

FLORA AND FAUNA ASSESSMENT REPORT

PROPOSED REZONING LOT 1 DP 112876, LOT 1 DP 342364, LOT 1 DP 375642 & LOT 16 DP 225197 WALKER STREET HELENSBURGH

SEPTEMBER 2011 (REF: 1181F)

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Conacher Environmental Group

Environmental and Land Management Consultants

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PREFACE

This Flora and Fauna Assessment Report has been prepared by Conacher Environmental Group to identify the flora and fauna characteristics of land within Lot 1 DP 112876, Lot 1 DP 342364, Lot 1 DP 375642 & Lot 16 DP 225197, Walker Street Helensburgh.

This report provides an assessment of existing habitats and the potential for the proposed activity following rezoning of the subject site to significantly impact on threatened species according to the provisions of Section 5(A) of *the Environmental Planning and Assessment (EP&A) Act* 1979 and the *Threatened Species Conservation Act* 1995.

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SECTION 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Conacher Environmental Group has been engaged to prepare a Flora and Fauna Assessment Report for a proposed development within Lot 1 DP 112876, Lot 1 DP 342364, Lot 1 DP 375642 & Lot 16 DP 225197, Walker Street Helensburgh.

This Flora and Fauna Assessment Report has been prepared to identify the flora and fauna characteristics of the site and to determine whether or not a Species Impact Statement should be prepared for development according to the provisions of Section 5(A) of the *Environmental Planning & Assessment Act* 1979 (EP&A Act) and the *Threatened Species Conservation Act* 1995 (TSC Act). The planning and cadastral details of the subject site are provided in Table 1.1.

TABLE 1.1				
	SITE DETAILS			
Location	Lot 1 DP 112876, Lot 1 DP 342364, Lot 1 DP 375642 & Lot 16 DP 225197, Walker Street Helensburgh.			
Area	Approximately 32 hectares			
Topographic Map	Appin 1:25 000			
Grid Reference	314020E 6213178N			
Local Government Area	Wollongong City Council			
Existing Land Use	Resource recovery facility / Rural residential			
Current Zoning	E3 Environmental Management			
Proposed Development	Rezoning			

1.2 PROPOSED DEVELOPMENT

The site has been rezoned E3 Environmental Management in the Wollongong Local Environment Plan 2009 which was adopted in 2010. It is proposed to amend the zoning of the subject site to allow for the ongoing operation of the existing resource recovery facility within an appropriate zoning.

An Environmental Management Plan (EMP) has been prepared by Argus P/L (2010) for the existing resource recovery facility. This document provides the environmental procedures to be followed during resource recovery operations to prevent adverse impacts to the environment both with and off the subject site. The environmental procedures provided in the EMP have been considered in assessments undertaken within this report for the rezoning of the subject site.

SECTION 2

FLORA CHARACTERISTICS

2.1 THREATENED FLORA SPECIES

A search of the Atlas of NSW Wildlife (NPWS 2011) was undertaken to identify records of threatened flora species located within 10km of the site. This allowed for a specific search for threatened flora to be undertaken determining if any threatened flora species were present within the subject site. Details on threatened flora species as listed in Schedules 1 and 2 of the *TSC Act* (1995), with a known or possible occurrence within the local area, are provided in Table 2.1.

TABLE 2.1 THREATENED ELORA SPECIES OF THE AREA					
	TSC Act	EPBC	Growth Form and Habitat		
Species		Act	Requirements	Comments	
Acacia bynoeana	E1	V	Erect or spreading shrub to 0.3 m high growing in heath and dry sclerophyll open forest on sandy soils. Typically occurs on substrates of sand and sandy clay, often with ironstone gravels and is usually very infertile and well- drained. Often associated with disturbed areas such as roadsides.	Suitable habitat present.	
Astrotricha crassifolia	V	V	Shrub to 2.4 m high. Grows in dry sclerophyll woodland on sandstone. Distribution limits N- Patonga S- Royal NP	Suitable habitat present.	
Callistemon linearifolius	V	-	Shrub to 4m high. Grows in Sclerophyll Forest in moist gullies on coast and adjacent ranges, Nelson Bay to Georges River.	Suitable habitat present.	
Daphnandra sp. C Illawarra	E	E	Medium sized rainforest tree to 20m. Occupies the rocky hillsides and gully slopes of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes. It is associated soils are loams and clay loams derived from volcanic or fertile sedimentary rocks. Occurs within subtropical, moist subtropical, dry subtropical and mixed subtropical - warm temperate rainforest types of Mills & Jakeman (1995). Occasionally found in moist Eucalypt forest in association with <i>Eucalyptus tereticornis</i> <i>E. pilularis, E. quadrangulata</i> or <i>Casuarina cunninghamiana.</i>	Suitable habitat present.	
Epacris purpurascens var. purpurascens	V	-	Occurs in Sydney Sandstone Gully Forest (NPWS, 1997) and scrub with periodically poorly drained clay soil on sandstone or shale (Benson and McDougall 1996).	No suitable habitat present.	

TABLE 2.1 THREATENED FLORA SPECIES OF THE AREA					
	TSC Act	EPBC	Growth Form and Habitat		
Species		Act	Requirements	Comments	
Haloragis exalata subsp. exalata	V	-	A shrub to 1.5 metres high with 4-ribbed or square stems and opposite leaves. Grows in damp places near watercourses. Distribution: North Coast to South Coast & NW Slopes of NSW.	Suitable habitat present.	
Leucopogon exolasius	V	V	Grows in woodland on sandstone. Found along the upper Georges River area and in Heathcote National Park. Flowering occurs in August and September.	No suitable habitat present.	
Melaleuca deanei	V	V	Grows in heath on sandstone and flowers in summer. Occurs in two distinct areas, in the Ku-ring-gai/Berowra & Holsworthy / Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.	No suitable habitat present.	
Pultenaea aristata	V		A prickly small shrub less than 40cm high. Occurs in low nutrient sandstone soils in both moist and dry areas. Associated with the Upland Swamps, Banksia Thicket and Restioid Heath. Also reported from areas of impeded drainage and creek lines within sandstone woodland and gully forest plant communities. Restricted to the Woronora Plateau, Helensburg and Mt Kira.	Suitable habitat present.	
Pomaderris adnata	E	-	Known only from one site at Sublime Point, north of Wollongong. Occurs near the edge of the plateau behind the Illawarra escarpment. Associated vegetation is Eucalyptus sieberi, Corymbia gummifera with occasional Hakea.	No suitable habitat present.	
Prostanthera marifolia	PE	PE	Low straggling shrub to 1m. Grows in sclerophyll forest and woodland, usually near the coast, on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	No suitable habitat present.	
Syzygium paniculatum	E	V	Found in subtropical and littoral rainforests on sandy soil. On the south coast this species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast this species occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	No suitable habitat present.	
Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species					

No threatened flora species were observed on the subject site. The threatened flora species which are considered to have suitable habitat within the subject are assessed under the 7 part test of significance in Section 4 of this Report.

2.2 ENDANGERED FLORA POPULATIONS & ECOLOGICAL COMMUNITIES

2.2.1 Endangered Flora Populations

The following Endangered Flora Populations are currently listed as occurring in the local government area:

- Chorizema parviflorum in the Wollongong and Shellharbour Local Government Areas;
- Lespedeza juncea subsp. sericea in the Wollongong Local Government Area; and
- Woronora Plateau population of Callitris endlicheri.

These species were not observed within the subject site. It is therefore considered that no endangered population occurs within the subject site.

2.2.2 Endangered Ecological Communities

Details regarding the habitat attributes and indicative species for the Endangered Ecological Communities (EECs) known to occur in the local government area are provided in Table 2.2.

TABLE 2.2 RECORDED ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
NAME	HABITAT REQUIREMENTS	COMMENTS		
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions (BSF)	Geology / Soils: occurs on deep, freely draining to damp sandy soils Topography: Flat to moderate slopes within a few km of the sea and at altitudes below 100 m. Characteristic Species: Eucalyptus botryoides, Eucalyptus pilularis, Banksia integrifolia subsp. integrifolia, Banksia serrata, Acmena smithii, Casuarina glauca, Banksia serrata, Leptospermum laevigatum, Monotoca elliptica, Pittosporum undulatum, Dianella spp., and Themeda australis.	No suitable habitat present.		
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (CS)	Geology / Soils: Estuarine mud flats. Topography: Intertidal zone on the shores of estuaries and lagoons often inland of Mangrove stands. Characteristic Species: Variable with elevation; Lowest-Sarcocornia quinqueflora; Mid-Sporobolus virginicus; Upper-Juncus krausii & Baumea juncea	No suitable habitat present.		
Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion (FWCF)	Geology / Soils: Silts, muds or humic loams. Topography: in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. Characteristic Species: Carex appressa, Paspalum distichum, Baumea caniculata, Phylidrum lanuginosum, Ludwigia peploides ssp. montevidensis and Myriophyllum spp.	No suitable habitat present.		

TABLE 2.2 RECORDED ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
NAME	HABITAT REQUIREMENTS	COMMENTS		
Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion (ILGW)	Geology / Soils: Generally on the Berry Siltstone, Budgong Sandstone and Quaternary Alluvium. Topography: Relatively gently sloping and undulating lands below 200metres elevation. Characteristic Canopy Species: Eucalyptus tereticornis, Eucalyptus bosistoana, Eucalyptus eugenioides, Eucalyptus longifolia and Melaleuca decora Characteristic vegetation communities: NPWS (2003) identify two vegetation communities as corresponding with the EEC, ILGW. These communities are MU 23 – Coastal Grassy Red Gum Forest and MU 24 Lowland Woolybutt- Melaleuca Forest.	No suitable habitat present.		
Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (ISR)	Geology / Soils: High nutrient soils associated with the Permian Volcanics, but may occur on a range of geological substrates between Albion Park and Gerringong. Topography: Relatively gently sloping and undulating lands of the coastal plain and escarpment foothills. Characteristic Canopy Species: Baloghia inophylla, Brachychiton acerifolius, Dendrocnide excelsa, Diploglottis australis, Ficus rubiginosa, Ficus superba var. henneana, Pennantia cunninghamii and Toona australis. Characteristic vegetation communities: NPWS (2002) identify MU 4 – Lowland Dry- Subtropical Rainforest as corresponding with this community	No suitable habitat present.		
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Geology/soils: Sand dunes and soils derived from underlying rocks. Topography: Coastal sand dunes, hind dunes and head lands. Characteristic species: Predominantly rainforest species with emergent sclerophyll species such as Angophora costata, Banksia integrifolia, Eucalyptus botryoides and Eucalyptus tereticornis.	No suitable habitat present.		
Nontane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	Geology / Solis: Accumulated peaty or organic-mineral sediments. Topography: Poorly drained flats in the headwaters of streams. Characteristic Species: Baeckea spp., Callistemon spp., Leptospermum spp., Sphagnum spp.	present.		
O'Hares Creek Shale Forest (OCSF)	Geology / Soils: deep, well drained red loam on small outcrops of Hawkesbury shale Topography: Darkes Forest area on the Woronora Plateau Characteristic Species: Eucalyptus piperita, Eucalyptus globoidea, Angophora costata, Acacia binervata, Acacia longifolia ssp. longifolia, Leucopogon lanceolatus var. lanceolatus, Banksia spinulosa var. spinulosa.	No suitable habitat present.		

