

C. Matters of National Environmental Significance

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Executive Summary

The Commonwealth Department of the Environment and Water Resources determined on 17 January 2007 that the Hinze Dam Stage 3 project (the project) is a controlled action and will therefore require approval under Part 9 of the *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act) before it can proceed.

The Terms of Reference (TOR) for the Environmental Impact Statement (EIS) specifically require that a stand-alone report addressing the matters of NES should be provided as an appendix to the EIS that exclusively and fully addresses the issues relevant to the controlling provisions. This document has been prepared to satisfy this requirement.

A desktop analysis was completed to determine the known and likely suite of EPBC Act listed species and communities across the study area. The desktop analysis involved the collection and review of relevant database records, surveys and ecological literature with relevance to the Hinze Dam water catchment. Field surveys for terrestrial flora were completed between the 29 January and 18 April 2007.

Five EPBC listed plant species were recorded from the project area; *Randia moorei*, *Owenia cepiodora*, *Macadamia tetraphylla*, *Macadamia integrifolia* and *Plectranthus nitidus*.

A two week fauna survey was completed between the 12 and 23 February 2007. Fauna survey activities comprised a combination of systematic survey at seven sites representative of the dominant habitat types within the inundation area and less intensive opportunistic survey elsewhere within the study area.

Of 16 EPBC listed fauna species considered as potential occurrences within the study area, two are considered to be known inhabitants of the study area, six are considered possible inhabitants of the study area and eight are considered unlikely to utilise habitats within the study area. The two known inhabitants of the study area are the Grey-headed Flying Fox (*Pteropus poliocephalus*) and the Brush-tailed Rock Wallaby (*Petrogale penicillata*). Thirty-two Migratory or Marine fauna species were recorded during the field survey.

The current status of the matters protected under the EPBC Act in the study area has been addressed in detail for each species considered known, likely or possible occurrences in the study area.

The proposal will result in the loss of a substantial number of *Randia moorei*, *Owenia cepiodora*, *Macadamia tetraphylla*, *Macadamia integrifolia* and *Plectranthus nitidus*. The mitigation approach for these species involves a combination of actions including protection and management of retained populations, establishment of *ex situ* populations prior to site disturbance, translocation of the genetic material held in the parent plants via propagated stock and development of management and monitoring programs. The overarching objective is to ensure no net loss of individuals from the study area. The mitigation strategy involves the following measures:

- all populations of these species are to be protected from initial vegetation clearing works. A series of exclusion zones will be established around the perimeter of Advancetown Lake for the explicit purpose of protecting significant species and regional ecosystems;
- the propagation potential of these species will be reviewed during a formal propagation trial. The objective will be to establish a substantial *ex situ* population of these species derived from parent populations currently known from the study area. Ultimately it is envisaged that the *ex situ* population will be of a similar number of individuals to the entire population known from the study area, however, the propagation trial should be restricted to the minimum number of individuals to demonstrate success;

- preliminary analysis indicates that there are several substantial patches of preferred habitat for each of the target species within the study area but outside of impact zones. A formal review of the suitability of these sites for translocation purposes will be completed, with an assessment of biotic and abiotic characters used to select proposed translocation sites;
- a Translocation Plan will be developed which directs conservation efforts for these species at the local (study area) level. It will identify translocation sites, specify methods for propagation and translocation and provide a framework for ongoing management; and
- monitoring programs will be developed for in situ, ex situ and translocated populations to determine population size, health and reproductive status. The monitoring programs will document clear actions in the event of non compliance with performance criteria and objectives.

The combination of actions listed above is considered likely to ensure that these species do not decline at the local, regional or national scale.

None of the threatened fauna species considered in this assessment are considered likely to suffer significant adverse impacts as a result of the proposed action. Each of these species may, however, benefit from proposed mitigation and compensatory habitat strategies associated with the project.

The proposal will involve the loss of 318 ha of remnant vegetation (within the meaning of the Queensland *Vegetation Management Act 1999*) which is habitat for a number of migratory species recorded from the study area. However, the study area is not known to contain an area of important habitat for a migratory species. Furthermore, the study area is not known to contain an ecologically significant proportion of the population of any migratory species. As such, significant impacts on migratory species are not expected.

In addition to the mitigation approach for threatened flora set out above, a compensatory habitat strategy is to be developed to offset the impacts of vegetation clearing and habitat loss associated with the project.

A compensatory habitat strategy is to be developed for the project. The objectives of the strategy will be twofold; (a) the strategy will seek to comply with the requirements of the Queensland *Vegetation Management Act 1999* and associated Codes and Policies; and (b) the strategy will aim to provide tangible conservation benefits at the local and citywide scale, with an emphasis on threatened species conservation (species listed as threatened under the *EPBC Act 1999*). It is envisaged that a minimum of 481 ha of compensatory habitat will be provided.

The compensatory habitat strategy is likely to involve a combination of the following actions:

- securing advanced regrowth (near remnant) vegetation within and outside Gold Coast City which is representative of the regional ecosystems and essential habitat to be cleared for the project. The properties will be either be purchased by Gold Coast City Council or secured via registered covenant. In both cases the properties would be actively managed until such time as they reach remnant status;
- securing regional ecosystems of equivalent conservation status to those to be cleared for the project within and outside Gold Coast City and managing these areas until such time as they meet remnant status;
- strategic purchase of key land parcels which have been identified as key linkages or habitats for EVR taxa at the local, sub-regional or regional scale; and
- revegetation and rehabilitation of existing cleared areas of land within the study area, with a view to re-instating pre-clearing vegetation types.

The combined strategies of propagation and translocation of threatened plants, management of retained habitats (and populations contained therein) and provision of substantial areas of compensatory habitat are considered adequate to mitigate the adverse impacts of the proposed action on matters of national environmental significance.

1. Introduction

1.1 Background

Hinze Dam is located approximately 15 km southwest of Nerang on the Nerang River and supplies the majority of the water needs for Gold Coast City, a rapidly growing urban centre with a healthy economy. In addition to being a major water source for the region, the Hinze Dam catchment provides significant and appreciable benefits to the community through flood mitigation, environmental protection, tourism and recreation. The Hinze Dam was initially completed in 1976, and upgraded to Stage 2 in 1989. The Dam impoundment, Advancetown Lake, has a storage capacity of 161 070 million litres, surface area of 9.77 km² and a catchment area of 212 km².

Based on the adopted design option, the Hinze Dam Stage 3 Project (the project) proposes the raising of the Hinze Dam embankment from 93.5 metres to 108.5 metres, raising the Full Supply Level by 12.3 metres to 94.5 metres and providing a total capacity of in excess of 300 000 million litres. The upgrade will provide an additional 79 000 million litres of flood storage capacity and increase the dam's yield by at least an additional 16 million litres a day. The project will also provide greater flood mitigation for properties downstream of the Dam and will make the structure compliant with current dam safety design guidelines and standards.

The project scope of works for the dam raising will also include upgrades to the embankment, spillway and intake towers; establishment of site offices, storage, stockpile and lay down areas; establishment and operation of quarry activities to provide construction materials; establishment of construction roads; clearing of vegetation in inundation areas and for establishment of quarries and upgrading and relocating or replacing of ancillary services and structures including parks, car parks, recreational facilities, roads and bridges, including sections of the Nerang-Murwillumbah Road and Gold Coast-Springbrook Road.

The Terms of Reference for an Environmental Impact Statement (EIS) under Part (4) of the Queensland *State Development and Public Works Organisation Act 1971* specifically requires that:

"A stand-alone report addressing the matters of NES should be provided as an appendix to the EIS that exclusively and fully addresses the issues relevant to the controlling provisions."

This report has been prepared to satisfy this requirement.

1.2 Statutory Context

On 22 December 2006, the Gold Coast City Council (GCCC) referred the project to the Commonwealth Minister for the Environment and Heritage (now the Minister for the Environment and Water Resources) for a decision as to whether the project constitutes a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act). The Commonwealth Department of the Environment and Water Resources determined on 17 January 2007 that the project is a controlled action and therefore the project will require approval under Part 9 of the EPBC Act before it can proceed.

Matters of National Environmental Significance (NES) to be specifically addressed under the requirements of the EPBC Act are the project's impact and mitigation measures relating to, but not limited to, the species listed in **Table 1-1**.

■ **Table 1-1 Matters of NES to be addressed in this report**

Specific Name	Common Name(s)
Plants	
<i>Arthraxon hispidus</i>	Hairy-joint Grass
<i>Diploglottis campbellii</i>	Small-leaved Tamarind
<i>Endiandra floydii</i>	Floyd's Walnut
<i>Endiandra hayesii</i>	Rusty Rose Walnut, Velvet Laurel
<i>Floydia praealta</i>	Ball Nut, Possum Nut, Big Nut, Beefwood
<i>Hicksbeachia pinnatifolia</i>	Monkey Nut
<i>Macadamia integrifolia</i>	Bush Nut
<i>Owenia cepiodora</i>	Onion Cedar
<i>Plectranthus nitidus</i>	
<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly
<i>Westringia rupicola</i>	
Birds	
<i>Lathamus discolor</i>	Swift Parrot
<i>Rostratula australis</i>	Australian Painted Snipe
<i>Xanthomyza phrygia</i>	Regent Honeyeater
Frogs	
<i>Mixophyes fleayi</i>	Fleay's Frog
<i>Mixophyes iteratus</i>	Giant Barred Frog, Giant Barred Frog
Mammals	
<i>Dasyurus maculatus maculatus</i>	Spotted-tail Quoll
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby
Reptiles	
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink

1.3 Information Requested

In accordance with the TOR for the project, the stand alone assessment of impacts on matters of NES is required to include the following:

- Description of the Affected Environment Relevant to the Matters Protected. It is important that the current status of the matters protected under the EPBC Act be described in sufficient detail, to inform the analysis of the project's impact on these matters. For listed threatened species, the description of the environment should include:
 - a) the species' current distribution;
 - b) relevant information about the ecology of the species (habitat, feeding and breeding behaviour etc);
 - c) information about any populations of the species or habitat for the species in the area affected by the proposed action;
 - d) current pressures on the species, especially those in the area to be affected by the proposal; and
 - e) relevant controls or planning regimes already in place.
- Assessment of Relevant Impacts and Mitigation Measures. In this section, the impacts and potential impacts on the matters protected should be described, and the possible mitigation measures for each impact need to be analysed. If alternative ways of taking the action have been identified, the relative impacts of these alternatives should also be considered. When effective mitigation measures are not available, the discussion should be broadened to include compensatory measures to offset unavoidable impacts.

