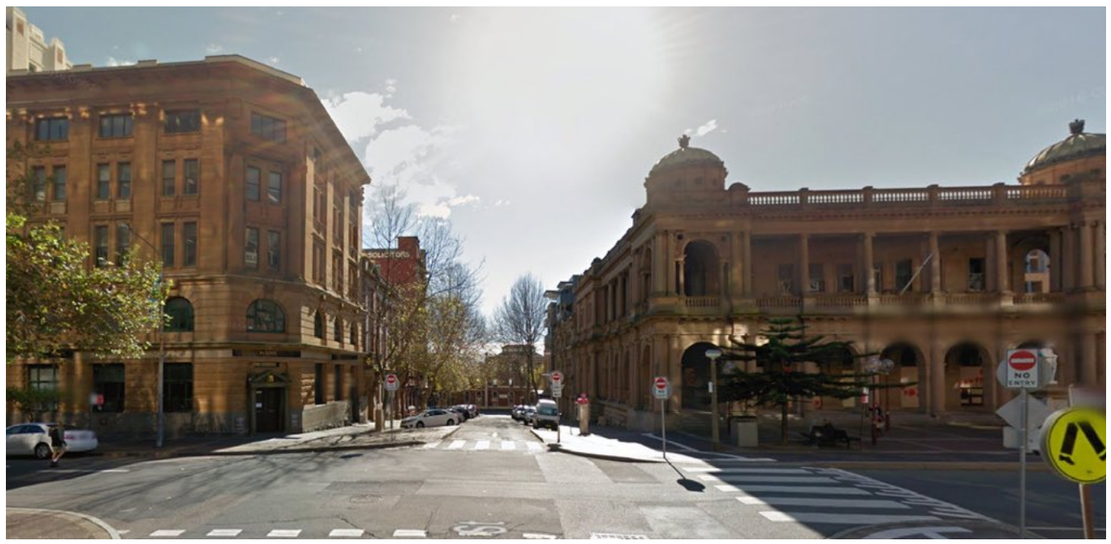


Image 5. Historic buildings along Bolton Street

4.0 Visual Character Assessment

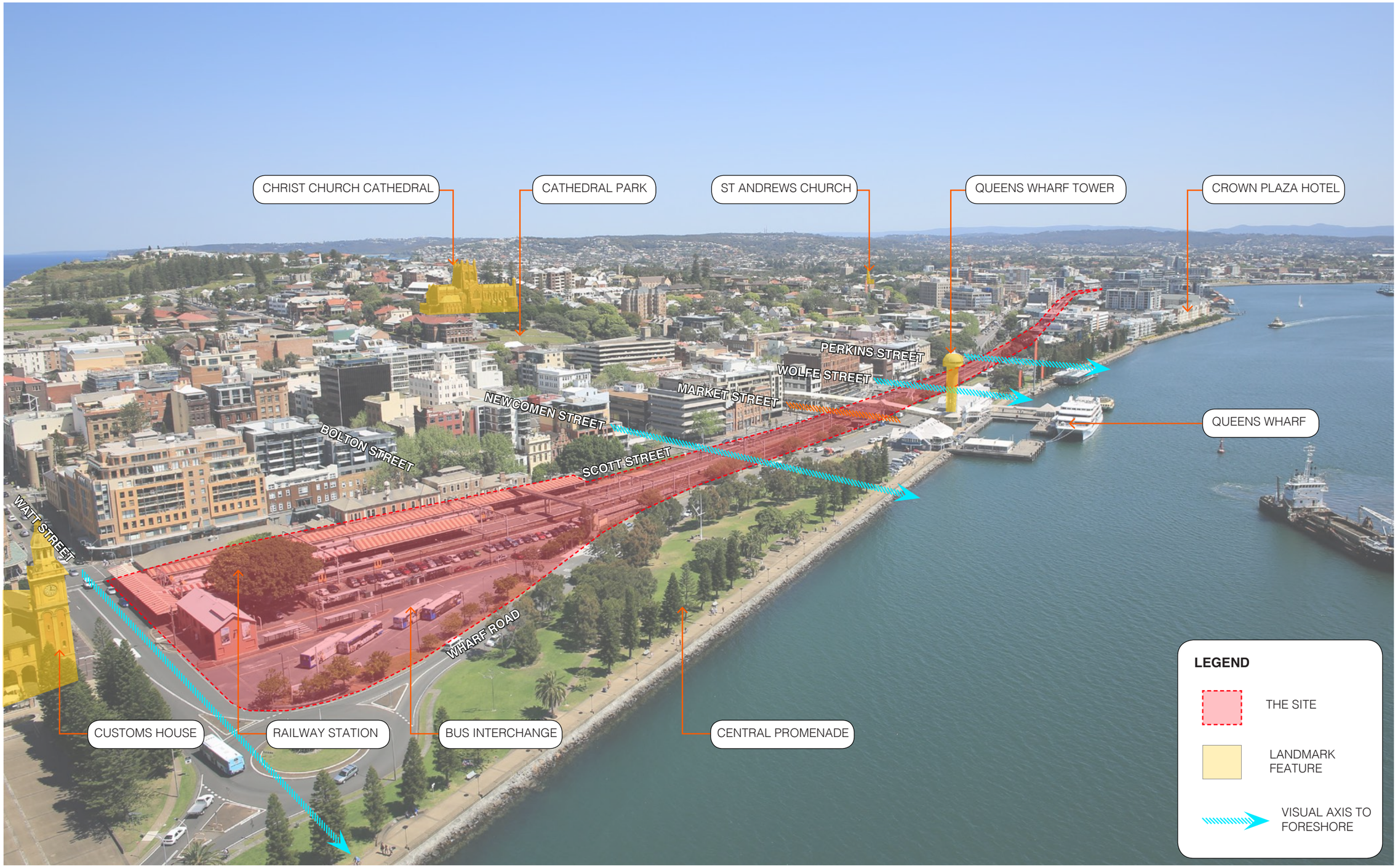


Figure 4. Existing Visual Character (Image adapted from Hassell 2016)

4.0 Visual Character Assessment

4.2 Existing View Corridors

The following section of the report provides an overview of the existing view corridors and visual axis within the study area (refer to ***Figure 5***).

