Table 9-7 Mapped Vegetation Communities

Vegetation Type	Vegetation Description	Regional Ecosystem	Conservation Status
1	Broad-leaved White Mahogany / Queensland Stringybark (*E. carnea / E. tindaliae*) Open Forest on Metasediments	12.11.5a	Regional significance
1b	Grey Gum/Ironbark (*E. propinqua / E. siderophloia +/- Corymbia intermedia / Lophostemon confertus*)	12.11.3	State significance
1e	Grey Ironbark/Tallowwood/Grey Gum (*E.siderophloia/E.microcorys/E.propinqua*) Open Forest on Cainozoic Igneous Rocks	12.8.8a	Regional significance
2	Brush Box (*L. confertus*) Open Forest with Rainforest understorey on Metasediments	12.11.3a	State significance
2a	Flooded Gum (*E. grandis*) Tall Open Forest on Alluvium	12.3.2	State significance
4d	Broad-leaved Spotted Gum/White Mahogany (*C.henryi / E.carnea*) Open Forest on Metasediments	12.11.5k	Local significance
29a	Gully Vine Forest on Metasediments	12.11.1	State significance
Non-remnant vegetation types			
	Regrowth of Acacia species	-	-
	Regrowth of Allocasuarina and Acacia species	-	-

Observed Vegetation Communities

Vegetation within the study area was surveyed to verify regional ecosystem mapping and to describe the vegetation community types present within the study area, including the presence of rare or threatened flora species. Twelve vegetation communities (species associations) were observed across the study area, representing seven regional ecosystems. These vegetation communities are listed in **Table 9-8** below.

Table 9-8 Vegetation Communities Observed in Study Area

No.	Short Vegetation Description	Regional Ecosystem Equivalent
	Dry Sclerophyll Forest Types	
1	Tall Open Forest (*Corymbia citriodora)*	12.11.5
2	Tall Open Forest (*E. siderophloia/E. microcorys/E. propinqua*)	12.11.5a
3	Tall Open Forest (*Eucalyptus fibrosa* subsp. *fibrosa*)	12.11.5k
	Wet Sclerophyll Forest Types	
4	Tall Open Forest (*E. grandis*)	12.11.2
5	Tall Open Forest (*E.propinqua/E. microcorys/L. confertus*)	12.11.3a
	Vineforest Types	
6	Evergreen notophyll vine forest	12.11.1
	Riparian/Alluvium Forests and Woodlands	
7	Tall Open Forest (*Casuarina cunninghamiana)*	12.3.7
8	Tall Open Forest (*Eucalyptus grandis*)	12.3.2
9	Tall Open Forest *E. tereticornis/E. siderophloia* +/- vineforest understorey	12.3.11a
	Disturbed/Regrowth Communities	
10	Low Open Forest (*Acacia disparrima)*	N/A
11	Tall Closed Grassland (Setaria spp)	N/A
12	Low Closed Grassland +/- scattered trees	N/A

For ease of discussion, the twelve vegetation communities have been allocated to five broad vegetation groups:

- Dry Sclerophyll Forests;
- Wet Sclerophyll Forests;

- Vineforests;
- Riparian/alluvial forests and woodlands; and
- Disturbed/regrowth communities.

Photographs of these five vegetation communities within the study area are shown in **Plates 9-7 to 9-12**.

Plate 9-7 Dry Sclerophyll Forest (RE 12.11.5)

Plate 9-8 Wet Sclerophyll Forest (RE 12.11.3)

Plate 9-9 Vine Forest 12.11.1

Plate 9-10 Riparian/Alluvial Forests

Plate 9-11 Acacia regrowth

Broad vegetation groups are discussed in **Table 9-9**. The vegetation groups are described in terms of :

- distribution and extent;
- species associations (and regional ecosystem equivalents);
- occurrence of EVR taxa; and
- ecological condition and threats.

Table 9-9 Broad Vegetation Groups

Dry Sclerophyll Forest Types	
Distribution and Extent	The study area is dominated by Dry Sclerophyll Forest types, predominantly associated with metamorphic rocks on exposed slopes of north east to westerly aspect.
Species Associations and Equivalent Regional Ecosystems	**Community 1 - Tall Open Forest (Corymbia citriodora)** This community is highly variable in terms of species composition and dominance. Spotted gum (Corymbia citriodora) is often a dominant or co-dominant feature of the canopy, however, other species which are locally dominant include Northern Grey Ironbark (Eucalyptus siderophloia), Narrow-leaved Red Ironbark (Eucalyptus crebra), Pink Bloodwood (Corymbia intermedia), Small-fruited Grey Gum (Eucalyptus propinqua), Smooth-barked Apple (Angophora leiocarpa) and Queensland Blue Gum (Eucalyptus tereticornis). Brushbox (Lophostemon confertus) is often present in gullies and as a sub canopy or understorey tree. The shrub and small tree layers are highly variable and influenced by slope, aspect and fire history. Species present (and often abundant) include Flat-stemmed Wattle (Acacia complanata), Hickory Wattle (Acacia disparrima), Green Wattle (Acacia irrorata subsp. irrorata), Forest She-oak (Allocasuarina torulosa), Black She-oak (Allocasuarina littoralis) Red Ash (Alphitonia excelsa), Midyim (Austromyrtus dulcis), Coast Banksia (Banksia integrifolia), Prickly Pine (Bursaria spinosa), Lolly Bush (Clerodendrum floribundum), Forest Hop Bush (Dodonaea triquetra), Guinea flower (Hibbertia stricta), Pointed-leaved Hovea (Hovea acutifolia), Crinkle Bush (Lomatia silaifolia), and Muttonwood (Rapanea variabilis). Groundcovers include Barbed Wire Grass (Cymbopogon refractus), Blue Flax lilly (Dianella caerulea), Goodenia hederacea, Blady Grass (Imperata cylindrica), Variable swordsedge (Lepidosperma laterale), Grass-trigger Plant (Stylidium gramiflorum), Kangaroo Grass (Themeda triandra) and Hyacincth Orchid (Dipodium variegatum). Climbers include Wombat Berry (Eustrephus latifolius), Native Sarsparilla (Hardenbergia violacea), and Austral Sarsparilla (Smilax australis). This community is representative of Regional Ecosystem 12.11.5, which is described as “Open-forest complex in which spotted gum is a relatively common species. Canopy trees include Corymbia citriodora, Eucalyptus siderophloia or E. crebra (sub coastal ranges), E. major and/or E. longirostrata and E. acmenoides or E. portuensis and/or E. carnea and/or E. eugenioides. Other species that may be present and abundant locally include Corymbia henryi, C. intermedia, C. trachyphloia, Eucalyptus tereticornis, E. propinqua, E. biturbinata, E. moluccana, E. melliodora, E. fibrosa subsp. fibrosa and Angophora leiocarpa. Lophostemon confertus often present in gullies and as a sub canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Occurs on hills and ranges of Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics.” **Community 2 - Tall Open Forest (E. siderophloia, E. microcorys, E. propinqua)** This community is dominated by Northern Grey Ironbark (Eucalyptus siderophloia), Tallowwood (Eucalyptus microcorys) and Small-fruited Grey Gum (Eucalyptus propinqua). In some areas Tindale’s Stringybark (Eucalyptus tindaliae) and Broad-leaved White Mahogany (Eucalyptus umbra) dominate or co-dominate the T1 layer. Shrub and small tree species present include Hickory Wattle (Acacia disparrima), Green Wattle (Acacia irrorata subsp. irrorata), Forest She-oak (Allocasuarina torulosa), Red Ash (Alphitonia excelsa), Lolly Bush (Clerodendrum floribundum), Forest Hop Bush (Dodonaea triquetra), Pointed-leaved Hovea (Hovea acutifolia), and Muttonwood (Rapanea variabilis). Groundcovers include Kangaroo Grass (Themeda triandra), Barbed Wire Grass (Cymbopogon refractus), Blue Flax lilly (Dianella caerulea), Blady Grass (Imperata cylindrica), Variable swordsedge (Lepidosperma laterale). Climbers include Wombat Berry (Eustrephus latifolius), Native Sarsparilla (Hardenbergia violacea), and Austral Sarsparilla (Smilax australis). This community is representative of Regional Ecosystem 12.11.5a., which is described as “Open forest of Eucalyptus tindaliae, Eucalyptus carnea ± Corymbia citriodora, Eucalyptus crebra, Eucalyptus major, Corymbia henryi, Angophora woodsiana, C. trachyphloia (away from the coast) or E. siderophloia, E. microcorys, E. racemosa, E. propinqua (closer to the coast). Occurs on Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics.”

	Community 3 – Tall Open Forest (Eucalyptus fibrosa subsp. fibrosa) This community is dominated by Broad-leaved Red Ironbark (Eucalyptus fibrosa subsp. fibrosa) with Spotted Gum (Corymbia citriodora), Smooth-barked Apple (Angophora leiocarpa), Broad-leaved White Mahogany (E. carnea), Queensland White Stringybark (E. tindaliae), Small-fruited Grey Gum (E. propinqua) and Pink Bloodwood (C. intermedia). Shrub and small tree species present include Forest She-oak (Allocasuarina torulosa), Red Ash (Alphitonia excelsa), Coast Banksia (Banksia integrifolia), Forest Hop Bush (Dodonaea triquetra), Pointed-leaved Hovea (Hovea acutifolia), Crinkle Bush (Lomatia silaifolia), and Muttonwood (Rapanea variabilis). Groundcovers include Blady Grass (Imperata cylindrica), Kangaroo Grass (Themeda triandra) and Barbed Wire Grass (Cymbopogon refractus). Climbers include Wombat Berry (Eustrephus latifolius), Native Sarsparilla (Hardenbergia violacea), and Austral Sarsparilla (Smilax australis). This community is representative of Regional Ecosystem 12.11.5k, which is described as "Open forest of Corymbia henryi, Eucalyptus fibrosa subsp. fibrosa ± C. citriodora, Angophora leiocarpa, E. carnea, E. tindaliae, E. propinqua, C. intermedia. Occurs on drier ridges and slopes on Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics."
Occurrence of EVR Taxa	No species considered significant at the National, Statewide or Local level were recorded from Dry Sclerophyll Forest types across the study area.
Ecological Condition and Threats	All Dry Sclerophyll forest types across the study area exhibit signs of previous and ongoing disturbance associated with logging, grazing and frequent fire. As all forestry and agricultural activity has now ceased in the study area, the most significant threats to the integrity of dry forest types are inappropriate fire regimes and weed invasion.
Wet Sclerophyll Forest Types	
Distribution and Extent	Sheltered slopes across the study area are dominated by Wet Sclerophyll Forest types, within which there are several distinctive species associations. Wet Sclerophyll Forests are primarily associated with metamorphic rocks, with minor occurrences on alluvium adjacent to Little Nerang Creek, in the far south of the study area.
Species Associations and Equivalent Regional Ecosystems	**Community 4 - Tall Open Forest (Eucalyptus grandis)** This community is a tall open-forest dominated by Flooded Gum (Eucalyptus grandis) with vine forest understorey. Co-occurring canopy species include Brushbox and Tallowwood, although these species are typically sub-dominant or suppressed. Common shrub species include Bennett's Ash (Flindersia bennettiana), Smooth Psychotria (Psychotria daphnoides), Currant Bush (Carissa ovata), Toothed Palm Lilly (Cordyline congensta), Chain Fruit (Alyxia ruscifolia), Brush Bloodwood (Baloghia inophylla), Bleeding Heart (Homalanthus nutans), Foambark (Jagera pseudorhus), Celerywood (Polyscias elegans), Scrub turpentine (Rhodamnia rubescens), Native Frangipani (Hymenosporum flavum), and Tree Heath (Trochocarpa laurina). In steeper gullies rainforest species such as Murrogun (Cryptocarya microneura), Jackwood (Cryptocarya glaucescens), Scentless Rosewood (Synoum glandulosum), and Red Kamala (Mallotus philippensis) occur. Groundcovers include Shiny Fan Fern (Sticherus flabellatus var. flabellatus), Settlers Flax (Gymnostchys anceps), Rasp fern (Doodia aspera), Graceful Grass (Ottochloa gracillima), Gristle Fern (Blechnum cartilagineum), Wiry Panic (Entolasia stricta), Oplismenus spp., Rasp Fern (Doodia aspera) and sporadic Spiny-headed Matrush (Lomandra longifolia) and Sawsedge (Gahnia aspera). This association is currently not mapped as occurring beneath proposed FSL and generally occurs as small non-mappable entities at the scale of Regional Ecosystem mapping. Small groves comprised primarily of Eucalyptus grandis are analogous with RE 12.11.2 which is described as "Tall open-forest with vine forest understorey ('wet sclerophyll'). Canopy species include Eucalyptus saligna or E. grandis, E. microcorys, E. acmenoides and Lophostemon confertus. Characteristic understorey species include Caldcluvia paniculosa, Pittosporum undulatum, Synoum glandulosum and Cryptocarya glaucescens. Occurs on Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics."