- Potential Significant Impacts on Matters of National Environmental Significance (NES). The following potential impacts may need to be addressed in the EIS:
 - a) lead to long term decrease in the size of a population;
 - b) reduce the area of occupancy of the species;
 - c) fragment an existing population into two or more populations;
 - d) adversely affect habitat critical to the survival of the species;
 - e) disrupt the breeding cycle of a population;
 - f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
 - g) result in invasive species that are harmful to the species becoming established;
 - h) introduce disease that may cause the species to decline;
 - i) interfere with the recovery of the species or ecological community; or
 - j) consistency with any recovery plan.

2. Description of the Existing Environment

2.1 Methodology

2.1.1 Desktop Analysis

A desktop analysis was completed to determine the known and likely suite of EPBC listed species and communities across the study area. The desktop analysis involved the collection and review of relevant database records, surveys and ecological literature with relevance to the Hinze Dam water catchment. The following data sources were used:

- searches of the Queensland Herbarium, Queensland Museum, Birds Australia, Gold Coast City Council publications and databases and the EPBC Act (Department of the Environment and Water Resources) protected matters search tool;
- the Environmental Protection Agency's (EPA) Regional Ecosystem (RE) mapping (Version 5.0, 2005) for the study area;
- the GCCC vegetation and ecological significance mapping; and
- aerial photography at 1:25 000 scale.

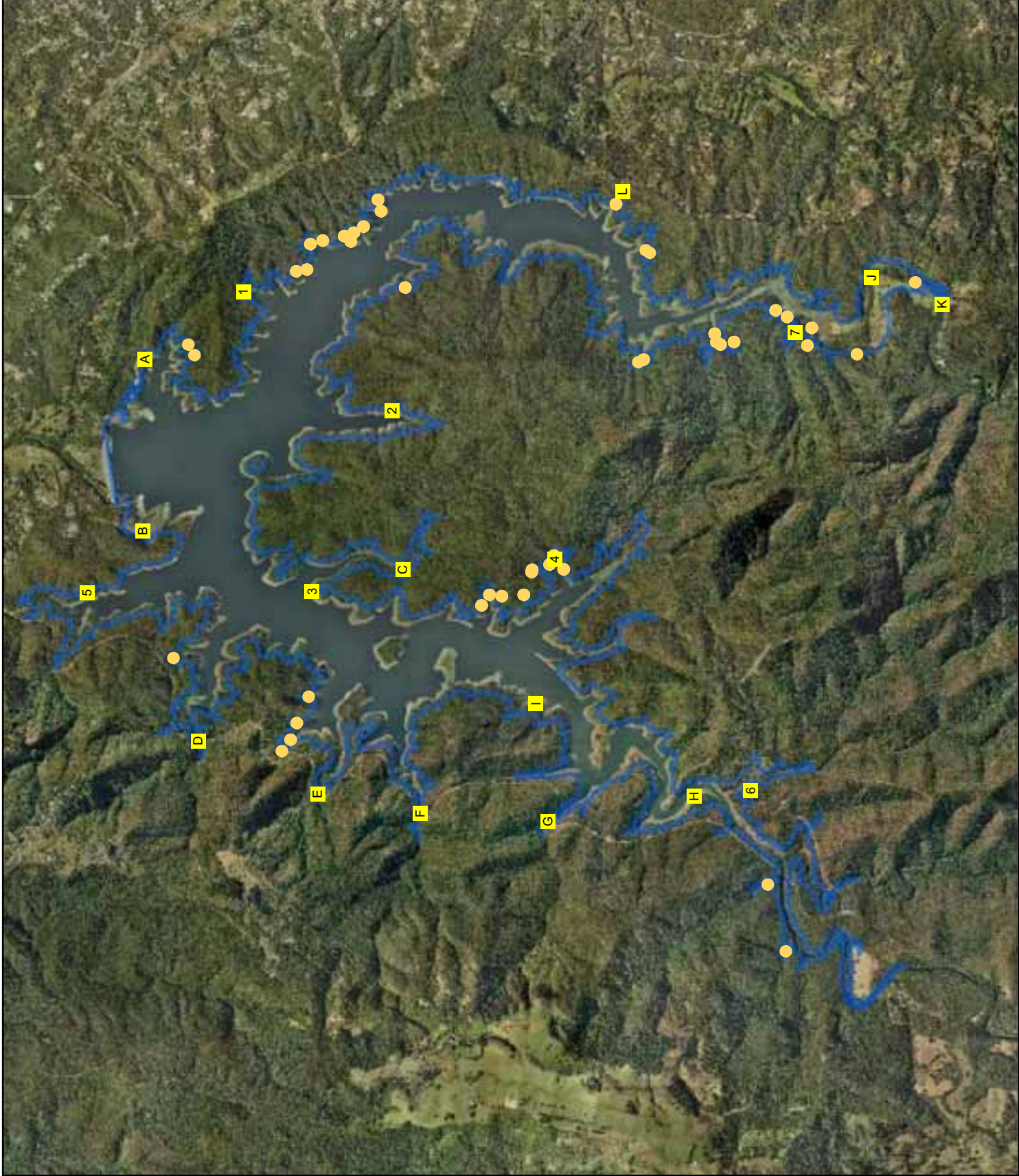
2.1.2 Field Surveys

Terrestrial Flora

Field surveys for terrestrial flora were completed between the 29 January and 18 April 2007. The survey was completed by SKM, Gold Coast Botany and PLACE Environmental. The flora survey involved the following:

- targeted survey for rare or threatened flora. All rainforest and wet sclerophyll forest ecosystems were searched using the random meander method (Cropper 1993). A substantial search effort was expended, with 30 survey sites sampled by at least two observers over 20 days, for an estimated total search effort of 350 person hours.
- field checking of existing vegetation maps covering the project area, namely the current (Version 5.0) RE mapping and GCCC vegetation mapping.
- compilation of a flora inventory for the project area, based on point and transect surveys and opportunistic traverses.

The location of the flora and fauna survey plots are indicated on **Figure 2-1**.



Scale - 1:50,000
Projection: MGA Zone 56

Legend

- Fauna Survey Sites
- Vegetation Survey Sites
- Current FSL (82.2 m)
- Proposed FSL (94.5m)

Figure 2-1
Location of Flora & Fauna Survey Sites
Hinze Dam Stage 3 EIS

Terrestrial Fauna

A two week fauna survey was completed between the 12 and 23 February 2007. Fauna survey activities comprised a combination of systematic survey at seven sites representative of the dominant habitat types within the inundation area and less intensive opportunistic survey elsewhere within the study area. The locations of the systematic and opportunistic survey sites are indicated on **Figure 2-1** and described in **Table 2-1**.

■ Table 2-1 Description of Fauna Survey Sites

Site	Description
<i>Systematic Survey Sites</i>	
1	Rainforest gully within RE 12.11.1. Located in the eastern section of the study area, along the eastern bank of the Little Nerang Creek stretch of the dam within the proposed inundation area.
2	Open eucalypt forest within RE 12.11.5. Located in the eastern section of the study area, along the western bank of the Little Nerang Creek stretch of the dam, behind the rowing platforms.
3	Open eucalypt forest within RE 12.11.5. Located in the central section of the study area, on the eastern bank of the Nerang River stretch of the dam within the proposed inundation area.
4	Rainforest gully within RE 12.11.3/12.11.1. Located in the central section of the study area, along the eastern bank of the Nerang River reach of the dam within the proposed inundation area.
5	Open eucalypt forest within RE 12.11.3. Located in the north-western section of the study area, west of the dam wall within the proposed inundation area.
6	Open eucalypt forest within RE 12.11.5. Located in the south-western section of the study area, approximately 750m east of Numinbah Environmental Education Centre, and 250m south of Nerang River off Pine Creek Road.
7	Eucalypt tall open forest within RE 12.3.2. Located in the south-eastern section of the study area, on the western bank of the upper reaches of Little Nerang Creek, within the proposed inundation area.
<i>Opportunistic Survey Sites</i>	
A	Hinze Dam walking trail, south-east of the recreational area.
B	Hinze Dam quarry area, west of the dam wall.
C	Gully within RE 12.11.5. Located in the central section of the study area, on the eastern bank of the Nerang River stretch of the dam within the proposed inundation area.
D	Nerang-Murwillumbah Road at the Beliss Creek crossing. Located on the western side of the dam adjacent to the inundation area.
E	Nerang-Murwillumbah Road at the Black Shoot Gorge crossing. Located on the western side of the dam adjacent to the inundation area.
F	Nerang-Murwillumbah Road at the Burns Creek crossing. Located on the western side of the dam adjacent to the inundation area.
G	Nerang-Murwillumbah Road at the Arkinstalls Gorge crossing. Located on the western side of the dam adjacent to the inundation area.
H	The boat ramp off Nerang-Murwillumbah Road on the western side of the dam within the inundation area.
I	Open eucalypt forest – RE 12.11.3. Located on the western side of the dam within the inundation area.
J	Upper reaches of Little Nerang Creek at the Currumbin Wildlife Sanctuary koala feed tree plantation.
K	Off Gold Coast – Springbrook Road at the Little Nerang Creek causeway. Located in the south-eastern section of the study area, outside the inundation area.
L	Off Little Nerang Road on the eastern side of the dam, near the intake tower.

2.2 Results

2.2.1 Desktop Analysis

Desktop analysis revealed the potential occurrence of twenty four EPBC listed flora species in the study area. As the database contains no site records (and is based solely on species distributions) it is generally considered an unreliable indication of actual threatened species values. The plant species that were listed in the search, their conservation status under the EPBC Act, their preferred habitat and likelihood of occurrence are discussed in **Table 2-2**.