Western Precinct

For the purpose of this report, the western precinct refers to land surrounding Parcels 1 - 5 (refer to ***Figure 2***). Land in this area is predominantly flat and as a result, views towards the harbour are limited. Built form generally contains views to the north from Hunter Street, with the exception of a indirect visual connections to the harbour (along Merewether Street and Wright Lane). From the south, built form associated with Hunter Street screens views towards the harbour.

Central Precinct

In this report, land surrounding Parcels 6-11 is referred to as the central precinct. Land surrounding the central precinct is generally flat, rising to the south towards Church and Tyrell Street. Views towards the Site and harbour from these elevated streets to the south are limited. From Hunter Street, views to the harbour are limited to Argyle Street and voids between built form. Vegetation and infrastructure associated with the railway corridor fragment the view corridors.

Eastern Precinct

For the purpose of this report, the east precinct refers to Parcels 12-16 the area between Brown Street (to the west) and Watt Street (to the east). From a pedestrian perspective, there are a number of locations from which the harbour is currently visible. View corridors towards the harbour are generally along north - south running streets including Brown Street, Perkins Street (refer to ***Viewpoint 06, pg 15***), Wolfe Street, Newcomen Street (refer to ***Viewpoint 02 pg 13***) and Watt Street. Views to the north from Bolton Street are terminated at the existing Railway Station Building (refer to ***Viewpoint 03, pg14***). Views from Market Street are currently obstructed by built form associated with the Queen Street Wharf and infrastructure (including the existing overhead pedestrian bridge) associated with the railway.

The topography rises steeply to the south, Tyrell Street runs in a generally east west direction along the ridge. Views from these high points continue along the view corridors to the harbour.

A visual axis towards the Cathedral from the foreshore is currently fragmented by infrastructure associated with the railway, including a overhead pedestrian connection from Queens Wharf to Market Street (refer to ***Viewpoint 09, pg17***).

Image 6. Christ Church Cathedral viewed from Queens Wharf Tower (Source: Google Earth)

Image 7. Railway Station and Custom House viewed from Queens Wharf Tower (Source: Google Earth)

4.0 Visual Character Assessment

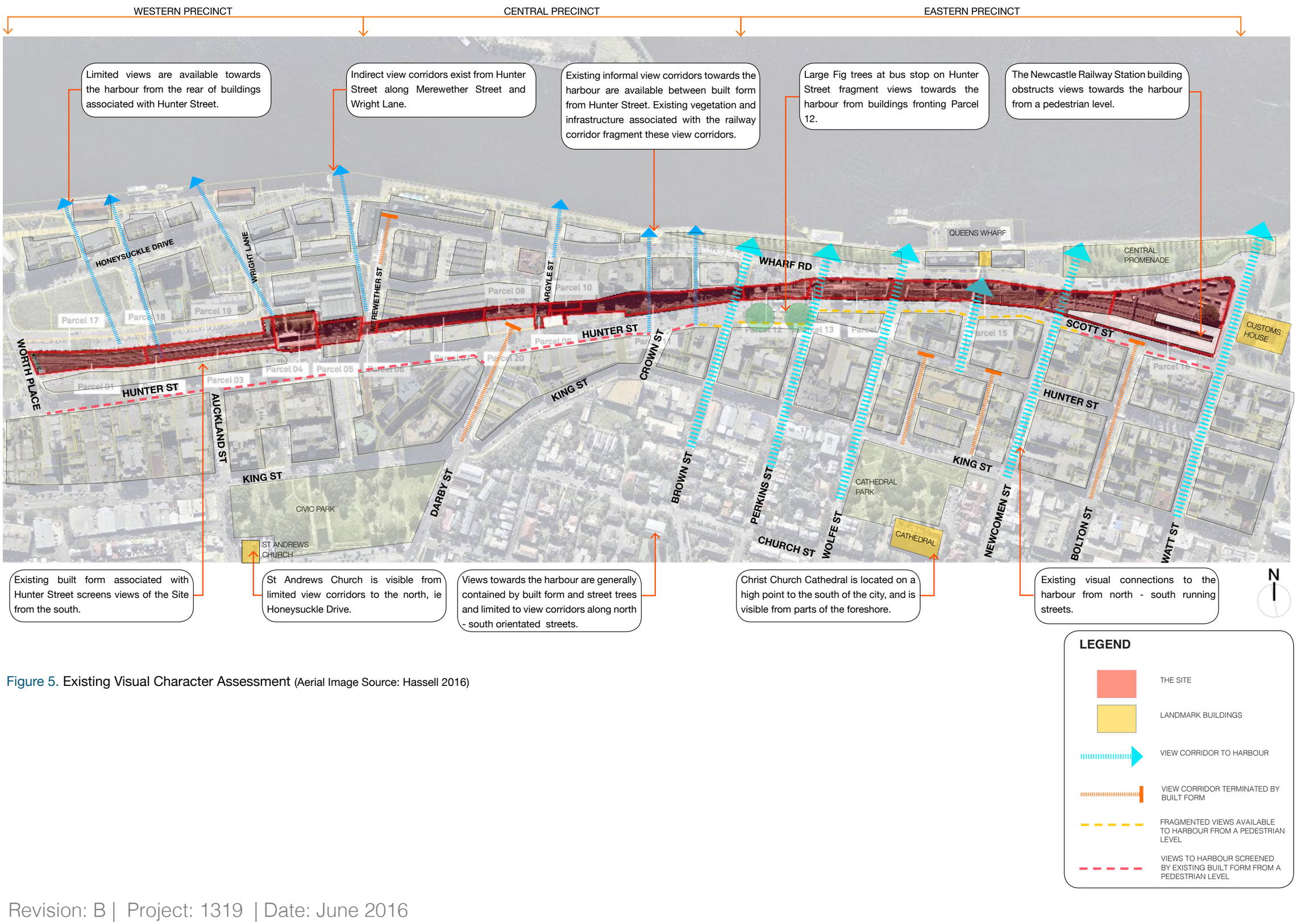


Figure 5. Existing Visual Character Assessment (Aerial Image Source: Hassell 2016)

5.0 Visual Impact Assessment

5.1 Visual Impact Assessment

This section of the report considers the likely impact that development would have on the existing landscape character and visual amenity.

