



C&R CONSULTING

Geochemical & Hydrobiological Solutions Pty Ltd

ABN 72 077 518 784

*Marine and Coastal Processes and Dynamics
Groundwater and Environmental Specialists
Environmental Compliance and Monitoring
Contaminated Site and Soil Assessment
HydroGeomorphic Evaluations
Chemical & Water Modelling
Spatial Analysis
GIS Services*

PO Box 1777
Thuringowa Qld, 4817, AUSTRALIA

Tel: +61 (0) 7 4725 3751
Mob: +61 (0) 417 635 032

info@candrconsulting.com.au
www.candrconsulting.com.au

ASSESSMENT OF ENVIRONMENTAL VALUES

**Lot 11 on SP171882, Explorer Drive,
South Mission Beach**



FINAL REPORT

Date: January 2010

C&R Consulting Pty Ltd

IMPORTANT NOTE

No part of this document may be reproduced without written permission from the Clients and C&R Consulting Pty Ltd. If this report is to form part of a larger study, or is a response to a "Request for Additional Information" from a Compliance Agency, this report must be included as an Appendix within the full report without any additions, deletions or amendments.

C&R Consulting Pty Ltd do not accept any responsibility in relation to any financial and/or business decisions made for any other property or development other than that for which this information has been provided.

A handwritten signature in black ink that reads 'Christopher Cuff'.

Dr Chris Cuff
Director

14 January 2010

Date

A handwritten signature in black ink that reads 'Cecily Rasmussen'.

Dr Cecily Rasmussen
Director

14 January 2010

Date

CLIENT: ABF GROUP PTY LTD
PROJECT: EXPLORER DRIVE DEVELOPMENT, SOUTH MISSION BEACH
REPORT: ENVIRONMENTAL ASSESSMENT
DATE: JANUARY 2010



SUMMARY OF RELEVANT INFORMATION

Project Title	Environmental Assessment for proposed development at South Mission Beach – Third Revised Report February 2009
Property Location	Explorer Drive, South Mission Beach
Property Description	Lot 11 on SP171882
Project Purpose	Environmental assessment report
Applicants Details	ABF Group Pty Ltd
Nominated Representative	George Milford
Title/Position	Manager
Company	Wolter Rowlands Pty Ltd
Postal Address	PO Box 5094, Townsville, Qld 4810
Telephone	(07) 4724 0117
Fax	(07) 4724 0116
Email	gmilford@wolterrowlands.com.au
Survey Conducted by:	LH; BC
Report Checked by:	CER
Cover Photograph:	Southern Cassowary (<i>Casuarius casuarius johnsonii</i>) at South Mission Beach. Photograph by C&R Consulting



Table of Contents

1	BACKGROUND	6
2	INTRODUCTION	7
	2.1 SCOPE OF WORKS	7
3	GENERAL SITE DESCRIPTION	8
4	VEGETATION OF THE SITE	10
	4.1 REGIONAL ECOSYSTEMS	10
	4.2 PLANT SPECIES	12
	4.3 ONSITE HABITAT ASSESSMENT	13
	4.3.1 Vegetation Communities	13
	4.3.2 Cassowary Utilisation	15
	4.3.3 Weeds	23
	4.4 ECOLOGICAL COMMUNITIES	24
5	FAUNA OF THE SITE	25
	5.1 THREATENED SPECIES	25
	5.2 SOUTHERN CASSOWARY (CASUARIUS CASUARIUS JOHNSONII)	27
	5.2.1 Ecology of the Southern Cassowary	27
	5.2.2 Recognised Threats to the Southern Cassowary	27
	5.2.3 Potential Impacts of the Proposed Development on the Southern Cassowary	28
	5.2.4 EPBC Act and Referral Guidelines, as they relate to the southern cassowary	43
	5.2.5 Southern Cassowary as a Matter of National Environmental Significance	43
	5.2.6 Significant Impacts to Matters of NES	43
	5.3 RESPONSE TO SIGNIFICANT IMPACT CRITERIA FOR SOUTHERN CASSOWARY (WET TROPICS POPULATION)	44
	5.3.1 Significant Impact Criteria 1	44
	5.3.2 Significant Impact Criteria 2	44
	5.3.3 Significant Impact Criteria 3	44
	5.3.4 Significant Impact Criteria 4	45
	5.3.5 Significant Impact Criteria 5	46
	5.3.6 Significant Impact Criteria 6	46
	5.3.7 Significant Impact Criteria 7	46
	5.3.8 Significant Impact Criteria 8	46
	5.3.9 Significant Impact Criteria 9	47
	5.4 OTHER MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE (NES)	47
	5.4.1 Listed Migratory Species	47
	5.4.2 World Heritage Properties and National Heritage Places	48
6	RECOMMENDATIONS	49
7	ATTACHMENTS	52

List of Figures

Figure 1.	Lot 11 on SP171882, Explorer Drive, South Mission Beach.....	6
Figure 2.	Photographs displaying existing house pads and access track clearings.....	8
Figure 3.	2009 Google Earth image showing extent of clearing.....	9
Figure 4.	Regional Ecosystem 7.12.40 on Lot 11 on SP171882.....	11
Figure 5.	Male southern cassowary with three chicks on Explorer Drive.	12
Figure 6.	Southern cassowary scat.	12
Figure 7.	Map displaying location and extent of the two different habitat communities.	14
Figure 8.	Photographs displaying typical vegetation of the site.....	15
Figure 9.	Spatial representation of likely cassowary utilisation areas	16
Figure 10.	Spatial representation of likely and potential cassowary movement corridors.	19
Figure 11.	Simplified diagram of areas likely to be currently utilised more often for movement within and through the site, based on habitat and geomorphological features	21
Figure 12.	Simplified diagram of areas likely to be utilised more often for movement within and through the site after development, based on habitat and geomorphological features, and exclusion barriers (fences)	22
Figure 13.	Minor incursions of environmental weeds.	24
Figure 14.	Snakeweed (<i>Stachytarpheta urticifolia</i>)	24

List of Tables

Table 1.	Regional Ecosystem and specific sub-classes present within the proposed development site.	10
Table 2.	Threatened species within a 1km radius of the proposed development site, produced by the EPBC Protected Matters Search Tool.....	28
Table 3.	Migratory species within a 1 km radius of the proposed development site, produced by the EPBC Protected Matters Search Tool..	47

1 BACKGROUND

C&R Consulting Pty Ltd (C&R) was commissioned by Wolter Rowlands on behalf of the ABF Group Pty Ltd to undertake an assessment of on-site environmental factors and habitat values, in particular those pertaining to the Wet Tropics southern cassowary population, for a proposed development at Lot 11 on SP171882, Explorer Drive, South Mission Beach (Figure 1).

Preliminary desktop studies identified remnant vegetation within the proposed development that is considered to be important habitat for the southern cassowary (*Casuarus casuaris johnsonii*) (Latch 2007). The southern cassowary is listed as an endangered species under the Commonwealth *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* (OLDP 2007). In addition, the Wet Tropics population of the southern cassowary is listed as Endangered under the *Queensland Nature Conservation Act 1992* (Queensland *Nature Conservation (Wildlife) Regulation 2006*) (OQCP 2009).

This report details the results of on-site investigations conducted during December 2008 and January 2009, and provides an assessment of current on-site habitat characteristics and values. Potential uses of the site by the southern cassowary are discussed, as are the implications to the development of southern cassowary presence within the allotment. Potential impacts of a proposed development on the local southern cassowary population are also considered and discussed. It should be noted that the opinions and recommendations outlined in this report are based on the technical and practical experience of the environmental practitioners who conducted the study. A thorough understanding of southern cassowary utilisation of this site was not possible within the scope of this study.



Figure 1. Lot 11 on SP171882, Explorer Drive, South Mission Beach



2 INTRODUCTION

2.1 SCOPE OF WORKS

C&R were required to undertake the following tasks:

- Desktop analysis of existing data, particularly in relation to the southern cassowary, including but not limited to a review of regional ecosystem mapping, topographic data, aerial photographs and/or satellite imagery, relevant database searches, existing species lists;
- Review of on-site details, characteristics and environmental values, considering the southern cassowary and its habitat and connectivity values, and
- Review of on-site values with respect to the site's context including habitat values, connectivity values and significance to the southern cassowary.

3 GENERAL SITE DESCRIPTION

The proposed development site is located on Lot 11 on SP171882, Explorer Driver, South Mission Beach.

The site is located on a small granite hill/headland at the southern end of South Mission Beach. A small 1st order stream is located at the base of the scarp of this small hill. At the time of initial field investigations in early December 2008, no water was present within this stream. However, there is evidence of broad scale sheet wash running down the hill into this drainage feature. During the site visit in January 2009, the stream was flowing after rainfall that occurred in the 2008 – 2009 wet season. A rocky outcrop is present to the west of the site.

Little historic clearing has taken place across the entire allotment. However, the current mapped extent of remnant vegetation is disputed (refer Section 4 – Vegetation of the site), as a cleared footprint for house pads and access tracks was observed during the initial field investigation (Figure 2, 3) in December 2008. This cleared footprint was surveyed and a vegetation line established in August 2008, and mapped with hand-held GPS during the site investigations in January 2009. Some regrowth throughout the cleared footprint, comprising mostly acacia seedlings, was observed during the second site visit in January 2009.



Figure 2. Photographs displaying existing house pads and access track clearings (a, b) as observed in December 2008.



Figure 3. 2009 Google Earth image of Lot 11 on SP171882 showing extent of clearing (red) as observed during site investigations in December 2008.

4 VEGETATION OF THE SITE

4.1 REGIONAL ECOSYSTEMS

Certified regional ecosystem maps of the proposed development site (produced by the Queensland Environmental Protection Agency) show that the block is completely covered by the regional ecosystem, 7.12.40 (Table 1; Figure 4; Attachment 1). Regional ecosystem 7.12.40 is listed as 'of concern' (EPA 2009a). While the majority of the allotment does fit this regional ecosystem description, vegetation of the site also comprises elements of open forest and tall open forests containing a mosaic of species.

Within the allotment an older sclerophyll component is also present. Elements of the regional ecosystem 7.12.23b (described as *Corymbia intermedia* open forest to tall open forest with a very well developed vine understorey on coastal granite and rhyolite headlands and near-coastal foothills) exist within the site. It is thought that the vine understorey present throughout the majority of the allotment is due to a lack of disturbance within the sclerophyllous component (i.e. lack of fire) and too much disturbance within the rainforest component (i.e. historic cyclone damage).

Under the Queensland EPA regional ecosystem mapping, the regional ecosystem 7.12.40 is listed as one of the many 'essential habitat' regional ecosystems for the southern cassowary (EPA 2009b). Essential habitat is described by the Queensland EPA as vegetation in which a species that is endangered, vulnerable, rare or near threatened has been known to occur (EPA 2009c), in this case the southern cassowary. However, under the *Recovery Plan for the Southern Cassowary 2007* (Latch 2007), the regional ecosystem 7.12.40 is not listed as essential habitat (refer Section 5.2.4; Attachment 2). Essential habitat in this context refers to habitat deemed critical to the survival of a threatened species (DEH 2006), and this has been discussed in detail in Section 5.3.4. Although no southern cassowaries were observed on the allotment during the site visits, an adult male and three developed chicks were incidentally observed on Explorer Drive approximately 200m from the property boundary on 28 February 2009 (Figure 5). Another incidental sighting of an adult male and three older chicks, presumed to be the same family, was made in the same location 10 August 2009. In addition, their presence and/or utilisation of the site is not disputed, as scats were found during both site visits (Figure 6).

Table 1. Regional Ecosystem and specific sub-classes present within the proposed development site (EPA 2009a).