Figure 2-2 shows site locations for the species recorded from the study area. This assessment of the likely occurrence of each species is based on a comparison of the species preferred habitat against the habitat present within the study area and whether the species has been recorded in the area.

■ **Table 2-2 Likelihood of Occurrence of EPBC Listed Flora Species**

Species	Common Name	EPBC Act Status	Habitat	Likelihood of occurrence
<i>Arthraxon hispidus</i>	Hairy-joint grass	V	Variety of wet sclerophyll and rainforest ecosystems	Possible
<i>Austromyrtus fragrantissima</i>	Scale Myrtle	E	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Baloghia marmorata</i>	Marbled Balogia	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Bosistoa selwynii</i>	Heart-leaved Bosistoa	V	Typically occurs on deep basaltic soils in subtropical rainforest.	Unlikely
<i>Bosistoa transversa</i>	Three-leaved Bosistoa	V	Typically occurs on deep basaltic soils in subtropical rainforest.	Unlikely
<i>Bulbophyllum globuliforme</i>	Miniature Moss orchid	V	This species is restricted to high elevation (above 300m) rainforests.	Unlikely
<i>Clematis fawcettii</i>	Stream Clematis	V	Streams within wet sclerophyll forest and rainforest.	Possible
<i>Cryptocarya foetida</i>	Stinking Cryptocarya	V	Primarily an inhabitant of littoral and sub-littoral rainforest types	Unlikely
<i>Cryptostylis hunteriana</i>	Leafless Tongue orchid	V	This species is restricted to coastal, sandy habitat types	Unlikely
<i>Cyperus semifertilis</i>	-	V	This species occurs in wet situations in lowland Eucalypt forest types, typically on alluvium.	Unlikely
<i>Diploglottis campbellii</i>	Small-leaved Tamarind	E	Range of wet forest types, from lush subtropical rainforest to notohpyll vineforest with Brushbox elements.	Possible
<i>Endiandra floydii</i>	Floyd's Walnut	E	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Endiandra hayesii</i>	Rusty Rose Walnut	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Floydia praealta</i>	Ball Nut	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Fontainea australis</i>	Southern Fontainea	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Hicksbeachia pinnatifolia</i>	Monkey Nut	V	Range of wet forest types, from lush subtropical rainforest to notohpyll vineforest with Brushbox elements.	Possible
<i>Macadamia integrifolia</i>	Macadamia Nut	V	Range of wet forest types, from lush subtropical rainforest to notohpyll vineforest with Brushbox elements.	Present (in hybrid form)
<i>Owenia cepiodora</i>	Onionwood	V	This species occurs in subtropical and dry rainforest, typically on or near soils derived	Present

Species	Common Name	EPBC Act Status	Habitat	Likelihood of occurrence
			from basalt.	
<i>Plectranthus nitidus</i>	-	E	<i>P. nitidus</i> grows on rocky cliff faces and boulders, in the shelter and shade provided by the adjacent rainforest.	Present
<i>Sarcochilus hartmannii</i>	Waxy Sarcochilus	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely.
<i>Sophora fraseri</i>	-	V	Range of rainforest types, including subtropical rainforest and notophyll vineforest.	Possible
<i>Syzygium hodgkinsoniae</i>	Smooth-bark Rose Apple	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Syzygium moorei</i>	Rose Apple	V	This species is restricted to lowland subtropical and warm temperate rainforest on alluvial or basaltic soils, such habitats are absent from the study area.	Unlikely
<i>Zieria collina</i>	-	V		Unlikely

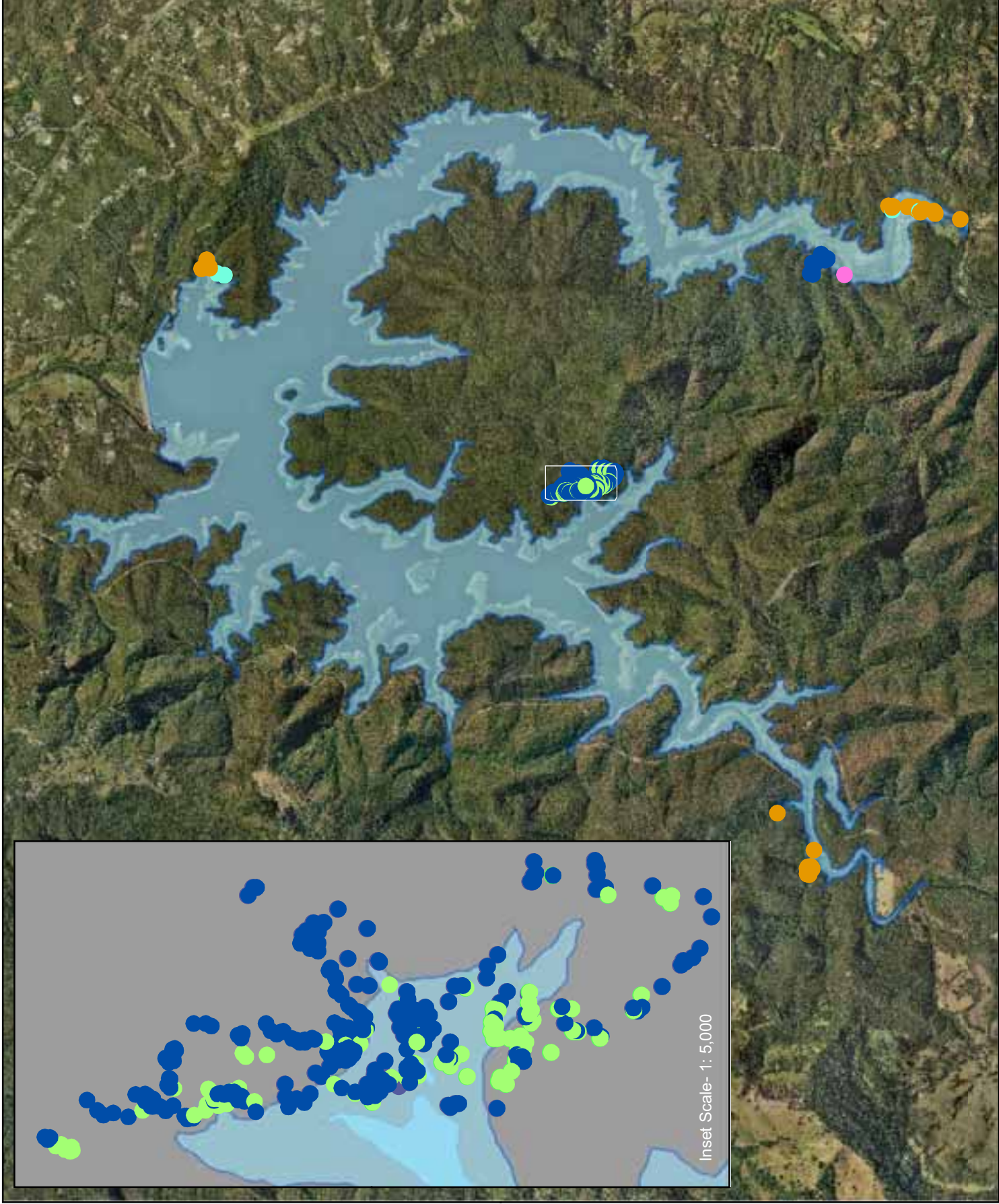


Figure 2-2
Location of EPBC
Listed Flora
Hinze Dam Stage 3 EIS

2.2.2 Field Surveys

Terrestrial Flora

Five EPBC listed plant species were actually recorded from the project area; *Randia moorei*, *Owenia cepiodora*, *Macadamia tetraphylla*, *Macadamia integrifolia* and *Plectranthus nitidus*. *Arthraxon hispidus* is included in the Herbreccs database for the study area but was not recorded during field surveys. These species and their conservation status are listed in **Table 2-3** below.

■ **Table 2-3 EPBC Listed Flora Species recorded in the Study Area**

Species	Common Name	Status
<i>Macadamia integrifolia</i>	Queensland nut	V
<i>Macadamia tetraphylla</i>	Macadamia nut	V
<i>Owenia cepiodora</i>	Onion wood	V
<i>Plectranthus nitidus</i>	-	E
<i>Randia moorei</i>	Spiny gardenia	E

Terrestrial Fauna

Fauna surveys completed in February 2007 recorded a total of 204 species of terrestrial vertebrates from the study area. Fauna species which are listed under the EPBC Act are known to be found within the study area. **Table 2-4** lists the EPBC listed fauna considered potential occurrences in the study area that have been identified from searches of the Queensland Museum, Birds Australia and EPBC Act Protected Matters databases and observed from the field surveys, and provides an assessment of the likely occurrence of each species with the study area based on the known habitat preferences of each species, observations of the habitat type present within the study area and any recorded species observations within the study area.

Of the 14 EPBC listed fauna species included in **Table 2-4** as potentially occurring within the study area, two are considered to be known inhabitants of the study area, four are considered possible inhabitants of the study area and eight are considered unlikely to utilise habitats within the study area.