A preliminary viewpoint analysis has been undertaken to illustrate the existing visual character of the study area and to identify the potential visual impact from prominent sites.

In addition to the viewpoint analysis, photomontages have been developed to illustrate the proposed building mass and height indicated in the Preliminary Master Plan.

5.2 Viewpoint Analysis

Viewpoints have been selected to illustrate a combination of the following:

- Present landscape character types.
- Areas of high landscape or scenic value.
- Visual composition (eg. focused or panoramic views, simple or complex landscape pattern).
- Range of distances.
- Varying aspects.
- Various elevations.
- Various extent of development visibility (full and partial visibility).
- Sequential along specific routes.

Viewpoints have been carefully selected to be representative of the range of views within the study area. The selection of viewpoints is informed by topographical maps, field work observations and other relevant influences such as access, landscape character and the popularity of vantage points.

A total of **15 viewpoints** were recorded as part of the field work process. The majority of these viewpoints were taken from publicly accessible roads surrounding the site. The viewpoints which have been included represent the areas from where the development would appear most prominent, either based on the degree of exposure or the number of people likely to be affected.

It is important to note that viewpoints for this study have been taken only from accessible public land and from a pedestrian perspective.

5.2.2 Process of Viewpoint Analysis

Once the viewpoint was selected, panoramic photographs were taken at eye level from the viewpoints towards The Site. Photographs were taken with a Canon EOS 5D Mark III digital SLR through a 50mm lens to best represent the perspective of the human eye.

The visual impact of the viewpoint was then assessed both on site and with the topographic and aerial information to ensure accuracy. Viewpoint photographs and analysis is included the following pages.

Figure 6. Viewpoint Assessment Locations (Aerial Image Source: Hassell 2016)

5.0 Visual Impact Assessment

Viewpoint 01. View North from corner of Hunter Street and Brown Street

Viewpoint 01.

This photograph was taken from the corner of Brown Street and Hunter Street looking in a generally north direction towards the Site. From a pedestrian perspective, views towards the harbour are fragmented by a combination of street trees, railway infrastructure and parked cars. Large Fig trees and Plane Trees impede existing views towards the harbour from buildings associated with Hunter Street.

The preliminary Master Plan indicates the potential for Mixed Use buildings within Parcels 12 and 14. It is likely these buildings would be visible from this location, with the potential to alter the existing visual character. It is likely the existing view corridors would be retained.

Refer to Photomontage 01

Viewpoint 02. View North along Newcomen Street

Viewpoint 02.

This photograph was taken from Newcomen Street to the south of the intersection with Hunter Street. Newcomen Street runs in a generally north to south direction, with topography rising steeply to the south. Views to the north extend along Newcomen Street, across the existing railway corridor to the harbour.

The preliminary Master Plan proposes Parcel 15 be developed into open space. The view corridor between Newcomen Street to the harbour is likely to be retained as a result of the proposal. Based on the preliminary Master Plan, the visual impact from this location is likely to be negligible.

5.0 Visual Impact Assessment

Viewpoint 03. View North along Bolton Street

Viewpoint 03.

View from Bolton Street, south of the intersection at Hunter Street looking in a northerly direction towards the Site. Built form associated with Bolton Street is typical of the city, with a mix of historic and newer commercial buildings. Built form ranges in height, in excess of five storeys.

Views along Bolton Street are generally contained by built form. Views to the north, are terminated by street trees and the existing railway station building. The preliminary master plan indicates a maximum permissible building height of up to 20 metres on the southern end of the existing railway station site. The proposal has the potential to alter the existing visual character from this location.

Viewpoint 04. View from the corner of Scott and Watt Street

Viewpoint 04.

This photograph was taken from the corner of Scott Street and Watt Street looking in a generally north west direction towards Newcastle Railway Station building. Views along Watt Street extend towards the harbour. Customs House is a landmark feature.

The preliminary Master Plan identified the Railway Station Site as a Special Use with a indicative maximum building height of up to 20 metres (along Scott Street). It is unlikely there would be a loss of existing views towards the harbour from a pedestrian perspective as a result. This would alter the existing visual character from this location. In addition there is potential for loss of harbour views from properties along Scott Street.

5.0 Visual Impact Assessment

Viewpoint 05. View North from Cathedral Park

Viewpoint 05.

This photograph was taken from Cathedral Park, immediately north of Christ Church Cathedral. Views of the harbour from this location are fragmented by built form. The top of Queens Wharf Tower is visible behind the multi storey car park in the foreground.

It is unlikely the proposal would alter the existing outlook from Cathedral Park as existing built form in the foreground screens views towards the Site.

Viewpoint 06. View along Perkins Street from Church Street

Viewpoint 06.

This photograph is taken looking in a generally north direction along Perkins Street from a high point at the intersection with Church Street. Views from Church Street are generally contained by built form, with view corridors along north - south orientated streets. Views from this location extend across the harbour to Stockton yet are fragmented by built form and street trees.

From this location, development associated with Parcels 12 and 14 may be partially visible, however it is unlikely there would be a noticeable visual impact.

5.0 Visual Impact Assessment

Viewpoint 07. View South along Watt Street from Wharf Road

Viewpoint 07.

View from roundabout at the northern end of Watt Street at Central Promenade on Wharf Road. Custom House and the T&G Building are visible along Watt Street. From this location, built form associated with Scott Street is visible behind the Railway Station. Large trees associated with Scott Street and the Bus Interchange Site fragment views of built form to the south.

From this location proposed built form associated with the Railway Station and Bus Interchange Sites (Parcel 16) is likely to alter the existing visual character from this location.

Refer to Photomontage 02

Viewpoint 08. View from Wharf Road in a generally South West direction

Viewpoint 08.

View from Central Promenade looking in a generally south west direction along Wharf Road. Part of the Christ Church Cathedral is visible to the south behind buildings fronting Scott Street and vegetation associated with the railway corridor. Queens Wharf Tower and the elevated pedestrian walkway are visible to the west.