	Community 5 – Tall Open Forest (E. propinqua/E. microcorys/Lophostemon confertus) The canopy of this community is dominated by Small-fruited Grey Gum, Tallowwood (Eucalyptus microcorys), Northern Grey Ironbark (Eucalyptus siderophloia), Pink Bloodwood (Corymbia intermedia) and Brushbox (Lophostemon confertus). Throughout the site, Eucalyptus grandis (flooded gum) forms near pure stands in small groves within EPA mapped RE 12.11.3. The sub-canopy is dominated by Brushbox, Forest She-oak (Allocasuarina littoralis) and Hickory Wattle (Acacia disparrima var. disparrima) occurring more commonly on the drier slopes beyond the proposed full supply level (FSL) and White Bottlebrush (Callistemon salignus) and Blackwood Wattle (Acacia melanoxylon) within drainage lines. In steeper gullies rainforest species such as Murrogun (Cryptocarya microneura), Jackwood (Cryptocarya glaucescens), Scentless Rosewood (Synoum glandulosum), Red Kamala (Mallotus philippensis) and Bennett's Ash (Flindersia bennettiana) occur. The shrub layer is, too, highly variable in species composition. The slopes beyond the gullies are dominated by sporadic juvenile sub-canopy species, Crab-apple (Schizomeria ovata), Lantana (Lantana camara var. camara), Poison Peach (Trema tomentosa var. viridis), Brown Kurrajong (Commersonia bartramia), Gympie Stinger (Dendrocnide moroides) and sporadic Veiny Wilkea (Wilkea huegeliana) and Glossy Laurel (Cryptocarya laevigata). Within the gullies, Cheese Tree (Glochidion ferdinandi var. ferdinandi) and Grey Myrtle (Backhousia myrtifolia) occur commonly, with Water Gum (Tristaniopsis laurina), Creek Sandpaper Fig (Ficus coronata), Silverleaf (Argophyllum nullamense) and Lilly Pilly (Acmena smithii {minor forma}) occurring sporadically. The groundcover layer is dominated by Graceful Grass (Ottochloa gracillima), Gristle Fern (Blechnum cartilagineum), Wiry Panic (Entolasia stricta), Oplismenus spp., Rasp Fern (Doodia aspera) and sporadic Spiny-headed Matrush (Lomandra longifolia), Shield Ferns (Lastreopsis spp.), Mistflower (Ageratina riparia) and Blady Grass (Imperata cylindrica). Common vines include Water Vines (Cissus spp.), Austral Sarsparilla (Smilax australis), Molucca Bramble (Rubus moluccanus) and Cockspur Thorn (Maclura cochichinensis). Epiphytes are limited to sporadic Rock Felt Fern (Pyrrosia rupestris), Arthropteris tenella, Platycerium spp. and very occasional Basket Fern (Drynaria rigidula). This community is representative of Regional Ecosystem 12.11.3a, described as follows "Open-forest generally with Eucalyptus siderophloia and E. propinqua ± E. microcorys, Lophostemon confertus, Corymbia intermedia, E. biturbinata, E. acmenoides, E. tereticornis, E. moluccana, Angophora leiocarpa, Syncarpia verecunda with vine forest species and E. grandis or E. saligna in gullies. Eucalyptus pilularis and E. tindaliae sometimes present e.g. mid D'Aguilar Range, Conondale Range. Occurs predominantly on hills and ranges of Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Major vegetation communities include: 12.11.3a: Open-forest of Lophostemon confertus with Eucalyptus microcorys and E. propinqua. Occurs in gullies and exposed ridges of Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics."
Occurrence of EVR Taxa	Wet Sclerophyll remnants in the study area support a number of EVR taxa, including species of statewide significance. EVR taxa present include Silverleaf (Argophyllum nullumense), Narrow-leaved Tuckeroo (Cupaniopsis newmanii), Rusty Oak (Helecia ferruginea), Smooth Scrub-turpentine (Rhodamnia maideniana), Richmond Bridwing Vine (Pararistolochia praevenosa), Brush Cassia (Cassia marksiana) and Veiny Laceflower (Archidendron muellerianum).
Ecological Condition and Threats	Wet Sclerophyll Forests across the study area suffer extensive infestation of Lantana camara and Solanum mauritianum. These forest types also exhibit signs of previous and ongoing disturbance associated with logging, grazing and frequent fire. As all forestry and agricultural activity has now ceased in the study area, the most significant threats to the integrity of dry forest types are inappropriate fire regimes and weed invasion. .
Vineforests	
Distribution and Extent	Vineforest remnants occur in sheltered gullies and gully floors which have avoided recent fires and other stochastic events. This is a restricted vegetation type of which there are only three patches greater than 1 hectare in area across the study area.

Species Associations and Equivalent Regional Ecosystems	**Community 6 - Evergreen notophyll vine forest** This community is dominated by a variety of rainforest tree species. Emergent species include Deciduous Fig (Ficus superba var. henneana), Strangling Fig (Ficus watkinsiana), White Fig (Ficus virens var. sublanceolata), Moreton Bay Fig (Ficus macrophylla), Hoop Pine (Araucaria cunninghamii) and Brushbox, with sporadic Flooded Gum. 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 woollsii) 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 (Bouchhardtia 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 (Atractocarpus 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). The groundcover layer is dominated by Shield Ferns (Lastreopsis spp.), Matrush (Lomandra spicata), Sickle Ferns (Pellaea spp.), Great Brown Sedge (Carex brunnea) and Pademelon Grass (Oplismenus hirtellus ssp. imbecillis). Common lianes (vines) include Melodorum leichhardtii, Melodinus acuitflorus, Melodinus australis, Burney Vine (Trophis scandens), Water Vines (Cissus spp.), Native Grape (Tetrastigma nitens), Round Vine (Legnephora moorei), Native Wisteria (Callerya megasperma), Supplejacks (Ripogonum spp.),Native Derris (Derris involuta) and Blood Vine (Austrosteenisia blackii). Richmond Birdwing Vine (Pararistolochia praevenosa), which is listed as rare under the Nature Conservation Wildlife Regulation 2006 and an important larval food source for the threatened Ornithoptera richmondia (Richmond birdwing butterfly) was recorded in numerous gullies throughout the investigation area. Epiphytic plants which were commonly recorded include Arthropteris tenella, Pothos (Pothos longipes), Elkhorn (Platycerium bifurcatum), Staghorn (Platycerium superbum), Bird's Nest Fern (Asplenium australascicum), Asplenium attenuatum var. indivisum, Dendrobium spp. (orchids), Tangle-root Orchid (Plectorrhiza tridentata) and Fragrant Fern (Microsorum scandens). This community is analogous with remnant Regional Ecosystem (RE) 12.11.1, which is described as "Evergreen notophyll vine forest and/or Lophostemon confertus closed forest. Archontophoenix cunninghamiana often present in gully floors. The plant families Lauraceae, Myrtaceae and Elaeocarpaceae are characteristic of the type. Occurs in gullies on Paleozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics." As of December 2005, this RE had a Vegetation Management Act 1999 conservation status of "Not of Concern". This community possesses a high ecological value in that it provides the greater majority of essential habitat for recorded and potentially occurring threatened species and landscape amenity.
Occurrence of EVR Taxa	Vineforest remnants in the study area support a number of EVR taxa, including species of national and statewide significance. EVR taxa present include Spiny Gardenia (Randia moorei), Onion Cedar (Owenia cepiodora), Silverleaf (Argophyllum nullumense), Narrow-leaved Tuckeroo (Cupaniopsis newmanii), Long-leaved Tuckeroo (Lepiderema pulchella), Rusty Vine (Marsdenia hemiptera), Rusty Oak (Helecia ferruginea), Smooth Scrub Turpentine (Rhodamnia maideniana), Nightcap Wattle (Acacia orites), Richmond Birdwing Vine (Pararistolochia praevenosa), Brush Cassia (Cassia marksiana) and Veiny Laceflower (Archidendron muellerianum).
Ecological Condition and Threats	Vineforests across the study area contain evidence of logging (large sawn-off stumps are reasonably common) and agricultural activity (remnants of fencelines). All patches are threatened by frequent fire in surrounding vegetation types and invasion by Lantana. Wtter gullies contain infestations of Mistflower (Ageratina riparia) and disturbed areas support Wild Tobacco (Solanum mauritianum). Areas subject to frequent fire are dominated by Lantana.