■ **Table 2-4 Likelihood of Occurrence of EPBC Listed Fauna Species**

Species	Common Name	Status	Habitat	Likelihood of occurrence
Birds				
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's Fig-Parrot	E	Primarily inhabits lowland rainforests but also uses semi-deciduous vine forests and gallery forests. Restricted to south-eastern Qld and north-eastern NSW.	Unlikely. Limited suitable habitat present within the study area.
<i>Lathamus discolor</i>	Swift Parrot	E / Ma	Periodic visitor to Queensland from Tasmania. Typically inhabits open and dry eucalypt woodland and forest containing box-ironbark where they feed on nectar and sap sucking insects. Known to utilise Narrow-leaved Ironbark (<i>Eucalyptus crebra</i>)/ Blue Gum (<i>E. tereticornis</i>) forests on coastal lowlands of southeast Queensland.	Possible. Suitable open forest habitat present. Favoured food tree <i>E. tereticornis</i> is present within the eucalypt forest communities occurring within the study area. Potential to utilise the site when in Queensland.
<i>Poephila cincta cincta</i>	Blackthroated Finch	E	The black-throated finch occupies grassy woodland dominated by eucalypts, paperbarks or acacias, where there is access to seeding grasses and water (BTFRT 2004).	Unlikely. Limited suitable habitat present within the study area.
<i>Rostratula australis</i>	Australian Painted Snipe	V	Inhabits shallow vegetated wetlands, either freshwater or brackish, that are either permanently or temporarily filled in coastal or inland areas.	Possible. Suitable vegetated wetland habitat may be present along the edges and upper reaches of the dam.
<i>Turnix melanogaster</i>	Black-breasted Button-quail	V	Most often found in vine thicket rainforest with a closed canopy and deep litter layer. This species has also been recorded from vine scrubs and dry sclerophyll forest adjacent to rainforest.	Unlikely. Limited suitable habitat present within the study area.
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E	Typically inhabit box ironbark eucalypt associations, and within these, prefer the wettest, most fertile sites, usually along watercourses (Garrett and Crowley, 2000).	Unlikely. Limited suitable habitat present within the study area.
Amphibians				
<i>Mixophyes fleayi</i>	Fleay's barred frog	E	In Qld, this species inhabits permanent and semi-permanent freshwater streams between altitudes of 100-1000m in rainforest and other forest communities of the McPherson, Main and Conodale Ranges, Mt Tamborine and the Mistake and Bunya Mountains.	Unlikely. Suitable habitat apparently present but not recorded despite ideal survey conditions.
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	Occurs in slow moving, sandy streams and rivers in rainforest, wet sclerophyll forest and farmland between 100 and 1000m.	Unlikely. Has been recorded in the upper reaches of the Nerang River near Springbrook. Several key microhabitat attributes are absent from rainforest gullies in the study area, particularly sandy banks and slow moving pools which are preferred by this species. Not recorded despite ideal survey conditions.
Mammals				
<i>Chalinolobus dwyeri</i>	Large-eared	V]	This species is insectivorous and	Unlikely. The Large-eared Pied

Species	Common Name	Status	Habitat	Likelihood of occurrence
	Pied Bat		roost in caves and disused mines (Churchill, 1998). Utilises a variety of drier eucalypt forest habitats for feeding.	Bat is primarily an inhabitant of dry sclerophyll forests and woodlands on the western slopes and plains. There are few confirmed local records and the habitat across the study area is suboptimal for this species.
<i>Dasyurus maculatus maculatus</i>	Spotted-tail quoll	E	Inhabits a wide range of habitats including rainforests, eucalypt forests and woodlands.	Possible. Suitable eucalypt and rainforest habitat occurs across the study area. Historical records from Mudgeeraba-Springbrook Road, less than 5 years old suggest that the species persists in the Springbrook/Numinbah habitat complex.
<i>Petrogale penicillata</i>	Brush-tailed rock-wallaby	V	Known released population inhabits the rocky areas around Pages Pinnacle.	Present. Pages Pinnacle is 398m high and will not be inundated by the raising of the Hinze Dam. No expected impact to this species.
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo	V	Inhabits coastal heath and dry and wet sclerophyll forests. Thick groundcover is a major habitat requirement and it displays a preference for areas where soil is light and sandy (Johnstone, 1995).	Unlikely. No suitable habitat present and no records in area.
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	V	Forages through a variety of eucalypt forests and woodlands, where preferred flowering and fruiting plants area available.	Present. Feeds on the eucalypt dominated forest habitats present across the study area. However, no camp sites are present within the study area.
Reptiles				
<i>Coeranoscincus reticulatus</i>	Three-toed snake-tooth skink	V	Inhabits rainforest and wet eucalypt forests.	Possible. Small areas of suitable habitat present within sheltered gullies of the study area.

The two inhabitants of the study area are the Grey-headed Flying Fox (*Pteropus poliocephalus*) and the Brush-tailed Rock Wallaby (*Petrogale penicillata*). Records of these species from the study area are shown graphically in **Table 2-4**.

The four species which are considered to be possible inhabitants of the study area include Swift Parrot (*Lathamus discolor*), Australian Painted Snipe (*Rostratula australis*), Spotted-tail Quoll (*Dasyurus maculatus*) and Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*).

The remaining species are generally unlikely to occur due to a lack of suitable habitat, poor habitat quality, or because the study area is beyond the known distribution of the species.

Migratory Species

Migratory species that are protected under the Japan–Australia Migratory Bird Agreement (JAMBA) and China–Australia Migratory Bird Agreement (CAMBA) are listed under the schedules of the EPBC Act.

Table 2-5 lists the migratory and other Commonwealth significant species (other than vulnerable or endangered species) known from the study area that have been identified from searches of the Queensland Museum, Birds of Australia and EPBC Act Protected Matters databases and observed from the field surveys. The table also provides an assessment of the likely occurrence of each species within the study area. This list includes:

- wetland species covered by migratory provisions of the EPBC Act comprising species listed under CAMBA and/or JAMBA;
- terrestrial species covered by migratory provisions of the EPBC Act; and
- species covered by marine provisions of the EPBC Act.

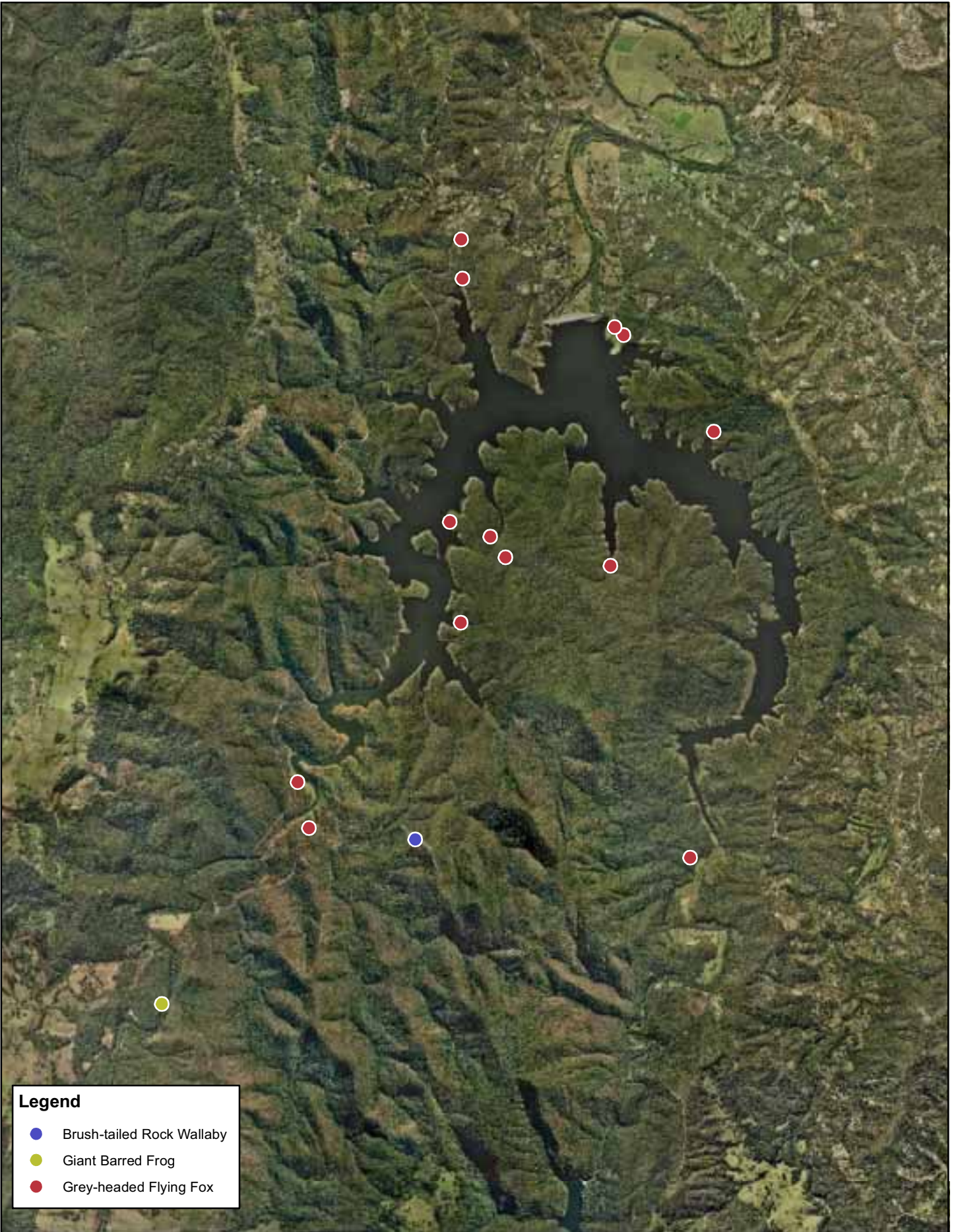
Of the 40 migratory and marine species identified as potentially occurring within the study area, 32 were observed within or overflying the study area during the field surveys.