Regional Ecosystem No.	Status	Description
7.12.40	Of Concern	<p>Closed vineland of wind-disturbed vine forest. Granites and rhyolites. Major vegetation communities include:</p> <p>7.12.40a: Open areas in vine forests, dominated by sprawling vines, commonly <i>Merremia peltata</i> and a number of other vine species, presumed to mostly originate from cyclone damaged Type 2a forests (where the entire canopy has been destroyed). Generally foothills of coastal ranges below 400 metres.</p> <p>7.12.40b: Mesophyll to notophyll vine forest suffering from extreme wind damage where at least half of the canopy has been destroyed. Granite and rhyolite.</p> <p>7.12.40c: Complex notophyll vine forest (with emergent <i>Agathis robusta</i>) suffering from extreme wind damage where at least half of the canopy has been destroyed.</p>

Regional Ecosystem No.	Status	Description
		<p>Granite and rhyolite.</p> <p>7.12.40d: Simple notophyll vine forest (often with <i>Agathis microstachya</i>) suffering from extreme wind damage where at least half the canopy has been destroyed. Granite.</p> <p>7.12.40e: Complex mesophyll vine forest suffering from extreme wind damage where at least half the canopy has been destroyed. Colluvium of the very wet and wet rainfall zones.</p>

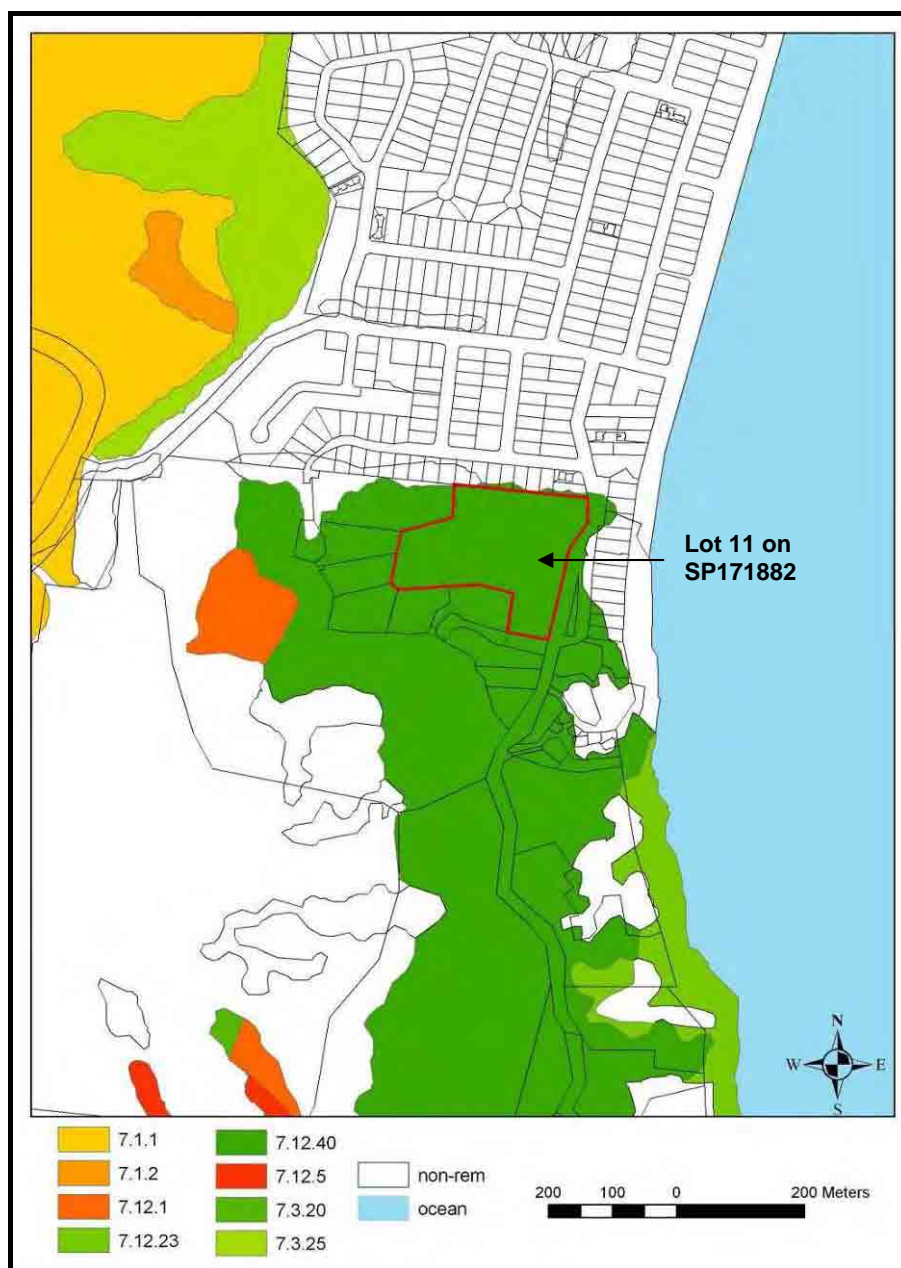


Figure 4. Regional Ecosystem 7.12.40 on Lot 11 on SP171882 as depicted on the Regional Ecosystem Mapping. Non-rem = non-remnant or cleared.



Figure 5. Incidental sighting of a male southern cassowary with three chicks on Explorer Drive on 29 February 2009.



Figure 6. Southern cassowary scat found within Lot 11 on SP171882 in December 2008.

4.2 PLANT SPECIES

A number of dominant rainforest plant species were identified throughout the notophyll vine forest community during the preliminary site investigations. A number of these species are known to be utilised by the southern cassowary for foraging purposes (Table 2) (CWRL 2009; John Paul McFadden, Australian Rainforest Foundation, pers. comm.). It should be noted that this is by no means a complete species list for this site and many other less dominant species occur throughout the site. A complete vegetation survey and subsequent species list for the allotment was not included within the scope of this study.

Table 2. Plant species identified during initial site investigations, and their potential use by the cassowary (species in bold are dominant).

Plants located within the SNVF that are utilized by the southern cassowary	Plants located within the SNVF that are not utilized by the southern cassowary
<i>Cryptocarya oblate</i> <i>Elaeocarpus angustifolius</i> <i>Calamus australis</i> <i>Calamus caryototoides</i> <i>Archontophoenix alexandrae</i> <i>Syzygium cormiflorum</i> <i>Syzygium tierneyanum</i> <i>Acronychia aberrans</i> <i>Aglaia sapindina</i> <i>Beilschmiedia tooram</i> <i>Canthium coprosmoides</i> <i>Chionanthus ramiflorus</i> <i>Cinnamomum laubatii</i> <i>Galbulimima spp</i> <i>Hypserpa laurina</i> <i>Alphitonia whitei</i> <i>Alphinia caerulea</i>	<i>Flindersia bourjotiana</i> <i>Alstonia muelleriana</i> <i>Grevillea baileyana</i> <i>Franciscodendron laurifolium</i> <i>Austromuellera trinervia</i> <i>Stenocarpus reticulatus</i> <i>Macaranga tanarius</i>

4.3 ONSITE HABITAT ASSESSMENT

4.3.1 Vegetation Communities

An onsite habitat assessment was conducted during site investigations in December 2008 and January 2009. While the regional ecosystem mapping depicts a single regional ecosystem across the site, it was found that two different vegetation communities occur within the allotment (Figure 7). These communities comprise a notophyll vine forest and a vineland (Figure 8).

The notophyll vine forest community includes a complex of species in which no one species is dominant. Slightly more individuals of *Cryptocarya oblate*, *Elaeocarpus angustifolius* and *Macaranga tanarius* are observed within this area. *Calamus australis* is observed as the dominant vine and several individuals of the palm *Archontophoenix alexandrae* were observed.

The other community consists of a vineland of *Corymbia intermedia* with some *Pandanus monticola* and a very well developed understorey of *Merremia peltate*, *Calamus australis* and *Calamus caryototoides*.



Figure 7. Map displaying location and extent of the two different habitat communities within the allotment. The red areas show the previously cleared footprint, as observed on site in December 2008 and January 2009.



Figure 8. Photographs displaying typical vegetation of the site, with closed vineland (left) and more open notophyll vine forest (right).

4.3.2 Cassowary Utilisation

In considering the characteristics and values of the different vegetation communities of the site, it is noted that the notophyll vine forest within the allotment probably provides more suitable habitat in general for the southern cassowary than the denser vineland areas (Figure 9). However, it would be irresponsible to suggest that the vineland areas are not utilised, as numerous suitable food plants also occur throughout this vegetation community. In addition, the vineland areas are likely to be more resilient to disturbance from extreme weather events such as cyclones, and therefore may provide an important food and shelter refuge following such events. The overall extent to which these areas are utilized throughout this site is unknown and could not be established within the scope of this study. Long term, detailed surveys would be required to determine such factors.

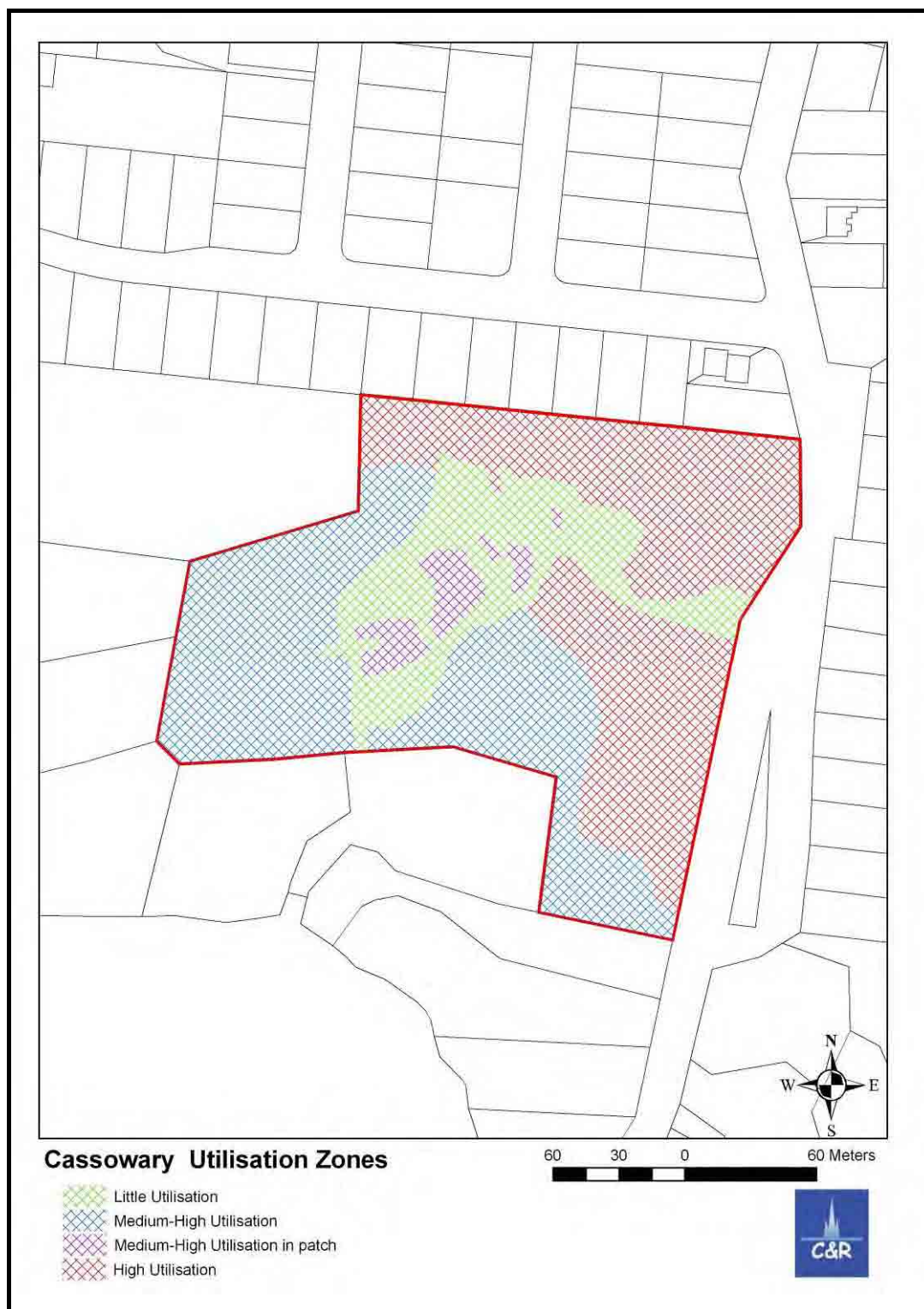


Figure 9. Spatial representation of likely cassowary utilisation areas throughout the allotment (refer below for a description of each utilisation description)

The following descriptions have been applied to areas of little utilisation, medium to high utilisation, medium to high utilisation within patch and high utilisation zones (Figure 9).

Little utilisation

These areas encompass the cleared footprint within the allotment, and are considered to hold little habitat value for the southern cassowary. However, at the very least these areas are utilised for movement between remnant patches. Scats of the southern cassowary were observed in these areas during the site visits.

Medium to high utilisation

These areas are considered to be of medium to high habitat value for the southern cassowary depending on climatic conditions and season. The area is dominated by two types of lawyer vine (*Calamus australis* and *Calamus caryototoides*) which is a known food source for the cassowary within the area. It is envisaged that these areas may be heavily or even exclusively utilised by the southern cassowary during prolonged dry seasons and after cyclones. Immediately following storm damage to the rainforest there is little fruit produced, but several weeks to months afterwards there may be an abundance of fruit, with less fruit produced in the surrounding rainforest. During these times it is envisaged that the southern cassowary may seek prolonged refuge in areas that are not as highly storm damaged. Vinelands tend to be less heavily affected by cyclone damage due to the vines' a high tensile strength. The area may also be used for movement and nesting. A closed understorey of vines, regrowth or dense grass thickets are common features of cassowary nests (DEWHA 2009). It is unknown whether this site is used for nesting purposes. An adult male and three chicks were observed in close proximity to the site (approximately 200m from the property boundary) in February 2009 (Figure 5), and it is considered likely that the site is used by breeding males and their chicks.

Medium to high utilisation in patch

It is the opinion of C&R Consulting that within the context of this site, the isolated patches of remnant vegetation within the cleared footprint are of medium to high significance for foraging purposes and therefore should be maintained.

However, it is recognised that within the context of a developed landscape, it is not desirable to encourage cassowaries into isolated patches surrounded by infrastructure, including roads, houses and the general built environment, for the following reasons:

- Increased risk of road incident or vehicle strike, causing injury or harm to cassowaries, people and / or property
- Increased risk of wildlife-human interactions, potentially resulting in injury or harm to cassowaries, people and / or property

Therefore, it could be argued that the maintenance of these remnant patches within the developed landscape could be detrimental to the southern cassowary.