The railway corridor in the foreground has been identified in the preliminary Master Plan as open space, which is likely to have a positive visual effect from this location. Potential built from associated with Parcels 12 and 14 would be visible to the west from this location, however it is likely the visual effect would be minimal.

5.0 Visual Impact Assessment

Viewpoint 09. View South along Market Street from Wharf Road

Viewpoint 09.

View from Wharf Road at Queens Wharf Tower looking in a southerly direction across the railway corridor to Market Street. Views from this location extend to the Christ Church Cathedral, however are currently fragmented by the overhead pedestrian walkway.

The Preliminary Master Plan proposes the removal of the overhead walkway and a wide pedestrian connection to Market Street. It is likely this would have a positive visual effect through re-establishing a visual axis between Queens Wharf Tower and Christ Church Cathedral.

Viewpoint 10. View South along Wolfe Street from Wharf Road

Viewpoint 10.

View from Wharf Road looking in a south west direction along Wharf Road. Wolfe Street runs in a generally south direction from this location, rising steeply to the south. Views are currently fragmented by large street trees adjoining Parcel 12.

The existing view corridor between Wolfe Street and the harbour will be retained and potentially strengthened. It is likely the development of Parcels 12 and 14 would obstruct existing views towards the harbour from properties fronting Scott Street. It is likely a site specific DCP would include design controls (where possible) to ensure views are not impacted.

Refer to Photomontage 03

5.0 Visual Impact Assessment

Viewpoint 11. Corner of Wright Lane and Settlement Lane

Viewpoint 11.

View from the corner of Wright Lane and Settlement Lane looking in a generally south direction towards the Site. The rear of existing buildings associated with Hunter Street screen views to the south from Wright Lane. The Site sits between the Wright Lane carpark and buildings associated with Hunter Street.

The indicative built form would be visible from this location, and it is likely the scale would be in keeping with the character of the Honeysuckle precinct. Some views of the harbour from the rear of Hunter Street buildings may be impeded by the built form.

Viewpoint 12. Wright Lane

Viewpoint 12.

View from Wright Lane looking in a south direction towards the Site. It is unlikely proposed built form would result in a noticeable change to the existing visual character from this location.

5.0 Visual Impact Assessment

Viewpoint 13. Merewether Street

Viewpoint 13.

View from the corner of Hunter Street and Merewether Street looking in a north direction to the harbour. Views along Merewether Street are terminated by the Crowne Plaza Hotel. A small view corridor to the harbour is visible to the west of Crowne Plaza Hotel. This existing view corridor is unlikely to be impacted by the proposal.

Viewpoint 14. View from Wharf Road look south along Argyle Street

Viewpoint 14.

View from Wharf Road looking in south direction along Argyle Street. Parcel 09 is indicated on the preliminary mater plan as a park / plaza space with no built form. It is likely the removal of infrastructure associated with the railway corridor would result in improvements to the visual character. A view corridor from Hunter Street to the harbour would be established.

5.0 Visual Impact Assessment

Viewpoint 15. View from the corner of Crown Street and Hunter Street

Viewpoint 15.

View from the corner of Crown Street and Hunter Street looking in a north direction towards the Site. An view corridor towards the harbour is fragmented by vegetation and infrastructure associated with the existing rail corridor.

It is likely built form indicated on the preliminary master plan would screen the existing view corridor towards the harbour from this location.

5.0 Visual Impact Assessment

5.3 Summary of Visual Impact

For the purpose of this report, the visual impact resulting from the proposed rezoning and potential future built form on the Site has been assessed in three sections: west, central and east precincts. The preliminary land use, building heights and building massing has been assessed for the Site (**refer to Figure 2**) in relation to the existing visual character and view corridors.

West Precinct (Parcels 1-5)

The western end of the Site defined in the Urban Design Analysis as the 'City West Precinct' and for the purpose of this assessment refers to Parcels 1-5. Existing views in this area from a pedestrian perspective are predominantly contained by existing built form. Buildings associated with Hunter Street to the south of the Site are in excess of 2 to 3 storeys high. From a pedestrian perspective, views towards the Site from Hunter Street are screened by dense built form (*refer to Image 08*) between Worth Place and Merewether Street.

View towards the Site from areas to the south of Hunter Street are generally impeded by built form and street trees. It is likely the visual impact of the proposed development in the west precinct would be minimal from the south.

It is proposed Parcel 1, 2, 3 and 5 will be rezoned B4 Mixed Use with a maximum building height of 30 metres (Parcels 1 and 3) and 24 metres (Parcel 5). The proposed Master Plan and proposed FSR identifies a building mass of a similar scale to existing buildings.

Parcel 4 has been identified as RE1 Public Recreation. The preliminary Master Plan indicates open space in these Parcels. It is likely this will have a positive impact on the existing visual character as existing informal view corridors would be formally defined. From the north, views towards St Andrews Church (located on the corner of Auckland and Laman Street) would be emphasised by the view corridor.

Image 08. Existing built form typical of Hunter Street (to the south of Parcels 1-3)

Image 09. Existing view south towards St Andrews Cathedral along Settlement Lane from Honeysuckle Drive

5.0 Visual Impact Assessment

Central Precinct (Parcels 6 -11)

The Master Plan indicates Parcel 6 to be retained as Merewether Street, connecting Hunter Street and Wharf Road. Existing views along Merewether Street are terminated to the north by built form associated with Crown Plaza Hotel. A view corridor to the left of the Crown Plaza building will be retained.

The proposed rezoning would see Parcels 7 and 8 zoned as B4 Mixed Use with a maximum building height of 30 metres and 24 metres respectively. Existing buildings associated with Hunter Street to the south of Parcel 7 screen views to the north from a pedestrian perspective. It is likely proposed building would appear as a continuation of the existing built form.

Parcel 8 has been identified as potential B4 Mixed Use rezoning. Built form in the preliminary Master Plan runs on an angle aligned with Darby Street with open space shown on the eastern side of Parcel 8 and across Parcel 9 and 10. From a pedestrian perspective, it is likely visual connections to the harbour along Argyle Street would become improved as they would likely be available from Hunter Street and potentially Darby Street.