TABLE 2.2 RECORDED ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
NAME	COMMENTS			
	Calochlaena dubia, Pteridium esculentum, Doryanthes excelsa, Dianella caerulea, Lomandra longifolia, Blechnum cartilagineum, Entolasia stricta, and Imperata cylindrica var. major.			
River-Flat Eucalypt Forest on Coastal Floodplains of the North Coast, Sydney basin and South East Corner bioregions (RFEF)	Geology / Soils: Silts, clay-loams and sandy loams. Topography: Periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains with a recurring flood interval of less than 1 in 100 years. Characteristic Species: Eucalyptus tereticornis, E. amplifolia, E. botryoides, E. grandis, E. benthamii, Angophora floribunda, A. subvelutina, Melaleuca decora, M. stypheloides, Backhousia myrtifolia, Casuarina cunninghamiana and Casuarina glauca.	No suitable habitat present.		
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion (SSSFTSS)	 Geology and Soils: Transitional sandstone- derived soils enriched from sources of additional nutrients Topography: Heads and upper slopes of sandstone gullies, which are downslope from residual shale or ironstone caps with slopes often not exceeding 10°. Characteristic Species: Angophora costata, Eucalyptus piperita, E. pilularis, Corymbia gummifera, Allocasuarina littoralis, Ceratopetalum gummiferum Acacia sp., Banksia sp., Persoonia sp., Leptospermum polygalifolium, Leucopogon lanceolatus, Lomatia silaifolia, Allocasuarina littoralis, Smilax glyciphylla, Lomandra longifolia, Entolasia stricta, Imperata cylindrica, Lepidosperma laterale, Lepyrodia scariosa, Gonocarpus teucrioides and Dianella caerulea. 	No suitable habitat present.		
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF)	Geology / Soils: Alluvial soils of fluvial or estuarine origin, with significant salinity. Topography: Flood plains in areas with saline soils and flats adjoining estuaries. Characteristic Species: Casuarina glauca.	No suitable habitat present.		
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SSFCF)	Geology / Soils: Waterlogged or periodically inundated humic clay loams and sandy loams. Topography: Alluvial flats and drainage lines of coastal floodplains with a recurring flood interval of less than 1 in 100 years. Characteristic Species: includes species such as Eucalyptus robusta, Melaleuca quinquenervia and eucalyptus botryoides.	No suitable habitat present.		
Sydney Freshwater Wetlands in the Sydney Basin Bioregion (SFW)	Geology / Soils: Generally on the Warriewood and Tuggerah Soil Landscapes (Chapman and Murphy 1989). Topography: Swales and depressions on sand dunes and sandplain sites. Characteristic Species: <i>Eleocharis</i>	No suitable habitat present.		

TABLE 2.2 RECORDED ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
NAME	HABITAT REQUIREMENTS	COMMENTS		
	sphacelata, Baumea juncea, B. rubignosa, B. articulata, Gahnia sieberiana, Ludwigia peploides and Persicaria sp			
Themeda Grassland on Seacliffs and Coastal Headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions (TGSCH)	Geology / Soils: Found on a range of substrates including old sand dunes above cliffs and on basalt headlands, and less frequently on sandstone. Topography: Seacliffs and Coastal Headlands Characteristic Species: Themeda australis, Acacia sophorae, Banksia integrifolia subsp. integrifolia, Commelina cyanea, Glycine clandestina, Glycine microphylla, Hibbertia scandens, Isolepis nodosa, Kennedia rubicunda, Lepidosperma spp., Leptospermum laevigatum, Lomandra longifolia, Monotoca elliptica, Opercularia aspera, Pimelea linifolia, Poranthera microphylla, Sporobolus virginicus, Viola banksii, Westringia fruticosa.	No suitable habitat present.		

No endangered ecological communities were observed within the subject site.

2.3 VEGETATION SURVEY METHODOLOGY

To determine the likely and actual occurrence of flora species and plant communities on the subject site, field survey work was undertaken to supplement literature reviews and previous flora surveys of the area. The methods utilised for the flora survey are outlined as follows.

Literature Review

- A review of available literature for the area was undertaken to obtain reference material and background information for this study. These documents are listed in the References section of this Report.
- A search of the Atlas of NSW Wildlife (NPWS 2011) was undertaken to identify records of threatened flora species located within 10km of the site. This enabled the preparation of a predictive list of threatened flora species that could possibly occur within the habitats found on the site.

Aerial Photograph Interpretation

• Aerial photographs were utilised to identify the extent of vegetation with respect to the site and surrounding areas.

Flora Survey

- The field survey consisted of foot traverses within vegetated areas and was conducted according to Cropper (1993) to identify the occurrence of flora species and the extent and location of vegetation communities present across the subject site.
- A flora survey was undertaken on 8 and 9 September 2011 generally incorporating the methodologies outlined DECC (2004). Due to the disturbed condition of areas currently utilised for resource recovery operations, it was considered that a reduced level of flora

survey was appropriate. Specifically surveys were conducted to determine the distribution and extent of vegetation communities and likely presence of threatened flora species within the site. Detailed quadrat and targeted meander surveys were confined to areas containing endemic vegetation.

- Three 20 x 20m (400m²) quadrats were established and sampled within the subject site for all flora species. One quadrat was sampled within each of the three endemic vegetation types identified, as shown in Figure 1.
- Three targeted 100m meander searches were undertaken with observation and recording of species occurring within 2m. One targeted meander search was undertaken within each of the three endemic vegetation types identified, as shown in Figure 1.
- Specimens of plants not readily identified in the field were collected for identification.
- Specimens of plants tentatively identified as threatened species are sent to the Sydney Royal Botanic Gardens for confirmation of the identification.
- All vascular plants were identified using keys and nomenclature in Harden (1994), Harden and Murray (2000) and Harden (2002). Wherever they were known, changes to nomenclature and classification have been incorporated into the results.

Vegetation Community Nomenclature

- Initial identification of vegetation communities was undertaken by *Conacher Environmental Group* in accordance with the formations and classes of Keith (2004) with classification undertaken according to species composition and the structural descriptions of *Specht et. al.* (1995).
- Corresponding units of available vegetation mapping are identified where available.
- Corresponding Endangered Ecological Communities listed on both the *TSC Act* (1995) and *Environmental Protection and Biodiversity Conservation Act* (1999) (EPBC) are also provided if relevant.

Seasonality

As many threatened flora species are best observed during their flowering period, this survey was unable to detect species which flower at various other times of the year. In order to detect species that flower at other times of the year, additional targeted searches may be required. The flowering times of cryptic threatened flora and the dates of seasonally targeted searches are provided in Table 2.3.

However due to the highly disturbed nature of the current area of resource recovery operations it is considered that areas of previous and ongoing operations within the site have a very low potential for occupation by threatened flora species. The completion of further seasonal flora surveys for cryptic threatened flora species is not recommended for this project.

TABLE 2.3 FLOWERING TIMES OF CRYPTIC FLORA					
SPECIES FLOWERING PERIOD* SURVEYED					
Astrotricha crassifolia	September - November	September 2011			
Haloragis exalata subsp. exalata	November to January	-			
Pultenaea aristata	June and November	September 2011			
* The flowering period may differ (earlier or later) due to annual differences in seasonal intensity					

2.4 VEGETATION COMMUNITY DESCRIPTIONS AND FLORA SPECIES

The vegetation communities present within the subject site consist of:

- Cleared Land with Scattered Trees;
- Sydney Peppermint / Smooth-barked Apple / Silvertop Ash Open Forest;
- Blackbutt Open Forest;
- Coachwood/Sassafras Closed Forest.

Vegetation community descriptions are provided below while a detailed species list is provided in Table 2.4 and vegetation community locations are shown in Figure 1. No threatened flora species were observed during surveys.

CLEARED LAND WITH SCATTERED TREES

Structure: Trees:	To 25 metres in height with <5% PFC.				
Shrubs:	To 3 metres in height with <5% PFC.				
Groundlayer:	To 0.25 metres in height with 80% PFC.				
Floristics: (Characteristic Species) Canopy Trees:	Eucalyptus piperita, Eucalyptus haemastoma, Angophora costata, Salix sp. and Syagrus romanzoffiana.				
Shrubs:	Verbena bonariensis and Acacia mearnsii.				
Groundlayer:	Pennisetum clandestinum, Senecio madagascariensis, Cynodon dactylon and Ageratina adenophora.				
Weeds:	Salix sp., Syagrus romanzoffiana, Pennisetum clandestinum, Senecio madagascariensis and Ageratina adenophora.				

Weed Invasion:

This community is dominated by an understorey of weed species.

Disturbance:

This community contains low levels of remnant scattered canopy trees. This area of the site has been cleared many decades prior and subjected to high levels of disturbance from the operation of the existing resource recovery facility, occupation of residential dwellings, infilling and earth moving, the creation of tracks and pasture improvement for grazing.

Variation:

Large areas of this community are devoid of vegetation and the distribution of exotic species is variable.

Location and Distribution:

This community occurs within the western area of the site and occupies approximately 10.3 hectares.

Classification:

Due to the low levels of native vegetation observed and high levels of previous and ongoing disturbance, it is considered that this vegetation community does not represent any endemic vegetation type described by NPWS (2002). This vegetation community does not correspond to any threatened ecological communities listed within the *TSC Act* (1995).