Riparian Forests and Woodlands	
Distribution and Extent	Riparian forests and woodlands occur adjacent to Little Nerang Creek and the Nerang River in the far south of the study area. On Little Nerang Creek, riparian communities have been reduced significantly by clearing for agriculture, whilst the Nerang River has a narrow floodplain upstream of Hinze Dam and subsequently supports only narrow fringing riparian communities as opposed to extensive riparian/floodplain forests which would have historically characterised areas downstream.
Species Associations and Equivalent Regional Ecosystems	**Community 7 – Tall Open Forest (Casuarina cunninghamiana)** This community is dominated by River Oak (Casuarina cunninghamiana), with occasional Queensland Blue Gum in the upper strata. Weeping Bottlebrush (Callistemon viminalis) and Weeping Lilly Pilly (Waterhousia floribunda) dominate the lower tree strata interchangeably. The stream channel and its margins support a dense cover of Spiny-headed Matrush (Lomandra hystrix). Additional species present in this community include Python Tree (Gossia bidwillii), Scrub Myrtle (Gossia acmenoides), Hard Quondong (Elaeocarpus obovatus), Sandpaper Fig (Ficus coronatus), Wild Quince (Guioa semiglauca), Orange thorn (Pittosporum multiflorum), Rose Walnut (Endiandra discolor), Red Muttonwood (Rapanea subsessilis), Holly Wood (Auranticarpa rhombifolia), Brush Caper Berry (Capparis arborea), Brown Myrtle (Choricarpia leptopetala), Yellow Tulip (Drypetes deplanchei), Red Olive Plum (Elaeodendron australe), Steelwood (Sarcopteryx stipata), Large-leaved Wilkea (Wilkea macrophylla) and Walking-stick Palm (Linospadix monostachya). This community is representative of Regional Ecosystem 12.3.7, which is described as “Narrow fringing community of Eucalyptus tereticornis, Callistemon viminalis, Casuarina cunninghamiana ± Waterhousea floribunda. Other species associated with this RE include Melaleuca bracteata, M. trichostachya and M. fluviatilis in north of bioregion. Lomandra hystrix often present in stream beds. Occurs on Quaternary alluvial plains along watercourses.” **Community 8 - Tall Open Forest (Eucalyptus grandis)** This community occurs in a small number of relict patches close to Little Nerang Creek. It is dominated by Flooded Gum, largely to the exclusion of other canopy species. Depending on recent fire history, this community supports an understorey of vineforest species or dense regrowth of Acacia disparrima. Common shrub species include Bennett’s Ash (Flindersia bennettiana), Smooth Psychotria (Psychotria daphnoides), Currant Bush (Carissa ovata), Toothed Palm Lilly (Cordyline congensta), Chain Fruit (Alyxia ruscifolia), Foambark (Jagera pseudorhus), Celerywood (Polyscias elegans), Scrub turpentine (Rhodamnia rubescens), Scentless Rosewood (Synoum glandulosum), and Tree Heath (Trochocarpa laurina). This community is representative of Regional Ecosystem 12.3.2, which is described as “Eucalyptus grandis ± E. microcorys, Lophostemon confertus tall open-forest with vine forest understorey ('wet sclerophyll'). Patches of Eucalyptus pilularis sometimes present especially in vicinity of sedimentary rocks (e.g. around Palmwoods). Fringing streams and in narrow gullies in high rainfall areas.” **Community 9 – Tall Open Forest (E. tereticornis/Eucalyptus siderophloia)** This community is dominated by Queensland Blue Gum and Northern Grey Ironbark over a vineforest understorey. Hoop Pine is also prominent feature of the canopy. The midstorey supports a variety of species including Brushbox, Bennett’s Ash, Crows Ash, Red Ash, Small-leaved Tuckeroo (Cupaniopsis parvifolia) and Hickory Wattle. Other species present include Smooth Psychotria (Psychotria daphnoides), Currant Bush (Carissa ovata), Chain Fruit (Alyxia ruscifolia), Foambark (Jagera pseudorhus), Celerywood (Polyscias elegans), Scrub turpentine (Rhodamnia rubescens), Scentless Rosewood (Synoum glandulosum), and Tree Heath (Trochocarpa laurina). This community is representative of Regional Ecosystem 12.3.11, which is described as “Open-forest to woodland of Eucalyptus tereticornis, E. siderophloia and Corymbia intermedia. Corymbia tessellaris, Lophostemon suaveolens and Melaleuca quinquenervia frequently occur and often form a low tree layer. Other species present in scattered patches or low densities include Angophora leiocarpa, E. exserta, E. grandis, C. trachyphloia, C. citriodora, E. latisinensis, E. tindaliae, E. racemosa, Melaleuca sieberi and M. viridiflora. E. seeana may be present south of Landsborough. Occurs on Quaternary alluvial plains and drainage lines along coastal lowlands. Rainfall usually exceeds 1000mm/y. Major vegetation communities include:

	12.3.11a: Open-forest of Eucalyptus siderophloia with vine forest understorey. Other canopy species include Corymbia intermedia, Araucaria cunninghamii and Agathis robusta. Frequently occurring understorey species include Flindersia spp., Lophostemon suaveolens, L. confertus, Cupaniopsis parvifolia, Achronychia spp., Alphitonia excelsa and Acacia disparrima. Occurs on sub-coastal Quaternary alluvial plains."
Occurrence of EVR Taxa	Riparian/alluvial vegetation communities support a number of EVR taxa. Bush Nut (Macadamia integrifolia) was recorded from the riparian zone of Little Nerang Creek.
Ecological Condition and Threats	These communities are linear in nature and therefore subject to a suite of threatening processes, particularly weed invasion, with the Nerang River and Little Nerang Creek as major dispersal pathways for weed seed. These forest types also exhibit signs of previous and ongoing disturbance associated with logging, grazing and frequent fire. As all forestry and agricultural activity has now ceased in the study area, the most significant threats to the integrity of dry forest types are inappropriate fire regimes and weed invasion.
Disturbed/Regrowth Communities	
Distribution and Extent	There are three major areas of disturbance within the study area, the largest of which is associated with a former dairy farm in the south of the study area (Numinbah Valley). This area is devoid of remnant vegetation and exhibits poor regenerative potential. Other areas of predominantly regrowth vegetation occur close to the southern intake tower (on the Little Nerang Creek reach of Hinze Dam), including both eastern and western shorelines of that reach, and vegetation in the northeast of the study area, close to an existing walking track and boat ramp (to the south of existing recreational areas).
Species Associations and Equivalent Regional Ecosystems	**Community 10 – Low Open-Closed Forest (Acacia disparrima)** This community varies between an open forest and closed forest in structure, depending on location, aspect and disturbance history. Dominant species are either Hickory Wattle or Blackwood Wattle (Acacia melanoxylon), with scattered regenerating Eucalypt species. Most commonly Hickory Wattle regrowth low open forest dominates the non-remnant areas supporting woody vegetation. This community is not analogous with any described Regional Ecosystem. **Community 11 – Tall Closed Grassland (Setaria spp)** Setaria grassland dominates the area of land between the current full supply level and the existing water level on the banks of Hinze Dam. The community is dominated by Setaria species to the exclusion of other genera. This community is not analogous with any described Regional Ecosystem. **Community 12 - Low Closed Grassland +/- scattered trees** This community is dominated by improved pasture grasses, with scattered, mixed regrowth. Species present typically include Wild Tobacco (Solanum mauritianum), Easter Cassia (Senna pendula), Broad-leaf Pepper Tree (Schinus terebinthifolius), Castor Oil Plant (Ricinus communis), Lantana, Morning Glory (Ipomoea indica), Silver-leaved Desmodium (Desmodium unicinatum) and Scotch Thistle (Cirsium vulgare). This community is not analogous with any described Regional Ecosystem.
Occurrence of EVR Taxa	These communities are devoid of EVR taxa, with one notable exception. A population of the Vulnerable Rough-leaved Bush Nut (Macadamia tetraphylla) and Queensland Nut (Macadamia integrifolia) was recorded under an Acacia canopy (Community 10) in the northeast of the study area.
Ecological Condition and Threats	These communities exhibit poor regenerative potential and limited recruitment of a relatively small number of species of flora. The Acacia communities are generally near-senescent and appear to have stalled at an early successional stage. The Setaria grasslands characterise the area between the current fully supply level of the dam and the current water level. Due to significant fluctations in water level over time, this zone has proven inhospitable to the majority of native flora which might otherwise inhabit the shallow water zone and adjacent shore. Grassland areas with scattered trees characterised a former dairy farm on the Nerang River reach of Hinze Dam. These areas are heavily infested with exotic species and currently exhibit limited regrowth and restricted regenerative potential.

Significant Vegetation Communities

The VM Act classifies Queensland regional ecosystems under three conservation categories as follows:

- *Endangered*- less than 10% of the pre-European extent remains in an intact condition across the bioregion;
- *Of concern*- 10-30% of the pre-European extent remains in an intact condition across the bioregion; and
- *Not of Concern at present*- over 30% of the pre-European extent remains in an intact condition across the bioregion.

Endangered, of concern and threshold regional ecosystems are regarded as significant regional ecosystems. A threshold ecosystem is one where further clearing will cause a change in their conservation status (DNRW 2006). Significant vegetation communities which have been confirmed to occur within the inundation following field investigation are listed in **Table 9-10**.

- **Table 9-10 Significant Vegetation Communities within the Inundation Area**

Regional Ecosystem	Description	Status	Occurrence within the study area
12.3.2	*Eucalyptus grandis* tall open forest on alluvial plains	Of concern	Present, but in very poor condition due to intense wildfire, linear nature and extensive weed invasion.
12.3.11	*Eucalyptus siderophloia*, *E. tereticornis*, *Corymbia intermedia* open forest on alluvial plains usually near coast	Of concern	Restricted to the immediate riparian zone of Nerang River, upstream of Numinbah Environmental Education Centre.
12.11.1	Evergreen notophyll vine forest	Threshold	Restricted to sheltered gullies and south-facing slopes.

Rare or Threatened Species

EPBC Database Records

A search of the EPBC Act Protected Matters Database was made for the study area. This information was used to assess the potential occurrence of nationally threatened flora species listed under the EPBC Act. 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. For the plant species that were listed in the search, their conservation status under the EPBC Act, their preferred habitat and likelihood of occurrence are shown in **Table 9-11.** 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.