It is proposed Parcel 11 be rezoned B4 Mixed Use with a maximum building height of 14 metres. There is unlikely to be any significant visual impact as a result of proposed buildings in this Parcel. Existing buildings associated with Wharf Road generally impede views of the harbour from Hunter Street. An informal view corridor is present from Hunter Street between buildings associated with Lots 251 and 237. Proposed buildings on the preliminary Master Plan are likely to reinforce the view corridor.

Image 10. Existing view towards the harbour along Merewether Street to be maintained

Image 11. Existing view towards the harbour between building associated with Wharf Street from Hunter Street

Image 12. Existing view from Hunter Street towards Argyle Street.

5.0 Visual Impact Assessment

East Precinct (Parcels 12 - 16)

Parcels 12 and 14 have been identified for potential rezoning of B4 - Mixed Use with a maximum building height of 17 metres and 14 metres respectively. An indication of the scale of preliminary built form identified in the Master Plan has been illustrated in **Photomontage 01.** The highest visual impact is likely to be felt from buildings fronting Hunter Street and Scott Street. Existing views towards the harbour are fragmented from a pedestrian perspective by a combination of street trees, railway and road infrastructure. Existing views from buildings on Hunter Street fronting Parcel 12 are fragmented by large street trees (refer to Image 14). Views of the proposed development may be visible from buildings on high points to the south (ie. Church Street) however the development is unlikely to impact existing view corridors.

The proposal designates Parcel 13 for RE1 Public Recreation, and will improve the existing view corridor towards the harbour along Perkins Street.

The proposal identifies the rezoning of land within Parcel 15 to RE1 Public Recreation. The proposed Master Plan portrays large areas of open space, which would ensure existing views are maintained or improved from a pedestrian perspective. It is likely existing view corridors towards the harbour along Wolfe Street and Newcomen Street would be reinforced as a result of the proposal. The proposal suggests the removal of the existing overhead pedestrian walkway between Market Street and Queens Wharf Tower. If removed, this would result in an improvement to the visual amenity, and reinforce a significant visual axis from the Christ Church Cathedral to Queens Wharf Tower and the harbour foreshore. It is important to note this is a heritage precinct and development would require input from an approved heritage consultant.

Parcel 16 has been identified for rezoning for SP3 Special Activities with the majority of the site having a maximum building height of 10 metres and a small portion to the south having a building height of 20 metres. The proposed development of Parcel 16 is likely to have minimal impacts on existing views from a pedestrian perspective from Scott Street and Bolton Street. There is the potential for visual impacts on properties fronting Scott Street, from which views currently extend over the railway station to the harbour. It is understood that the visual impact is likely to be mitigated by design controls and heritage considerations.

The potential for the extension of built form into the northern pocket of Parcel 16 (currently occupied by the Newcastle Bus Interchange) at a maximum building height of 10 metres has the potential to result in minor visual impacts. Customs house is a landmark building, visible when travelling along Wharf Road in a easterly direction. Though currently fragmented by street trees and infrastructure associated with and railway / bus interchange the axis between queens Wharf and Customs House is a visual connection. The Master Plan illustrates an extension of the existing pedestrian promenade to the north of Customs House which would assist in creating a visual axis between Queens Wharf Tower and Customs House.

Image 13. Existing view across the Site from Perkins Street

Image 14. Existing view towards Christ Church Cathedral along Market Street

Image 15. View from Wharf Road illustrating existing street trees fragmenting views from buildings along Hunter St