Further discussion of this issue is presented in Section 5.2.3.

High utilisation

These areas are considered of high habitat value, and represent areas of high utilisation for the southern cassowary. Many species of plants present within this area (including but not limited to *Cryptocarya oblate*, *Elaeocarpus angustifolius*, *Calamus australis*, *Calamus caryototoides*, *Archontophoenix alexandrae*, *Syzygium cormiflorum*, *Syzygium tierneyanum*, *Acronychia aberrans*, *Aglaia sapindina*, *Beilschmiedia tooram*, *Canthium coprosmoides*, *Chionanthus ramiflorus*, *Cinnamomum laubatii*, *Galbulimima spp*, *Hypserpa laurina*, *Alphitonia whitei* and *Alphinia caerulea*) are known and preferred food sources for the southern cassowary (CWRL 2009; John Paul McFadden, Australian Rainforest Foundation, pers. comm.). Primary known uses of the area are foraging and movement. These areas may be utilised for breeding, with confirmed sightings and historic accounts of breeding males and chicks within the area. The habitat is also suitable for nesting.

The broad range of species found within the notophyll vine forest may indicate extensive foraging use of these areas by the southern cassowary. Many of the above listed plant species (refer Section 4.2) are reliant on the southern cassowary for seed germination and dispersal (Webber and Woodrow 2004; WTMA 2009) and the cassowary is considered the



only long distance dispersal vector for some of the large-seeded fruits (EPA 2009b). It is envisaged that these areas would likely be used for foraging at different times, as different plants fruit across the site throughout the year. It is also considered possible that the southern cassowary may move through the site to surrounding patches of suitable vegetation, notably to the west and south of the proposed development site.




The following figure (Figure 10) provides a spatial representation of likely and possible cassowary movement corridors and linkages on a regional scale in the South Mission Beach area. It must be noted that the extent of corridors displayed in the figure below is based on aerial interpretation. Ground-truthing of the area to identify existing physical barriers (such as major fences) was not within the scope of this study.



Figure 10. Spatial representation of likely and potential cassowary movement corridors through remnant vegetation in South Mission Beach, derived from aerial photograph interpretation. Note the red border around the proposed development site.

The following table details the descriptions allocated to each of the movement corridor types or habitat linkages shown in Figure 10.

Table 3. Description of movement corridors and habitat linkages as shown in Figure 10.

	Open areas. These areas probably contain low habitat value for southern cassowary. However, this species is known to disperse across open country, particularly after disturbance of forest by cyclones, and they are also capable swimmers, able to cross water barriers (DEWHA 2009)
	Stepping stone corridors between patches of remnant vegetation. These areas include medium to high habitat value areas for southern cassowary. These vegetated corridors are important to allow cassowaries to move through the landscape (Latch 2007). Within the context of the South Mission Beach area, stepping stone corridors link remnant rainforest habitat within the allotment to the remnant rainforest to the south and extensive mangrove forest to the west.
	Solid linkages through patches of remnant rainforest and vineland habitat. Of high value to the southern cassowary for movement between patches of favourable feeding habitat and for direct foraging. A large number of preferred food plants occur throughout these areas.

On a local scale, cassowary movement within the allotment should also be considered. It should be noted that the allotment is part of a larger piece of remnant vegetation through which cassowaries move from habitat to habitat. The following figure (Figure 11) provides a simplified diagram of more likely current cassowary movement areas within and through the allotment, based on habitat and geomorphological features of the site and professional opinion of the consultants. The bold arrows indicate most likely movement areas, while the finer arrows represent areas where the cassowary is likely to move into denser forest to forage. As noted previously, cassowaries are known to utilise this site, and scats were found throughout the cleared footprint, indicating cassowary movement through this area. It is likely that cassowaries utilise the small remnant patches of vegetation within the cleared footprint for food and to a lesser degree for shelter.

If the development was to be fenced as a mitigation to exclude cassowary access, the movement corridors indicated in Figure 11 would be altered (Figure 12).

The 1st order stream is located along the base of scarp on the eastern side of the allotment. The cassowary may utilise this riparian corridor for foraging and movement purposes, and this riparian corridor would remain accessible with or without fencing of the development.

Other on site factors, such as the slope of the land are not considered limiting factors for cassowary utilisation of the site. Essential habitat for the cassowary, as classified by the Queensland Environmental Protection Agency, includes habitat to a maximum elevation of 1000m above sea level (Attachment 1). Cassowary habitat within this elevation range includes both slopes and plains.

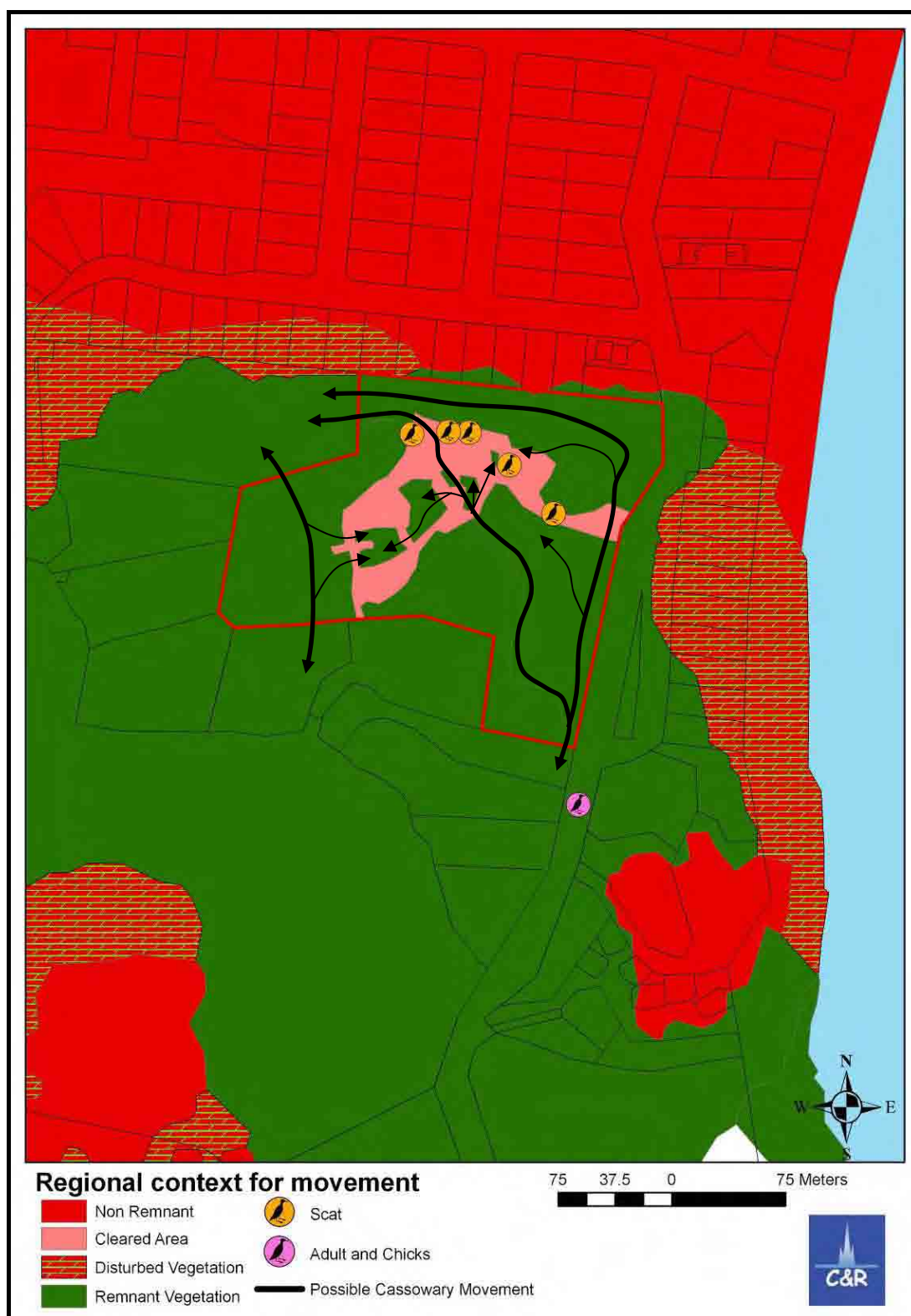


Figure 11: Simplified diagram of areas likely to be currently utilised more often for movement within and through the site, based on habitat and geomorphological features

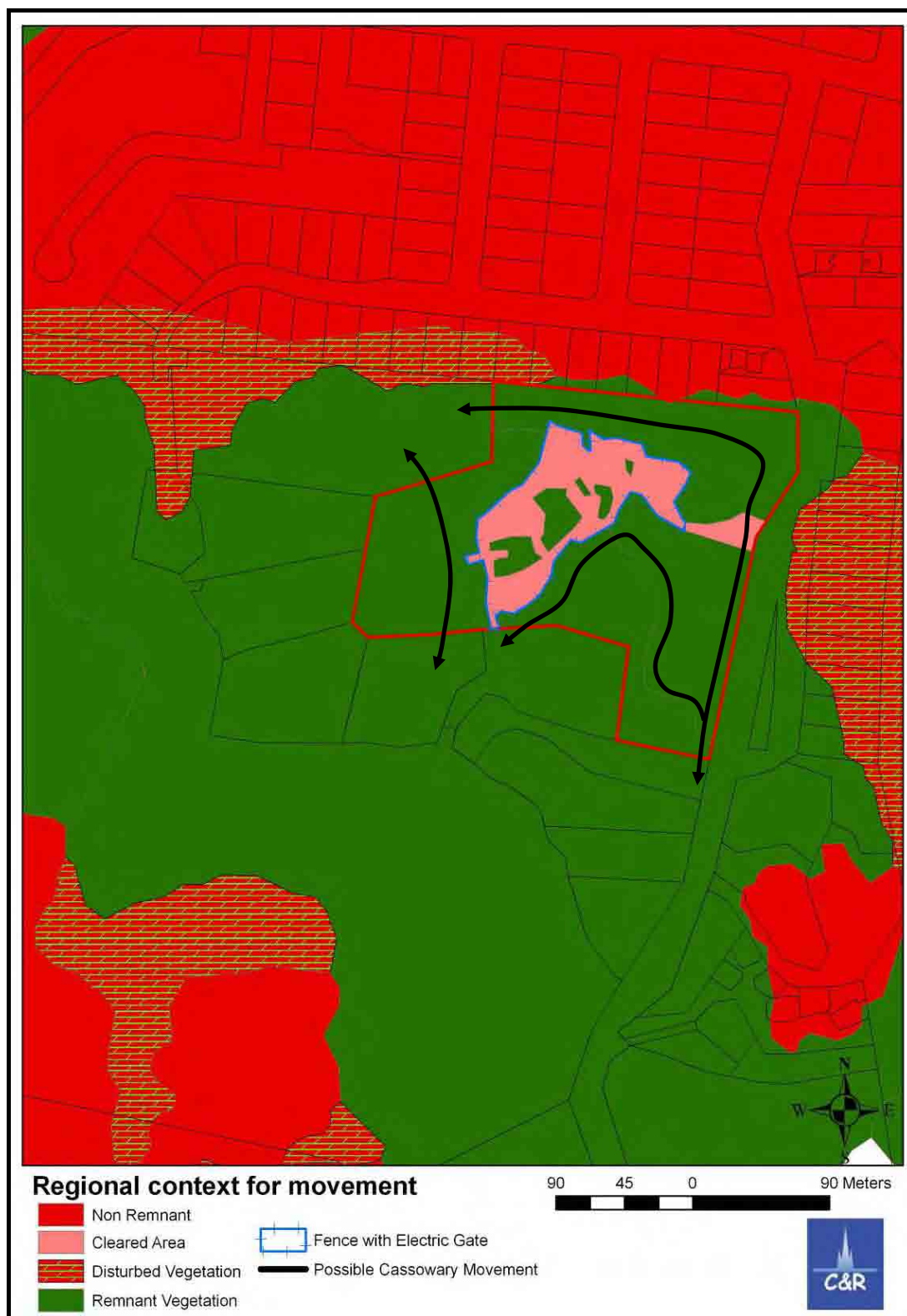


Figure 12: Simplified diagram of areas likely to be utilised for movement within and through the allotment if exclusion fencing is installed around the development footprint. These movement corridors are based on habitat and geomorphological features

The EPBC Act Policy Statement 3.15 Nationally Threatened Species and Ecological Communities – Significant Impact Guidelines for the endangered southern cassowary (*Casuarius casuarius johnsonni*) Wet Tropics Population – released in July 2009 presents guidelines for the fencing of developments proposed within Wet Tropics cassowary habitat. Considering these new guidelines in the context of the proposed development, there are two potential options that may be considered for this proposal, a fenced development and an unfenced development. It is noted that there are likely positive and negative impacts resulting from both options as outlined below (Tables 4 and 5) and it is understood that these guidelines will be applied on a case-by-case basis for each development proposal.