■ **Table 2-5 Likelihood of Occurrence of Migratory and other EPBC Listed Fauna**

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence along the study corridor
Birds					
<i>Anseranas semipalmata</i>	Magpie goose	Ma	EPBC	Rush and sedge dominated swamps and floodplains. Predominantly coastal distribution but may appear further inland.	Possible. Suitable wetland habitat present on upper reaches of the lake.
<i>Amauromis olivaceus</i>	Bush hen	Ma	FS	Restricted to densely vegetated margins of rivers, streams and lakes.	Present. Observed during the field survey.
<i>Apus pacificus</i>	Fork-tailed swift	Ma	EPBC	Aerial habitat over inland regions.	Possible. May forage over study area.
<i>Ardea alba</i>	Great egret, white egret	M, Ma	EPBC, Wildnet, FS	Floodwaters, rivers, wetlands, inter-tidal habitats.	Present. Suitable wetland habitat on upper reaches of the lake.
<i>Ardea ibis</i>	Cattle egret	M, Ma	EPBC, Wildnet, FS	Pasture especially among cattle, occasionally wetlands.	Present. Observed during the field survey.
<i>Ardea intermedia</i>	Intermediate egret	Ma	FS	Margins of natural and artificial wetlands, lakes and swamps.	Present. Observed during the field survey.
<i>Chrysococcyx minutillus</i>	Little Bronze-Cuckoo	Ma	FS	Variety of forest types including wet sclerophyll forest and rainforest.	Present. Observed during the field survey.
<i>Circus approximans</i>	Swamp Harrier	Ma	FS	Dense grasslands, sedgeland, wet heathlands and open swampy margins.	Present. Observed during the field survey.
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Coracina papuensis</i>	White-bellied Cuckoo-shrike	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	Present. Observed during the field survey.
<i>Coracina tenuirostris</i>	Cicadabird	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	Present. Observed during the field survey.
<i>Dicrurus bracteatus</i>	Spangled Drongo	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Eudynamis scolopacea</i>	Common Koel	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Eurostopodus mystacalis</i>	White-throated Nightjar	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	Present. Observed during the field survey.
<i>Eurystomus orientalis</i>	Dollarbird	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence along the study corridor
<i>Falco cenchroides</i>	Nankeen Kestrel	Ma	FS	Wide variety of open habitats.	Present. Observed during the field survey.
<i>Gallinago hardwickii</i>	Latham's Snipe	MW / Ma	EPBC	Open wetland areas.	Possible. Suitable habitat present within the study area.
<i>Gallirallus philippensis</i>	Buff-banded Rail	Ma	FS	Margins of natural and artificial wetlands, lakes and swamps.	Present. Observed during the field survey.
<i>Grallina cyanoleuca</i>	Magpie-lark	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Haliastur sphenurus</i>	Whistling Kite	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	MT / Ma	EPBC, QM, FS	Large rivers including inland, fresh and saline lakes, coastal seas and shoreline, islands.	Present. Suitable feeding and roosting habitat present within the study area. Observed flying over the study area during the field surveys.
<i>Hirundapus caudacutus</i>	White-throated Needle-tail	MT / Ma	EPBC	Aerial habitat over coastal regions and mountain ranges.	Possible. May forage over the study area.
<i>Hirundo neoxena</i>	Welcome Swallow	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Merops ornatus</i>	Rainbow bee-eater	Ma	EPBC, FS	Most habitats apart from closed forest.	Present. Observed during the field survey.
<i>Monarcha melanopsis</i>	Black-faced Monarch	MT / Ma	EPBC / QM	Found in rainforests, eucalypt forests and riparian forests.	Present. Observed during the field survey.
<i>Monarcha trivirgatus</i>	Spectacled Monarch	MT / Ma	EPBC	Inhabits moist gullies of rainforest and wet eucalypt forest.	Possible. May occur in the rainforest and wet sclerophyll forest habitat associated with sheltered gullies draining into the dam.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	MT / Ma	EPBC	Inhabits forests, riparian forests and woodlands.	Possible. Suitable open forest habitat present throughout the study area.
<i>Nettapus coromandelianus albipennis</i>	Australian Cotton Pygmy-goose	MW / Ma	EPBC	Coastal wetlands, open water bodies and swamps.	Possible. May utilise open water habitat provided by the dam.
<i>Pandion haliaetus</i>	Osprey	M, MA	FS	Typically estuaries and coastal rivers. Subcoastal occurrences on major inland river systems and impoundments.	Present. Observed during the field survey.
<i>Pelecanus conspicillatus</i>	Australian Pelican	Ma	FS	Estuaries, rivers, creeks, wetlands, open water bodies and swamps.	Present. Observed during the field survey.
<i>Pitta versicolor</i>	Noisy Pitta	Ma	FS	Wet sclerophyll forest and rainforest.	Present. Observed during the field survey.
<i>Porphyrio porphyrio</i>	Purple swamphen	Ma	FS	Margins of natural and artificial wetlands, lakes and swamps.	Present. Observed during the field survey.
<i>Rhipidura rufifrons</i>	Rufous Fantail	MT / Ma	EPBC	Inhabits dense rainforest and wet eucalypt forests.	Present. Recorded during field survey at Sites 7, E and G.
<i>Rostratula benghalensis</i>	Painted Snipe	MW / Ma	EPBC	Found in shallows of well-vegetated wetlands and dams.	Possible. Suitable habitat present along the edges and upper reaches of the lake.

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence along the study corridor
<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Threskiornis molucca</i>	Australian White Ibis	Ma	EPBC, FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Threskiornis spinicollis</i>	Straw-necked Ibis	Ma	EPBC, FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<i>Todiramphus macleayi</i>	Forest Kingfisher	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	Present. Observed during the field survey.
<i>Todiramphus sanctus</i>	Sacred Kingfisher	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	Present. Observed during the field survey.
<i>Zosterops lateralis</i>	Silvereye	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	Present. Observed during the field survey.
<p>Key to Status:</p> <p>MT – Terrestrial species covered by migratory provisions of EPBC Act</p> <p>MW – Wetland species covered by migratory provisions of EPBC Act</p> <p>Ma – Species covered by marine provisions of EPBC Act</p>				<p>Key to Source:</p> <p>EPBC – Environment Protection and Biodiversity Conservation Act Protected Matters database search records for the study area</p> <p>QM – records from the Queensland Museum database</p> <p>Wildnet – records from the EPA’s Wildnet database</p> <p>FS – recorded during the field surveys</p>	



Legend

- Brush-tailed Rock Wallaby
- Giant Barred Frog
- Grey-headed Flying Fox

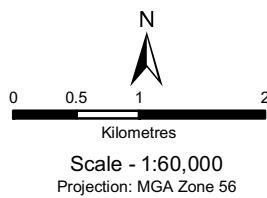


Figure 2-3
Location of EPBC
Listed Fauna
Hinze Dam Stage 3 EIS

3. Description of the Affected Environment

3.1 Introduction

This section details the current status of the matters protected under the EPBC Act in detail. For listed threatened species, the description of the affected environment includes the following:

- a discussion of the species' current distribution;
- relevant information about the ecology of the species (habitat, feeding and breeding behaviour etc);
- information about any populations of the species or habitat for the species in the area affected by the proposed action;
- a discussion of current pressures on the species, especially those in the area to be affected by the proposal; and
- a discussion of relevant controls or planning regimes already in place.

3.2 Status of listed threatened species known from the study area

3.2.1 Spiny Gardenia (*Randia moorei*)

Current Distribution

The known range of Spiny Gardenia extends from Lismore on the north coast of NSW northwards to the Logan River, southern Queensland (Quinn *et al* 1995), however the current distribution and abundance of the species within this range is poorly understood.

Ecology

Spiny Gardenia occurs in subtropical, riverine, littoral and dry rainforest and sometimes along moist scrubby watercourses. In NSW the species is often found in Hoop Pine (*Araucaria cunninghamii*) - Brush Box (*Lophostemon confertus*) forest with other rainforest elements present in the understorey.

Spiny Gardenia coppices and produces root suckers readily, with suckers evident on many plants. In particular, a large tree at Brunswick Heads has apparently responded to disturbance (soil erosion) by producing numerous root suckers. Clumps of shrubs and small trees occurring at many sites may represent single genetic individuals.

Populations within the area affected by the proposed action

Spiny Gardenia occurs as several discrete sub-populations around Hinze Dam, with an overall known population size of approximately 1500 individuals. All specimens are located within Regional Ecosystem 12.11.1, evergreen notophyll vineforest on metamorphic rocks or on the periphery of Regional Ecosystem 12.11.3, brushbox and grey gum wet sclerophyll forest. Canopy species include Native Olive (*Olea paniculata*), Myrtle Ebony (*Diospyros pentamera*), Blush Walnut (*Beilschmiedia obtusifolia*), Cheese tree (*Glochidion ferdinandi*), Yellow Pear-fruit (*Mischocarpus pyriformis*), Rose Marara (*Pseudoweinmannia lachnocarpa*), Wheel of Fire (*Stenocarpus sinuatus*), Satinwood (*Vitex lignum-vitae*), Mango Bark (*Canarium australasicum*), Black Apple (*Pouteria australis*), Black Bean (*Castanospermum australe*), Red Carabeen (*Geissois benthami*), Ribbonwood (*Euroschinus falcata*), Buff Hazelwood (*Symplocos thwaitesii*), Yellow Carabeen (*Sloanea woollsi*) and Brush Cherry (*Syzygium australe*).

The sub-canopy layer is dominated by Scrub Bloodwood (*Baloghia inophylla*), Scaly Myrtle (*Gossia hillii*), Scrub Turpentine (*Rhodamnia rubescens*), Buff Hazelwood (*Symplocos thwaitseii*), Wheel-of-fire-tree (*Stenocarpus sinuatus*), Union Nut (*Bouchardtia neurococca*), Green Tamarind (*Elattostachys nervosa*), Coogera (*Arytera divaricata*), Scrub Ironwood (*Gossia acmenoides*), Grey Myrtle (*Backhousia myrtifolia*), Brown Myrtle (*Choricarpa leptopetala*) and Green-leaved Rose Walnut (*Endiandra muelleri* ssp. *muelleri*).

The shrub layer is dominated by Fissistigma (*Meiogyne stenopetala*), Cleistanthus (*Cleistanthus cunninghamii*), Bonewood (*Medicosma cunninghami*), Muskwood (*Alangium villosum* ssp. *polyosmoides*), Native Gardenia (*Attractocarpus chartacea*), Scrub Turpentine (*Rhodamnia maideniana*), Blunt-leaved Coondoo (*Pouteria myrsinifolia*), Veiny Wilkea (*Wilkea huegeliana*), Smooth Wilkea (*Wilkea austroqueenslandica*), Actephila (*Actephila lindleyi*) and Glossy Laurel (*Cryptocarya laevigata*).

Current pressures on the species

All populations of Spiny Gardenia in the study area are currently threatened by fire and weed invasion. Site surveys revealed that specimens of Spiny Gardenia have been killed by recent fire in the study area. Proliferation of *Lanata camara* post-fire also threatens this species in the study area.