5.0 Visual Impact Assessment

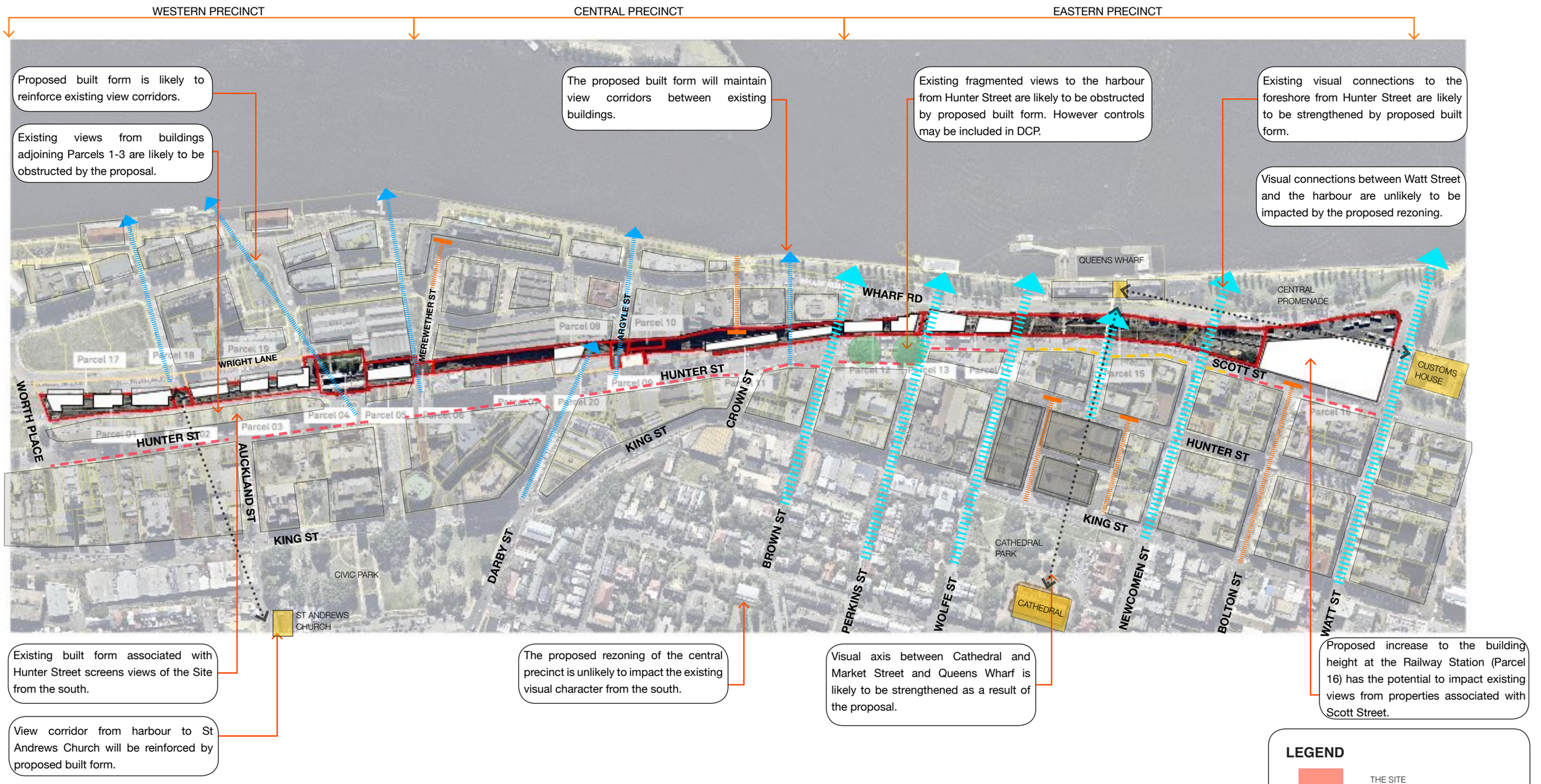


Figure 7. Visual Impact Assessment (Image Source: Hassell 2016)

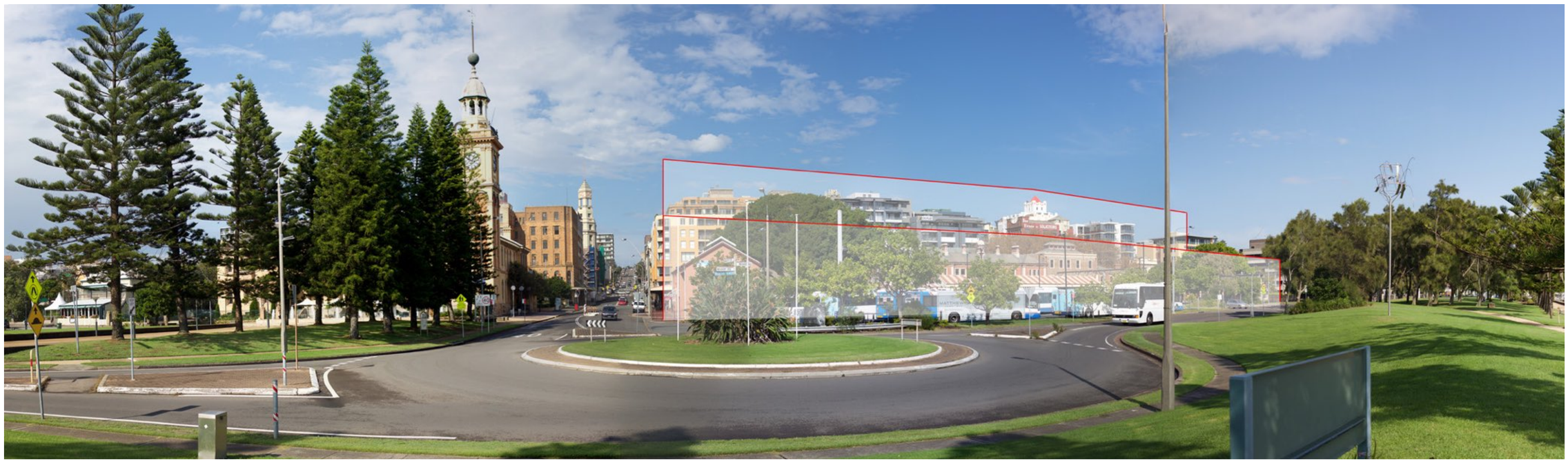
5.0 Visual Impact Assessment

Photomontage 01A. Existing View

Photomontage 01B. Indicative Built Form Overlay

5.0 Visual Impact Assessment

Photomontage 02A. Existing View



Photomontage 02B. Indicative Built Form Overlay

5.0 Visual Impact Assessment

Photomontage 03A. Existing View

Photomontage 03B. Indicative Built Form Overlay

6.0 Conclusion

6.1 Conclusion

The objective of this Visual Impact Statement is not to determine whether the proposed impact is visible or not visible, but to determine how the proposal will impact on the existing visual amenity, landscape character and scenic quality.

The built form of the proposed buildings are of a similar scale to the surrounding industrial and commercial buildings. From most areas within the Study area, the proposed development will appear as a continuation of the existing built form. Distant views towards the harbour from the south are unlikely to be impeded as a result of the proposal.

The highest visual impact is likely to be from buildings immediately surrounding the proposal. Existing harbour views from buildings fronting Scott Street immediately south of Parcels 12, 14 and 16 may be obstructed by built form suggested in the Preliminary Master Plan.

From a pedestrian perspective it is likely the proposal will result in a positive visual impact upon the existing visual character of the study area. Key view corridors between the City and Harbour will be retained and in some cases reinforced or improved as a result of the proposed built form.

Some aspects of the existing visual character of the study area are likely to be improved through the reinforcement and improvement of existing view corridors and visual axis between key landmark buildings. For example the visual axis between Christ Church Cathedral and Queens Wharf will be reinforced and have a positive impact on the visual character from Market Street.

The proposed redevelopment of rail corridor land to the north of the city (currently inaccessible to the public) into functional open space will have a positive impact on the existing character of the study area.

It is our opinion that the proposed rezoning and built form as per the Preliminary Master Plan could be undertaken with minimal visual impact.

References

PUBLICATIONS AND REPORTS

Colleran, JR. & Gearing D. (1980) *A Visual Assessment Method for Botany Bay*, Landscape Australia, 3 August.

DOP (1988) *Rural Land Evaluation*, Government Printer, Department of Planning.

EDAW (Australia) Pty Ltd (2000) '*Section 12 – Visual Assessment', The Mount Arthur North Coal Project: Environmental Impact Statement*, URS Australia Pty Ltd, Prepared for Coal Operations Limited.

New South Wales Department of Planning, (2010) http://www.planning.nsw.gov.au/

Hassell (2016) Newcastle Urban Transformation and Transport Program, Urban Design Analysis, Australia.