SYDNEY PEPPERMINT / SMOOTH-BARKED APPLE / SILVERTOP ASH OPEN FOREST

Structure:

Trees:	To 20 metres in height with 40% Projected Foliage Cover (PFC).		
Sub-canopy	To 15 metres in height with 10% PFC.		
Shrubs:	To 2 metres in height with 5-40% PFC.		
Groundlayer:	To 0.5 metres in height with 25% PFC.		
Floristics: (Characteristic Species) Trees:	Eucalyptus piperita, Angophora costata and Eucalyptus sieberi.		

Sub-canopy:	Banksia serrata and Allocasuarina torulosa.
Shrubs:	Doryanthes excelsa, Banksia spinulosa, Hakea gibbosa.
Groundlayer:	Patersonia glabrata, Lomandra longifolia and Acacia ulicifolia.
Weeds:	Ageratina adenophora.

Weed Invasion:

Weed invasion is low throughout and is generally confined to track edges and the western extent of the community.

Disturbance:

Historical infilling has occurred along the western extent of this community and an access track was observed along the top of the escarpment in the southern areas of the site.

Variation:

This community consists of a dense heathy understorey on the top of the escarpment, which thins significantly on side slopes. There is also some overlap where this community grades into the Blackbutt Open Forest vegetation community which occurs downslope.

Location and Distribution:

This community occurs predominantly on top of the escarpment and upper side slopes within the subject site and covers approximately 4.1 hectares.

Classification:

This vegetation community corresponds to Map Unit 28 – Sandstone Gully Apple-Peppermint Forest as described and mapped by NPWS (2002). This vegetation community does not correspond to any threatened ecological communities listed within the *TSC Act* (1995).

BLACKBUTT OPEN FOREST

Structure:

	Trees:	To 30 metres in height with 40% PFC.			
	Sub-canopy	To 10 metres in height with 10% PFC.			
	Shrubs:	To 4 metres in height with 20% PFC.			
	Groundlayer:	To 1 metres in height with 15% PFC.			
Florist (Chara	i cs: cteristic Species) Trees:	Eucalyptus pilularis and Angophora costata.			
	Sub-canopy:	Syncarpia glomulifera.			
	Shrubs:	Leucopogon lanceolatus, Banksia spinulosa, Doryanthes excelsa, Trochocarpa laurina and Acacia binervata.			
	Groundlayer:	Lomandra longifolia, Pteridium esculentum, Blechnum cartilagineum, Hypolepis muelleri, Xanthorrhoea minor and Entolasia marginata.			
	Weeds:	Ageratina adenophora and various exotic grasses.			

Weed Invasion:

Weed invasion is low throughout and is generally confined to edge areas where this community adjoins the Cleared Land with Scattered Trees vegetation community.

Disturbance:

Disturbances observed include weed invasion, clearing and infilling all of which are confined to upper slope edge areas adjoining the Cleared Land with Scattered Trees vegetation community.

Variation:

Smooth-barked Apple is a sub-dominant canopy tree in upper slope areas with an understorey of heath species and is generally absent from moister areas on lower slopes which contain predominantly Blackbutts with a more mesic understorey.

Location and Distribution:

This community occurs predominantly on escarpment slopes within the site and occupies approximately 14.1 hectares.

Classification:

This vegetation community corresponds to Map Unit 16 – Escarpment Blackbutt Forest as described and mapped by NPWS (2002). This vegetation community does not correspond to any threatened ecological communities listed within the *TSC Act* (1995).

COACHWOOD/SASSAFRAS CLOSED FOREST

Structure:

Canopy Trees:	To 30 metres in height with 40% PFC.
Sub-Canopy Trees:	To 20 metres in height with 50% PFC.
Shrubs:	To 5 metres in height with 10% PFC.
Groundlayer:	To 1 metres in height with 5% PFC.
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Floristics:

(Characteristic Species) Canopy Trees:	Ceratopetalum apetalum and Doryphya sassafras.			
Sub-Canopy Trees:	Synoum glandulosum and Livistona australis.			
Shrubs:	Cyathea leichhardtiana, Livistona australis, Tasmania insipida, Doryphya sassafras Claoxylon australe and Synoum glandulosum.			
Groundlayer:	Blechnum cartilagineum, Pteris umbrosa and Blechnum ambiguum.			
Weeds:	Lantana camara.			

Weed Invasion:

Very low levels of Lantana were observed within the eastern areas of this community.

Disturbance:

Low levels of weed invasion.

Variation:

Projected foliage cover within the understorey and the distribution of some canopy tree species is variable throughout this community.

Location and Distribution:

This community occurs in sheltered areas of lower elevation along the drainage line of Herbert Gully within the site and occupies approximately 3.7 hectares.

Classification:

This vegetation community corresponds to Map Unit 2 – Coachwood Warm Temperate Rainforest as described and mapped by NPWS (2002). This vegetation community also corresponds to Coachwood Warm Temperate Rainforest Type 7 of Mills and Jakeman (1995). This vegetation community does not correspond to any threatened ecological communities listed within the *TSC Act* (1995).

TABLE 2.4 FLORA SPECIES OBSERVED ON THE SUBJECT SITE				
Family	Scientific Name	Common Name		
TREES				
Arecaceae	Svagrus romanzoffiana*	Cocos Palm		
Casuarinaceae	Allocasuarina torulosa	Forest Oak		
Cunoniaceae	Ceratopetalum apetalum	Coachwood		
Lauraceae	Cinnamomum camphora*	Camphor Laurel		
Meliaceae	Synoum alandulosum subsp. alandulosum	Scentless Rosewood		
	Toona ciliata	Red Cedar		
Monimiaceae	Dorvphora sassafras	Sassafras		
Moraceae	Ficus coronata	Creek Sandpaper Fig		
Myrtaceae	Acmena smithii	Lilly Pilly		
	Angophora costata	Svdnev Red/Rustv Gum		
	Corvmbia gummifera	Red Bloodwood		
	Eucalyptus botrvoides	Bangalay		
	Eucalyptus haemastoma	Broad-leaved Scribbly Gum		
	Eucalyptus niperita	Sydney Peppermint		
	Eucalyptus sieberi	Silvertop Ash		
	Lophostemon confertus	Brush Box		
	Svncarpia glomulifera			
Salicaceae	Salix sp.	Willow		
Canoaccac				
SHRUBS				
Cactaceae	Opuntia stricta var. stricta*	Common Prickly Pear		
Cunoniaceae	Callicoma serratifolia	Black Wattle		
Cvatheaceae	Cvathea leichhardtiana	Prickly Treefern		
Ericaceae	Epacris pulchella	Wallum Heath		
	Leucopogon iuniperinus	Prickly Beard-heath		
	Leucopogon lanceolatus	,		
	Styphelia viridis			
	Trochocarpa laurina	Tree Heath		
Escalloniaceae	Abrophyllum ornans	Native Hydrangea		
Euphorbiaceae	Claoxvlon australe	Brittlewood		
Fabaceae				
(Caesalpinioideae)	Senna pendula var. glabrata*			
Fabaceae (Faboideae)	Aotus ericoides			
	Bossiaea obcordata	Spiny Bossiaea		
	Dillwynia retorta			
	Dillwynia sieberi			
	Glycine microphylla	Small-leaf Glycine		
	Platylobium formosum subsp. formosum			
	Pultenaea daphnoides	Large-leaf Bush-pea		
	Pultenaea flexilis			
Fabaceae (Mimosoideae)	Acacia binervata	Two-veined Hickory		
	Acacia falcata			
	Acacia linearifolia	Narrow-leaved Wattle		
	Acacia longifolia subsp. longifolia	Sydney Golden Wattle		
	Acacia mearnsii	Black Wattle		
	Acacia obtusifolia			
	Acacia suaveolens	Sweet Wattle		
	Acacia ulicifolia	Prickly Moses		

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TABLE 2.4 FLORA SPECIES OBSERVED ON THE SUBJECT SITE				
Family	Scientific Name	Common Name		
Mvrtaceae	Leptospermum polygalifolium			
	Melaleuca squarrosa			
Proteaceae	Banksia ericifolia subsp. ericifolia			
	Banksia paludosa			
	Banksia serrata	Old-man Banksia		
	Banksia spinulosa var. spinulosa			
	Conospermum taxifolium			
	Grevillea oleoides	Red Spider Flower		
	Grevillea sericea			
	Grevillea sphacelata	Grey Spider Flower		
	, Hakea qibbosa	,		
	Isopogon anethifolius			
	Lambertia formosa	Mountain Devil		
	Persoonia linearis	Narrow-leaved Geebung		
Rutaceae	Zieria smithii	Sandfly Zieria		
Sapindaceae	Alectryon subcinereus	Wild Quince		
Thymelaeaceae	Pimelea latifolia subsp. latifolia			
GROUNDCOVERS				
Adiantaceae	Adiantum hispidulum	Rough Maidenhair		
Apiaceae	Actinotus minor	Lesser Flannel Flower		
	Centella asiatica	Indian Pennywort		
Apocynaceae	Vinca major*	Periwinkle		
Araceae	Zantedeschia aethiopica*	Arum Lily		
Araliaceae	Polyscias sambucifolia	Elderberry Panax		
Arecaceae	Livistona australis	Cabbage Palm		
Asparagaceae	Asparagus aethiopicus*	Asparagus Fern		
Asteraceae	Ageratina adenophora*	Crofton Weed		
	Onopordum acanthium subsp. acanthium*	Scotch Thistle		
	Senecio madagascariensis*	Fireweed		
Blechnaceae	Blechnum ambiguum			
	Blechnum cartilagineum	Gristle Fern		
Commelinaceae	Commelina cyanea	Native Wandering Jew		
Cyperaceae	Carex appressa	Tall Sedge		
	Gahnia clarkei	Tall Saw-sedge		
Dennstaedtiaceae	Hypolepis muelleri	Harsh Ground Fern		
	Pteridium esculentum	Bracken		
Doryanthaceae	Doryanthes excelsa	Gymea Lily		
Euphorbiaceae	Pseudanthus pimeleoides			
	Ricinus communis*	Castor Oil Plant		
Fabaceae (Faboideae)	Trifolium repens*	White Clover		
Gleicheniaceae	Gleichenia dicarpa Pouched Coral Fern			
	Gleichenia rupestris			
	Sticherus flabellatus var. flabellatus	Umbrella Fern		
Iridaceae	Patersonia glabrata	Leafy Purple-flag		
Juncaceae	Juncus bufonius*	Toad Rush		
Lomandraceae	Lomandra gracilis			
	Lomandra longifolia			
Loranthaceae	Amylotheca dictyophleba			