Table 4: Potential impacts of maintaining the proposed development as an unfenced development

Positive impacts of an unfenced development	Negative impacts of an unfenced development
No restriction to cassowary movement through habitat	Increased risk of cassowary – human interaction around dwellings
No loss of habitat or restricted access to habitat	Increased risk of cassowary road incidents within the development area
No reduction in connectivity between habitat and between or within riparian corridors	
No funnelling of cassowaries towards roads	

Table 5: Potential impacts associated with fencing the proposed development

Positive impacts of fencing	Negative impacts of fencing
Reduced risk of cassowary – human interaction as cassowaries will be excluded from the development area	Restricted cassowary movement throughout the allotment
Reduced risk of cassowary road incidents within the development area	Reduction of cassowary habitat through exclusion to patches of remnant vegetation within the development area
Greater control over the design of cassowary road crossing points at the entrance to the development	Potential funnelling of cassowaries towards roads and closer to existing areas of human habitation
	Potential for cassowaries to become trapped inside fenced areas
	Reduction in connectivity throughout the allotment

If exclusion fencing is required for this development, fencing will comply with best practice standards and guidelines.

4.3.3 Weeds

During the site visits in December 2008 and January 2009, minor incursions of environmental weeds were observed on the edge of vegetation along the road verge on Explorer Drive (Figure 13). Some environmental weeds, particularly groundcover species such as snakeweed (*Stachytarpheta urticifolia*), were also present throughout the cleared footprint (Figure 14). No Weeds of National Significance (WONS) or Class 1, 2 or 3 State declared weeds were observed.



Figure 13: Minor incursions of environmental weeds (mainly grasses and herbs) along the road verge on Explorer Drive.



Figure 14: Snakeweed (*Stachytarpheta urticifolia*) incursion through the cleared footprint with acacia regrowth

4.4 ECOLOGICAL COMMUNITIES

Some listed threatened ecological communities, such as the littoral rainforest and coastal vine thickets of Eastern Australia ecological community, occur in the Mission Beach area. However, no such listed ecological communities occur within the allotment or within a 1km radius of the site, as per the EPBC Protected Matters search (Attachment 4).

5 FAUNA OF THE SITE

A search of the Queensland Wildlife Online database (maintained by the Queensland Environmental Protection Agency) to a distance of 1km from the point coordinates: Latitude – 17.95 and Longitude 146.09 identified 41 bird species recorded from the nominated area, of which one, the Australian swiftlet (*Aerodramus terraereginae*), is listed as rare under the Queensland *Nature Conservation (Wildlife) Regulation 2006*. Another species, the Macleay's fig-parrot (*Cyclopsitta diophthalma macleayana*), is listed as vulnerable under this legislation. An extract of the Queensland EPA Wildlife Online database search is included in Attachment 3.

While it was not identified through the Queensland Wildlife Online database search, the southern cassowary (*Casuarius casuarius johnsonii*) is known to occur in the South Mission Beach area, and evidence of its presence on the proposed development site was observed during the initial site inspection. The southern cassowary is discussed in detail below (Section 5.2).

5.1 THREATENED SPECIES

In addition to the rare and vulnerable species noted above, a search of the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search Tool to a distance of 1km from the point coordinates: Latitude -17.95 and Longitude 146.09 (approximate centre of the allotment) provided an indication of nationally threatened fauna species that may occur in, or relate to, the nominated area. In total, 12 threatened terrestrial fauna species were recognised as having the potential to occur within 1km of the site, or suitable habitat for these species may occur within this area. With this list of threatened species in mind, a thorough habitat assessment was undertaken during field investigations in early December 2008 and January 2009.

A number of nationally threatened terrestrial fauna species were identified that may occur in the area, or for which suitable habitat may occur, according to the EPBC Protected Matters Search (Table 6). Likelihood of occurrence within the area has been assessed, based on professional experience and opinion. A full report from this EPBC Protected Matters search has been generated and included in Attachment 4.

Based on the habitat characteristics and values of the site, and in considering the specific requirements of each threatened species identified through this search, the southern cassowary (*Casuarius casuarius johnsonii*) is considered the most likely of the listed threatened species to occur within or utilise the proposed site. Section 5.2 discusses the southern cassowary in more detail.

It is considered unlikely that the other listed species will suffer any significant impacts from the localised activities associated with development on this site (i.e. the remaining species are either widespread species within the Wet Tropics and beyond, and/or appropriate habitat for these species does not occur within the allotment, and/or they are not tightly tied to particular micro-habitats).

Table 6. Threatened species within a 1km radius of the proposed development site, produced by the EPBC Protected Matters Search Tool. Likelihood of occurrence is based on professional opinion.

Species group	Species	Common Name	Status	Likelihood of occurrence within the area
Birds	<i>Casuarius casuaris johnsonii</i>	Southern cassowary (Australian)	E	Known to occur
	<i>Erythroriorchis radiatus</i>	Red goshawk	V	Possible. However, based on habitat preferences unlikely to permanently inhabit the site.
	<i>Rostratula australis</i>	Australian painted snipe	V	Unlikely to occur, based on habitat requirements
Frogs	<i>Litoria nannotis</i>	Waterfall frog, Torrent treefrog	E	Unlikely to occur, based on habitat requirements
	<i>Litoria rheocola</i>	Common mistfrog	E	Unlikely to occur, based on habitat requirements
	<i>Nyctimystes dayi</i>	Lace-eyed treefrog, Australian laceid	E	Unlikely to occur, based on habitat requirements
Mammals	<i>Dasyurus hallucatus</i>	Northern quoll	E	Unlikely to occur, based on habitat requirements
	<i>Hipposideros semoni</i>	Semon's leaf-nosed bat, Greater wart-nosed horse-shoe-bat	E	Unlikely to occur, based on habitat requirements
	<i>Petaurus gracilis</i>	Mahogany glider	E	Unlikely to occur, based on habitat requirements
	<i>Pteropus conspicillatus</i>	Spectacled flying-fox	V	Possible. However, no breeding or roosting colonies present
	<i>Rhinolophus philippinensis</i> (large form)	Greater large-eared horseshoe bat	E	Unlikely to occur, based on habitat requirements
	<i>Saccolaimus nudicluniatus</i>	Bare-rumped sheath-tail bat	CE	Unlikely to occur, based on habitat requirements

5.2 SOUTHERN CASSOWARY (*CASUARIUS CASUARIUS JOHNSONII*)

The southern cassowary is listed as an endangered species under the Commonwealth *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* (OLDP 2007). In addition, the Wet Tropics population of the southern cassowary is listed as Endangered under the *Queensland Nature Conservation Act 1992 (Queensland Nature Conservation (Wildlife) Regulation 2006)* (OQPC 2009). Some recent estimates of population numbers are in the order of approximately only 49 adults, 28 sub adults, and 31 chicks within the forests of Mission Beach (DEWHA 2009b). It is also estimated that there only about 900 southern cassowaries remaining in the whole of the Wet Tropics (Global Greenhouse Warming 2009). A *Recovery Plan for Southern Cassowary, 2007* (Latch 2007) has been prepared by the Australian Government and Queensland Environmental Protection Agency for the long-term conservation of this species.

5.2.1 Ecology of the Southern Cassowary

The southern cassowary (*Casuarius casuarius johnsonii*) is the only one of three cassowary species found in Australia, and the largest native vertebrate to inhabit Australian rainforests (Global Greenhouse Warming 2009).

Although they occur primarily in the rainforest and associated vegetation mosaics, the southern cassowary also utilises habitats such as swamps, woodlands, mangroves and disturbed areas for a year-round supply of fleshy fruits (Latch 2007), particularly at times of food stress in the rainforest, such as after cyclones and other catastrophic events. These areas are also used as movement corridors between patches of suitable habitat. The Mission Beach area is recognised as high quality habitat for the southern cassowary (Latch 2007; DEWHA 2009a).

The southern cassowary is principally a fruit-eater, with the diet known to include the fleshy fruits of at least 238 plant species (Latch 2007). Fallen fruit comprises the bulk of the diet. A selection of important food plants for southern cassowary is included in Attachment 5. Small vertebrates, invertebrates, fungi, plants and carrion may also be consumed (DEWHA 2009a; John Paul McFadden, Australian Rainforest Foundation, pers. comm.). They may also visit farms and gardens within their home range if they can find food there (Harrington 2006). Many of the seeds ingested by cassowaries retain their viability and are passed whole. They are considered the only dispersal agent of some rainforests species and the only long distance dispersal vector for many more large-seeded fruits. Thus, the southern cassowary is considered a keystone species as it plays a significant role in seed dispersal and rainforest regeneration (EPA 2009b).

They are territorial and solitary, with contact between adults usually only occurring during mating. However, male and female territories can overlap (EPA 2009b). During the breeding season, females generally lay three to five eggs, which are incubated by the male. Chicks are raised and protected by the male alone for about a year (EPA 2009b). After this time, young chicks must seek their own territory if they are to survive.

5.2.2 Recognised Threats to the Southern Cassowary

As outlined in the *Recovery Plan for the Southern Cassowary 2007* (Latch 2007), the Wet Tropics southern cassowary population is subject to eight main threats, as follows:

- Habitat loss from clearing: more than 80 per cent of coastal lowland habitat has gone;
- Habitat fragmentation: much of remaining habitat is fragmented, isolating groups and disrupting movement;
- Habitat degradation: through invasion of weeds and changed fire regimes;
- Roads and traffic;
- Dog attacks;

- Hand feeding (brings cassowaries closer to potential threats such as traffic and dogs);
- Diseases, and
- Natural catastrophic events (eg. cyclones)

5.2.3 Potential Impacts of the Proposed Development on the Southern Cassowary

Any development has an inherent risk of ecological disturbance from general human habitation. While habitat loss and fragmentation from clearing is considered the greatest threat to the long-term survival of the southern cassowary (Latch 2007), there will be no further broad scale clearing of vegetation within the allotment for the proposed development. All buildings and associated infrastructure will be restricted to previously cleared areas.

Therefore the following risks and potential impacts to southern cassowary have been identified according to priority for this particular site as listed below (Tables 7-12).

1. Road and traffic incidents
2. Habitat degradation and disturbance
3. Domestic animals and pets
4. Human interactions
5. Weeds and pests
6. Lack of awareness of local residents

In addition, Section 5.2.5 provides a response to the obligatory *Significant Impact Criteria* for endangered species, as outlined in the *Significant Impact Guidelines* by the Australian Government Department of Environment, Water, Heritage and the Arts (DEH 2006), as they relate to this site and the proposed development concept.

Table 7. Road and traffic incidents

Roads and Traffic	
Relevance	Road and traffic management is of extreme relevance to the proposed project, as the development will result in increased vehicular movements in and around the site.
Objectives Broad statement of aims	<ul style="list-style-type: none"> No net loss of southern cassowaries will occur as a result of road and traffic incidents associated with the development.
Performance Targets Actions on-site will meet performance targets. Performance targets address objectives	<ul style="list-style-type: none"> As a result of wildlife movement solution strategies to be incorporated into the concept design (eg. traffic mitigation measures and cassowary-proof fencing), there will be no unnecessary injury or mortality of southern cassowaries as a result road or traffic interactions (ie vehicle strike).
Rationale Why the above performance targets are required	<p>Regardless of the size, all development creates an ecological impact. Development on this site will lead to an increase in traffic movements, increasing the risk of road or traffic-related wildlife incidents. Road mortality is a major issue in areas where substantial urban/peri-urban development encroaches on cassowary habitat (Latch 2007). Roads and traffic-related incidents are recognised as one of the most substantial threats to this endangered species (Latch 2007). This issue is applicable to the construction phase of the development and on-going management thereafter, as road and traffic movement increases.</p> <p>Mitigation measures are necessary to prevent unnecessary injury or mortality to listed threatened or migratory species as a result of road or traffic incidents.</p>
Background Information Information describing processes and matters which may be affected	Roads may fragment habitat, create barriers to cassowary movement, produce edge effects, allow for the introduction of invasive species and may cause substantial mortality through direct vehicle strike (Latch 2007). In addition, road and traffic issues potentially impact other listed threatened and migratory species in the area. This section is applicable to the construction phase of the development and on-going management thereafter, as road and traffic movement increases.
Potential Issues and Impacts Issues which may arise or matters that may be impacted on, by improper management occurring	<p>Direct impacts to the southern cassowary may include:</p> <ul style="list-style-type: none"> Vehicle strike, resulting in stress, injury or death. <p>Indirect impacts to listed threatened or migratory species may include:</p> <ul style="list-style-type: none"> Roads can cause fragmentation of habitat, thus potentially leading to fragmentation and isolation of populations. Roads can create barriers to wildlife movement. Roads can be a source of introduction of invasive species that may impact on the southern cassowary,

Roads and Traffic	
	<p>directly through predations and competition, and indirectly through altered habitat</p> <p>Other impacts may include:</p> <ul style="list-style-type: none"> • Injury to people through traffic-wildlife incidents • Damage to property
<p>Mitigation Measures</p> <p>Measures which will prevent potential issues and impacts, and which will ensure performance targets are met at all times</p>	<ul style="list-style-type: none"> • Fencing of the development footprint would prevent cassowaries from accessing the developed area, particularly roads within the development and an electric gate would provide a speed mitigation measure. However, it is understood that the fencing of this proposed development may create some negative implications for the cassowary. As such, fencing as a mitigation measure for the prevention of road incidents is a suggestion rather than a recommendation for this site. • Clearing for roads, verges and access tracks will be minimised (to the stipulated requirements of relevant legislation and guidelines) to reduce potential direct and indirect impacts on the habitat of the southern cassowary and other wildlife in the area. • Wildlife movement solutions should be incorporated into road design. These should include cassowary road crossing points, under-road culverts, speed bumps, 'S' bends etc. • Enforcement of low speed limits throughout the development. • Visitor car parking areas should be located at the entrance to the development, with pedestrian access tracks to and from dwellings. This will limit the volume of visitor traffic moving through the site and reduce the total area required for road / parking infrastructure. • Car parking areas should be limited for each dwelling to minimise the volume of local traffic moving through the site. • Appropriate signage should be erected along the roads throughout the development.
<p>Corrective Measures</p> <p>If performance targets are not met, these actions will be undertaken to ensure that the development is brought back into compliance</p>	<p>A non-compliance with the performance criteria will be in the form of:</p> <ul style="list-style-type: none"> • Unnecessary stress, injury or mortality of a southern cassowary as a result of vehicle strike. • Stress or injury to people as a result of vehicle strike. • A new weed incursion or infestation along a road or road verge within the development. <p>The following corrective actions will need to be undertaken:</p> <ul style="list-style-type: none"> • An investigation into the circumstances of the road or traffic-related (wildlife) injury or mortality will take place as soon as practically possible.