The Landscape Institute with the Institute of Environmental Management and Assessment (2008) *Guidelines for Landscape and Visual Assessment Second Edition,* Newport, Lincoln.

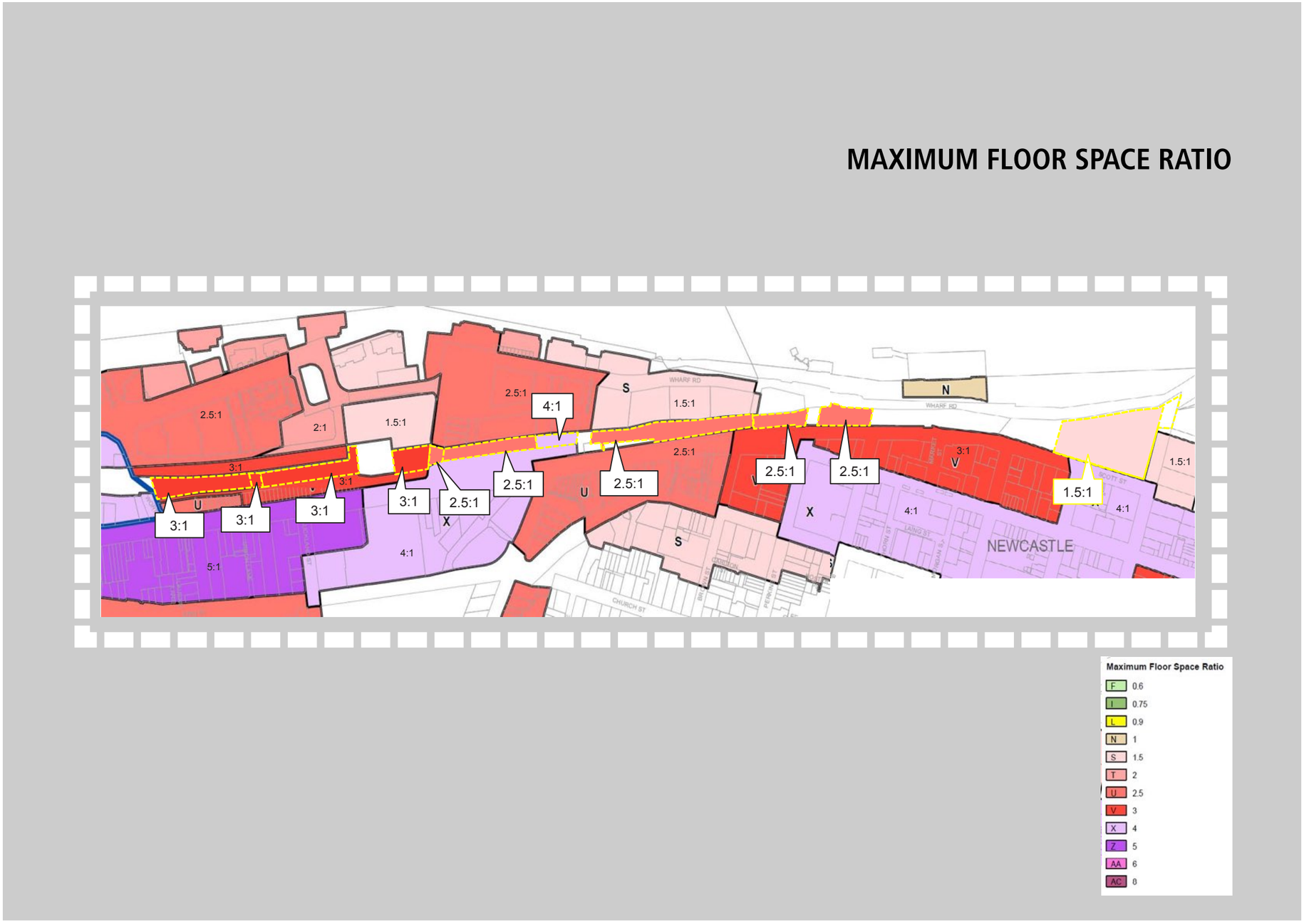
Urbis (2009) *Berrybank Visual Impact Assessment* - Final Report, Australia.