TABLE 2.4 FLORA SPECIES OBSERVED ON THE SUBJECT SITE				
Family	Scientific Name	Common Name		
Orchidaceae	Caladenia catenata	White Fingers		
Osmundaceae	Todea barbara	King Fern		
Phormiaceae	Dianella caerulea	Blue Flax-lily		
Poaceae	Chloris gayana*	Rhodes Grass		
	Cortaderia selloana*	Pampas Grass		
	Cynodon dactylon	Common Couch		
	Entolasia marginata	Bordered Panic		
	Entolasia stricta	Wiry Panic		
	Imperata cylindrica var. major	Blady Grass		
	Pennisetum clandestinum*	Kikuyu Grass		
	Poa labillardieri var. labillardieri	Tussock grass		
	Stenotaphrum secundatum*	Buffalo Grass		
Polygonaceae	Fallopia japonica*			
Polypodiaceae	Pyrrosia rupestris	Rock Felt Fern		
Pteridaceae	Pteris umbrosa	Jungle Brake		
Restionaceae	Empodisma minus			
Rosaceae	Rubus fruticosus sp. agg.*	Blackberry complex		
Solanaceae	Cestrum parqui*	Green Cestrum		
Urticaceae	Urtica incisa	Stinging Nettle		
Verbenaceae	Verbena bonariensis*	Purpletop		
Winteraceae	Tasmannia insipida	Brush Pepperwood		
Xanthorrhoeaceae	Xanthorrhoea minor subsp. minor			
Zingiberaceae	Hedychium gardnerianum*	Ginger Lily		
CLIMBERS				
Aphanopetalaceae	Aphanopetalum resinosum	Gum Vine		
Apocynaceae	Marsdenia suaveolens	Scented Marsdenia		
	Parsonsia straminea	Common Silkpod		
Chenopodiaceae	Einadia nutans subsp. nutans	Climbing Saltbush		
Convolvulaceae	Ipomoea cairica*	Morning Glory		
Lauraceae	Cassytha pubescens	Downy Dodder-laurel		
Menispermaceae	Stephania japonica var. discolor	Snake Vine		
Ranunculaceae	Clematis aristata	Old Man's Beard		
	Clematis glycinoides var. glycinoides			
Rubiaceae	Morinda jasminoides	Sweet Morinda		
Smilacaceae	Smilax glyciphylla	Sweet Sarsparilla		
EPIPHYTES				
Aspleniaceae	Asplenium australasicum	Bird's Nest Fern		
Polypodiaceae	Platycerium bifurcatum	Elkhorn		
Species name ^{TS} = Threatened Species * = Introduced Species				

2.5 LOCAL AND REGIONAL DISTRIBUTION AND CONNECTIVITY OF VEGETATION

An inspection of the 1:25,000 aerial photograph of the local area identified that the subject site is surrounded by extensive areas of bushland to the north and east and south-west and cleared land to the south-east and west.

The endemic vegetation communities observed within the site correspond to the following Map Units of NPWS (2002):

- Map Unit 28 Sandstone Gully Apple-Peppermint Forest;
- Map Unit 16 Escarpment Blackbutt Forest;
- Map Unit 2 Coachwood Warm Temperate Rainforest.

Map Unit (MU) 28 adjoins the subject site to the north and south-east and extends along escarpment edges and upper slopes within connected areas of the locality. This community occupies 494.90 hectares within the Illawarra Escarpment and Coastal Plain area including 71.06 hectares within lands reserved for conservation (NPWS 2002).

MU 16 adjoins the eastern areas of the subject site and occurs extensively within the locality on escarpment slopes. This community occupies 1833.51 hectares within the Illawarra Escarpment and Coastal Plain area including 288.85 hectares within lands reserved for conservation (NPWS 2002).

Map Unit 2 adjoins areas adjacent to the site along the drainage line of Herbert Gully. This community occupies 2293.95 hectares within the Illawarra Escarpment and Coastal Plain area including 1069.63 hectares within lands reserved for conservation (NPWS 2002).

SECTION 3

FAUNA AND FAUNA HABITATS

3.1 THREATENED FAUNA SPECIES

A search of the Atlas of NSW Wildlife (NPWS 2011) was conducted for threatened fauna recorded within 10km of the subject site. This revealed a number of threatened species that may be present in the area. Details on threatened fauna species (Schedule 1 or 2 of the *TSC* Act (1995)) which are known to occur within the area are provided in Table 3.1.

TABLE 3.1				
RECORDED THREATENED FAUNA OF THE AREA				
Common Name Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Comments
Green and Golden Bell Frog <i>Litoria aurea</i>	E	V	Generally restricted to shallow, still or slow flowing, ephemeral and/or widely fluctuating water bodies which are unpolluted and without heavy shading. Known habitats include coastal swamps, marshes, dune swales, lagoons, lakes and other estuary wetlands as well as riverine floodplain wetlands and billabongs, constructed water bodies including farm dams and ditches and other excavations capable of capturing water. Often found under debris.	No suitable habitat present.
Giant Burrowing Frog <i>Heleioporus</i> australiacus	V	V	The Giant Burrowing Frog is usually only found around sandstone plateaux mostly associated with hanging sandstone shelves and the upper laterals.	Suitable habitat present.
Littlejohn's Tree Frog <i>Litoria littlejohni</i>	V	V	Permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	Suitable habitat present.
Red-crowned Toadlet <i>Pseudophryne</i> <i>australis</i>	V	-	This species occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. It inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or capping.	Suitable habitat present.
Broad-headed Snake Hoplocephalus bungaroides	E	E	Sandstone outcrops, exfoliated rock slabs and tree hollows in coastal and near coastal areas.	Suitable habitat present.
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V		Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops.	Suitable habitat present.

TABLE 3.1 RECORDED THREATENED FAUNA OF THE AREA				
Common Name Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Comments
Australasian Bittern <i>Botaurus</i> poiciloptilus	CE	-	Inhabits shallow freshwater or brackish wetlands with tall dense beds of reeds, sedges or rush species and swamp edges.	No suitable habitat present.
Black Bittern Ixobrychus flavicollis	V	-	Freshwater & brackish streams & ponds.	No suitable habitat present.
Beach Stone-curlew Esacus neglectus	E		Inhabits remote and secluded beaches, coral reefs and cays, mangrove fringes and estuarine mudflats.	No suitable habitat present.
Little Eagle Hieraaetus morphnoides	V	-	Prefers plains, foothills, open forests, woodlands and scrublands, watercourses and lakes.	Suitable habitat present.
Square-tailed Kite Lophoictinia isura	V	-	Utilises mostly coastal and sub- coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and mallee that are rich in passerine birds.	Suitable habitat present.
Gang-gang Cockatoo <i>Callocephalon</i> fimbriatum	V	-	Prefers wetter forests and woodlands from sea level to > 2000m on Divide, timbered foothills and valleys, timbered watercourses, coastal scrubs, farmlands and suburban gardens.	Suitable habitat present.
Glossy Black- Cockatoo Calyptorhynchus lathami	V	-	Open forests with <i>Allocasuarina</i> species and hollows for nesting. Distribution Limit – N-Tweed Heads. S-South of Eden.	Suitable habitat present.
Swift Parrot Lathamus discolor	E	E	Inhabits eucalypt forests and open forests with winter flowering eucalypts.	Suitable habitat present.
Little Lorikeet Glossopsitta pusilla	V	-	Found in forests, woodlands, large trees in open country, timbered watercourses and street trees.	Suitable habitat present.
Turquoise Parrot Neophema pulchella	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands.	No suitable habitat present.
Eastern Ground Parrot <i>Pezoporus wallicus</i> <i>wallicus</i>	V		Inhabits low heath, sedgeland and buttongrass plains with dense vegetation to provide suitable roosting cover.	No suitable habitat present.
Barking Owl Ninox connivens	V	-	Inhabits principally open forests but also open forests and partially cleared land and utilises hollows for nesting.	Suitable habitat present.
Powerful Owl Ninox strenua	V	-	Forests containing mature trees for shelter or breeding & densely vegetated gullies for roosting.	Suitable habitat present.

	RECC	DRDED TI	TABLE 3.1 HREATENED FAUNA OF THE AREA	TABLE 3.1 RECORDED THREATENED FAUNA OF THE AREA								
Common Name Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Comments								
Masked Owl Tyto novaehollandiae	V	-	Open forest & open forests with cleared areas for hunting and hollow trees or dense vegetation for roosting. Distribution Limit – N- Border Ranges National Park. S- Eden.	Suitable habitat present.								
Sooty Owl Tyto tenebricosa	V	-	Tall, dense, wet forests containing trees with very large hollows.	Suitable habitat present.								
Barred Cuckoo- shrike <i>Coracina lineata</i>	V	-	Inhabits warm temperate to tropical rainforest and their margins, feeding mainly on fruit.	Suitable habitat present.								
Regent Honeyeater Xanthomyza phrygia	CE	E	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts.	No suitable habitat present.								
Flame Robin Petroica phoenicea	V	-	Found in forests and woodlands during summer and open woodlands, paddocks and parks during winter from sea level to 1800m.	Suitable habitat present.								
Scarlet Robin <i>Peterocia boodang</i>	V	-	Utilises foothill forests, woodlands and water courses, dispersing into more open habitats during autumn and winter such as River Red Gum woodlands and parks.	Suitable habitat present.								
Pink Robin Petroica rodinogaster	V	-	Found in dense gullies, rainforests and open forests, dispersing into drier more open habitats in winter.	Suitable habitat present.								
Rose-crowned Fruit- dove <i>Ptilinopus regina</i>	V	-	Occurs in dense rainforests with a substantial understorey where it feeds entirely on fruit.	Suitable habitat present.								
Wompoo Fruit Dove Ptilinopus magnificus	V	-	Inhabits large undisturbed patches of lowland, adjacent highland rainforest and moist eucalypt forests feeding on fruit.	Suitable habitat present.								
Varied Sittella Daphoenositta chrysoptera	V	-	Prefers open eucalypt woodlands and forests, mallee, inland acacia, coastal tee-tree scrubs, parks and gardens.	Suitable habitat present.								
Eastern Quoll Dasyurus viverrinus	E		Dry and moist sclerophyll forests containing hollow logs, rock caves, abandoned burrows or trees with open grazing land interspersed.	Suitable habitat present.								
Spotted-tailed Quoll Dasyurus maculatus	V	V	Dry and moist open forests containing rock caves, hollow logs or trees.	Suitable habitat present.								
Koala Phascolarctos cinereus	V	-	Inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees.	Suitable habitat present.								