Rare or Threatened Flora Recorded in the Study Area

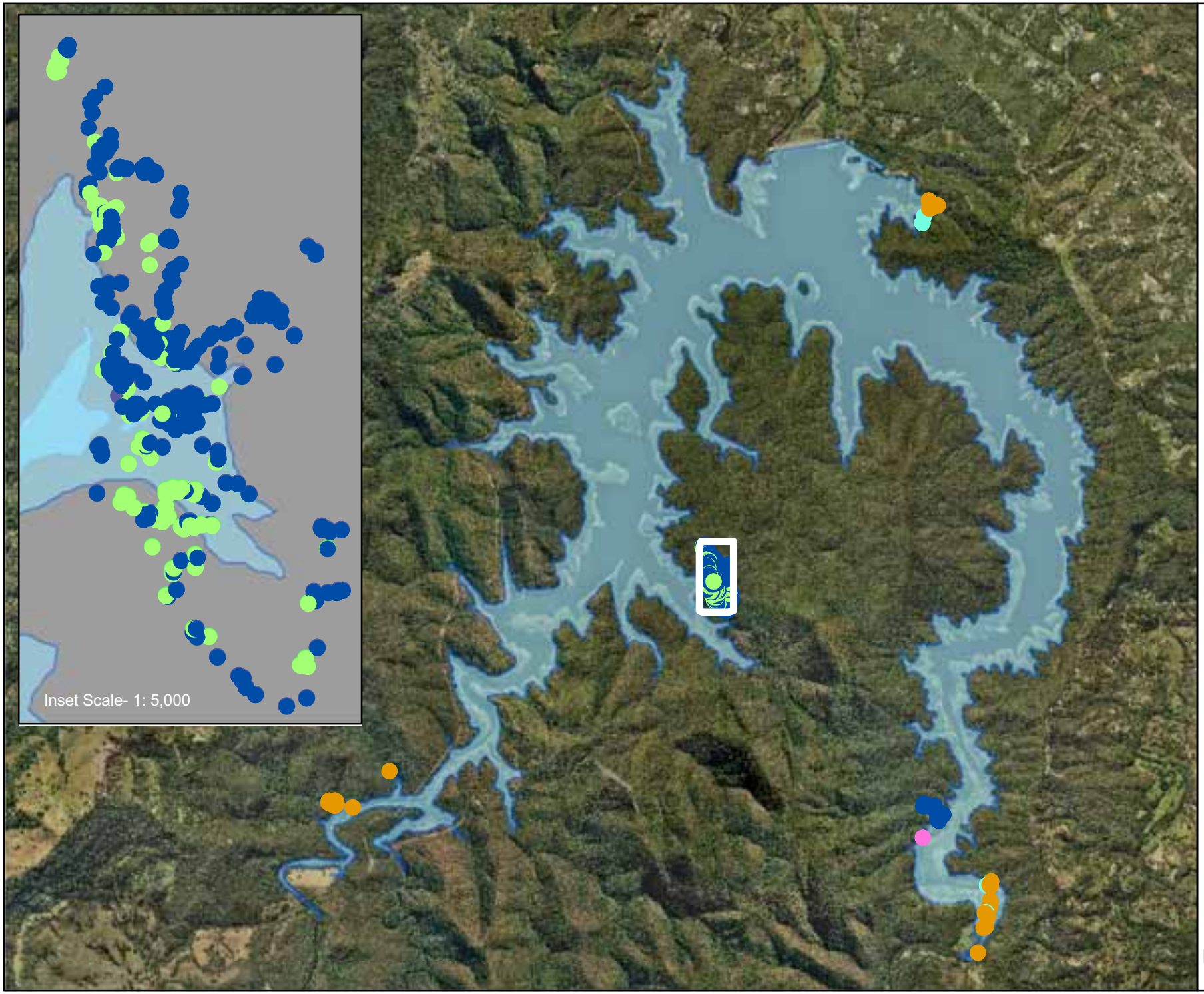
Database searches revealed the potential occurrence of 29 species considered rare or threatened by Commonwealth and State legislation in the study area.

Twenty-two of these species were actually recorded during the field survey. Six EPBC listed plant species were recorded from the Project area; *Randia moorei*, *Owenia cepiodora*, *Bosistoa transversa*, *Macadamia tetraphylla*, *Macadamia integrifolia* and *Plectranthus nitidus*. *Arthraxon hispidus* is included in the Herbrecs database for the study area but was not recorded during field surveys. The distribution of these species in the study area is shown in **Figure 9-6** .

Table 9-11 Likelihood of Occurrence of EPBC Listed Flora Species

Species	Common Name	Status	Habitat	Likelihood of occurrence
Arthraxon hispidus	Hairy-joint grass	V	Variety of wet sclerophyll and rainforest ecosystems	Possible
Austromyrtus fragrantissima	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
Baloghia marmorata	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
Bosistoa selwynii	Heart-leaved Bosistoa	V	Typically occurs on deep basaltic soils in subtropical rainforest.	Unlikely
Bosistoa transversa	Three-leaved Bosistoa	V	Typically occurs on deep basaltic soils in subtropical rainforest.	Present within the CID, beyond the impact area
Bulbophyllum globuliforme	Miniature Moss orchid	V	This species is restricted to high elevation (above 300m) rainforests.	Unlikely
Clematis fawcettii	Stream Clematis	V	Streams within wet sclerophyll forest and rainforest.	Possible
Cryptocarya foetida	Stinking Cryptocarya	V	Primarily an inhabitant of littoral and sub-littoral rainforest types	Unlikely
Cryptostylis hunteriana	Leafless Tongue orchid	V	This species is restricted to coastal, sandy habitat types	Unlikely
Cyperus semifertilis	-	V	This species occurs in wet situations in lowland Eucalypt forest types, typically on alluvium.	Unlikely
Diploglottis campbelli	Small-leaved Tamarind	E	Range of wet forest types, from lush subtropical rainforest to notohpyll vineforest with Brushbox elements.	Possible
Endiandra floydii	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
Endiandra hayesii	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
Floydia praealta	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
Fontainea australis	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
Hicksbeachia pinnatifolia	Monkey Nut	V	Range of wet forest types, from lush subtropical rainforest to notohpyll vineforest with Brushbox elements.	Possible

Species	Common Name	Status	Habitat	Likelihood of occurrence
Macadamia integrifolia	Macadamia Nut	V	Range of wet forest types, from lush subtropical rainforest to notohpyll vineforest with Brushbox elements.	Present (in hybrid form)
Owenia cepiodora	Onionwood	V	This species occurs in subtropical and dry rainforest, typically on or near soils derived from basalt.	Present
Plectranthus nitidus	-	E	*P. nitidus* grows on rocky cliff faces and boulders, in the shelter and shade provided by the adjacent rainforest.	Present
Sarcochilus hartmannii	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.
Sophora fraseri	-	V	Range of rainforest types, including subtropical rainforest and notophyll vineforest.	Possible
Syzygium hodgkinsoniae	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
Syzygium moorei	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
Zieria collina	-	V		Unlikely



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Kilometres

Scale -1:50,000

Projection: MGA Zone 56

Legend

Species

- Randia moorei
- Owenia cepiodora
- Macadamia tetraphylla
- Macadamia integrifolia
- Plectranthus nitidus

Figure 9-6

Location of EPBC Listed Flora

Hinze Dam Stage 3 EIS

Table 9-12 lists the rare and threatened flora species observed during the field surveys or recorded from database records within the study area and details their conservation status under the EPBC Act and the NCA. This list includes species scheduled as:

- Rare, vulnerable or endangered under the NCA; and
- Vulnerable or endangered under the EPBC Act.

In addition, a total of forty-two (42) species considered to be of citywide significance (by Gold Coast City Council) were recorded from the study area, these are listed in full in the species inventory for the Project.

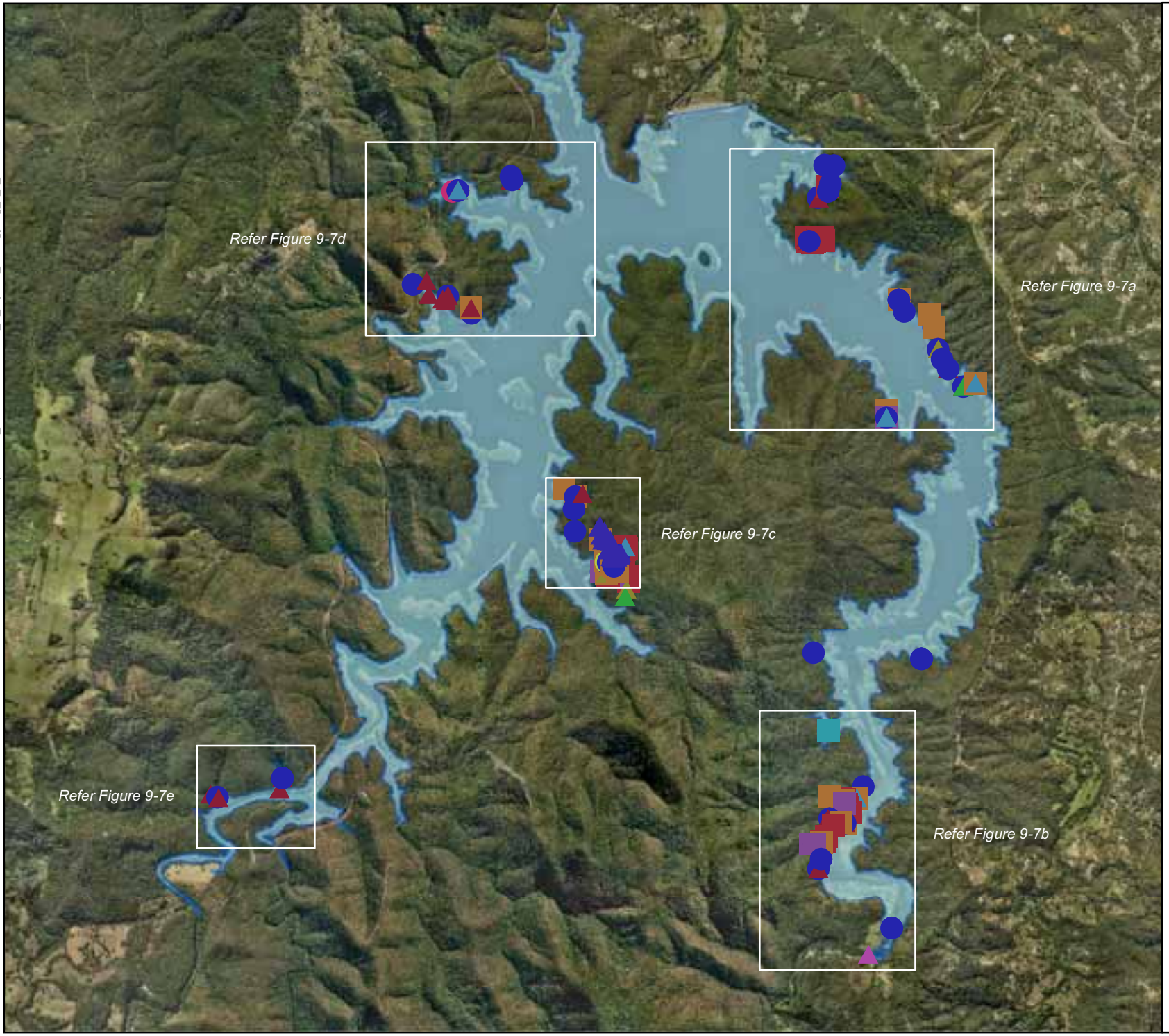
Table 9-12 Rare or Threatened Plant Species Recored in Study Area

Species	Common Name	Status	Source
Acacia orites	Mountain wattle	R (Q)	FS
Acronychia baeuerlenii	Byron Bay acroychia	R (Q)	QH
Archidendron muellerianum	Veiny laceflower	R (Q)	FS
Argophyllum nullumense	Silverleaf	R (Q)	FS, QH, G
Arthraxon hispidus	Hairy-joint grass	V (A)	QH
Beyeria lasiocarpa	-	R (Q)	FS
Bosistoa transversa	Three-leaved bosistoa	V (A)	QH
Brunoniella spicifilora	-	R (Q)	FS, G
Callerya australis	Native wisteria	R (Q)	FS, QH
Cassia marksiana	Brush Cassia	R (Q)	FS, G
Cupaniopsis newmanii	Long-leaved tuckeroo	R (Q)	FS, QH, G
Cyperus rupicola	-	R (Q)	QH
Diploglottis campbellii	Small-leaved tamarind	E (A and Q)	QH
Helicia ferruginea	Rusty oak	R (Q)	FS, QH, G
Helmholtzia glaberrima	Stream lily	R (Q)	QH
Lepiderema pulchella	Fine-leaved tuckeroo	R (Q)	FS
Macadamia integrifolia	Queensland nut	V (A and Q)	FS, QH
Macadamia tetraphylla	Macadamia nut	V (A and Q)	FS, QH
Marsdenia hemiptera	Rusty vine	R (Q)	FS, QH
Owenia cepiodora	Onion wood	V (A and Q)	FS
Pararistolochia praevenosa	Richmond birdwing butterfly vine	R (Q)	FS, QH, G
Plectranthus nitidus	-	E (A and Q)	FS, QH
Randia moorei	Spiny gardenia	E (A and Q)	FS, QH
Rhodamnia maideniana	Smooth scrub turpentine	R (Q)	FS, QH, G
Ricinocarpos speciosus	Smooth-bark rose-apple	V (Q)	QH
Senna acclinis	Rainforest cassia	R (Q)	FS
Symplocos harroldii	Hairy hazelwood	R (Q)	FS
Tinospora tinosporoides	Southern arrow-head vine	V(Q)	FS
Westringia blakeana	-	R (Q)	QH
Westringia rupicola	-	V (A and Q)	QH
Status: E – endangered V – vulnerable R – rare CS – culturally significant	Listing: Q – Queensland *Nature Conservation Wildlife Regulation 1994* A – Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* GC – Gold Coast City Council's Nature Conservation Strategy	Source: FS – Field Survey QH – Queensland Herbarium GC – Gold Coast City Council G – Gold Coast and Hinterland Environment Council (Gecko)	

The distribution and abundance of Rare and Threatened species listed under the NCA and recorded from the study area is discussed in **Table 9-13** below, and shown in **Figure 9-7** and **Figure 9-7a to 9-7e**.