Roads and Traffic	
	<ul style="list-style-type: none"> Where new incursions of invasive species are detected, appropriate pest management strategies will be implemented as soon as practically possible.
Recording and Reporting	<ul style="list-style-type: none"> Any road or traffic-related incidents will be reported to the relevant authorities as required. The relevant authorities (eg. Queensland Environmental Protection Agency; Australian Government Department of Environment, Water, Heritage and the Arts etc) will be notified of any injury or mortality to a southern cassowary or any other listed threatened or migratory species that occurs within the site.
Recommendations These numbers correspond to the recommendations listed and numbered in Section 6 of this report	<ul style="list-style-type: none"> 3, 4, 5, 6 and 7

Table 8. Habitat Degradation and Disturbance

Habitat Degradation and Disturbance	
Relevance	The management of habitat to prevent habitat degradation and disturbance is of high relevance to the proposed project. This potential impact is applicable to the construction phase of development and on-going management thereafter.
Objectives Broad statement of aims	<ul style="list-style-type: none"> • No loss of essential habitat (habitat critical to the survival of a species) for the southern cassowary will occur as a result of the proposed development • No degradation of essential habitat for the southern cassowary will occur as a result of the proposed development • No net loss of southern cassowaries will occur as a result of habitat modification due to the proposed development • Remnant vegetation will be repaired and restored where necessary
Performance Targets Actions on-site will meet performance targets. Performance targets address objectives	<ul style="list-style-type: none"> • There will be no further broad scale clearing of the site for the proposed development or any other purpose • Trees designated for removal will be identified by a professional vegetation manager, environmental scientist or botanist, described, recorded and mapped, and marked prior to removal • No significant habitat trees will be removed • No new incursions of invasive plant species will occur
Rationale Why the above performance targets are required	<p>The above Performance Targets for Habitat Management are required to prevent adverse impacts to the southern cassowary.</p> <p>While it is not classified as 'habitat critical to the survival of the southern cassowary' under the recovery plan for southern cassowary (Latch 2007), the remnant vegetation within the allotment is recognised as being of importance to the southern cassowary, and is mapped as essential habitat by the Queensland Environmental Protection Agency (EPA 2009a). As such, the degradation or disturbance of habitat has the potential to adversely impact the southern cassowary.</p> <p>Environmental management and mitigation measures will be required to prevent the following potential impacts.</p>
Background Information Information describing processes and matters which may be affected	The site is located within the Wet Tropics bioregion in the vegetation classification used in the <i>Vegetation Management Act 1999</i> . Most of the vegetation on the allotment is remnant rainforest, mapped as regional ecosystem (RE) 7.12.40. This regional ecosystem is classified as an 'of concern' regional ecosystem. While it is not recognised as essential habitat (habitat critical to the survival of the species) for the endangered southern cassowary under the recovery plan for southern cassowary (Latch 2007), this regional ecosystem is considered to

Habitat Degradation and Disturbance

	<p>be of importance for the long-term survival of this endangered species (EPA 2009a), and thus must be maintained and managed appropriately.</p> <p>Some past clearing has occurred within the allotment (for house pads and access tracks), and it is recommended that any future development should occur within these previously cleared areas to avoid any further removal, disturbance, and/or fragmentation of the remaining remnant vegetation within the allotment and to avoid isolation and fragmentation of habitat in a regional context.</p>
<p>Potential Issues and Impacts</p> <p>Issues which may arise or matters that may be impacted on, by improper management occurring</p>	<p>Potential impacts to the southern cassowary from improper habitat management include:</p> <ul style="list-style-type: none"> • A reduction in the area of occupancy by the southern cassowary that could lead to long-term decrease in population size on a local and regional scale • Fragmentation and/or isolation of an existing population • A reduction in habitat considered important for the long-term survival of the southern cassowary • Disruption to the reproductive cycle of the southern cassowary, through habitat modification and other associated disturbance • Introduction of invasive species (including weeds and pest animals), through poor habitat management practices, that could adversely impact the southern cassowary through competition, predation etc • Loss or degradation of an 'of concern' regional ecosystem
<p>Mitigation Measures</p> <p>Measures which will prevent potential issues and impacts, and which will ensure performance targets are met at all times</p>	<ul style="list-style-type: none"> • Minimal clearing for the purpose of the development will occur. The development is to occur within previously cleared areas as observed on site in December 2008. • There will be no clearing for fire breaks, fences or any other purpose. • A list of pre-determined local native species will be used for all landscaping purposes. No introduced exotic or invasive species will be used for landscaping or any other purpose. • Rehabilitation works will be undertaken in any areas that suffer disturbance during construction activities. • Rehabilitation and maintenance works may occur along the northern boundary of the property, between the fence and the allotment boundary. This will provide a more effective vegetated buffer between the proposed development and the neighbouring urban development (Figure XXX) • Rehabilitation of the riparian habitat along the on site creek may be undertaken using local native species. • Weed management will be undertaken for any existing infestations of environmental and noxious (Council declared) weed species and to prevent the establishment of new infestations (a Property Pest Management

Habitat Degradation and Disturbance	
	<p>Plan should be developed and implemented).</p> <ul style="list-style-type: none"> • Pest management will be undertaken as required to prevent disturbance or degradation to existing habitat values from pests such as feral pigs (a Property Pest Management Plan should be developed and implemented).
<p>Corrective Measures</p> <p>If performance targets are not met, these actions will be undertaken to ensure that the development is brought back into compliance</p>	<p>A non-compliance with the performance criteria will be in the form of:</p> <ul style="list-style-type: none"> • Inappropriate management of habitat surrounding the development that may result in deleterious affects to the local cassowary population. <p>The following corrective actions will need to be undertaken:</p> <ul style="list-style-type: none"> • Any activities deemed as non-compliant with the performance criteria will cease immediately. • In the case of invasive species incursions or infestations, appropriate weed or pest management will be implemented as soon as practically possible. • Rehabilitation and/or revegetation works will commence as soon as practically possible.
<p>Monitoring and Performance Programme</p> <p>Details how compliance with performance targets will be monitored</p>	<p>Monitoring of the habitat values of the allotment must occur on a regular basis.</p>
<p>Recording and Reporting</p>	<ul style="list-style-type: none"> • Records / logs of any rehabilitation and/or revegetation works undertaken on site should be maintained. Such records must be made available to the relevant vegetation management authorities if and as required. • Photographic records of all rehabilitation and/or revegetation works should be kept.
<p>Recommendations</p> <p>These numbers correspond to the recommendations listed and numbered in Section 6 of this report</p>	<ul style="list-style-type: none"> • 1, 2, 8, 9, 10 and 16.

Table 9. Domestic Animals and Pets

Domestic Animals and Pets	
Relevance	Management of domestic animals and pets is of relevance to the proposed project. This section is applicable to the on-going management of the estate post construction.
Objectives Broad statement of aims	<ul style="list-style-type: none"> No domestic animals or pets will be allowed within the development. No net loss of southern cassowaries will occur as a result of interactions between domestic animals and wildlife within the development.
Performance Targets Actions on-site will meet performance targets. Performance targets address objectives	<ul style="list-style-type: none"> There will be no stress, injury or mortality to a southern cassowary as a result of attack by domestic animals or pets.
Rationale Why the above performance targets are required	<p>It is necessary to ensure that no southern cassowaries are injured or killed as a result of attack by a domestic animal or pet within the development.</p> <p>Domestic animals and pets, particularly dogs, are recognised as a major threat to the southern cassowary (Latch 2007). Dog attacks on cassowaries are known to cause substantial injury and death and their presence potentially affects cassowary feeding, movements, and behaviour, as outlined in the recovery plan for southern cassowary (Latch 2007). Cats may also pose a threat to small cassowary chicks.</p> <p>As such, mitigation measures are required to ensure the objectives and performance target can be met.</p>
Background Information Information describing processes and matters which may be affected	<p>Domestic animals and pets, particularly dogs, are recognised as a major threat to wildlife, and more specifically in this instance, the southern cassowary. Dog attacks on cassowaries are known to cause substantial injury and death and their presence potentially affects cassowary feeding, movements, and behaviour, as outlined in the recovery plan for southern cassowary. Cats also pose a threat to many native wildlife species.</p> <p>In addition to direct impacts of injury and death associated with domestic animal attack on wildlife, domestic animals and pets may also carry and introduce disease to native wildlife species and populations.</p>
Potential Issues and Impacts Issues which may arise or matters that may be impacted on, by improper management occurring	<p>Direct impacts to the southern cassowary may include:</p> <ul style="list-style-type: none"> Stress, injury or death from dog or domestic animal attack <p>Indirect impacts to the southern cassowary may include:</p> <ul style="list-style-type: none"> Changed movement patterns as a result of domestic animal presence Changed feeding patterns as a result of domestic animal presence

Domestic Animals and Pets	
	<ul style="list-style-type: none"> • Changed behavioural patterns, including changes to breeding habits as a result of domestic animal presence
Mitigation Measures Measures which will prevent potential issues and impacts, and which will ensure performance targets are met at all times	<ul style="list-style-type: none"> • The development may be fully fenced with an electric gate to prevent cassowaries and other animals (including domestic animals) from accessing the site. However, it is understood that the fencing of this proposed development may create some negative implications for the cassowary. As such, fencing as a mitigation measure for the prevention of road incidents is a suggestion rather than a recommendation for this site. • Domestic animals and pets will not be allowed within the development. • Trapping of stray domestic animals and pets within the development site may be undertaken by qualified personnel under appropriate licences and permits. • All residents are to be informed of the 'no domestic animals' regulation for the site.
Corrective Measures	<p>A non-compliance with the performance criteria will be in the form of:</p> <ul style="list-style-type: none"> • Domestic animals or pets being kept within the site. • Stress, injury or death of a southern cassowary as a result of domestic animal or pet attack within the development. <p>The following corrective actions will need to be undertaken:</p> <ul style="list-style-type: none"> • Notices should be served on residents in breach of the 'no pets' regulation. • Stray domestic animals and pets within the area are to be trapped (by qualified and authorised personnel) and taken to the nearest animal shelter / pound. • Pest animals including wild dogs and feral cats will be managed as per a pest management plan for the property.
Recording and Reporting	<ul style="list-style-type: none"> • Any incident resulting in injury or death of a southern cassowary should be recorded and reported to the appropriate authorities as soon as practically possible. This may include notification to authorities such as the Queensland Environmental Protection Agency.
Recommendations These numbers correspond to the recommendations listed and numbered in Section 6 of this report	<ul style="list-style-type: none"> • 9, 12 and 16

Table 10. Human Interactions

Human Interactions	
Relevance	The management of human-wildlife interactions is of relevance to the proposed project, as human interactions with wildlife, particularly cassowaries, may result in injury or mortality of a southern cassowary or injury or mortality of people. This section is applicable to the construction phase of development and on-going management thereafter.
Objectives Broad statement of aims	<ul style="list-style-type: none"> • No injury or harm to any person as a result of human-wildlife interactions • No net loss of southern cassowaries from the site as a result of human-wildlife interactions
Performance Targets Actions on-site will meet performance targets. Performance targets address objectives	<ul style="list-style-type: none"> • To ensure to the greatest extent possible that human-wildlife interactions do not occur or are minimised, to prevent injury or harm to people and / or the southern cassowary.
Rationale Why the above performance targets are required	<p>Human-wildlife interactions may create a serious risk to the wildlife and person/s involved.</p> <p>As such, mitigation measures are required to ensure the objectives and performance target can be met.</p>
Background Information Information describing processes and matters which may be affected	Human-wildlife interactions, such as the feeding of wildlife, may create a serious risk to the wildlife and person/s involved. Such interactions have the potential to cause changes in normal behavioural patterns which can lead to a number of impacts and associated risks, as outlined in Potential Issues and Impacts below.
Potential Issues and Impacts Issues which may arise or matters that may be impacted on, by improper management occurring	<ul style="list-style-type: none"> • Wildlife, particularly the southern cassowary, that become conditioned to human food sources can become aggressive when protecting or seeking human food (Latch 2007). This can cause injury or harm to the person/s feeding the wildlife and the wildlife itself. • Feeding of cassowaries may attract them closer to areas where they may be attacked by domestic animals such as dogs. • Feeding of cassowaries may encourage them to move into and across areas, such as roads, where they may be more likely to suffer from vehicle strike and other impacts. • The feeding of wildlife has the potential to introduce disease or illness through unhygienic practices. • Recreational activities such as bushwalking, bike riding etc outside of any cleared and designated recreational areas can adversely impact habitat suitable for the southern cassowary, by degrading natural habitat values, introducing invasive species (eg. by way of seed dispersal on shoes, clothing etc), and altering normal behavioural patterns due to an increased human presence and activity within suitable habitat.