TABLE 3.1 RECORDED THREATENED FAUNA OF THE AREA									
Common Name Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Comments					
Eastern Pygmy Possum <i>Cercatetus nanus</i>	V	-	Found in a variety of habitats from rainforest through open forest to heath. Feeds on insects but also gathers pollen from banksias, eucalypts and bottlebrushes. Nests in banksias and myrtaceous shrubs.	Suitable habitat present.					
Squirrel Glider Petaurus norfolcensis	V	-	Mixed aged stands of eucalypt forest & open forests including gum barked & high nectar producing species & hollow bearing trees.	Suitable habitat present.					
Grey-headed Flying- fox <i>Pteropus</i> <i>poliocephalus</i>	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy.	Suitable habitat present.					
Eastern Freetail-bat Mormopterus norfolkensis	V	-	Inhabits open forests and open forests foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings.	Suitable habitat present.					
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals.	Suitable habitat present.					
Eastern False Pipistrelle Falsistrellus tasmaniensis	V	-	Inhabits wet sclerophyll forest, open forest, rainforest and coastal mallee. Roosts mostly in roosts in hollow trunks of eucalypts but also in caves and man made structures.	Suitable habitat present.					
Eastern Bentwing- bat Miniopterus schreibersii oceanensis	V	-	Inhabits rainforest, wet and dry sclerophyll forest, open woodland, Melaleuca forests and open grassland. Roosts in caves and man made structures.	Suitable habitat present.					
Southern Myotis Myotis macropus	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water.	Suitable habitat present.					
Greater Broad- nosed Bat Scoteanax rueppellii	V	- P Fxt = F	Inhabits moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forest, cleared areas with remnant trees and tree-lined creeks in open areas. Roosts in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark, and in man made structures.	Suitable habitat present.					
	Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species								

No threatened fauna species were observed within the subject site.

Threatened fauna species identified in Table 3.1 as having suitable habitat within the subject site will be assessed under the 7 part test of significance in Section 4 of this Report.

3.2 ENDANGERED FAUNA POPULATIONS

There are no Endangered Fauna Populations currently listed as occurring in the local government area, therefore this matter does not require any further consideration.

3.3 FAUNA HABITATS

A number of fauna habitats are present within the site. The vegetation within the subject site consists of Cleared Land with Scattered Trees, Sydney Peppermint / Smooth-barked Apple / Silvertop Ash Open Forest, Blackbutt Open Forest and Coachwood/Sassafras Closed Forest. The fauna habitats present within each of these communities are described below.

Cleared Land with Scattered Trees

This community occupies 10.3 hectares within the western area of the site which has been cleared many decades prior and subjected to high levels of disturbance from operation of the existing resource recovery facility, residential dwellings, infilling and earth moving, the creation of tracks and pasture improvement for grazing. Scattered remnant canopy trees are present with an understorey dominated by exotic species. Due to the disturbance history of this area of the site it is considered that habitat suitability is restricted primarily to those species which are able to exploit highly disturbed and degraded areas. Microchiropteran bats were observed and recorded foraging over cleared open areas and Feral Rusa Deer were observed foraging in pasture areas of this community. A hollow bearing tree survey was undertaken and is provided as Appendix 1. The hollow bearing tree survey was confined to areas of the site identified as Cleared Land with Scattered Trees vegetation. The tree hollows identified provide suitable nest sites for hollow dependent bird species, arboreal and flying mammals, reptiles and amphibians. Stockpiles of refuse and resource materials provide potential shelter areas for terrestrial mammals, amphibians and reptiles.

Sydney Peppermint / Smooth-Barked Apple / Silvertop Ash Open Forest

This community contains Sydney Peppermint, Smooth-barked Apple and Silvertop Ash as the dominant canopy trees and occupies approximately 4.1 hectares on the top of the escarpment and on upper slopes within the subject site. The composition of the understorey varies from dense heath on escarpment edges to a sparse heath on upper escarpment sideslopes. Areas of dense understorey vegetation provide suitable shelter for a range of fauna species including large mammals such as macropods. This community contains the head of a drainage line which flows east into Herbert Gully and provides suitable habitat for amphibian species. The flower and nectar producing tree and shrub species of this community provide a foraging resource for a number of bird and arboreal mammal species. Areas of sandstone outcropping and boulders provides suitable habitat for reptiles. A range of small to large sized tree hollows are present which provide potential shelter and nesting habitat for birds, arboreal mammals, tree frogs and reptiles.

Blackbutt Open Forest

This community occurs predominantly on escarpment side slopes within the site and occupies approximately 14.1 hectares. Blackbutt is the dominant canopy species with a subdominant occurrence of Smooth-barked Apple in upper slope areas. Understorey vegetation is composed of heath species in upper slope areas which contrasts with the more sheltered lower slopes which contain more mesic understorey species. The flower and nectar producing tree and shrub species of this community provide a foraging resource for a number of bird and arboreal mammal species. Areas of sandstone outcropping and boulders provide suitable habitat for reptiles. A range of small to large sized tree hollows are present which provide potential shelter and nesting habitat for birds, arboreal mammals, tree frogs and reptiles. Dense leaf litter is present which also provides suitable habitat for reptiles and terrestrial mammals.

Coachwood/Sassafras Closed Forest

This community occurs in sheltered areas of lower elevation along the drainage line of Herbert Gully and occupies approximately 3.7 hectares. Coachwood, Scentless Rosewood and Sassafras occurs as dominant canopy species. The understorey is generally sparse and a drainage line flows along the bottom of the gully. Fruit producing tree and shrub species of this community provide a foraging resource for a number of bird and mammal species. The drainage line provides suitable habitat for amphibian and reptile species and nourishment for birds and mammals. Trees hollows are generally confined to emergent eucalypts at the intergrade between this community and the Blackbutt Open Forest community and provide small to large sized hollows which provide suitable habitat for arboreal mammals and hollow dependent bird species.

3.4 FAUNA SURVEY METHODOLOGY

In order to detect the possible occurrence of threatened fauna species specific methods targeting these species were employed.

Literature Review

- Review of local resource documents;
- A search of the Atlas of NSW Wildlife (NPWS 2011) was undertaken to identify records of threatened fauna species located within 10km of the site. This enabled the preparation of a predictive list of threatened fauna species that could possibly occur within the habitats found on the site.

A detailed fauna survey and habitat assessment of the existing disturbed areas of the site was undertaken generally incorporating the methodologies outlined in DEC (2004). Due to the disturbed condition of areas currently utilised for resource recovery operations and the fact that further vegetation clearing is not proposed, mammal trapping and more than one night of fauna survey was considered not necessary as part of the fauna survey program.

The methods that were utilised consisted of:

- Diurnal habitat searches for amphibians, reptiles and mammals;
- Diurnal Bird census.
- Nocturnal spotlighting for birds, mammals, reptiles and frogs;
- Hollow bearing tree survey of the Cleared Land with Scattered Trees vegetation community (See Appendix 1);
- Call playback and listening for owl, mammal and amphibian responses;
- Anabat recording for microchiropteran bat species;

Survey duration and weather details during fauna surveys were as follows:

Diurnal Surveys:

- 08/09/11: 1030-1230, 4/8 cloud, ESE wind, 20⁰C, no rain;
- 08/09/11: 1330-1700, 4/8 cloud, ESE wind, 20^oC, no rain;
- 09/09/11: 0800-1300, 4/8 cloud, SW wind, 20^oC, light intermittent rain. *Nocturnal Surveys:*
- 08/09/11: 1700-1930, 8/8 cloud, SE wind, 15^oC, mostly dry.

Fauna survey locations are shown in Figure 1.

3.5 FAUNA OBSERVED

Fauna species observed within the subject site are listed in Table 3.3. No threatened species were observed within the subject site during surveys. All fauna species observed are considered relatively common within the local area.

TABLE 3.3 FAUNA OBSERVED AND RECORDED									
FAMILY	Common Name	Scientific Name	Observation Method						
AMPHIBIANS									
Myobatrachidae	Common Eastern Froglet	Crinia signifera	С						
Myobatrachidae	Brown-striped Frog	Limnodynastes peronii	С						
Hylidae	Leaf-green Tree Frog	Litoria phyllochroa	С						
BIRDS									
Anatidae	Australian Wood Duck	Chenonetta jubata	OC						
Columbidae	Brown Cuckoo-Dove	Macropygia amboinensis	С						
Charadriidae	Masked Lapwing	Vanellus miles	OC						
Cacatuidae	Little Corella	Cacatua sanguinea	OC						
Cacatuidae	Sulphur-crested Cockatoo	Cacatua galerita	OC						
Psittacidae	Rainbow Lorikeet	Trichoglossus haematodus	OC						
Psittacidae	Australian King-Parrot	Alisterus scapularis	OC						
Psittacidae	Crimson Rosella	Platycercus elegans	OC						
Psittacidae	Eastern Rosella	Platycercus eximius	OC						
Cuculidae	Fan-tailed Cuckoo	Cacomantis flabelliformis	С						
Cuculidae	Brush Cuckoo	Cacomantis variolosus	С						
Strigidae	Southern Boobook	Ninox novaeseelandiae	С						
Halcyonidae	Laughing Kookaburra	Dacelo novaeguineae	OC						
Ptilonorhynchidae	Satin Bowerbird	Ptilonorhynchus violaceus	С						
Maluridae	Superb Fairy-wren	Malurus cyaneus	OC						
Acanthizidae	White-browed Scrubwren	Sericornis frontalis	С						
Acanthizidae	Brown Gerygone	Gerygone mouki	OC						
Acanthizidae	Brown Thornbill	Acanthiza pusilla	OC						
Pardalotidae	Spotted Pardalote	Pardalotus punctatus Acanthorhynchus	С						
Meliphagidae	Eastern Spinebill	tenuirostris	OC						
Meliphagidae	Lewin's Honeveater	Meliphaga lewinii	ОC						
Eupetidae	Eastern Whipbird	Psophodes olivaceus	0 C						
Campephagidae	Black-faced Cuckoo-shrike	Coracina novaehollandiae	0 C						
Pachycephalidae	Golden Whistler	Pachvcephala pectoralis	С						
Pachycephalidae	Rufous Whistler	Pachycephala rufiventris	C						
Oriolidae	Olive-backed Oriole	Oriolus sagittatus	C						
Artamidae	Pied Currawong	Strepera graculina	0 C						
Rhipiduridae	Grev Fantail	Rhipidura albiscapa	00						
Corvidae	Australian Raven	Corvus coronoides	00						
Monarchidae	Magpie-lark	Grallina cvanoleuca	00						
Hirundinidae	Welcome Swallow	Hirundo neoxena							
Nectariniidae	Mistletoebird	Dicaeum hirundinaceum							
	Midletoobird		00						
MAMMALS									
Phalangeridae	Common Brushtail Possum	Trichosurus vulpecula	Sp						
Macropodidae	Swamp Wallaby	Wallabia bicolor	0						
Macropodidae	Eastern Grey Kangaroo	Macropus giganteus	0						