Table 9-13 Distribution & Abundance of Recorded Rare or Threatened Flora

Species	Distribution and Abundance
Acacia orites	This species is very restricted in it's occurrence, and was present at only one flora survey site, within Regional Ecosystem 12.11.1
Archidendron muellerianum	Approximately 50 individuals of this species were recorded primarily from the Nerang River reach of the dam in Regional Ecosystem 12.11.3.
Argophyllum nullumense	This species is prolific within Regional Ecosystem 12.11.3 across the study area, with over 400 individuals recorded from flora survey sites.
Beyeria lasiocarpa	This species is very restricted in it's occurrence, and was present at only one flora survey site, within Regional Ecosystem 12.11.1
Brunoniella spicifilora	This species is prolific within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with several hundred individuals recorded from flora survey sites.
Carronia multiseplaea	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 50 specimens recorded from flora survey sites.
Callerya australis	This species is restricted in its occurrence across the study area, with 11 specimens recorded from Regional Ecosystem 12.11.1.
Cassia marksiana	This species is restricted in its occurrence across the study area, with less than 20 specimens recorded from Regional Ecosystem 12.11.3.
Cupaniopsis newmanii	This species is prolific within Regional Ecosystem 12.11.3 across the study area, with over 1000 individuals recorded from flora survey sites.
Helicia ferruginea	This species is restricted in its occurrence across the study area, with less than 10 specimens recorded from Regional Ecosystem 12.11.1.
Lepiderema pulchella	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 80 individuals recorded from flora survey sites. Records from the study area represent a minor range extension for this species.
Macadamia integrifolia	This species is restricted to several small patches and less than 30 individuals. The largest number of plants is found in Acacia regrowth.
Macadamia tetraphylla	This species is restricted to several small patches, although a fairly large number of individuals was recorded, with 80-90 plants present in the study area. The largest number of plants is found in Acacia regrowth.
Marsdenia hemiptera	This species is restricted in its occurrence across the study area, with less than 10 specimens recorded from Regional Ecosystem 12.11.1.
Owenia cepiodora	This species is restricted to a single patch of Regional Ecosystem 12.11.1 in the central portions of the study area. Approximately 90 individuals were recorded.
Pararistolochia praevenosa	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 50 specimens recorded from flora survey sites.
Plectranthus nitidus	This species is restricted to a single, isolated patch close to Little Nerang Creek in the southern portion of the study area.
Randia moorei	This species occurs in three discrete sub-populations of approximately 750, 22 and 1 individual specimen, restricted to Regional Ecosystem 12.11.1.
Rhodamnia maideniana	This species is common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 400 specimens recorded from flora survey sites.
Senna acclinis	This species is restricted in its occurrence across the study area, with less than 10 specimens recorded from Regional Ecosystem 12.11.3.
Symplocos harroldii	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 80 specimens recorded from flora survey sites. Records from the study area represent a range extension for this species.
Tinospora tinosporoides	This species was recorded as a single individual within RE 12.11.1, northwest of the Nerang River bridge at Numinbah and outside of the impact area.



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Kilometres

Scale - 1:50,000

Projection: MGA Zone 56

Legend

Species

- *Acacia orites*
- *Archidendron muellerianum*
- *Argophyllum nullamense*
- *Brunoniella spiciflora*
- *Cassia marksiana*
- *Callerya australis*
- *Cupaniopsis newmanii*
- *Helicia ferruginea*
- *Lepiderema pulchella*
- *Marsdenia hemiptera*
- *Pararistolochia praevenosa*
- *Rhodamnia maideniana*
- *Senna acclinis*
- *Symplocos harroldii*
- Proposed FSL 94.5m

Figure 9-7

Location of NCA Listed Flora

Hinze Dam Stage 3 EIS

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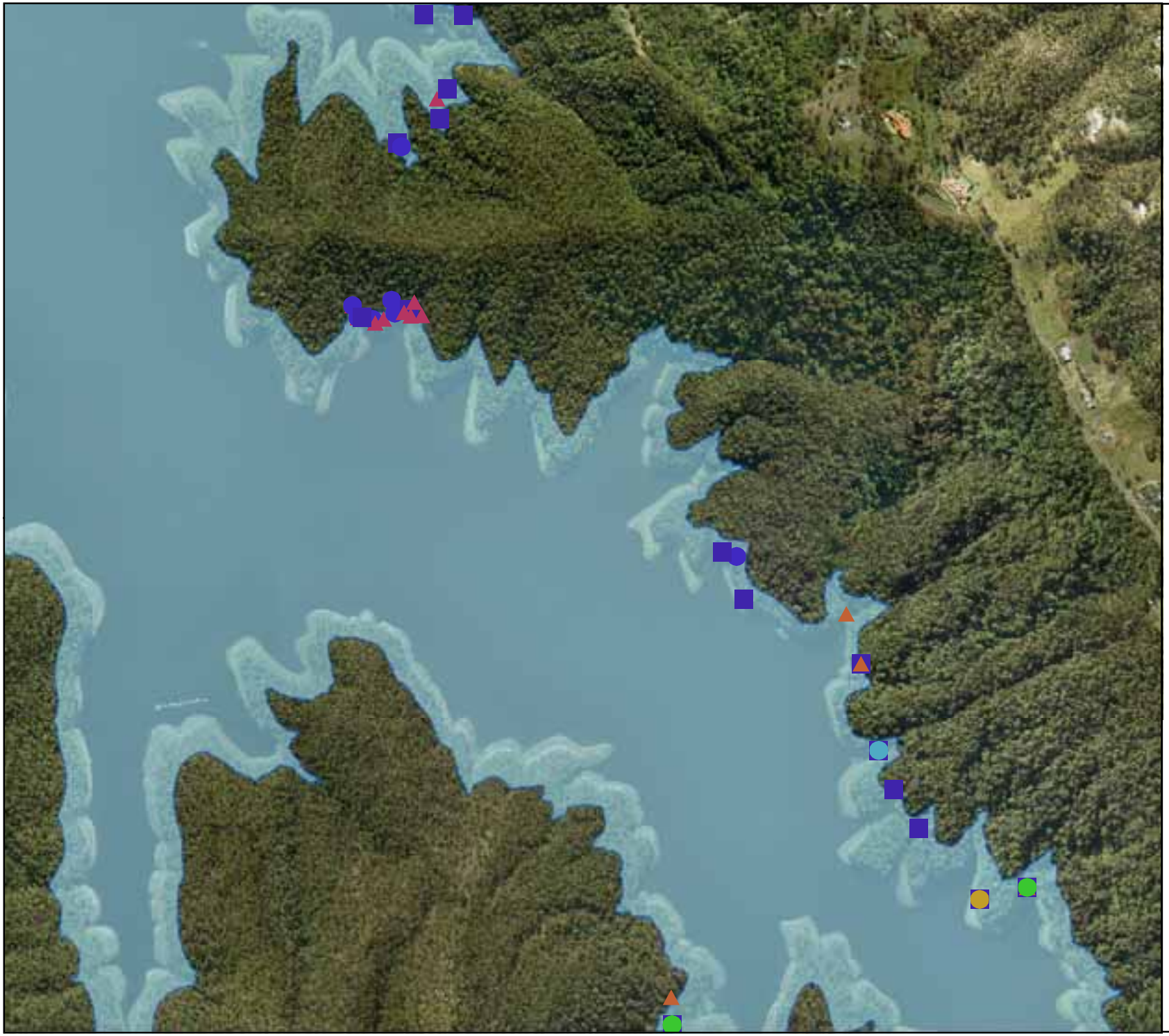