Existing controls and planning regimes

There is a Draft Recovery Plan for Spiny Gardenia in NSW, which has status at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth *EPBC Act 1999*, the Queensland *Nature Conservation Act 1992* and indirectly through the *Vegetation Management Act 1999*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

The population of this species recorded from the study area was previously unknown and there is currently no management plan in place which promotes the protection of this species or its habitat.

3.2.2 *Plectranthus nitidus*

Current Distribution

Plectranthus nitidus is restricted to south-eastern Queensland and north-eastern New South Wales, from the Nightcap Range north to the McPherson Range. There are a small number of records in Queensland with one site possibly conserved in Springbrook National Park near the Mudgeeraba - Springbrook road and an additional site within the Land Warfare Centre near Canungra. There is no information on population sizes at these sites.

Ecology

P. nitidus grows on rocky cliff faces and boulders, in the shelter and shade provided by the adjacent rainforest. It co-occurs with *P. graveolens* and often with Crofton Weed. There have been no studies into the biology or autecology of *P. nitidus*. *P. nitidus* is a herb with an unknown life span. It is easily propagated by cuttings. The main method of reproduction is by sexually produced seeds. *P. nitidus* as with most other *Plectranthus* spp. produces roots from branch nodes where the branches come in contact with the soil surface.

It is believed that the plants are fire-sensitive. The continued existence of this species after fire would rely on successful seedling recruitment. *P. nitidus* has been recorded flowering in February. The pollinators of *P. nitidus* are unknown.

Pollinators reported for the family Lamiaceae include bees, birds, flies, wasps, butterflies and hawkmoths (Huck 1992). The most common pollinators for *Plectranthus* are bees and flies (Huck 1992). Fruits develop and mature soon after flowering. The fruit comprise 4 (1-seeded) nutlets which fall from the fruit after maturity. There is no information about seed viability and germination.

Populations within the area affected by the proposed action

Within the impact area, a single population of approximately 50 plants was recorded from the riparian zone of Little Nerang Creek, upstream of the existing full supply level. The plants occur over a small area of less than 1000m².

An additional population was recorded from an un-named creek which runs north-west from the vicinity of the Nerang River Bridge at Numinbah.

Current pressures on the species

This species may be threatened by weed invasion. Crofton Weed is currently competing with *P. nitidus* for habitat and could exclude *P. nitidus* from suitable habitat.

The species is suspected to be fire-sensitive and incapable of regenerating from underground organs. The continued existence of the species in the wild after a fire would require the regeneration of the species from seed (obligate seeder). If fires were at a frequency that did not allow the production of adequate seed for future recruitment events then the population would decline and the species would be eliminated from the area. This is a potential threat at all sites.

However, the habitat in which the species has been observed provides some degree of protection from frequent burning in that the rocky outcrops may buffer plants from fires.

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act (1992)* and indirectly through the *Vegetation Management Act (1999)*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

The population of this species recorded from the study area was previously unknown and there is currently no management plan in place which promotes the protection of this species or its habitat.

3.2.3 Onion Cedar (*Owenia cepiodora*)

Current Distribution

Onion Cedar has a restricted distribution from the Richmond River in north-east New South Wales, extending north to the Canungra Land Warfare Centre in Queensland. Within this distribution there are few known occurrences of adult trees, and until the late 1970's only a single mature specimen was known from Queensland. Additional specimens have subsequently been recorded, although populations are widely scattered and restricted.

Ecology

This species occurs in subtropical and dry rainforest, typically on or near soils derived from basalt. Flowering occurs between November and December, with a pink/red drupe ripe between February and March.

Populations within the area affected by the proposed action

Onion Cedar occurs in several patches of Regional Ecosystem 12.11.1, which has been described in Section 3.2.1 of this report. The estimated population at known sites is 237 plants, although there may be additional individuals present in the study area.

Current pressures on the species

As for Spiny Gardenia, Onion Cedar is currently threatened by fire and weed invasion, although the majority of individuals recorded occur away from the edges of the vineforest and are therefore less prone to stochastic events.

Existing controls and planning regimes

There is a Draft Recovery Plan for Onion Cedar in New South Wales, but no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act (1992)* and indirectly through the *Vegetation Management Act (1999)*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

The population of this species recorded from the study area was previously unknown and there is currently no management plan in place which promotes the protection of this species or its habitat.

3.2.4 Bush Nuts (*Macadamia tetraphylla*/*M. integrifolia*)

Current Distribution

Rough-shelled Bush Nut is confined chiefly to the Richmond and Tweed Rivers in north-east New South Wales, extending just across the border into Queensland, north to the Coomera River catchment. Bush Nut occurs across a wider area from the Clarence to Logan Rivers.

Ecology

Both species primarily occur in subtropical rainforest types, but persists in a variety of situations, including amongst Acacia and mixed species regrowth. The species flowers from August to September, with fruit ripe between January and March.

Populations within the area affected by the proposed action

Rough-shelled Bush Nut occurs in four discrete locations within the impact area, with a total of approximately 80 individuals. Several hundred individuals of *Macadamia tetraphylla* were located within the CID, but outside of the impact area of the project.

There are a small number of individuals which exhibit characters of Bush Nut, and are likely to be hybrids of the two species. For conservation planning purposes, the hybrids are treated as *Macadamia integrifolia* throughout this document.

Current pressures on the species

Rough-shelled Bush Nut and Bush Nut are currently threatened by habitat loss, inappropriate fire regimes and weed invasion.

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species are protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act (1992)* and indirectly through the *Vegetation Management Act (1999)*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

3.2.5 Giant Barred Frog (*Mixophyes iteratus*)

Current Distribution

The Giant Barred Frog is distributed from Belli Creek near Eumundi, south-east Queensland, south to Warrimoo, mid-eastern New South Wales (Hines et al. 1999). The Giant Barred Frog is currently known from mid to low altitudes below 520 m (Goldingay et al. 1999; White 2000).

In south-east Queensland, the Giant Barred Frog is currently known from scattered locations in the Mary River catchment downstream to Kenilworth, the Upper Stanley River, Caboolture River and Coomera River (Hines et al. 1999).

A population was located in the southern Nambucca River catchment (NSW NPWS 1994). North of this there is currently a large population in the Dorrigo-Coffs Harbour area, North Washpool and Bungawalbin State Forest (Hines et al. 1999). In far north-east New South Wales this species is known from three broad areas (Mebbin, Whian and Richmond Range). There is a report that the Giant Barred Frog is found as far south as Narooma (Cogger 1996) but there are no specimens or other records to substantiate this statement (Hines & SEQTFRT 2002). The species is currently only known from five populations in the Watagan Mountain area (White 2000).

Ecology

The Giant Barred Frog occurs in uplands and lowlands in rainforest and wet sclerophyll forest, including farmland (Ingram & McDonald 1993). Populations have been found in disturbed areas with vegetated riparian strips on cattle farms and in regenerated logged areas. Many sites where the Giant Barred Frog is known to occur are the lower reaches of streams which have been affected by major disturbances such as clearing, timber harvesting and urban development in their headwaters (Hines et al. 1999).

Streatfeild (1999) monitored the spatial movements of four male and four female Giant Barred Frogs at Coomera River, south-east Queensland. Over six weeks, the average area of used by females and males was 622 m and 403 m respectively. Individuals moved a maximum distance of 268 m along the stream and 50 m away from the stream. Displacement distances between diurnal refuges, after a night of activity, were small which suggests a high degree of fidelity to the previous day's shelter. Similar patterns of movement were observed by Lemckert & Brassil (2000) although less perpendicular movement away from the stream was observed. Individuals tracked for 2 to 5 days made nightly movements from 0 to over 100 m, and all were within a 20 m wide band either side of the stream (Lemckert & Brassil 2000). Adults are often found half-buried under leaf litter (Meyer et al. 2001).

Populations within the area affected by the proposed action

The Giant Barred Frog occurs at several sites on the Nerang River, upstream from Hinze Dam. The only site with potential to be affected by the project is at Pocket Road Bridge, approximately 1km upstream from the limit of inundation at FSL. The species was recorded at this site by Harry Hines (EPA) in 2004. Site inspections revealed that the Pocket Road Bridge reach has been compromised by weed invasion and by recent revegetation works, which have disturbed relatively extensive reaches of the Nerang River, including the complete removal of understorey vegetation over a 50m long section of the southern bank. Given the very poor condition of the riparian zone, the status of this population should be considered uncertain. For the purposes of this assessment, the precautionary principle is adopted and it is assumed that the population has persisted.

Current pressures on the species

Many sites where *M. iteratus* occurs are the lower reaches of streams that have had major disturbances such as clearing, timber harvesting and urban development in their headwaters. In the Dorrigo area (north-east New South Wales), Lemckert (1999) found that *M. iteratus* was less abundant in recently logged areas and at sites where there was little undisturbed forest. The impacts of the chytrid fungus, upstream clearing, changes in water flow regimes, degradation of water quality, feral animals, domestic stock, weed invasion and disturbance to riparian vegetation, all potential threats to current populations, are unknown. Individuals of *Mixophyes iteratus* have sometimes been killed in the mistaken belief that they are the introduced cane toad *Bufo marinus*.

Existing controls and planning regimes

This species is subject to a range of recovery actions and is included in the National recovery plan for Stream Frogs of South-east Queensland 2001-2005. Known sites occur in conservation reserves or state forest. Recovery actions, outlined in earlier recovery plans, have been implemented since 1998.

3.2.6 Brush-tailed Rock Wallaby (*Petrogale penicillata*)

Current Distribution

The historical range of the Brush-tailed Rock Wallaby extended from the Grampians in western Victoria to Nanango in south-eastern Queensland, roughly following the line of the Great Dividing Range. However, there has been a decline in numbers and a reduction in the species range, with the decline being greatest in Victoria, and in western and southern NSW (Short and Milkovits 1990; Dovey *et al* 1997; Lunney *et al* 1997). The species range is now fragmented, particularly in the south where it is now mostly found as small isolated populations dotted across the former range.

Ecology

This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Animals browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.

This species seeks shelter or basks during the day in rock crevices, caves and overhangs and are most active at night. Individuals are highly territorial and display strong site fidelity with an average home range size of about 15 ha.