TABLE 3.3 FAUNA OBSERVED AND RECORDED									
FAMILY Common Name			Scier	ntific Name	Observation Method				
Leporidae		Rabbit *		Oryct	olagus cuniculus	0			
Cervidae		Rusa Deer *		Cervu	us timorensis	O, Sp			
Molossidae		White-striped Freetail	-bat	Tadarida australis		А			
Vespertilionida	Vespertilionidae Gould's Wattled Bat			Chalinolobus gouldii		А			
Vespertilionida	ıe	Chocolate Wattled Ba	at Chalinolobus morio		nolobus morio	А			
Vespertilionida	ie	Little Forest Bat		Vesp	adelus vulturnus	А			
		Key to	o Observ	vation T	уре				
0	-	Observation	S	-	Search				
С	-	Call identification	Α	-	Anabat II				
Sp	-	Spotlight	Sc	-	Scat, Track or Sigr	า			
E	-	Elliott Trap	K	-	Kill				
Note	: * indic:	ates introduced species.	in TS in	dicates t	threatened species TS	C Act NSW.			

SECTION 4

ASSESSMENTS AND CONCLUSIONS

4.1 ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT (1999) ASSESSMENT

The *Environment Protection and Biodiversity Conservation Act*, (1999) requires that Commonwealth approval be obtained for certain actions that may have a significant impact on matters of National Environment Significance (NES). These may include:-

- Wetlands protected by international treaty (the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species.

Actions are projects, developments, undertakings, activities or series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on a matter of National Environmental Significance.

Where a proposed activity is located in an area identified to be of NES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, the matter needs to be referred to the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC).

No threatened flora or fauna species listed within the *EPBC Act* (1999) were observed within the subject site.

No migratory fauna species, listed within the *EPBC Act* (1999), were observed within the subject site.

No endangered ecological communities (EECs) listed within the *EPBC Act* (1999), were observed within the subject site.

It is considered that the proposed action does not constitute a matter of National Environmental Significance and a referral of this project to SEWPAC is not required as the proposed action is not likely to impact on a significant population of nationally listed threatened or a migratory species or on any nationally listed ecological community.

4.2 ASSESSMENT OF IMPACT ON THREATENED SPECIES

As identified in Section 5(A) of the *EP&A Act* 1979 the following matters need to be addressed to determine whether or not a significant effect on threatened species, populations or ecological communities or their habitats is likely to result from the proposed development.

For the purposes of the following assessments the definitions of specific terminology and interpretations of the key terms used are as per the DECC (2007) Threatened Species Assessment Guidelines. Further clarification is also provided where deemed appropriate.

FLORA

Acacia bynoeana

This species occurs mainly in heath and dry sclerophyll forest on very infertile and well-drained substrate of sand and sandy clay, often with ironstone gravels. It prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt open patches. The flowering period is from September to March (NPWS 1999).

It is considered that suitable habitat for this species is present within the open forest vegetation communities of the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Astrotricha crassifolia

This species occurs in dry sclerophyll woodland and rich heath communities on sandstone ridgetops to altitudes of 300m. Vegetation associations include typical sandstone species such as *Hakea*, *Banksia* and *Xylomelum* (DEWHA 2008). It is easily identifiable outside of the flowering period.

It is considered that suitable habitat for this species is present within the open forest vegetation communities of the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Callistemon linearifolius

This species grows in woodland or dry sclerophyll forest on the coast and adjacent ranges. It grows in damp places such as gullies on sandstone. This species is easily identifiable when not in flower.

It is considered that suitable habitat for this species is present within the open forest and closed forest vegetation communities of the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Daphnandra sp. C 'Illawarra' (Illawarra Socketwood)

This species is found on loams and clay loams derived from volcanic and fertile sedimentary rocks. It has been recorded in rainforest and moist eucalypt forest on rocky hillsides and gullies of the Illawarra lowlands and occasionally on upper escarpment slopes. It is restricted to the Illawarra region where is has been recorded within the local government areas *of* Shoalhaven, Kiama, Shellharbour and Wollongong.

It is considered that suitable habitat for this species is present within the open forest and closed forest vegetation communities of the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Haloragis exaltata subsp. exaltata

This species prefers protected and shaded damp situations in riparian habitats. Flowering in NSW is from November to January.

It is considered that suitable habitat for this species is present within the open forest and closed forest vegetation communities of the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Pultenaea aristata

This species is an erect shrub that grows in either dry sclerophyll woodland or wet heath on sandstone.

It is considered that suitable habitat for this species is present within the open forest vegetation communities of the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

FAUNA

Giant Burrowing Frog (Heleioporus australiacus)

This species is most common on the Hawkesbury Sandstone in the Sydney region. It occurs south to Victoria (Barker *et. al.* 1995). Males call from beside smaller semi permanent to permanent streams or dams or from burrows within the bank of streams or dams. They call mainly in spring and late autumn, but also after rain in late summer. Foamy egg mass laid in a burrow such as an old crayfish hole in a stream bank, or concealed under dense vegetation (Anstis 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Littlejohns Tree Frog (Litoria littlejohni)

This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground (DECC 2005).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Red-crowned Toadlet (Pseudophryne australis)

Red-crowned Toadlet use small ephemeral drainage lines, which feed water from the top of ridges to perennial creeks below. Totally confined to the Hawkesbury sandstone formation. Breeding congregations occur deep in grass and debris beside non-perennial creeks, gutters etc. in sandstone areas: at other times individuals disperse and are found under rocks, logs etc. on sandstone ridges (Cogger 2000).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the

action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Broad-headed Snake (Hoplocephalus bungaroides)

This species prefers areas on Triassic sandstone with exposed outcrops and benching. Vegetation within areas of suitable habitat is generally woodland, open woodland and heath. During the warmer months this species occupies tree hollows and during the colder months it is generally found in rock crevices and under exfoliating sheets of weather sandstone on exposed north-west facing ridges (NPWS 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Rosenberg's Goanna (Varanus rosenbergi)

On the east coast of NSW the Rosenberg's Goanna is a sandstone outcrop specialist. It inhabits humid woodlands, dry hardwood forests and heathland where it shelters in self-dug burrows, hollow logs, rock crevices and sandstone outcrops. Eggs are laid within a terrestrial termite mound (Cogger 2000).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Eagle (Hieraaetus morphnoides)

This species forages in a variety of habitats including woodland open forest, partially cleared areas, along watercourses and around wetlands, avoiding large areas of dense forest. This species nests in mature living trees in open forest, woodland and remnant areas including farmland and areas close to urban development (Marchant and Higgins 1993).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Square-tailed Kite (Limosa limosa)

The Square-tailed Kite inhabits the coastal forested and wooded lands of tropical and temperate Australia (Marchant & Higgins 1993). The Square-tailed Kite is a specialist hunter of passerines, especially honeyeaters, and insects in the tree canopy, picking most prey items from the outer foliage (Marchant & Higgins 1993).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Gang-gang Cockatoo (Callocephalon fimbriatum)

The Gang-gang Cockatoo is associated with a variety of woodland and forest habitats, and occasionally more open areas in south–eastern New South Wales and Victoria (NSW Scientific Committee, 2005). This species utilises eucalypt forests and exotic trees, and is known to feed on the seeds of native shrubs and trees, in addition to some exotic species such as the Hawthorn and Cupressus species (Schodde & Tideman 1986).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Glossy Black-Cockatoo (Calyptorhynchus lathami)

The Glossy Black-Cockatoo inhabits mountain forests, coastal woodland, open forest and trees bordering watercourses where there are substantial stands of Allocasuarina. They choose trees with larger cone crops but show no sign of selecting trees on the basis of cone size – concentrating foraging in trees with a high ratio of total seed weight to cone weight (Clout 1989). They breed in hollow trees or stumps usually in Eucalypts.

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Swift Parrot (Lathamus discolor)

This species feeds mainly on nectar and lerp from eucalypt flowers, particularly Blue Gum (*Eucalyptus globulus*). On the mainland, the Swift Parrot congregates where winter flowering species such as Red Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Yellow Gum (*Eucalyptus leucoxylon*) and Swamp Gum (*Eucalyptus ovata*) (Brown, 1989). This species also occurs within Swamp Mahogany (*Eucalyptus robusta*) or Spotted Gum (*Corymbia maculata*) dominated communities along the coast. The Swift Parrot is a migratory species that breeds in Tasmania and its offshore islands in summer. In late March almost the entire population migrates to mainland Australia spreading from Victoria through to central and coastal NSW and south east Queensland (Schodde & Tidemann, 1986).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet (Glossopsitta pusilla)

Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Lorikeets are gregarious, usually foraging in small flocks, often with other species of lorikeet. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes (Courtney & Debus 2006).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Barking Owl (Ninox connivens)

The Barking Owl utilises dry sclerophyll forests and woodlands of tropical, temperate and semi-arid zones, often dominated by *Eucalyptus*, and containing many large trees suitable for roosting or breeding. This species is both carnivorous and insectivorous, taking mainly insects outside breeding season and more birds and mammals when breeding (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Powerful Owl (Ninox strenua)

The Powerful Owl breeds in open or closed sclerophyll forests and woodlands, including wet sclerophyll forest and dry sclerophyll forest and woodlands. They nest in hollows in large old trees; usually living Eucalyptus, within or below canopy in stumps or broken-off trunks (Higgins 1999). Powerful Owls are sedentary within home ranges of about 1,000 hectares within open eucalypt, casuarina or *Callitris* pine forest and woodlands, though they often roost in denser vegetation, including rainforest or exotic pine plantations (Garnett & Crowley 2000). Powerful Owls feed mainly on medium-sized arboreal marsupials that are most readily available at any given locality (Lavazanian *et al* 1994).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl (Tyto novaehollandiae)

The Masked Owl is widespread through forests and woodlands. The Masked Owl is known to utilise forest margins and isolated stands of trees within agricultural land. This species is often found in heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained. The Masked Owl is dependent upon hollow bearing trees all year round requiring old mature trees with large hollows for breeding and as diurnal roosting sites.