N

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Metres

Scale - 1:12,500

Projection: MGA Zone 56

Legend

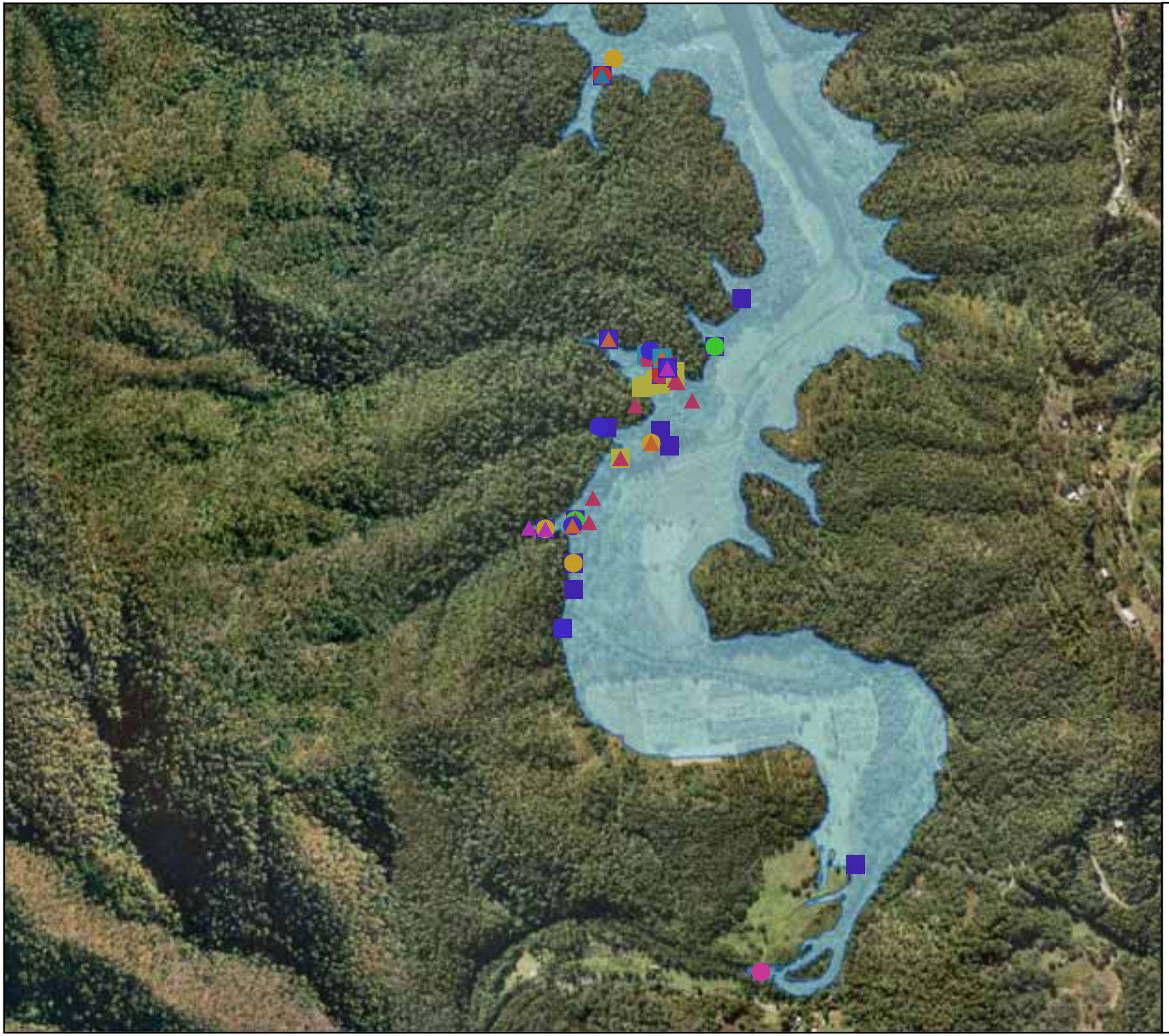
Species

- *Acacia orites*
- *Argophyllum nullamense*
- *Brunoniella spiciflora*
- *Cassia marksiana*
- *Cupaniopsis newmanii*
- *Helicia ferruginea*
- *Pararistolochia praevenosa*
- *Rhodamnia maideniana*
- *Symplocos harroldii*
- Proposed FSL (94.5m)

Figure 9-7a

Location of NCA Listed Flora

Hinze Dam Stage 3 EIS



N

0 125 250 500

Metres

Scale - 1:12,500

Projection: MGA Zone 56

Legend

Species

- *Archidendron muellerianum*
- *Argophyllum nullamense*
- *Brunoniella spiciflora*
- *Callerya australis*
- *Cassia marksiana*
- *Cupaniopsis newmanii*
- *Helicia ferruginea*
- *Lepiderema pulchella*
- *Pararistolochia praevenosa*
- *Rhodamnia maideniana*
- *Senna acclinis*
- *Symplocos harroldii*
- Proposed FSL (94.5m)

Figure 9-7b

Location of NCA Listed Flora

Hinze Dam Stage 3 EIS

N

0 50 100 200

Metres

Scale - 1:5,000

Projection: MGA Zone 56

Legend

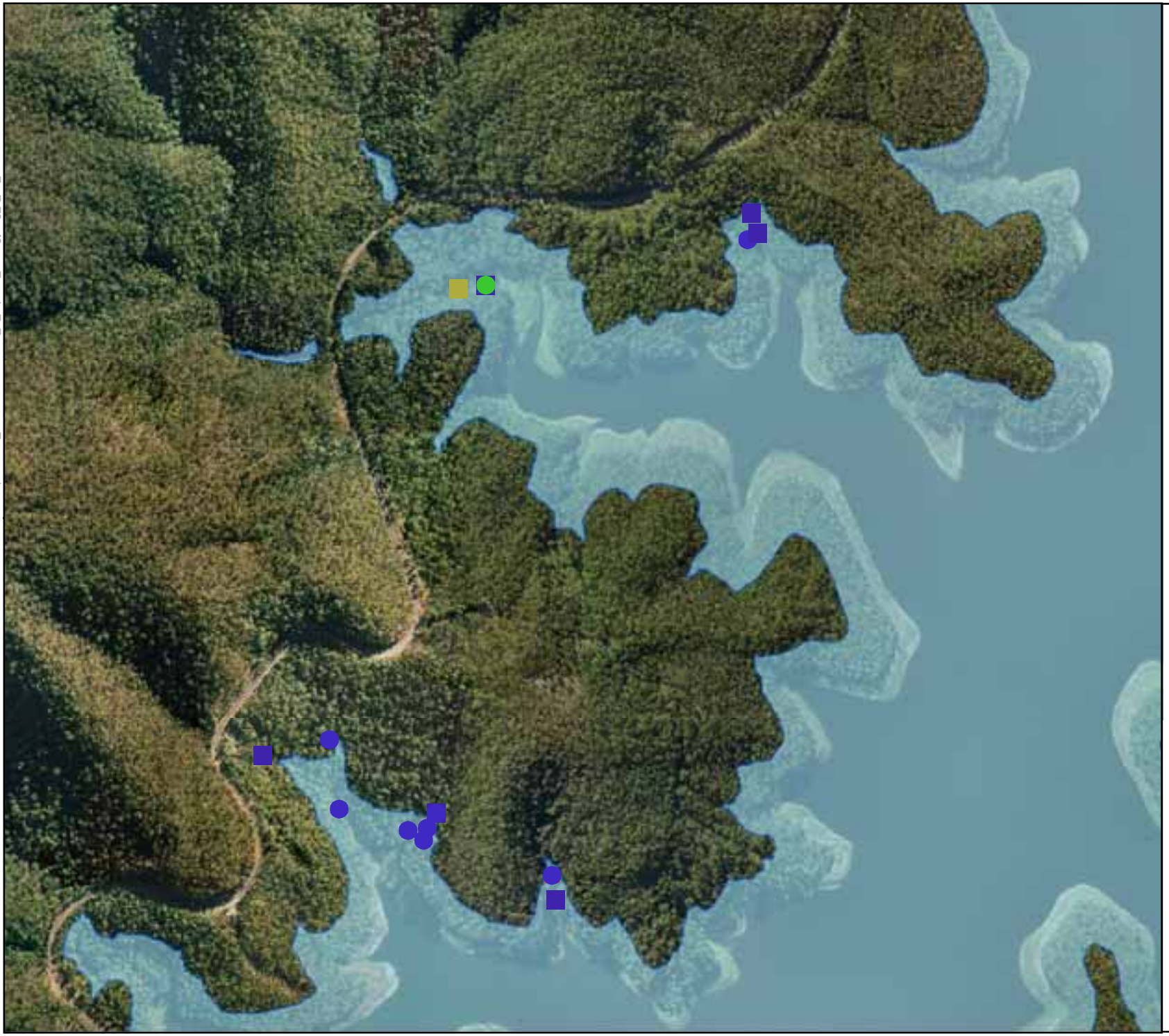
Species

- *Acacia orites*
- *Argophyllum nullamense*
- *Brunoniella spiciflora*
- *Cassia marksiana*
- *Cupaniopsis newmanii*
- *Marsdenia hemiptera*
- *Pararistolochia praevenosa*
- *Rhodamnia maideniana*
- *Symplocos harroldii*
- Proposed FSL (94.5m)

Figure 9-7c

Location of NCA Listed Flora

Hinze Dam Stage 3 EIS



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Metres

Scale - 1:10,000

Projection: MGA Zone 56

Legend

Species

- *Argophyllum nullamense*
- *Brunoniella spiciflora*
- *Cupaniopsis newmanii*
- *Lepiderema pulchella*
- *Rhodamnia maideniana*
- *Symplocos harroldii*
- Proposed FSL (94.5m)

Figure 9-7d

Location of NCA Listed Flora

Hinze Dam Stage 3 EIS

N

0 50 100 200

Metres

Scale - 1:5,000

Projection: MGA Zone 56

Legend

Species

- *Argophyllum nullamense*
- *Cupaniopsis newmanii*
- *Senna acclinis*
- Proposed FSL (94.5m)

Figure 9-7e

Location of NCA Listed Flora

Hinze Dam Stage 3 EIS

The field survey has increased the understanding of the distribution, abundance and habitat requirements of a number of significant flora species, including nationally endangered and vulnerable species. Significant findings include the following:

- prior to this survey, the population of Randia moorei at Brunswick Heads Nature Reserve (northern NSW) was the largest on the public record, with approximately 60 individuals recorded. At the time of preparation of the draft recovery plan for Spiny Gardenia there were 33 verified sites known to support 121 mature plants and 98 juvenile plants in NSW. In Queensland there were only 11 recorded sites supporting only 15 individuals. Findings to date estimate the Hinze population at some 1500 individuals, increasing the known population almost tenfold;
- in 1977, there were only two Owenia cepiodora trees known in existence. In 1979 a publicity campaign requested information about the location of any other specimens. A total of 30 trees were located, of which 29 were in NSW. The one tree located in Queensland was at Stockyard Creek, Lamington National Park. In subsequent years additional populations were discovered, however, mature trees were thought to be extremely restricted in occurrence. Prior to the discovery of the Hinze population, there were approximately 10 mature trees known in Queensland and 100+ regenerating saplings. Findings to date estimate the Hinze population at approximately 300 plants, many of which are mature or semi-mature;
- the previously known ranges of the rare plant species Symplocos harroldii and Lepiderema pulchella have been extended;
- two additional populations of Plectranthus nitidis (nationally endangered) have been discovered. This species had previously been recorded from less than five sites in Queensland;
- populations numbering several hundred individuals of the nationally vulnerable Macadamia tetraphylla and Bosistoa transversa have been recorded from the study area (but outside impact areas); and
- a population of the vulnerable Tinospora tinosporoides was recorded. This species is known from very few sites in Queensland.

The discovery and description of previously unrecorded populations of a suite of EVR flora taxa presents a unique (and previously unavailable) opportunity to promote their conservation and recovery.

The Queensland Herbarium has been advised of these finds and joint inspections have been completed with senior botanists of that department. The significance of these findings have been discussed with EPA/Herbarium staff and several conservation priorities established. All EVR taxa recorded from the study area require targeted conservation or offset approaxches, however, several species are of heightened concern because of their known or suspected rarity at the local and landscape scale. These species are:

- *Randia moorei*;
- *Owenia cepiodora*; and
- *Symplocos harroldii*.

Flora Species Inventory for the Study Area

Six-hundred and twenty-eight (628) terrestrial flora species were recorded from the study area, with dominant families typically including *Myrtaceae*, *Lauraceae*, *Sapotaceae*, *Meliaceae*, *Sapindaceae*, and *Rutaceae*. A full species inventory is provided in **Appendix F.9.2**.

Weeds and Exotic Flora

A total of twenty-one exotic species were recorded during the field survey. Of these, three are declared weeds listed under the *Land Protection (Pest and Stock Route Management) Act 2002* (Qld). A list is provided in **Table 9-14**.