Human Interactions	
Mitigation Measures Measures which will prevent potential issues and impacts, and which will ensure performance targets are met at all times	<ul style="list-style-type: none"> • The development may be fully fenced with an electric gate to prevent cassowaries from accessing the site, where they may be in close proximity to humans. However, it is understood that the fencing of this proposed development may create some negative implications for the cassowary. As such, fencing as a mitigation measure for the prevention of road incidents is a suggestion rather than a recommendation for this site. • The feeding of wildlife will not be permitted. • Recreational activities will be prohibited in remnant vegetation within the development.
Corrective Measures	<p>A non-compliance with the performance targets will be in the form of:</p> <ul style="list-style-type: none"> • A breach of regulations, including the feeding of wildlife within the estate, or improper use of habitat (remnant vegetation) areas for recreational activities etc. <p>The following corrective actions will need to be undertaken:</p> <ul style="list-style-type: none"> • Depending on the situation, signage may be installed to ensure all residents have been information of the possible impacts of human-wildlife interactions, particularly for interactions with cassowaries.
Recommendations These numbers correspond to the recommendations listed and numbered in Section 6 of this report	<ul style="list-style-type: none"> • 11 and 16

Table 11. Weeds and pests

Weeds and Pests	
Relevance	Pest and weed management is of relevance to the proposed project. This section is applicable to the construction phase of development and on-going management thereafter.
Objectives Broad statement of aims	<ul style="list-style-type: none"> No deleterious impacts to the southern cassowary, either directly or indirectly, as a result of invasive species incursions or infestations, including pests and weeds. No net loss of southern cassowaries within the local area as a result of invasive species within the allotment.
Performance Targets Actions on-site will meet performance targets. Performance targets address objectives	<ul style="list-style-type: none"> Pests and weeds will be managed to ensure there will be minimal risk of deleterious impacts to the southern cassowary as a result of direct or indirect effects of weeds and pests. To prevent the introduction, establishment and spread of invasive species throughout the site and to achieve early detection and eradication of new incursions. To ensure compliance with relevant legislation and guidelines. To reduce the current area of weed infestation within the site.
Rationale Why the above performance targets are required	Pests and weeds pose a significant threat to listed threatened and migratory species, including the southern cassowary, and other native wildlife species.
Background Information Information describing processes and matters which may be affected	Pest animals such as feral pigs, wild dogs and feral cats are recognised as a major threat to native wildlife, including the endangered southern cassowary. Weeds are also recognised as a threat to native wildlife populations.
Potential Issues and Impacts Issues which may arise or matters that may be impacted on, by improper management occurring	Potential impacts to the southern cassowary may include: <ul style="list-style-type: none"> Attack by pest animals such as wild dogs or feral cats causing stress, injury or death Decrease in available resources, including food, shelter, breeding sites etc, through competition with pest animals Decrease in available resources and/or habitat values as a result of weed infestation Severe weed infestations may create movement barriers between patches of suitable habitat.
Mitigation Measures Measures which will prevent potential issues and impacts, and which will ensure performance targets are met at	<ul style="list-style-type: none"> A Property Pest Management Plan should be prepared for the development. The plan should ensure weeds and pests are adequately and appropriately managed within the site. Weed management will be undertaken as required and as per a Property Pest Management Plan, using

Weeds and Pests	
all times	<p>standard, recommended techniques on a species-by-species basis. Weed management should be undertaken by qualified and authorised personnel.</p> <ul style="list-style-type: none"> • Pest animal management will be undertaken as required by qualified and authorised personnel. • A pre-determined list of local native species will be used for all landscaping and revegetation works within the site. No invasive species (declared or noxious) are to be introduced to the site for any purpose. • All residents will be informed of any regulations relating to plants which may be used for landscaping or decorative purposes.
Corrective Measures	<p>A non-compliance with the performance targets will be in the form of:</p> <ul style="list-style-type: none"> • Introduction of invasive species by residents for landscaping or decorative purposes. • New incursion of an invasive weed species within the site, resulting in the establishment of the species. • Failure to appropriately manage existing weed infestations and feral animal populations within the site. <p>The following corrective actions will need to be undertaken:</p> <ul style="list-style-type: none"> • Immediate management action is to be taken where new weed incursions are detected. • Where existing infestations of weed species are identified, management action (as per a Property Pest Management Plan) will be implemented as soon as practically possible. • If pest animals are identified within the site, action will be taken as soon as practically possible to eradicate the pest from the site, as per a Property Pest Management Plan.
Monitoring and Performance Programme	<ul style="list-style-type: none"> • Monitoring for weeds and pest animals should occur on a regular basis to allow for rapid response if and when incursions are detected.
Recommendations These numbers correspond to the recommendations listed and numbered in Section 6 of this report	<ul style="list-style-type: none"> • 8, 9 and 10

Table 12. Lack of awareness of local residents

Environmental Education targeting community awareness of cassowaries	
Relevance	Environmental education and awareness is of relevance to the proposed project. This section is applicable to the construction phase of development and on-going management thereafter.
Objectives Broad statement of aims	<ul style="list-style-type: none"> • All construction personnel and residents will be informed of the potential risks and impacts of their actions on the southern cassowary. • All construction personnel and residents will understand and abide by any regulations put in place to ensure protection of the environment, including the southern cassowary and its habitat
Performance Targets Actions on-site will meet performance targets. Performance targets address objectives	<ul style="list-style-type: none"> • Potential impacts of the development on the southern cassowary will be minimised through the use of environmental education and awareness programmes which aim to achieve the above objectives. • There will be no injury or harm to a southern cassowary as a result of inappropriate actions due to a lack of knowledge and understanding. • There will be no injury or harm to any person/s as a result of inappropriate actions due to a lack of knowledge and understanding.
Rationale Why the above performance targets are required	Environmental education is a valuable tool that has an important role to play in conservation. Education leads to an understanding, which can raise awareness and appreciation for the environment, and in this instance, the southern cassowary which occurs within the site.
Background Information Information describing processes and matters which may be affected	Of the potential risks to the southern cassowary discussed above, human behaviour may cause or contribute to all of the abovementioned associated impacts. It therefore becomes essential particularly in areas where human-wildlife interactions are possible, such as the proposed development area, to provide education to all residents.
Potential Issues and Impacts Issues which may arise or matters that may be impacted on, by improper management occurring	<ul style="list-style-type: none"> • Inadequate or improper education of residents could result in a breach of the above “Environmental Education and Awareness” objectives. This could result in injury or harm to the southern cassowary or injury or harm to a person/s.
Mitigation Measures Measures which will prevent potential issues and impacts, and which will ensure performance targets are met at all times	<ul style="list-style-type: none"> • All construction personnel and residents must be adequately informed and educated on environmental issues relevant to site, with particular focus on potential issues associated with the occurrence of the southern cassowary. Information provided to residents must be up to date and should be re-distributed on a regular basis. It is suggested that the Cassowary Education Kit developed by the Wet Tropics Management Authority and the Cassowary Advisory Group and any other relevant material be made available to all residents. This resource is available online at http://www.wettropics.gov.au/pa/pa_casso.html
Corrective Measures	A non-compliance with the performance targets will be in the form of:

Environmental Education targeting community awareness of cassowaries

	<ul style="list-style-type: none"> One or more of the abovementioned impacts occurring as a result of inadequate education and understanding of cassowary behaviour and biology by construction personnel, residents of the estate and their visitors. <p>The following corrective actions will need to be undertaken:</p> <ul style="list-style-type: none"> Re-distribution of appropriate educational materials to all estate residents
Recommendations These numbers correspond to the recommendations listed and numbered in Section 6 of this report	<ul style="list-style-type: none"> 16

5.2.4 EPBC Act and Referral Guidelines, as they relate to the southern cassowary

This section discusses the implications of southern cassowary occurrence within the proposed development site, particularly as they relate to the EPBC Act. The opinions expressed in this section are based on the technical and practical experience of the environmental consultants conducting the study. They are not presented as legal advice, nor do they represent decisions from the regulatory agencies charged with the administration of the relevant acts.

5.2.5 Southern Cassowary as a Matter of National Environmental Significance

Under the EPBC Act (herein referred to as the Act), a listed threatened species, such as the southern cassowary, is recognised as a matter of National Environmental Significance (NES) (OLDP 2007).

5.2.6 Significant Impacts to Matters of NES

Under the Act, an action (ie. a project, such as the proposed development) requires approval from the Federal Minister for the Environment if the action has, will have, or is likely to have, a significant impact on a matter of NES. As outlined in the *Significant Impact Guidelines*, a significant impact is assessed against significant impact criteria for endangered species, as listed below (taken directly from the DEWHA website: <http://www.environment.gov.au/epbc/publications/pubs/neg-guidelines.pdf>). An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

While the southern cassowary was not recorded on-site during the field inspection in December 2008, evidence in the form of cassowary scats shows that the southern cassowary does occur within and/or utilize the allotment. In addition, a male with three chicks was incidentally observed in the vicinity of the allotment on 28 February 2009. In considering the vegetation of the site, it is considered likely that the southern cassowary may forage within the allotment and move through the site to other surrounding patches of vegetation. It is noted that notophyll vine forest within the allotment probably provides more suitable habitat for the southern cassowary than the denser vineland areas.

The following section addresses each Significant Impact Criteria, as it relates to the proposed development and the southern cassowary in South Mission Beach.

5.3 RESPONSE TO SIGNIFICANT IMPACT CRITERIA FOR SOUTHERN CASSOWARY (WET TROPICS POPULATION)

5.3.1 Significant Impact Criteria 1

Will the action lead to a long-term decrease in the size of the southern cassowary (Wet Tropics) population

Provided a number of stringent recommendations are followed (Section 6, Tables 5-10), it is considered unlikely that development within the currently cleared footprint will lead to a long-term decrease in the size of the southern cassowary (Wet Tropics – Mission Beach) population.

There will be no further fragmentation of habitat within the landscape as there will be no further broad-scale clearing of habitat within the allotment.

Built structures such as roads and dwellings are not likely to pose a significant fragmentation barrier as the development is on the edge of a remnant patch. To the east of the block there is remnant vegetation no greater than 30 metres wide, which includes a road and a significant road verge.

5.3.2 Significant Impact Criteria 2

Will the action reduce the area of occupancy of the southern cassowary

It is the recommendation of C&R Consulting that development is restricted to the cleared footprint and all remnant vegetation is maintained on this site. If development is restricted to this footprint (7532m²), the area of occupancy of the southern cassowary will be reduced by the area of space that the houses and associated infrastructure occupy (approximately 7532m²).

However, as discussed in Section 4.3.2 it is considered that the maintenance of the isolated remnant patches as shown in Figure 9 could be detrimental to the southern cassowary in the context of a developed landscape, encouraging cassowaries close to dwellings where there is an increased risk of human and road related incidents. Should these isolated patches be cleared, the overall area of occupancy of the southern cassowary will be reduced by approximately 9120m².

It is believed that southern cassowaries are utilising the cleared areas within the allotment for migration from one remnant patch to another and for foraging purposes.

Mitigation measures (Section 6, Tables 5-10), should be adopted to ensure the action will not lead to a reduction in the area of occupancy of the southern cassowary.

5.3.3 Significant Impact Criteria 3

Will the action fragment an existing southern cassowary population into two or more populations

It is considered unlikely that development within the cleared footprint will lead to a fragmentation of the existing southern cassowary population, provided all recommendations are stringently followed. Infrastructure such as roads and dwellings are not likely to pose a significant fragmentation barrier as the proposed development is on the edge of a remnant patch. To the east of the allotment there is remnant vegetation no greater than 30 metres wide that includes a road and a significant road verge. The

positioning of the fence and gate as shown in Figure 12 still allows for the movement of cassowaries within and through the remnant vegetation on the allotment.

In addition, there will be no further broad scale clearing of vegetation for the purpose of the proposed development. Recommendations have also been made to manage the remainder of remnant vegetation within the allotment (refer Section 6; Tables 5-10).