Brush-tailed Rock Wallabies live in family groups of 2 – 5 adults and usually one or two juvenile and sub-adult individuals. Dominant males associate and breed with up to four females. Breeding is considered likely to be continuous.

Populations within the area affected by the proposed action

A population of Brush-tailed Rock Wallabies was released at Pages Pinnacle by Currumbin Sanctuary in the 1990's. Anecdotal evidence suggests that the species has persisted in the general vicinity of the release site. Population size and structure are unknown.

Current pressures on the species

Threatening processes acting on this species include the loss, degradation and fragmentation of habitat, predation by foxes and dogs, competition with feral goats and fire regimes that reduce the abundance and diversity of ground forage.

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act (1992)* and indirectly through the *Vegetation Management Act (1999)*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

3.2.7 Grey-headed Flying Fox (*Pteropus poliocephalus*)

Current Distribution

The Grey-headed Flying-fox is endemic to Australia. It occurs along the east coast from Bundaberg in Queensland to Melbourne, Victoria (Eby, 2000a). The distribution of this species has contracted south, formerly ranging north to Rockhampton (Eby, 2000a). This species may range to the western slopes of the Great Dividing Range in northern NSW (Eby, 1991). At any one time, the majority of animals only occupy a small proportion of this entire range.

Ecology

The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species.

Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia* (Eby, 2000a), and fruits of rainforest trees and vines. This species is an important pollinator and seed-disperser of native trees.

The availability of native fruits, nectar and pollen varies over time and throughout the life of the species. Grey-headed Flying foxes accommodate this by migrating in response to food availability, sometimes travelling hundreds of kilometres. In addition, during periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops. This species occasionally inflicts severe crop damage during periods of native food shortage.

A number of studies have noted the annual southerly movement of animals in spring and summer and their return to the coastal forests of north-east New South Wales and south-east Queensland in winter (Ratcliffe, 1932; Eby, 1991; Parry- Jones & Augee, 1992). This results in large fluctuations of the numbers of this species in New South Wales from as few as 20% of the total population in winter up to around 75% of the total population in summer (Eby, 2000a).

This species roosts in large aggregations or camps, of up to tens of thousands of animals, depending upon the abundance of locally available food sources. Camps are generally located in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Site fidelity is high and some camps in NSW have been used for over a century (Eby, 2000b).

Grey-headed Flying-foxes breed annually with mating commencing in January. Males use strongly-scented secretions to mark mating territories and loud calls are made while defending territories and during mating. This species has a sophisticated array of vocalisations (Tidemann, 1995) and noise at camps can be substantial. The majority of reproductively mature females give birth to a single young each

October/November after a 6-month gestation. Females carry their dependent young during foraging flights for 3 weeks following birth. For the next 2 months, lightless young remain at the camp while adults forage. At around 3 months, young are able to fly and forage outside the camp, and at 6 months they are weaned.

Populations within the area affected by the proposed action

The Grey-headed Flying Fox was recorded at numerous locations across the study area, consistent with the daily movement patterns and foraging behaviour of the species throughout its range. The species is likely to occur in the study area whenever dominant canopy Eucalypts are in blossom. As such, its occurrence in the study area is seasonal, and heavily influenced by forest phenology.

Current pressures on the species

Loss of foraging habitat is a major threat to this species throughout its distribution. Loss of foraging habitat increases the severity of food shortages leading to starvation of animals, spontaneous abortion and high infant mortality. Loss of known and potential roost sites also represents a major threat.

Disturbance at roosting sites can be a significant issue, particularly during the last few weeks of pregnancy when females can spontaneously abort.

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act (1992)* and indirectly through the *Vegetation Management Act (1999)*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

3.3 Status of listed species which may occur in the study area

3.3.1 Swift Parrot (*Lathamus discolor*)

Current Distribution

The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In New South Wales mostly occurs on the coast and south west slopes. Only small numbers of swift parrots are occasionally recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland.

Ecology

The Swift Parrot migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum (*E. globulus*).

The principal over wintering habitat on the mainland is the box-ironbark forests and woodlands inland of the Great Dividing Range in Victoria and New South Wales (Kennedy & Tzaros in press, Kennedy & Overs 2001). Box-ironbark forest is a vegetation type dominated by yellow gum, red ironbark and grey box in central Victoria, and mugga ironbark and grey box in north-east Victoria and the western slopes of New South Wales. The box-ironbark habitats occur across a range of landforms, but drainage lines account for a disproportionately high number of foraging sites. A variety of grassy woodland vegetation types are also used in these areas including white box grassy woodland, grey box grassy woodland and grey box/yellow gum woodland).

Certain forest types on the coastal plains along the eastern seaboard are also important foraging habitats. In lowland coastal forests of New South Wales, swift parrots forage in flowering swamp mahogany, spotted gum and red bloodwood. In south east Queensland and northern New South Wales, Narrow-leaved Red Ironbark/Queensland Blue Gum forests and Yellow Box forest are utilised.

Populations within the area affected by the proposed action

No confirmed records from the study area, but a potential occurrence based on the presence of winter flowering Eucalypts such as Queensland Blue Gum and Narrow-leaved Red Ironbark. In southeast Queensland the majority of recent records have come from the western suburbs of Brisbane, centred on Bardon, Toowong and Kenmore. These suburbs are characterised by suburban parks with clusters of mature (old growth) Queensland Blue Gums. However, these areas are also a focal point for survey activity for the species because they are easily accessible from the centre of Brisbane and local patterns of distribution and habitat use should be viewed as poorly known.

Current pressures on the species

On the mainland the key threat is loss of habitat through clearing for agriculture, and urban and industrial development. The species is also threatened by collisions with wire netting fences, windows and cars, during the breeding season and winter migration (especially where such obstacles are in close proximity to suitable habitat).

Existing controls and planning regimes

A Recovery Plan was prepared for the Swift Parrot in 2001 and is currently under review.

3.3.2 Regent Honeyeater (*Xanthomyza phrygia*)

Current Distribution

The Regent Honeyeater was formerly distributed within about 300 km of the eastern Australian coast from approximately 100 km north of Brisbane to Adelaide (Franklin et al. 1989); however, it is no longer found in South Australia (Franklin and Menkhorst 1988) or western Victoria (Franklin et al. 1987) and records from Queensland are uncommon. Within this reduced distribution population dispersion is also extremely patchy, and little information is available on movement patterns of this highly mobile species.

Ecology

Most records of the Regent Honeyeater have come from box-ironbark eucalypt associations and it seems to prefer wetter, more fertile sites within these associations, such as along creek flats, broad river valleys and lower slopes. Along streams in NSW, riparian forests of River She-oak (*Casuarina cunninghamiana*) are also important for feeding and breeding.

A large proportion of these forest types has been cleared for agriculture, leaving only patches of natural vegetation in a predominantly agricultural landscape. These remnants are frequently located on the least fertile sites and have been heavily harvested for timber in the past. In Victoria, stands of immature, even-aged and slow-growing box-ironbark forests totalling some 250 000 ha, mostly on less fertile soils, are all that remain of roughly one million hectares that were present at the time of European occupation (Muir et al. 1995). There are no examples of uncut, old-growth box-ironbark woodland remaining. A similar, though less critical, situation exists in New South Wales.

The other major environment regularly utilised by Regent Honeyeaters, perhaps largely as a drought refuge, is wet lowland coastal forest dominated by Swamp Mahogany or Spotted Gum.

Two earlier studies (Franklin et al. 1989, Webster and Menkhorst 1992) highlighted the reliance of the Regent Honeyeater on nectar from a small number of eucalypt species - Mugga Ironbark, White Box, Yellow Box and Yellow Gum. Recent studies by Geering (1997) and Oliver (1998b), while adding to the number of eucalypt species from which Regent Honeyeaters obtain nectar, have reinforced the significance of nectar from Mugga Ironbark, White Box and Yellow Box. In NSW, Regent Honeyeaters also regularly take nectar from Needle-leaf Mistletoe (*Amyema cambagei*) growing on River She-oak (Webster and Menkhorst 1992, Geering and French 1998) and from Swamp Mahogany on the Central Coast (Franklin et al. 1989).

Populations within the area affected by the proposed action

There are no confirmed records of the Regent Honeyeater from the study area, and preferred feed trees are largely absent. Riparian woodlands of River Oak (*Casuarina cunninghamiana*) may be utilised by this species and it may forage on a variety of Eucalypts across the study area.

Current pressures on the species

Loss of woodland habitat is the major threat to this species and to other woodland birds. Due to expanding agriculture eighty-five percent of the box-ironbark woodlands, once extensively distributed across inland eastern Australia, have been cleared, making them one of the most threatened ecosystems in the country.

For example, at the time of European occupation roughly one million hectares of box-ironbark forest existed in Victoria. Today only twenty-five per cent of the original coverage remains, mostly on less fertile soils which are marginal habitat for this species. Special dietary and habitat needs, in particular the Regent Honeyeater's nomadic lifestyle and reliance on a small area of favoured habitat within the remnants, has meant that these reductions in habitat are having a huge impact on the species.

The clearance of the most fertile stands, the poor health of many remnants and very slow growth rate of replacement trees as well as the lack of regeneration due to stock grazing are also contributing to the decline in numbers. Firewood collecting, which many people may see as 'tidying up' the forest, actually results in removal of dead trees and fallen timber crucial to the healthy survival of the forest ecosystem, of which the Regent Honeyeater is an integral part.

Existing controls and planning regimes

A National Recovery Plan was prepared for this species in 1999, and is currently under review.

3.3.3 Australian Painted Snipe (*Rostratula australis*)

Current Distribution

The species has a scattered distribution throughout many parts of Australia, with a single record from Tasmania. Though some individuals are apparently resident in some areas, other individuals appear to be nomadic, temporarily occupying areas where suitable habitat exists. The Murray–Darling drainage system appears to have been a key area for this species, as many records of this species come from this region.