Table 9-14 Declared Pest Plants

Species	Common Name	Class
**Aristolochia elegans*	Dutchman's Pipe	3
**Lantana camara var. camara*	Lantana	3
**Macfadyena unguis-cati*	Cat's claw vine	3

Note: Declared under *Land Protection (Pest and Stock Route Management) Act 2002 (Qld)*

9.4.3 Terrestrial Fauna

Habitats within the Study Area

The main habitat features within the study area comprise:

- Dry Eucalypt open forest dominated by Spotted Gum, Narrow-leaved and Broad-leaved Red Ironbarks, Northern Grey Ironbark, Tindale's Stringybark and Nroad-leaved White Mahogany, with sparse or shrubby understorey;
- Wet Eucalypt open forest dominated with Brushbox, Tallowwood and Small-fruited Grey Gum or Flooded Gum with a rainforest understorey;
- Rainforest with thick understorey in steep, sheltered gullies draining into the lake;
- Ephemeral and permanent pools on rocky streams and gullies draining into the lake;
- Riparian vegetation associated with permanent creeks and rivers upstream of the dam;
- Pigeon Grass dominated floodplains of Little Nerang Creek upstream of the dam; and
- Acacia regrowth.

Although much of the habitat within the study area has been lost through inundation from Stages 1 and 2 of the Hinze Dam, relatively extensive areas of remnant eucalypt open forest and rainforest remain in the areas surrounding the dam, and provide substantial habitat opportunities for native fauna. This vegetation is in relatively good condition, however, there are varying levels of disturbance for vehicular access and from weeds, fire and past logging/grazing activities, as described below.

Weeds are prevalent across the study area, in particular along the banks of the lake (where a single species, Setaria sphacelata dominates) and in forest communities where recolonisation of weeds (mainly lantana) has occurred after disturbance from fire.

In October 2004, an intense bushfire spread across the study area. The bushfire burnt through most of the forest on the western side of the dam along the area colloquially known as "Conrod Straight". It is also understood that prescribed burning has occurred at Hinze Dam in the past for bushfire control purposes. Disturbance from fire has resulted in a dense regrowth of understorey and midstorey vegetation in these areas, but a reduction in suitable ground habitat, such as leaf litter, logs and sticks.

There is also evidence that the majority of the remnant vegetation within the study area has been subject to past logging and thinning/grazing activities. There is a distinct lack of mature and over mature (old growth) canopy elements. The sheltered rainforest gullies appear to be the only exception to this general pattern, most likely due to the steep terrain and presence of a dense rainforest understorey which prevented logging and grazing activities occurring in these areas.

Areas of Acacia regrowth occur in patches along the upper reaches of the dam. These areas were modified through historic clearing of vegetation from past agricultural activities and often exhibit limited regenerative potential.

The habitat at each of the systematic fauna survey sites is described in **Table 9-15**.

Table 9-15 Habitats within the Study Area

Survey Site	Habitat Description
1	Simple notophyll vine forest found within steep sheltered gully draining into the dam (RE 12.11.1). This habitat type provides high habitat diversity and value for native fauna. The rainforest canopy and dense rainforest understorey provides habitat for birds, bats and mammals. A steep, rocky stream drains through the gully and consists of ephemeral pools providing habitat for some stream dwelling frogs, although ephemeral in nature.
2	Open eucalypt forest (RE 12.11.5). This is the most common habitat type found within the study area, and surrounds the majority of the dam. Within this habitat area there is a low availability of ground microhabitat including leaf litter, logs and branches, and the understorey is sparse, most likely due to frequent fire. Large tree hollows are also sparse, most likely due to disturbance from historic logging activities, with medium and small tree hollows more typical.
3	Open eucalypt forest (RE 12.11.5). Within this habitat area there is a low availability of ground microhabitat including leaf litter, logs and branches, and the under-storey is sparse, most likely due to disturbance from fire and grazing activities. Large tree hollows are also sparse, most likely due to disturbance from historic logging activities, with medium and small tree hollows more typical.
4	Gully vine forest with dense rainforest understorey and hoop pine emergents (RE 12.11.1). Within the habitat area there are rocky streams which drain into the dam consisting of ephemeral pools with emergent aquatic vegetation providing habitat for stream dwelling frogs.
5	Open eucalypt forest (12.11.3). This habitat area is steep and has a moderate availability of ground microhabitat including leaf litter, logs and branches. Large tree hollows are sparsely distributed, most likely due to disturbance from historic logging activities, with medium and small tree hollows more typical. A vehicular access tracks runs to the west of this habitat area.
6	Open eucalypt forest (RE 12.11.5). This habitat is contiguous with similar habitat in the Numinbah Forest Reserve to the south of the study area. Habitat diversity within this area is enhanced by moderate availability of ground microhabitat including leaf litter, logs and branches, which provide habitat for ground dwelling species. Both the understorey and presence of tree hollows are sparse, most likely due to disturbance from grazing and logging activities. A scout's hut and vehicular access tracks exist within the habitat area.
7	Notophyll Vine forest under a very tall canopy of Flooded Gum (12.11.1/12.11.3). A stream runs through the habitat area, and consists of ephemeral and permanent pools which provides habitat for stream and pool dwelling frogs.

Wildlife Corridors

The remnant vegetation within the study area is of significance in that it forms part of a larger mosaic of forests that are interconnected and includes Numinbah Forest Reserve, Springbrook National Park, Lamington National Park, Border Ranges National Park and Canungra Land Warfare Centre. The EPA's Biodiversity Planning Assessment (BPA) for the study area shows that the majority of the vegetation surrounding the dam is classified as having regional significance. The vegetation in the south-western corner of the study area has state significance and forms part of a declared State Wildlife Corridor. The corridor provides connectivity for flora and fauna between the forests of Springbrook and Lamington National Park in the south, through Numinbah Forest Reserve to Canungra in the west. The wildlife corridor is restricted to areas of riparian vegetation along the upper reaches of the dam and Nerang River as vegetation communities are fragmented by the existing inundation area throughout the remainder of the study area.

Fauna Recorded from the Study Area

Fauna surveys completed in February 2007 recorded a total of 204 species of terrestrial vertebrates from the study area. A list of these fauna species is included in **Appendix F.9.2**, and further detail is provided below. This is not intended as a comprehensive list of the fauna expected to utilise the study area, but provides a good indication of the fauna present during a late summer season survey. Additional survey effort over the winter period may yield further species diversity.

The fauna survey detected a relatively high diversity of terrestrial vertebrate fauna, reflecting the large area of intact remnant vegetation communities surrounding the Hinze Dam.

A search of the Queensland Museum and Birds of Australia databases was undertaken to identify species that have been recorded from the study area, and fauna records are included in **Appendix F.9.2.**

Amphibians

A total of 17 species of amphibians were observed within the study area. Frogs encountered were associated with streams and gullies draining into the Hinze Dam, and along the banks of the dam. The majority of frog species recorded are common and widespread within south-east Queensland. The Great Barred Frog (*Mixophyes fasciolatus*) and the Stony Creek Frog (*Litoria wilcoxii*) were found calling within the sheltered rainforest lined gullies. Other species recorded from the study area include

- Beeping Froglet (*Crinia parinsignifera*);
- Common Eastern Froglet (*Crinia signifera*);
- Striped Marsh Frog (*Limnodynastes peroni*);
- Great Brown Broodfrog (*Pseudophryne major*);
- Copper-backed Broodfrog (*Pseudophryne raveni*);
- Red-eyed Tree Frog (*Litoria chloris*);
- Eastern Dwarf Tree Frog (*Litoria fallax*);
- Dainty Tree Frog (*Litoria gracilenta*);
- Broad-palmed Frog (*Litoria latopalmata*);
- Rocket Frog (*Litoria nasuta*);
- Emerald-spotted Tree Frog (*Litoria peronii*);;
- Desert Tree Frog (*Litoria rubella*) and
- Laughing Tree Frog (*Litoria tyleri*).

Only one species of conservation significance was recorded. The Tusked frog (*Adelotus brevis*), listed as vulnerable under the NCA, was heard calling from several locations within the study area, including disturbed areas around the edges of the dam, at both the dam wall and along the Nerang River stretch, as well as from riparian habitat adjacent to Little Nerang Creek upstream of the dam.

There are records of the endangered Giant Barred Frog (*Mixophyes iteratus*) from the periphery of the study area in the Nerang River, upstream from the inundation area. The species is known to occur at Pocket Road Bridge, and as such may be impacted by proposed works. The endangered Fleay's Barred Frog (*Mixophyes fleayi*) also occurs in the Numinbah Valley, although no known sites will be impacted by the Project.

The most common and abundant species recorded was the introduced Cane Toad (*Bufo marinus*).

The endangered Cascade Tree Frog (*Litoria pearsoniana*) and rare Whirring Tree Frog (*Litoria revelata*) and Pouched Frog (*Assa darlingtoni*) were recorded from Springbrook plateau during the survey period, indicating that the timing of the survey was adequate to detect these species. None of these species was recorded from the study area.

Reptiles

Twenty-three species of reptile were recorded during the fauna survey. The majority of reptile species recorded are commonly found in south-east Queensland, with the exception of the Rare Common Death Adder (*Acanthophis antarcticus*). This species was recorded from a single specimen within Regional Ecosystem 12.11.3 in vegetation dominated by Tallowwood, Grey Gum and Brushbox.

The most widespread and abundant species were the Wall Skink (*Cryptoblepharus virgatus*) and *Lampropholis delicata*. A single saw-shelled turtle (*Elseya latisternum*) was observed in the rock pools of a stream draining into the dam within RE 12.11.5.

Native Geckoes were conspicuous by their absence during the field survey, and it is likely that several species are present, including *Gehyra dubia* and *Oedura robusta*, which are locally abundant. The Leaf-tailed Gecko (*Saltuarius swaini*), which was readily detected on Springbrook Plateau during the survey period, was not recorded from the study area, reflecting a defined altitudinal gradient between high and low elevation herpetofauna in the broader region.

Birds

A total of 131 bird species were observed within the study area, including a mixture of wading birds, woodland species, diurnal and nocturnal raptors. Of the birds observed, four species are listed as rare or threatened under the NCA and NCS. These include the vulnerable Glossy-black Cockatoo (*Calyptorhynchus lathami*), and the rare Grey Goshawk (*Accipiter novaehollandiae*), Sooty Owl (*Tyto tenebricosa*) and Red-browed Treecreeper (*Climacteris erythrops*). No bird species listed as endangered or vulnerable under the EPBC Act were encountered during the field survey.

Several of the bird species observed are also listed under the Japanese Australian Migratory Bird Agreement (JAMBA) or the Chinese Australian Migratory Bird Agreement (CAMBA) for the conservation of migratory birds and their habitats, and as such are protected under the EPBC Act. These include the Great Egret (*Ardea alba*), Cattle Egret (*Ardea ibis*), Osprey (*Pandion haliaetus*), White-bellied sea-eagle (*Haliaeetus leucogaster*) and the Rainbow bee-eater (*Merops ornatus*). These species are also recognised as special cultural significance under the Gold Coast's Nature Conservation Strategy.