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Sooty Owl (Tyto tenebricosa)

The Sooty Owls habitat is often tall old-growth montane forests, including temperate and subtropical rainforest. This species occurs mostly in uplands in gullies and on slopes of valleys but rarely on ridges (Higgins 1999). Optimal habitat contains tall eucalypts with large hollows suitable for nesting and roosting, but also a range of hollows that provide shelter for prey. The same nest is used repeatedly, and the owls also roost and occasionally nest in caves (Garnett & Crowley 2000). The Sooty Owl preys on arboreal and terrestrial mammals and occasionally birds.

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Barred Cuckoo-shrike (Coracina lineata)

The Barred Cuckoo-shrike inhabits rainforest, vine scrubs and margins; eucalypt watercourses; native figs, and other fruiting tree. Native and exotic fruits and insects are the primary source of food for this species. In NSW this species inhabits coastal areas ranging from Cape York in QLD to the Manning River in NSW.

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Flame Robin (Petroica phoenicea)

This species inhabits upland wet to moist eucalypt forests and woodlands woodlands with an open understorey, often on ridges and slopes to 1800m asl. during the spring-summer breeding season. During the autumn to winter non breeding season this species disperses to open lowland habitats including grasslands, farmland dry sclerophyll forests and woodlands (Higgins and Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Scarlet Robin (Petroica boodang)

This species inhabits mainly dry eucalypt forest and woodlands with open shrubby and grassy understorey on ridges and slopes during the spring-summer breeding season, dispersing during autumn–winter into open habitats including urban areas (Higgins and Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Pink Robin (Petroica rodinogaster)

The Pink Robin inhabitats the dense shrub layer of damp or wet forests or rainforests moving to dense gully forest or cool-temperate rainforests during the breeding season which usually occurs from September to March. The Pink Robin is insectivorous and considered to be partly resident to partly migratory or dispersive in autumn to winter (Higgins & Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Rose-crowned Fruit-dove (Ptilinopus regina)

The Rose-crowned Fruit-dove inhabits tall tropical and subtropical, evergreen or semi-deciduous rainforest, especially with dense growth of vines. In NSW this species is widespread in north-east, in Northern Rivers, Northern Tablelands, and Mid-North Coast Regions. This species is a frugivore, taking fruits of many species of rainforest trees, palms, and vines, feeding mainly in the canopy but also in low trees and undergrowth (Higgins & Davies 1996).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Wompoo Fruit-dove (Ptilinopus magnificus)

The Wompoo Fruit-dove mainly inhabits large undisturbed patches of tall tropical or subtropical evergreen rainforest. In NSW the Wompoo Fruit-dove is widespread east of the Great Dividing Range from the Northern Rivers Region, North of Lismore South to the Hunter Valley. The Wompoo Fruit-dove is an obligate frugivore, taking fruits of many species of rainforest trees, palms, vines and epiphytes, feeding mostly in the canopy (Higgins & Davies 1996).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella (Daphoenositta chrysoptera)

This species inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland (Higgins & Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Quoll (Dasyurus viverrinus)

Once ranging over most of southeastern Australia, this species is now only common in Tasmania. This species uses a variety of habitats including dry sclerophyll forest, scrub, heathland and cultivated land are utilised. In Tasmania, the highest densities occur where eucalypt forest and pastures are indispersed (Strahan, 1995).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species

such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted-tailed Quoll (Dasyurus maculatus)

The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry open forest and rainforest. It appears to prefer moist forest types and riparian habitat. It has been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in inland riparian areas, it also ranges over dry ridges (NPWS, 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Koala (Phascolarctos cinereus)

Koalas inhabit forested areas with acceptable Eucalypt food trees, also utilising some other non-Eucalypt species as a food source. Koalas inhabit both wet and dry Eucalypt forest that contain a canopy cover of between 10 and 70% as well as suitable feed trees (Reed *et al.* 1990).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Pygmy Possum (Cercartetus nanus)

The Eastern Pygmy-possum is found from rainforest through sclerophyll forest to tree heath. Banksia and myrtaceous shrubs and trees are favoured. Eastern Pygmy-possums usually shelter alone in tree cavities, rotten stumps, holes in the ground, disused bird nests and possum dreys and in vegetation thickets such as *Xanthorrhoea* species. The home ranges of males, about 0.65 hectares are larger than those of females, about 0.35 hectares and not exclusive with home ranges broadly overlapping. Apart from females with young in the nest, individuals may utilise a number of nest sites within the home range (Turner & Ward 1995; Menkhorst 1996).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Squirrel Glider (Petaurus norfolcensis)

The Squirrel Glider inhabits dry sclerophyll forest and woodland nesting in small tree hollows. The presence of mature, hollow-bearing eucalypts is a critical characteristic of habitat occupied by Squirrel Gliders as they are utilised for nesting and breeding (Suckling, 1995).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species

such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox (Pteropus poliocephalus)

The Grey-headed Flying-fox inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. This species roosts in camps, which may contain tens of thousands of individuals. Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy (Tidemann 1998).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Freetail-bat (Mormopterus norfolkensis)

The Eastern Freetail-bat utilises dry eucalypt forest and woodland on the coastal side of the Great Dividing Range. They show a preference for open spaces in woodland or forest, and are more active in the upper slopes of forest areas rather than in riparian zones. They also forage over large waterways. This species roosts in hollow trees (usually in hollow spouts), under exfoliating bark and in various man made structures (Churchill 2009).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Large-eared Pied Bat (Chalinolobus dwyeri)

In the Sydney Basin this species is most commonly recorded in areas of high fertility soils in wet sclerophyll forest along the edges of sandstone escarpments. This species is also recorded in dry sclerophyll forest and woodlands, sub-alpine woodland, at the edges of rainforest, Callitris forest and within sandstone outcrop country. Large-eared Pied Bats roost in clusters in fairy martin nests and on the ceilings of caves, crevices in cliffs and mines in twilight areas (Churchill 2009).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern False Pipistrelle (Falsistrellus tasmaniensis)

The Eastern False Pipistrelle inhabits wet sclerophyll forest, open forest, rainforest and coastal mallee. They generally prefer tall and wet forests where the trees are more than 20 metres high and the understorey is dense. This species predominantly roosts in hollow trunks of eucalypts, however have also been reported to roost in caves and old buildings (Churchill 2009).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species

such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Bentwing-bat (Miniopterus schreibersii)

Preferred habitats for this species include rainforest, wet and dry sclerophyll forest, open woodland, Melaleuca forests and open grassland. The Eastern Bentwing-bat forages high in forested areas from just above canopy height to many times canopy height. In more open areas such as grasslands, flight may be within a few metres of the ground. Eastern Bentwing-bats are cave dwellers, but will also roost in man made structures such as road culverts and mines (Churchill 2009).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Southern Myotis (*Myotis macropus*)

This species has a strong association with streams and permanent waterways, most commonly within vegetated areas at lower elevations and in flat undulating country. This species forages over water for small insects, fish and invertebrates and have a preference for large pools rather than flowing streams. Roost habitats for this species are near water and include caves, tree hollows, abandoned fairy martin nests, among vegetation, in clumps of Pandanus, and man made structures including under bridges, in mines, tunnels, road culverts and stormwater drains (Churchill 2009).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat (Scoteanax rueppellii)

A wide variety of habitats are utilised by this species including moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forest, cleared areas with remnant trees and tree-lined creeks in open areas. The Greater Broad-nosed Bat forages about 5m from the edge of isolated trees, forest remnants or along forest crowns with a slow direct flight pattern. This species is known to roost in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark, as well as in man made structures including roofs of old buildings (Churchill 2009).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed during surveys. It is considered that the action proposed is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

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

No flora or fauna specimens belonging to any endangered population were observed within the subject site.

Therefore the proposed action will not have an adverse effect on the life cycle of any species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

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

No endangered ecological communities were observed within the subject site during surveys.

Therefore the proposed action is not likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

ii. Is likely to substantially and adversely modify the composition such that its local occurrence is likely to be placed at risk of extinction,

No endangered ecological communities were observed within the subject site during surveys.

Therefore the proposed action is not likely to substantially and adversely modify the composition such that its local occurrence is likely to be placed at risk of extinction.

d) In relation to the habitat of threatened species, populations or ecological community:

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

Not suitable habitat was observed within the subject site for threatened populations or ecological communities currently listed within the *TSC Act* (1995).

No threatened species were observed within the subject site, however the intact areas of native vegetation within the subject site provide suitable habitat for several species of locally occurring threatened flora and fauna.

The existing resource recovery facility is located within the western cleared portion of the subject site, which is described within this report as the Cleared Land with Scattered Trees vegetation community. The proposal is for rezoning of the site to allow for the operation of the existing resource recovery facility. Ongoing operations of the existing resource recovery facility will be undertaken in accordance with the Environmental Management Plan (EMP) prepared by Argus P/L (2010). The EMP outlines the environmental procedures which will be followed to ensure that ongoing operations do not impact directly or indirectly on the surrounding environments, including the intact naturally vegetated areas of the site and surrounding offsite areas of habitat.

As such it is considered that the proposal will not require further removal or modification to the extent of suitable habitat present for threatened species within the subject site.

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

There is not suitable habitat within the subject site for threatened populations or ecological communities currently listed within the *TSC Act* (1995).

It is considered that the intact naturally vegetated areas of the site provide suitable habitat for several locally occurring threatened flora and fauna species.

The existing resource recovery facility is located within the western cleared portion of the subject site, which is described within this report as the Cleared Land with Scattered Trees vegetation community. The proposal is for rezoning of the site to allow for the operation of the existing resource recovery facility. As such it is considered that an area of habitat is not likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

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

The existing resource recovery facility is located within the western cleared portion of the subject site, which is described within this report as the Cleared Land with Scattered Trees vegetation community. The proposal is for rezoning of the site to allow for the operation of the existing resource recovery facility. The area of existing resource recovery operations is relatively small in size and contains cleared and highly degraded habitats which do not provide a role in sustaining habitat connectivity in the locality. This area is also considered not suitable for regeneration or revegetation due to the high levels of existing disturbances and soil modification from previous land uses. As such it is considered that the habitats within the areas of existing operations are not of importance to the lifecycle stages or reproductive success of threatened species within the locality.