5.3.4 Significant Impact Criteria 4

<i>Will the action adversely affect habitat critical to the survival of the southern cassowary</i>
--

Critical Habitat

Some of the criteria used to assess potential significant impacts to threatened species, such as the southern cassowary, include an assessment of 'habitat critical to the survival of the species' (DEH 2006). Critical habitat for species is often defined within *Species Recovery Plans* or on the *Register of Critical Habitat* maintained by the Minister for the Environment under the EPBC Act (DEH 2006). Critical habitat for the southern cassowary is identified and defined in the *Recovery Plan for the Southern Cassowary (Casuarius casuarius johnsonii)* 2007 (Latch 2007).

In the recovery plan, three categories of habitat utilised by cassowaries have been identified and mapped in the Wet Tropics by the Queensland EPA, and these are based on the Queensland regional ecosystem mapping. They are as follows:

- Essential Habitat – necessary for the persistence of cassowary populations in perpetuity. Essential habitat includes regional ecosystems that are known to be preferentially used by cassowaries for breeding, feeding and general activity. As such, regional ecosystems categorized as 'essential habitat' form the habitat critical to the survival of this species.
- General Habitat – that which is occasionally used by cassowaries, but not considered essential for the persistence of cassowary populations in perpetuity. General habitat includes those regional ecosystems where there is an accurate and verified record of a cassowary, but it is not known to be preferentially used as habitat.
- Rehabilitating habitat – non-remnant regional ecosystems that consist of rehabilitating and regrowing vegetation that provide shelter and supplementary feeding and breeding resources. If allowed to return to a remnant state, these regional ecosystems would be likely to be categorized as either essential or general cassowary habitat.

Under the *Recovery Plan* the regional ecosystem 7.12.40 present on the allotment (Section 3.1) is not listed as 'essential habitat', or habitat critical to the survival of the southern cassowary. However, it is recognised that regional ecosystem 7.12.40 is of importance to the southern cassowary, and as such, the current on-ground extent of remnant vegetation as observed on-site in December 2008 should be maintained. Again, it should be noted that current on-ground extent in this circumstance does not refer to the certified regional ecosystem map as this is not an accurate depiction of the current condition of the allotment. As previously mentioned, the allotment has been selectively cleared with several house pads and access tracks throughout. Any development is to occur within these previously cleared areas. No additional broad scale clearing will occur within the allotment.

It is considered unlikely that development on this site will have a detectable impact on the survival of this species through adverse affects on habitat critical to the survival of the southern cassowary, provided all recommendations are stringently followed.

5.3.5 Significant Impact Criteria 5

Will the action disrupt the breeding cycle of the southern cassowary population

No additional broad scale clearing will occur within the allotment, thereby maintaining any potential breeding habitat for nesting and for use by males with chicks.

However, it is recommended that mitigation measures are adopted to minimise potential disruption to the breeding cycle of the southern cassowary population (refer Section 6, Tables 5-10).

5.3.6 Significant Impact Criteria 6

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the southern cassowary is likely to decline

It is considered unlikely that development within the cleared footprint will significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the southern cassowary is likely to decline, provided all recommendations are stringently followed. The current extent of remnant vegetation as per December 2008 will remain and be maintained on the allotment and thus the current extent of habitat will remain. There may be some degradation of habitat within the allotment associated with the infrastructure that will be built within the pre-cleared areas.

It is recommended that suitable mitigation measures are put in place to facilitate cassowary protection and achieve a 'no net loss' in the southern cassowary population (Section 6, Tables 5-10).

5.3.7 Significant Impact Criteria 7

Will the action result in invasive species that are harmful to the southern cassowary becoming established in the southern cassowaries habitat

Invasive species are recognised as one of the eight main threats to the Wet Tropics southern cassowary population.

As such, it is strongly recommended that invasive species management strategies are implemented to ensure invasive species that are harmful to the southern cassowary are not introduced to the site as a result of development, and to ensure such species do not become established in cassowary habitat throughout the allotment. It is also recommended that existing infestations are managed appropriately.

As no further broad scale clearing is to occur, disturbance to existing habitat will be minimised. Provided appropriate pest management measures are put in place, it is considered unlikely that the proposed development will result in the establishment of invasive species that are harmful to the southern cassowary.

5.3.8 Significant Impact Criteria 8

Will the action introduce disease that may cause the southern cassowary to decline

It is unknown whether the proposed development will result in the decline of the Wet Tropics southern cassowary population due to the introduction of disease. The potential for disease introduction will be mitigated through the management of weeds, pests and domestic pets.



5.3.9 Significant Impact Criteria 9

Will the action interfere with the recovery of the southern cassowary

The overall recovery objective for the southern cassowary, as outlined in the *Recovery Plan for Southern Cassowary 2007*, is to secure the long-term protection of cassowary populations through improved planning mechanisms supported by robust monitoring, threat abatement and community engagement programmes.

A number of specific recovery actions have been identified to meet the overall objective of the recovery plan. The developer takes the recovery actions into consideration and it is recommended that the concept planning incorporates strategies that aim to meet the recovery actions wherever possible. Some examples include:

- Implementation of appropriate dog control to minimise dog attacks on cassowary (page 19 of the recovery plan).
- Minimisation of cassowary road mortality and injury through traffic mitigation measures.
- Community education and involvement in cassowary conservation.

If managed appropriately, it is considered unlikely that the proposed development will interfere with the recovery of the southern cassowary.

5.4 OTHER MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE (NES)

In ascertaining the potential impacts of the proposed development with respect to other matters of NES arising from the field investigations and desktop reviews, a number of points should be considered, including:

- What matters of NES are or may be located within the area of the development?
- Considering the development in its broadest scope, is there potential for impacts on matters of NES?
- Are there any proposed measures or solutions to avoid or reduce impacts on matters of NES?
- Are any impacts of the development on matters of NES likely to be significant?

This section describes the potential occurrence and extent of matters of NES protected by the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* that occur or may occur within the proposed development site.

5.4.1 Listed Migratory Species

A search of the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* Protected Matters Search Tool to a distance of 1km from the approximate centre of allotment identified eight (8) terrestrial migratory species that may occur in the area, or for which suitable habitat may occur (Table 13).

Table 13. Migratory species within a 1 km radius of the proposed development site, produced by the EPBC Protected Matters Search Tool. Likelihood of occurrence is based on professional opinion.

Species Group	Species	Common Name	Likelihood of occurrence within the area
Birds	<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	Likely to utilise the site but no permanent nests
	<i>Hirundapus caudacutus</i>	White-throated	Unlikely to occur based



Species Group	Species	Common Name	Likelihood of occurrence within the area
		needletail	on habitat requirements
	<i>Hirundo rustica</i>	Barn swallow	Unlikely to occur based on habitat requirements
	<i>Merops ornatus</i>	Rainbow bee-eater	May occur
	<i>Monarcha melanopsis</i>	Black-faced monarch	May occur
	<i>Monarcha trivirgatus</i>	Spectacled monarch	May occur
	<i>Myiagra cyanoleuca</i>	Satin flycatcher	May occur
	<i>Rhipidura rufifrons</i>	Rufous fantail	May occur

It is considered possible that some of the abovementioned migratory species may occur within the proposed development site. However, as no additional broad scale clearing is to occur, it is not considered likely that the proposed development will have a significant impact on these migratory species.

Mitigation measures should also be put in place to ensure the protection of migratory species and potential habitat for these species.

5.4.2 World Heritage Properties and National Heritage Places

No World Heritage or National Heritage places occur within the allotment. A search of the EPBC Protected Matters Search tool identified two world heritage properties and two National Heritage Places within a 1km radius of the proposed development site. These are the Great Barrier Reef Marine Park World Heritage Area, Queensland, and the Wet Tropics World Heritage Area of Queensland.

Provided adequate environment management parameters are adopted during and after development, it is considered unlikely that the proposed development will have a significant impact on the Great Barrier Reef Marine Park World Heritage Area and the Wet Tropics World Heritage Area.

6 RECOMMENDATIONS

The following recommendations have been made in relation to the minimum requirements necessary to facilitate southern cassowary conservation within the allotment of the proposed development.

1. No further broad scale clearing outside of the mapped cleared footprint is to occur within the bounds of the allotment. If granted permission by the relevant vegetation management authorities, limited individual trees outside of the mapped cleared footprint may be removed prior to construction. Any trees to be removed are to be identified by an experienced environmental manager and marked prior to any clearing or construction. A licensed wildlife spotter/catcher should be present during any tree removal to allow for the relocation / assessment of any displaced wildlife.
2. There will be no clearing of vegetation for fire breaks or any other purpose.
3. A very low speed limit should be enforced throughout the development. It is recommended that the speed limit is no greater than 10km per hour.
4. Speed mitigation measures should be put in place at the closest possible intervals allowable. Such measures may include speed bumps or similar design, 'S' bends, and signage along access roads.
5. In order to minimise traffic movement throughout the site, car spaces should be limited per dwelling.
6. To minimise traffic movement throughout the site, all visitors should be required to park in a designated visitor car park. Pedestrian access should be utilised by all visitors to the site.
7. A gated and fenced complex would minimise through traffic. Only authorised personnel / residents would have permanent access to the site.
8. Landscaping and gardening for all dwellings should make use of only local native plant species sourced from the local area.
9. A Property Pest Management Plan should be developed and implemented for the site to manage invasive species including pest animals and weeds.
10. Restoration works should be conducted along the 1st order stream at the base of the scarp to maintain and improve riparian value and restore connectivity along the stream system.
11. Feeding of cassowaries and other wildlife will be prohibited. Residents should be educated on the implications of feeding cassowaries and other wildlife.
12. As domestic animals, particularly dogs, are a serious threat to the cassowary, no domestic animals or pets will be allowed in the estate.
13. Environmental management parameters should be put in place to prevent any adverse impacts to the surrounding environment, including the World Heritage listed Great Barrier Reef and Wet Tropics ecosystems.
14. No construction should occur during extreme weather events or excessive rain to prevent runoff into the surrounding aquatic and marine ecosystems. Construction works should be undertaken during the dry season.
15. Careful consideration should be given to building design to further minimise impacts to surrounding habitat and threatened species (eg. standard building pads versus pole home design etc). Building design should also consider aesthetic values of the area and infrastructure should be designed to 'blend' into the environment as much as possible.

16. Following development, community education strategies are recommended to increase community awareness of cassowary ecology and biology, including information on the life cycle of the southern cassowary. This may include the use of tools such as community forums for residents of the estate, newsletters or flyers, signage and/or a number of additional educational strategies. For example, general information kits may be provided to all residents at the time of settlement and redistributed at regular intervals. A number of useful resources are available online such as the Wet Tropics Management Authority Cassowary education page at http://www.wettropics.gov.au/pa/pa_casso.html. Activity kits for school children are also available on the Wet Tropics Management Authority website. Alternatively, it may be an option to develop of site-specific education kits for residents. A copy of the *Recovery Plan for the Southern Cassowary 2007* could also be made available to residents to provide additional relevant information. This recovery plan is also available online at <http://environment.gov.au/biodiversity/threatened/publications/recovery/southern-cassowary/pubs/sth-cassowary.pdf>

It is noted that this particular site comprises a unique set of conditions (ie. existing cleared footprint) where limited development is considered possible in an area where it may otherwise detrimentally impact on environmental values, particularly the habitat for the endangered southern cassowary.

Provided all recommendations are stringently enforced, it is considered unlikely the proposed development will have a significant impact on the environmental values of the site. This includes the habitat values and connectivity values for the southern cassowary population on a localised scale.

7 REFERENCES

Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009a) *Casuarus casuarus johnsonii* – southern cassowary (Australian), southern cassowary http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25986 4 December 2008.

Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009b) Population Information http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25986#population_information 21 January 2009.

Chambers Wildlife Rainforest Lodges (CWRL) (2009) Cassowary food plants suitable for revegetation. <http://rainforest-australia.com/cassowary%20food%20plants%20list.htm> 14 January 2009.

Department of the Environment and Heritage (2006) EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Commonwealth of Australia, Canberra.

Global Greenhouse Warming (2009) Cassowary <http://www.global-greenhouse-warming.com/cassowary.html> 4 December 2008.

Harrington G (2006) Report on ecological impacts on Southern Cassowary of a 22 lot subdivision at Mission Beach (Lot 2 on RP732173) for the Planning & Environment Court at Cairns. A report to the Planning & Environment Court, Cairns.

Latch P (2007) National recovery plan for the southern cassowary *Casuarus casuarus johnsonii*. Report to Department of the Environment, Water, Heritage and the Arts, Canberra. Environmental Protection Agency, Brisbane.

Office of Legislative Drafting and Publishing (OLDP) (2007) *Environmental Protection and Biodiversity Conservation Act 1999*. Office of Legislative Drafting and Publishing Attorney-General's Department, Canberra.

Office of the Queensland Parliamentary Counsel (OQPC) (2009) Nature Conservation Act 1992 Reprinted as in force on 23 February 2009, Reprint No. 5E. Queensland.

Queensland Environmental Protection Agency (2009a) Regional Ecosystems Listing <http://www.epa.qld.gov.au/projects/redd/listing.cgi?bioregion=7&landzone=12> 21 November 2008

Queensland Environmental Protection Agency (2009b) Cassowary http://www.epa.qld.gov.au/nature_conservation/wildlife/threatened_plants_and_animals/endangered/cassowary/ 4 December 2008

Webber BL, Woodrow IE (2004) Cassowary frugivory, seed defleshing and fruit fly infestation influence the transition from seed to seedling in the rare Australian rainforest tree, *Ryparosa* sp. November 1 (Archariaceae). *Functional Plant Biology* 31: 505-16.