MAPS

Google Maps, 2014 http://google.com/maps/

Six Maps, 2014, http://http://maps.six.nsw.gov.au/

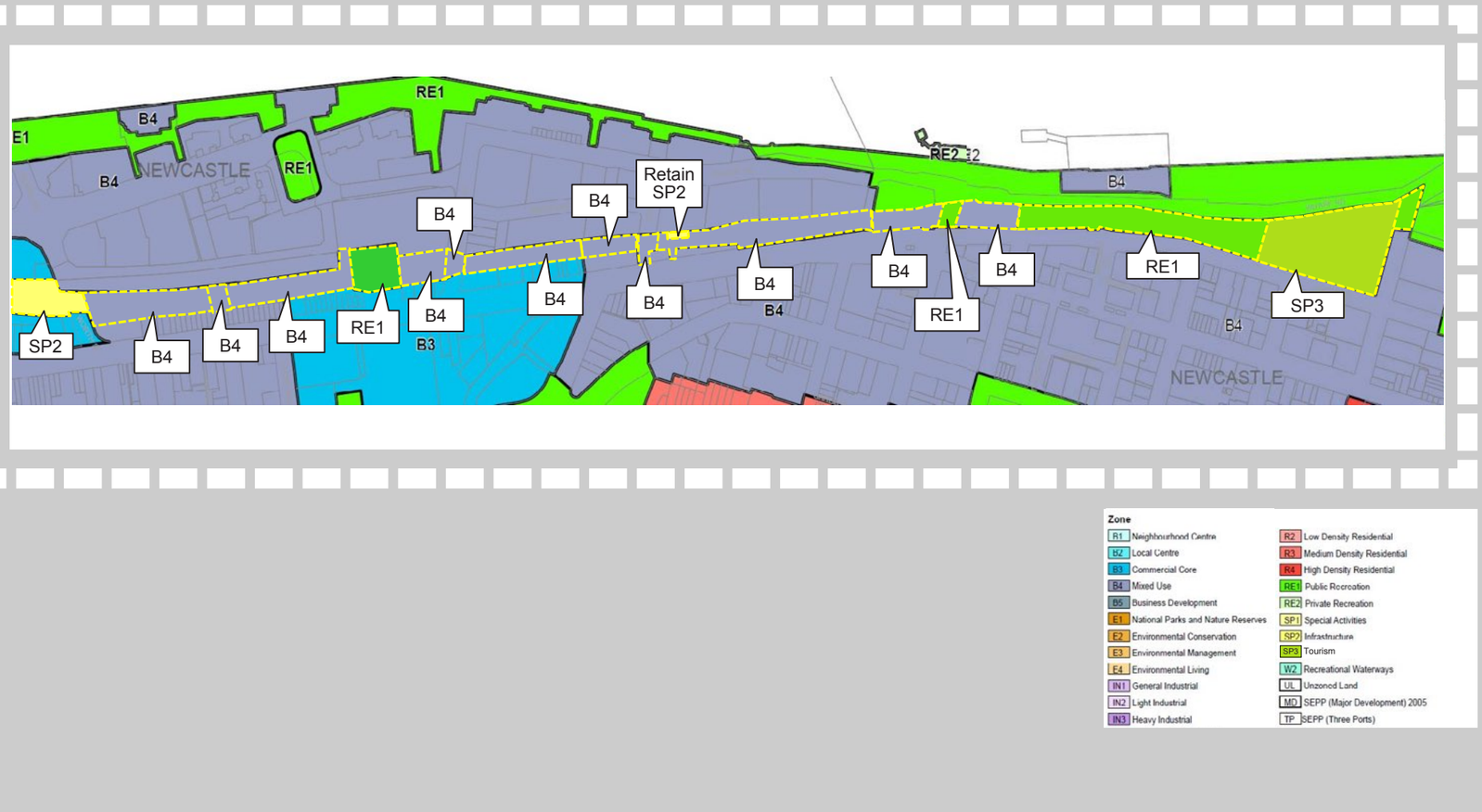
Appendix A



Appendix A. Maximum Floor Space Ratio (Source: Elton Consulting 2016)

Appendix B

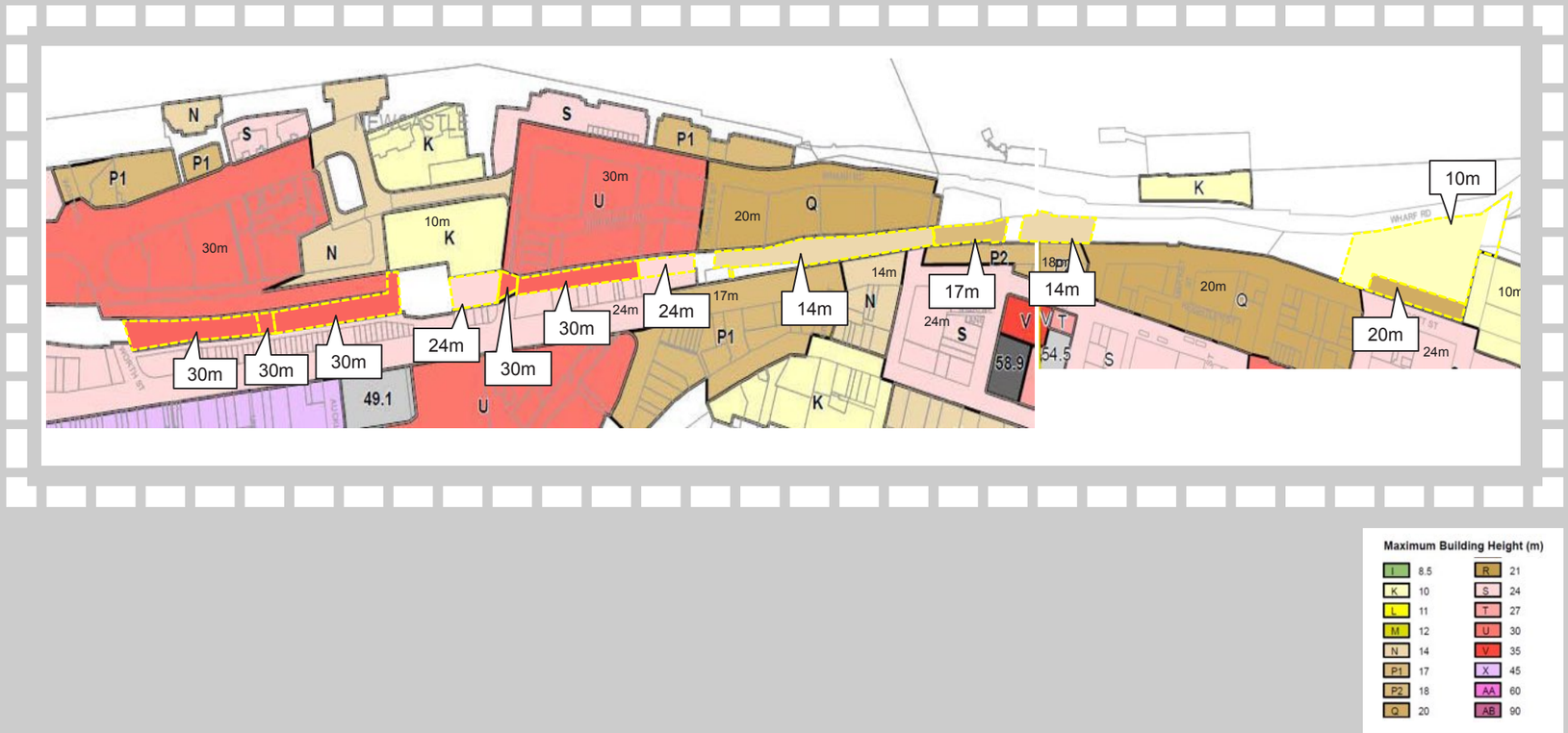
LAND USE ZONING



Appendix B. Land use Zoning (Source: Elton Consulting 2016)

Appendix C

MAXIMUM BUILDING HEIGHT



Appendix C. Maximum Building Heights (Source: Elton Consulting 2016)