There is not suitable habitat within the subject site for threatened populations or ecological communities currently listed within the *TSC Act* (1995).

It is considered that the intact naturally vegetated areas of the site provide suitable habitat for several locally occurring threatened flora and fauna species. Potential adverse impacts to these areas from the existing site operations will be mitigated through the implementation of the EMP (Argus P/L 2010). As such these areas will not be subject to further removal, modification, fragmentation or isolation of habitats as a result of the proposal.

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

The subject site has not been classed as critical habitat within the provisions of the *Threatened Species Conservation Act* (1995). Therefore it is considered that the proposed action will not have an adverse effect on critical habitat (either directly or indirectly).

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

There are recovery plans for the following fauna species with potential habitat within the subject site: Barking Owl, The Large Forest Owls, Koala and Grey-headed Flying Fox.

It is considered that the existing development and ongoing use of the site as a resource recovery facility is not inconsistent with the broader objectives or actions of these Recovery Plans.

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

The proposal does not constitute and is not part of a key threatening process and is not likely to result in the operation of, or increase the impact of a key threatening process.

4.3 STATE ENVIRONMENTAL PLANNING POLICIES

SEPP 14 - Coastal Wetlands

The subject site is not included within an area mapped as a wetland in SEPP 14.

SEPP 26 - Littoral Rainforest

The subject site is not included within any area mapped as a littoral rainforest in SEPP 26. The vegetation on-site does not correspond to Littoral Rainforest with respect to species composition and substrate.

SEPP 44 - Koala Habitat Assessment

The subject site was assessed for activity by Koalas using the following methods:

- i. A search of the Atlas of NSW Wildlife (NPWS 2011) was undertaken to identify records of Koalas in the area.
- ii. The site was surveyed on foot with any species of Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for presence of Koalas, scratch and claw marks on the trunk and scats around the base of each tree. The proportion of any trees showing signs of Koala use was calculated for the whole of the site. Additionally the location and density of droppings if found were documented.
- iii. Koalas were also targeted during spotlight surveys.
- iv. Identification and assessment of the density of tree species listed as Koala food trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site.

TABLE 4.1								
SEPP-44 KOALA FEED TREE SPECIES								
	(From SEPP-44 Schedule 2)							
Scientific Name	Common Name	Observed	Percentage					
		On Site	within survey					
plots								
Eucalyptus tereticornis	Forest Red Gum	No	0%					
Eucalyptus microcorys	Tallowwood	No	0%					
Eucalyptus punctata	Grey Gum	No	0%					
Eucalyptus viminalis	Ribbon or Manna Gum	No	0%					
Eucalyptus camaldulensis	River Red Gum	No	0%					
Eucalyptus haemastoma	Broad-leaved Scribbly Gum	Yes	<15%					

TABLE 4.1 SEPP-44 KOALA FEED TREE SPECIES (From SEPP-44 Schedule 2)						
Scientific Name Common Name Observed Percentag On Site within survey plots						
Eucalyptus signata	Scribbly Gum	No	0%			
Eucalyptus albens	White Box	No	0%			
Eucalyptus populnea	Bimble Box or Poplar Box	No	0%			
Eucalyptus robusta	Swamp Mahogany	No	0%			

One Koala food tree species *Eucalyptus haemastoma*, as listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) is present within the subject site. This tree species does not constitute more than 15% of the total number of trees in the upper or lower strata of the tree component. Therefore the subject site is considered not to form potential koala habitat as defined by SEPP 44.

No Koalas were observed during the fauna survey and no evidence of Koala habitation, such as scats, claw and scratch marks, were located on the site. Therefore the subject site is not considered to form core koala habitat as defined by SEPP 44.

4.4 CONCLUSIONS

Based on the detailed field survey and information provided in this report it is concluded that:

- i. No threatened flora or fauna species were observed within the subject site;
- ii. No threatened populations were observed within the subject site;
- iii. No threatened ecological communities were observed within the subject site;
- iv. The proposed development is not likely to have a significant effect on threatened species, populations or ecological communities or their habitats;
- v. A Species Impact Statement is not required for the proposed development;
- vi. A referral to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) is considered unnecessary.

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APPENDIX 1 HOLLOW BEARING TREE ASSESSMENT

TABLE 1 CMA – HOLLOW BEARING TREE ASSESSMENT								
CLIENTBlackwell Bro DATE09/09/2011A	S LOCA	TIONWalke	r Street Helen ners	nsburgh	RE	F NO1181 SHEET NO	of	3
TREES L	OCATED E	BY GPS ¥/ <mark>N</mark> (or APPROX		NS RECORDE	D ON MAP/ A	IR PHOTO <mark>Y</mark> /¥	1
Tree Tag Num	ber	1	2	3	4	5	6	7
Species		Eucalyptus haemastoma	Eucalyptus haemastoma	Eucalyptus piperita	Eucalyptus haemastoma	Eucalyptus haemastoma	Stag	Eucalyptus piperita
DBH (cm)		60	85	95	40/15	40/35/45/60	45	25/60
Spread (m)		10	7	10	12	15	5	15
Height (m)		10	10	10	10	8	8	10
Position		Top of slope	Top of	Top of	Top of slope	Top of slope	Top of slope	Top of slope
% Health		65	65	85	85	60	0	60
Fauna Use								
HOLLOWS								
	0-10cm							
I Broken Trunk	10-15cm							
	15-20cm					1		
	20-40cm							
	40+cm							
	0-10cm			1				
II Branch	10-15cm		1				1	
	15-20cm		2					
	20-40cm							
	40+cm							
	0-10cm				1	1		
III Trunk	10-15cm							
	15-20cm							
	20-40cm	2						
	40+cm							1
	0-10cm							
IV Splits	10-15cm							
	15-20cm							
	20-40cm							
	40+cm							
	0-10cm							
V Cracked Bark	10-15cm							
	15-20cm							
	20-40cm							
	40+cm							
Targeted fauna survey								

 POSITIONS:
 Topographical location - ridge, slope, gully etc
 HEALTH:
 Record % of healthy Growth

 compared to dead limbs.
 HEALTH:
 Record % of healthy Growth

Appendix 1 Hollow Bearing Tree Assessment – Walker Street, Helensburgh (Ref: 1181F) © Conacher Environmental Group Ph: 4324 7888

TABLE 1 CMA – HOLLOW BEARING TREE ASSESSMENT								
CLIENTBlackwell Bro DATE09/09/2011A	S LOCA	TIONWalke RJacob Man	r Street Hele ners	nsburgh	RE	F NO1181 SHEET NO	2of	3
TREES LO	OCATED E	BY GPS ¥/ <mark>N</mark> (or APPROX		IS RECORDE	D ON MAP/ A	IR PHOTO <mark>Y</mark> /Þ	t
Tree Tag Num	ber	8	9	10	11	12	13	14
Species		Eucalyptus piperita	Eucalyptus piperita	Stag	Angophora costata	Eucalyptus piperita	Eucalyptus piperita	Angophora costata
DBH (cm)		85	70	90	70	45	55/25/30	85
Spread (m)		4	10	10	20	15	17	15
Height (m)		6	15	10	15	10	10	15
Position		Top of slope	Side slope	Side slope	Side slope	Side slope	Side slope	Side slope
% Health		1	70	0	90	60	40	85
Fauna Use								
HOLLOWS								
	0-10cm							
l Broken Trunk	10-15cm							
	15-20cm							
	20-40cm						1	
	40+cm	1		2				
	0-10cm							
II Branch	10-15cm							1
	15-20cm		1					
	20-40cm		1					
	40+cm							
	0-10cm							3
III Trunk	10-15cm							
	15-20cm		1		1	2		
	20-40cm		1					
	40+cm	1						1
	0-10cm							
IV Splits	10-15cm							
	15-20cm							
	20-40cm							
	40+cm							
	0-10cm							
V Cracked Bark	10-15cm							
	15-20cm							
	20-40cm							
	40+cm							
Targeted fauna survey								

POSITIONS: Topographical location - ridge, slope, gully etc **HEALTH:** Record % of healthy Growth compared to dead limbs.

Appendix 1 Hollow Bearing Tree Assessment – Walker Street, Helensburgh (Ref: 1181F) © Conacher Environmental Group Ph: 4324 7888

TABLE 1 CMA – HOLLOW BEARING TREE ASSESSMENT								
CLIENTBlackwell Bro DATE09/09/2011	S LOCA	TIONWalke RJacob Man	r Street Hele ners	nsburgh	RE	F NO1181 SHEET NO	 1of	3
TREES L	OCATED E	BY GPS ¥ / <mark>N</mark>	or APPROX		IS RECORDE	D ON MAP/ A	IR PHOTO <mark>Y</mark> /Þ	ŧ
Tree Tag Num	ber	15	16	17	18	19	20	21
Species		Eucalyptus piperita	Angophora costata	Angophora costata	Eucalyptus piperita	Eucalyptus piperita	Eucalyptus piperita	Angophora costata
DBH (cm)		80	70	70	65/15	140	90	70
Spread (m)		10	10	8	10	15	15	10
Height (m)		15	8	10	12	12	15	25
Position		Side slope	Side slope	Side slope	Side slope	Side slope	Side slope	Side slope
% Health		50	30	60	30	40	60	50
Fauna Use								
HOLLOWS								
	0-10cm							
l Broken Trunk	10-15cm							
	15-20cm	2					1	
	20-40cm						1	
	40+cm							
	0-10cm							
II Branch	10-15cm					1		
	15-20cm				1	2		
	20-40cm							
	40+cm							
	0-10cm							
III Trunk	10-15cm		1					
	15-20cm						1	
	20-40cm			1				
	40+cm					1 (basal)		2
	0-10cm							
IV Splits	10-15cm							
	15-20cm							
	20-40cm							
	40+cm							
	0-10cm							
V Cracked Bark	10-15cm							
	15-20cm							
	20-40cm							
	40+cm							
Targeted fauna survey								

POSITIONS: Topographical location - ridge, slope, gully etc compared to dead limbs. **HEALTH:** Record % of healthy Growth

Appendix 1 Hollow Bearing Tree Assessment – Walker Street, Helensburgh (Ref: 1181F) © Conacher Environmental Group Ph: 4324 7888