Wet Tropics Management Authority (WTMA) (2009) Birds – The Cassowary http://www.wettropics.gov.au/pa/pa_casso.html 21 January 2009



8 ATTACHMENTS

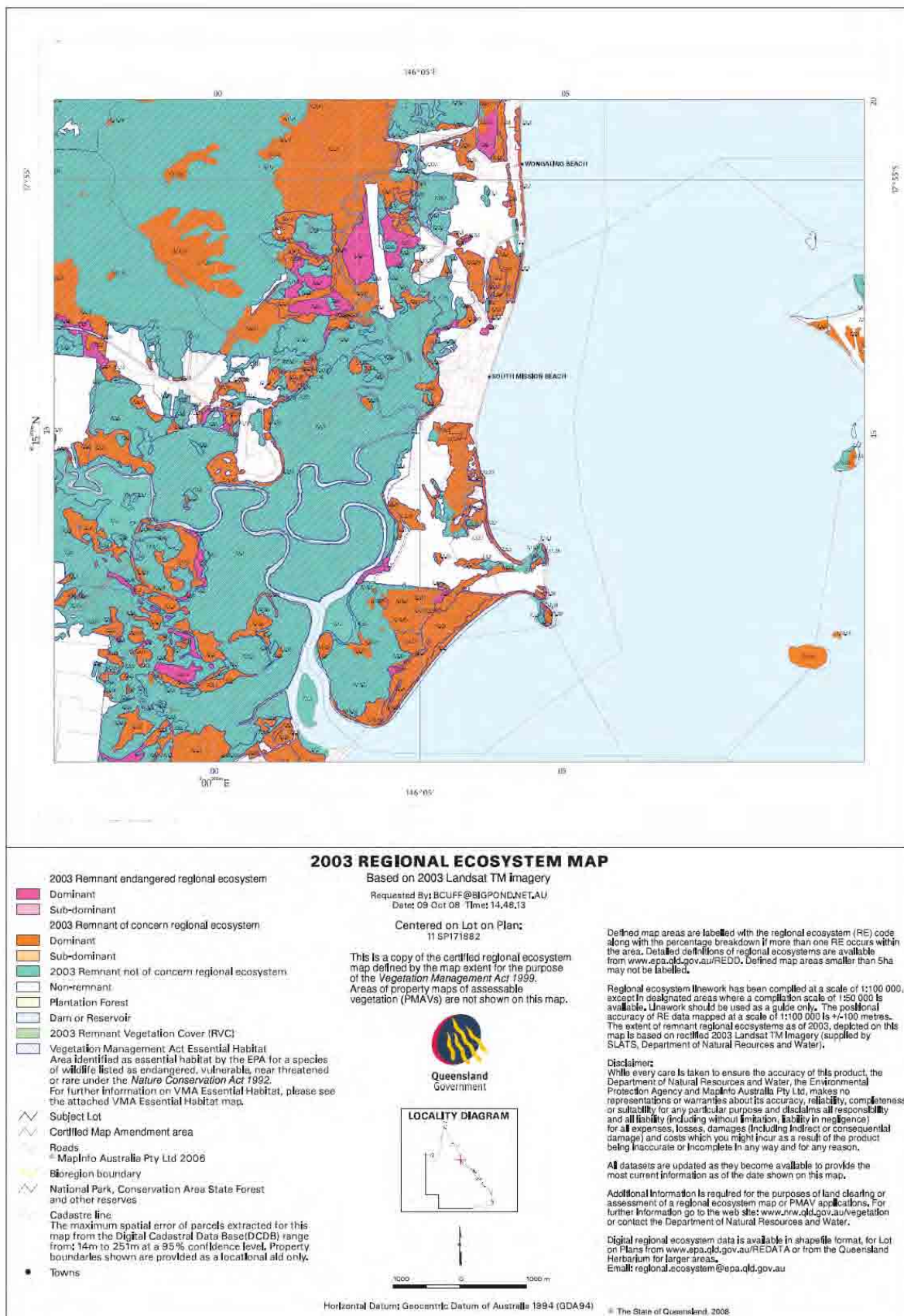
1. Regional Ecosystem and Essential Habitat Maps
2. Regional Ecosystems designated as essential habitat – an extract from the Recovery Plan for Southern Cassowary 2007
3. EPBC Act Protected Matters Search Tool extract for the proposed development site
4. Wildlife Online database search extract for the proposed development site
5. Cassowary Food Trees

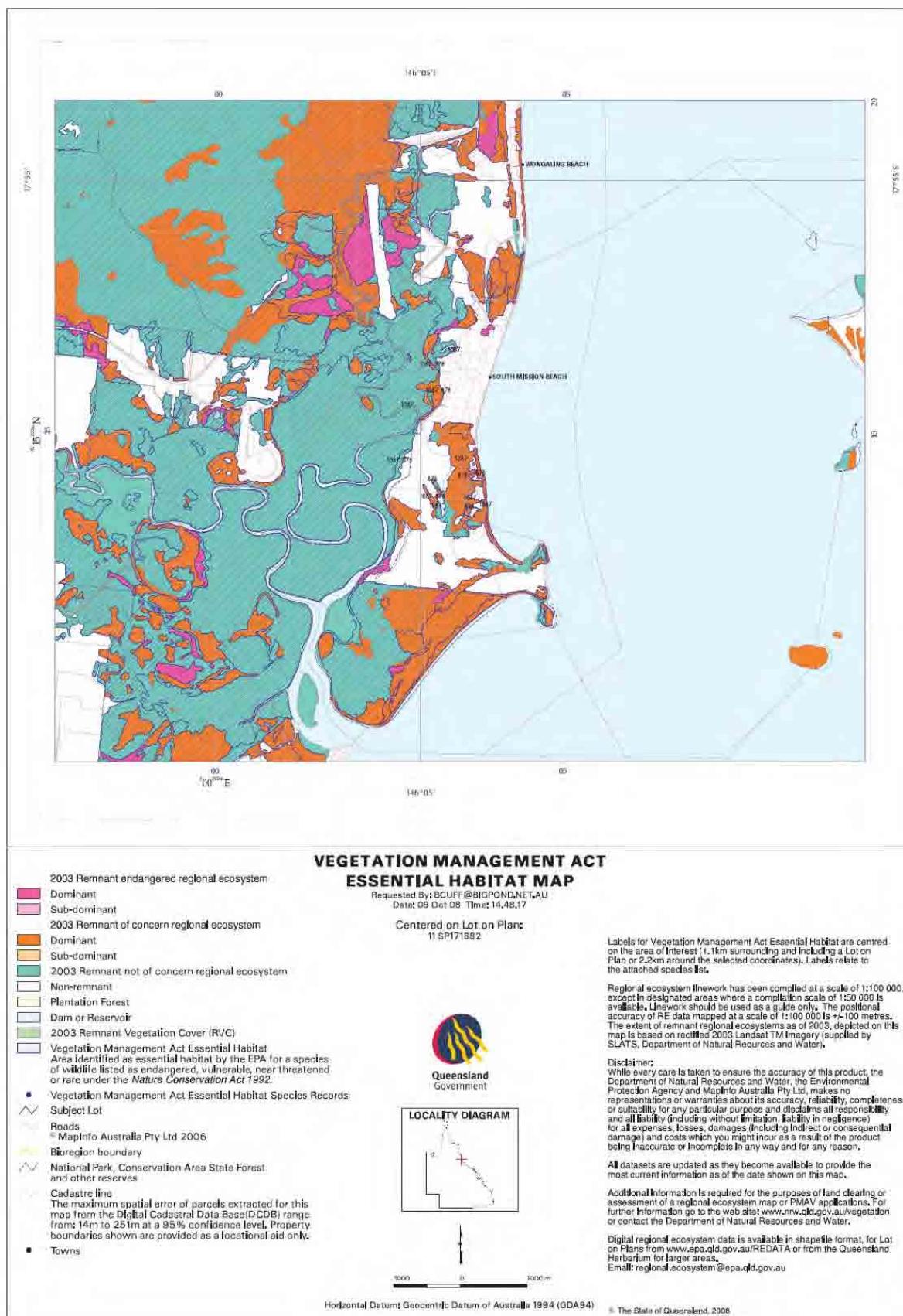
CLIENT: ABF GROUP PTY LTD
PROJECT: EXPLORER DRIVE DEVELOPMENT, SOUTH MISSION BEACH
REPORT: ENVIRONMENTAL ASSESSMENT
DATE: JANUARY 2010



ATTACHMENT 1

Regional Ecosystem and Essential Habitat maps produced by
Queensland EPA





**Vegetation Management Act Essential Habitat
Species Habitat Factors**

Essential habitat mapping for the following species is found within an area that includes :-

1. 1km surrounding and including a Lot on Plan

or

2. 2km around the selected coordinates.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The NRMW [essential habitat](#) page has more information on how the layer is applied under the VMA Codes.

Essential Habitat must include Regional Ecosystems (mandatory factor) as well as any two other factors.

Label	Scientific Name	Common Name	NCA Status	Regional Ecosystems	Vegetation Community	Altitude	Soils	Position in Landscape
878	<i>Petaurus gracilis</i>	Mahogany Glider	E	7.1.3, 7.1.5, 7.2.3, 7.2.4, 7.2.7, 7.2.8, 7.2.9, 7.2.10, 7.2.11, 7.3.5, 7.3.6, 7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.34, 7.3.35, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.46, 7.3.47, 7.3.48, 7.3.49, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.11.5, 7.11.6, 7.11.8, 7.11.10, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.26, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.38, 7.11.40, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 7.11.48, 7.11.49, 7.11.50, 7.11.51, 7.12.4, 7.12.5, 7.12.9, 7.12.12, 7.12.17, 7.12.21, 7.12.22, 7.12.23, 7.12.24, 7.12.25, 7.12.26, 7.12.27, 7.12.28, 7.12.29, 7.12.30, 7.12.33, 7.12.34, 7.12.35, 7.12.37, 7.12.51, 7.12.52, 7.12.53, 7.12.54, 7.12.55, 7.12.56, 7.12.58, 7.12.59, 7.12.60, 7.12.61, 7.12.62, 7.12.63, 7.12.65, 7.12.66, 7.12.69	Open, mature, medium to low sclerophyll woodland and forest (<i>Corymbia clarksoniana</i> , <i>C. intermedia</i> , <i>C. tessellaris</i> , <i>Eucalyptus. platyphylla</i> , <i>E. tereticornis</i> , <i>E. drepanophylla</i> , <i>Lophostemon suavolens</i> ; <i>Melaleuca viridiflora</i> , <i>M. dealbata</i>) with open understorey (<i>Xanthorrhoea johnstonii</i> , <i>Albizia procera</i>); also in sclerophyll areas (<i>C. intermedia</i>) with rainforest invasion/closed understorey (<i>Dillenia</i> , <i>Melaleuca</i> and <i>Acacia</i> spp.).	Sea level to 400m.	Quaternary alluviums and granite substrates.	Plains and rises.
1087	<i>Casuarium johnsonii</i> (southern population)	Southern Cassowary (southern population)	E	7.1.3, 7.2.1, 7.2.3, 7.2.4, 7.2.5, 7.2.6, 7.2.11, 7.3.1, 7.3.3, 7.3.4, 7.3.5, 7.3.6, 7.3.7, 7.3.8, 7.3.10, 7.3.11, 7.3.12, 7.3.17, 7.3.23, 7.3.25, 7.3.36, 7.3.37, 7.3.38, 7.8.1, 7.8.2, 7.8.3, 7.8.4, 7.8.7, 7.8.8, 7.8.14, 7.11.1, 7.11.2, 7.11.5, 7.11.6, 7.11.7, 7.11.10, 7.11.12, 7.11.13, 7.11.14, 7.11.18, 7.11.23, 7.11.24, 7.11.25, 7.11.28, 7.11.29, 7.11.30, 7.11.34, 7.12.1, 7.12.2, 7.12.4, 7.12.5, 7.12.7, 7.12.9, 7.12.13, 7.12.14, 7.12.16, 7.12.17, 7.12.19, 7.12.20, 7.12.39, 7.12.40, 7.12.43, 7.12.44, 7.12.47, 7.12.50, 7.12.68	Dense lowland and highland tropical rainforest, closed gallery forest, eucalypt forest with vine forest elements, swamp forest and adjacent melaleuca swamps, littoral scrub, eucalypt woodland and mangroves; often using a habitat mosaic; will cross open eucalypt, canefields and dry ridges between rainforest patches.	Sea level to 1000m.		

CLIENT: ABF GROUP PTY LTD
PROJECT: EXPLORER DRIVE DEVELOPMENT, SOUTH MISSION BEACH
REPORT: ENVIRONMENTAL ASSESSMENT
DATE: JANUARY 2010



ATTACHMENT 2

**Regional Ecosystems designated as essential habitat – an extract
from the *Recovery Plan for Southern Cassowary 2007***