Ecology

The Australian Painted Snipe is usually found in shallow inland wetlands, either freshwater or brackish, that are either permanently or temporarily filled. It is a cryptic bird that is hard to see and often overlooked. Usually only single birds are seen, though larger groups of up to 30 have been recorded. It nests on the ground amongst tall reed-like vegetation near water, and feeds near the water's edge and on mudflats, taking invertebrates, such as insects and worms, and seeds.

Populations within the area affected by the proposed action

There are no confirmed records of this species from the study area. Within Gold Coast City, this species is known from Saltwater Park at Hope Island, with few other confirmed occurrences.

Current pressures on the species

The loss and alteration of wetland habitat since European settlement is a key factor in the species decline, particularly in the Murray–Darling Basin, an area known to be important to the Australian Painted Snipe.

Though sufficiently opportunistic to take advantage of floods, the subspecies has probably suffered primarily from either wetland drainage, or the diversion of water from rivers, which means that shallow wetlands never form. Major water resource developments in the northern Murray–Darling Basin from the 1960s–1990s coincided with a significant decline in number of observations (Lane and Rogers, 2000). Such developments are continuing as river flows are reduced for irrigation with little regard for the ecological consequences (Kingsford and Thomas, 1998, Kingsford, 2000). Drainage and clearance of wetland vegetation probably caused a decline on the Swan Coastal Plain.

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act 1992* and indirectly through the *Vegetation Management Act 1999*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

3.3.4 Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

Current Distribution

There are two subspecies of the Spotted-tail Quoll: *Dasyurus maculatus gracilis* occurs in a small isolated population in north Queensland, while *D. m. maculatus* occurs along the remainder of the east coast from south-

east Queensland to Tasmania. This subspecies previously ranged over both sides of the Great Dividing Range from Queensland to South Australia and Tasmania (Edgar & Belcher 1995). However, following a dramatic decline in range and numbers, it is now distributed over a restricted range in isolated areas that may be too small to support long-term viable populations (Edgar & Belcher 1995). The species is probably extinct in South Australia and uncommon to rare in Queensland, NSW and Victoria, but numbers appear to have increased in Tasmania (Edgar & Belcher 1995).

Ecology

The Spotted-tailed Quoll utilises a variety of habitats including sclerophyll forest and woodlands, coastal heathlands and rainforests (Dickman & Read 1992; Edgar & Belcher 1995). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas.

The Spotted-tailed Quoll is primarily solitary and nocturnal, although some diurnal activity does occur (Dickman & Read 1992). This species is primarily terrestrial, although it is an agile climber, using trees as vantage points from which to hunt (Dickman & Read 1992). It is an opportunistic carnivore which preys on birds, reptiles, small mammals (including gliders, possums, rats and small macropods) and invertebrates (Ayers et al. 1996). This species also scavenges carrion.

The Spotted-tailed Quoll nests in rock shelters, small caves, hollow logs or tree hollows (Ayers et al. 1996) and utilises numerous dens within its home range. The home-range of this species is unknown, but estimates are between 800 ha and 20 km². It is a highly mobile species and there are numerous records of overnight movements of several kilometres (Edgar & Belcher 1995). Within its home range, this species has 'latrines' where it defecates, which are likely to define territories (Edgar & Belcher 1995).

The breeding period of the Spotted-tailed Quoll is from April to July with an average litter size of five (Edgar & Belcher 1995). The gestation period is 3 weeks and juveniles remain in the pouch for approximately 7 weeks (Dickman & Read 1992; Edgar & Belcher 1995). After leaving the pouch, social play is well developed by 13 weeks, and juveniles become independent at 18 weeks (Dickman & Read 1992). Maturity is attained at the age of one year (Edgar & Belcher 1995).

Populations within the area affected by the proposed action

The Spotted-tailed Quoll has not been recorded from the study area, although there are anecdotal records from the Mudgeeraba-Springbrook Road within the past five years. As such, the Spotted-tailed Quoll is regarded as a possible occurrence in the study area.

Current pressures on the species

Current pressures on the species include loss, fragmentation and degradation of habitat through clearing of native vegetation and subsequent development, logging and frequent fire (Edgar & Belcher 1995; Dickman & Read 1992.); loss of large hollow logs and other potential den sites (Scotts 1992); competition for food and predation by foxes and cats (Edgar & Belcher 1995; Dickman & Read 1992); spread of epidemics, such as a parasitic protozoan, by cats to the Quolls (Edgar & Belcher 1995; Dickman & Read 1992).

Historically (and currently) this species was extensively persecuted by humans following perceived predation on stock and poultry (Edgar & Belcher 1995; Dickman & Read 1992)

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act 1992* and indirectly through the *Vegetation Management Act 1999*. There are no official conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

3.3.5 *Coeranoscincus reticulatus*

Current Distribution

This species occurs in the sub-coastal ranges and lowlands between Cooloola in south-eastern Queensland and Grafton in north-eastern New South Wales (Greer & Cogger 1985). Known localities in Queensland include Emuvalle, Tambourine Mountain, Beechmont, Lamington National Park, Maleny, Cooloola State Forest, and Cunningham's Gap (Greer & Cogger 1985; Cogger *et al* 1993).

Ecology

This species is generally considered to be an inhabitant of closed forest (Czechura 1974) and possibly open layered Eucalyptus forest (McDonald 1977). It is generally recorded in moist layered forest on loamy basaltic soils, but also found in closed forest overlying silica sand dunes at Cooloola. There are two published records of individuals in logged forest which had tall softwood regrowth (Cogger *et al.* 1993). One specimen was recorded in a 3 ha isolated stand of rainforest regrowth near Maleny, southeast Queensland (Czechura 1974).

Within forests, this species is found in well-mulched, loose, friable rainforest soil in leaf litter, often immediately adjacent to fallen tree trunks (Ehmann 1987; Cogger *et al.* 1993).

Stomach contents of four specimens comprised three earthworms, one beetle larva and one unknown insect (McDonald 1977). Possesses pointed, recurved teeth which may be adapted for capturing earthworms (Greer & Cogger 1985). A captive specimen captured and ate earthworms below the soil surface (Ehmann 1987), and mud has been reported in the gut of seven specimens (McDonald 1977), indicating subterranean foraging.

Populations within the area affected by the proposed action

Not known from the study area, but a possible occurrence in wet sclerophyll forest and vineforest communities.

Current pressures on the species

Probably a combination of factors, including overgrazing by stock, clearance of habitat for agriculture and grazing, pasture improvement, crop production, native forest logging and fragmentation of habitat.

Much of the lowland closed forest within its range has been cleared for agriculture and grazing, pasture improvement, crop production, tropical fruit production, and native forest logging. Suitable habitat has generally been reduced to patches, especially in lowland areas (Cogger *et al.* 1993).

Existing controls and planning regimes

There is no formal Recovery Plan in place in Queensland or at the National level. The species is protected from inappropriate development (and subsequent loss) by the Commonwealth EPBC Act (1999), the Queensland *Nature Conservation Act 1992* and indirectly through the *Vegetation Management Act 1999*. There are no official

conservation actions currently underway in Queensland which focus on this species. At the local level, there are no management plans in place to protect or manage existing populations in Gold Coast City.

3.3.6 Rainforest Plant Assemblage

Current Distribution

There several species of rainforest flora which have not been recorded from the study area, but remain considered as potential occurrences, including Hairy-joint Grass (*Arthraxon hispidus*), Red Boppel-nut (*Hicksbeachia pinmatifolia*); Brush Sophora (*Sophora fraseri*), Small-leaved Tamarind (*Diploglottis campbelli*) and Northern Clematis (*Clematis fawcettii*).

As these species share similar or overlapping habitat requirements, they are discussed collectively throughout this assessment.

Ecology

Habitat preferences of the relevant species are as follows:

- Hairy-joint Grass occurs in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps;
- Red Boppel-nut occurs in subtropical rainforest, moist eucalypt forest and Brush Box forest;
- Brush Sophora is typically found in moist situations in rainforest;
- Small-leaved Tamarind occurs in a variety of forest types ranging of subtropical rainforest to Brush Box open forest with vineforest elements; and
- Northern Clematis occurs in drier rainforest types.

Populations within the area affected by the proposed action

There are no confirmed populations of any of these species within the study area.

Current pressures on the species

These species are collectively threatened by habitat loss and fragmentation, inappropriate fire regimes and weed invasion.

3.3.7 *Phyllodes imperialis*

Current Distribution

The southern subspecies of *P. imperialis* is distributed from Nambour, south-east Queensland, to Dorrigo, in northern New South Wales (Clarke & Spier-Ashcroft 2003). It is currently known from 5 locations and only one location, Mary Cairncross Park in Queensland, is confirmed breeding habitat (NSW Scientific Committee 2003).

The species *P. imperialis* occurs in Australia in rainforest from north-eastern Queensland to northern New South Wales. It also occurs overseas in Papua New Guinea, the Solomons, Vanuatu, and New Caledonia, with several subspecies (Herbison-Evans *et al* 2004).

Ecology

The southern subspecies of *P. imperialis* is found in the thick primary lower montane rainforests from south-eastern Queensland to northern New South Wales. The vine *Carronia multisepealea*, which provides food for the larvae, is only found in south-eastern Queensland. The presence of the vine in these old growth rainforest patches is believed to provide shade that the moths require in order to breed (Clarke & Spier-Ashcroft 2003). Larvae feed on the vine species *Carronia multisepealea* (Sands 1999), which is present in rainforest communities surrounding Hinze Dam.

Populations within the area affected by the proposed action

Only one location, Mary Cairncross Park, a 40 ha council reserve at Maleny, Queensland, is confirmed breeding habitat. This moth belongs to a group of species of moths (tribe *Ophiderini*) some of which are known to migrate considerable distance from their breeding sites. It is possible that most records of this moth represent individuals that have migrated from the one or very few remaining breeding sites. The species has not been recorded from the study area, although potential habitat is present.

Current pressures on the species

This species is predominantly threatened by the clearing of rainforest habitats known to contain the preferred larval food source *Carronia multisepealea*. Low overall population numbers and highly fragmented habitats indicate that the species is at risk of local extinction.

Existing controls and planning regimes

The species is not the subject of a formal recovery program at any level.