Mammals

Thirty-six species of mammal were recorded during the fauna survey. The open eucalypt forest sites yielded the highest ground mammal diversity, with a relatively low diversity observed in the wetter Eucalypt and rainforest gully sites. The Bush rat (*Rattus fuscipes*) was the most commonly recorded species, and was widely distributed across the study area. Trapping in the rainforest gullies also yielded the Fawn-footed Melomys (*Melomys cervinipes*). Species observed in the open eucalypt forest include Yellow-footed Antechinus (*Antechinus flavipes*), Common Dunnart (*Sminthopsis murina*), Northern Brown Bandicoot (*Isoodon macrourus*), Grassland Melomys (*Melomys burtoni*), Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*). The Water Rat (*Hydromys chrysogaster*) was recorded from the lake margins.

The Eastern Chestnut Mouse is a notable species at a local level. The GCCC Nature Conservation Strategy lists this species as "possibly present but not recorded from the Gold Coast". The Eastern Chestnut Mouse was recorded at a single, recently burnt site which is consistent with the observed preference of this species for post-fire successional vegetation types.

The Swamp Wallaby (*Wallabia bicolour*) was observed along the upper reaches of the dam at Little Nerang Creek. The Red-necked Wallaby (*Macropus rufogriseus*) was encountered along Little Nerang Road on the eastern side of the dam, but was not observed within the inundation area.

Arboreal mammals were relatively scarce but typically diverse with the Common Brushtail Possum (*Trichosurus vulpecula*), Mountain Brushtail Possum (*Trichosurus caninus*), Common Ringtail Possum (*Pseudocheirus peregrinus*), Sugar Glider (*Petaurus breviceps*), Koala (*Phascolarctos cinereus*), Feathertail Glider (*Acrobates pygmaeus*) and Greater Glider (*Petauroides volans*) recorded.

The low abundance of arboreal mammals is most likely due to the relatively low abundance of mature (large), hollow-bearing trees within the study area when compared to "old-growth" forests of the region, and the recent bushfire which burnt through a substantial proportion of the study area in 2002.

During the field survey, 10 species of microchiropteran bats were either observed in the harp traps or recorded using the ANABAT II bat detector. The Southern Myotis (*Myotis macropus*) was the most commonly recorded and abundant species. Harp trapping within rainforest gullies/streams yielded an abundance of this species, with approximately 30 individuals trapped in one night on the upper reach of Little Nerang Creek. Over 2000 passes of Southern Myotis were recorded via Anabat per night at several sites in the study area.

Other species include the Eastern Horseshoe Bat (*Rhinolophous megaphyllus*), White-striped Mastiff Bat (*Tadarida australis*), Gould's Wattled Bat (*Chalinolobous gouldi*), Little Bentwing Bat (*Miniopterus australis*), Eastern Freetail Bat (*Mormopterus norfolkensis*), Eastern Long-eared Bat (*Nyctophilus bifax*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), and *Vespadelus pumilis/vulturnus*.

The Southern Myotis commonly roosts in tree hollows and caves, often close to water and flies close to the surface of rainforest streams and large lakes/reservoirs to feed on aquatic insects and small fish. Likewise, the Little Bentwing Bat, Eastern Horseshoe Bat and Common Bent-wing Bat primarily roost in caves or artificial subterranean roosts. It is likely that several roosts for these species exist within or in the vicinity of the inundation area. The high abundance of Southern Myotis (indicated both by the number of trapped individuals and inferred from the high number of Anabat call sequence files attributable to this species) suggests that significant roost sites may be present surrounding Hinze Dam. Such sites are likely to be located on prominent rocky outcrops such as Pages Pinnacle, whilst opportunistic roosting may occur on minor rock faces and boulder piles.

The White-striped Mastiff Bat, Greater Broad-nosed Bat, Eastern Freetail Bat, Eastern Long-eared Bat and Gould's Wattled Bat commonly roosts in tree hollows, with opportunistic roosting in the foliage of trees and dense vegetation. There is an abundance of potential roost sites for hollow dependent microchiroptera in the study area.

Three species of megachiroptera (fruit bats or flying foxes) were also recorded during the field survey. The Grey-headed Flying-fox (*Pteropus poliocephalus*) was commonly observed within the study area feeding on the blossoms of eucalypt trees. The Black Flying Fox (*Pteropus alecto*) and Eastern Tube-nosed Bat (*Nyctimene robinsoni*) were also recorded, however less abundantly. No camp sites for the flying foxes were observed within the study area.

Invertebrates

A targeted survey of invertebrates was not completed. However, field survey teams noted the occurrence of the larval food plants of the endangered moth *Phyllodes imperialis* and the vulnerable Richmond Birdwing Butterfly (*Onithoptera richmondiana*).

Pests or Introduced Fauna

Six species of introduced fauna were observed within the study area during the field survey including several species listed under the *Land Protection Regulation* 2002 (class 2 pest animals). **Table 9-16** lists these species. All of these species were commonly encountered throughout the study area.

Table 9-16 Pest and Introduced Fauna Observed within the Study Area

Species	Common Name	Status
Bos taurus	Cattle	Introduced
Bufo marinus	Cane toad	Introduced
Canis familaris	Dog	Class 2
Felis cattus	Cat	Class 2
Oryctolagus cuniculus	Hare	Introduced
Mus musculus	House mouse	Introduced
Class 1 - Not generally established in Queensland and has potential to cause an adverse economic, environmental or social impact. Class 2 - Established in Queensland and can cause significant adverse economic, environmental or social impact. Class 3 - Established in Queensland and has or could have adverse economic, environmental or social impact.		

Fauna of Conservation Significance

Rare or Threatened Species

Fauna species which are listed under the NCA and/or EPBC Act are known to be found within the study area. **Appendix F.9.1** lists the rare or threatened fauna known from 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. This list includes species scheduled as:

- rare, vulnerable or endangered, or special cultural significance under the NCA; and
- vulnerable or endangered under the EPBC Act.

Of the 24 rare or threatened fauna species listed in **Table 9-17** as potentially occurring within the study area, nine are considered to be known inhabitants of the study area, eight are considered possible inhabitants of the study area and seven are considered unlikely to utilise habitats within the study area.

The eight inhabitants of the study area are:

- Giant Barred Frog (*Mixophyes iteratus*);
- Grey Goshawk (*Accipiter novaehollandiae*);
- Glossy-black Cockatoo (*Calyptorhynchus lathami*);
- Red-browed Tree-creeper (*Climacteris erythrops*);
- Sooty Owl (*Tyto tenebricosa*);
- Tusked Frog (*Adelotus brevis*);
- Grey-headed Flying Fox (*Pteropus poliocephalus*);
- Brush-tailed Rock Wallaby (*Petrogale penicillata*); and
- Koala (*Phascolarctos cinereus*).

The location of EPBC listed fauna species is shown in **Figure 9-8**, whilst State listed fauna species are shown in **Figure 9-9**.

A single Grey Goshawk was observed within open eucalypt forest to the south west of the study area. The Tusked Frog was abundant across the study area and was heard calling along the banks of the dam and the upper reaches of Little Nerang Creek. The Grey-headed Flying Fox was observed feeding on the eucalypt dominated forests across the study area. It is known that a population of the Brush-tailed Rock Wallaby was released around the rocky areas of Pages Pinnacle, however none were sighted during the field surveys and the species is likely to be restricted to exposed rocky outcrops and immediately adjacent areas.

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*). Of these species the Swift Parrot utilises open and dry eucalypt forest habitats, the Australian Painted Snipe utilises shallow vegetated wetlands in inland and coastal areas, the Spotted-tail Quoll utilises a wide range of habitats including rainforest and eucalypt forests and the Three-toed Snake-tooth Skink inhabits rainforest and wet eucalypt forests. Suitable habitat for these species is present across the study area.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. Several species are provided with suitable habitat in the study area, but were not detected despite ideal survey conditions.

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 9-18 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 9-17 Rare or Threatened Fauna Species

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence
Birds					
Accipiter novaehollandiae	Grey Goshawk	R (Q)	QM, FS	Primarily wet sclerophyll and rainforest types, although opportunistically exploits other vegetation types.	**Present**. Individual observed within open eucalypt forest in the vicinity of Numinbah Environmental Education Centre off the Nerang-Murwillumbah Road.
Calyptorhynchus lathami	Glossy-black Cockatoo	V (Q)	FS	Dry sclerophyll forests and woodlands in conjunction with the preferred feed tree species Allocasuarina torulosa and Allocasuarina littoralis.	**Present**. Recorded from numerous locations across the study area, most consistently adjacent to the Nerang-Springbrook Road.
Climacteris erythrops	Red-browed Tree-creeper	R (Q)	FS	Restricted to wet sclerophyll forest types, typically dominated by smooth-barked or half-barked Eucalypts such as Flooded gum.	**Present.** Recorded from several locations, primarily associated with Brushbox and Flooded gum dominated forest types.
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	E / MT (A)	EPBC	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.
Lathamus discolor	Swift Parrot	E / Ma (A)	EPBC	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 (*Eucalyptus crebra*)/ Blue Gum (*E. tereticornis*) forests on coastal lowlands of southeast Queensland.	**Possible**. Suitable open forest habitat present. Favoured food tree *E. tereticornis* is present within the eucalypt forest communities occurring within the study area. Potential to utilise the site when in Queensland.
Melithreptus gularis	Black-chinned Honey-eater	R (Q)		Drier Eucalypt forests and woodlands, primarily west of the Great Dividing Range with occasional sub-coastal records. Ironbark, Spotted Gum woodlands and open forests.	**Possible.** This species has been recorded from the 1 degree grid cell which contains the study area by Birds Australia as a part of their Atlas Project.
Poephila cincta cincta	Blackthroated Finch	E (A)	EPBC	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.
Rallus pectoralis	Lewin's rail	R (Q)		Shallow vegetated swamps, wet heathlands and dense margins of watercourses.	**Possible.** The margins of Advancetown Lake may be suitable for this species.
Rostratula australis	Australian Painted Snipe	V (A)	EPBC	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.

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence
Turnix melanogaster	Black-breasted Button-quail	V (A)	EPBC	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.
Tyto tenebricosa	Sooty Owl	R (Q)	FS	Rainforests and wet sclerophyll forests.	**Present.** Recorded from wet sclerophyll forest dominated by Flooded Gum.
Xanthomyza phrygia	Regent Honeyeater	E / MT (A)	EPBC	Typically inhabit box ironbark eucalypt associations, and within these, prefer the wettest, most fertile sites, usually along watercourses (Garnett and Crowley 2000).	**Unlikely**. Limited suitable habitat present within the study area.
Amphibians					
Adelotus brevis	Tusked frog	V (Q)	QM	A fairly ubiquitous species, the Tusked Frog occurs in a wide variety of habitats in southeast Queensland including suburban parks, wet and dry sclerophyll forests and woodlands, rainforest, Paperbark forest, fringing vegetation around farm dams and riparian vegetation types.	**Present**. Recorded from Pigeon grass communities fringing Advancetown Lake. Also present on Little Nerang Creek.
Mixophyes fleayi	Fleay's barred frog	E (A)	EPBC	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.
Mixophyes iteratus	Giant Barred Frog	E (Q & A)	EPBC / QM	Occurs in slow moving, sandy streams and rivers in rainforest, wet sclerophyll forest and farmland between 100 and 1000m.	**Known from boundary of study area**. Has been recorded in Nerang River at Numinbah. Several key microhabitat attributes are absent from rainforest gullies surrounding Advancetown Lake, particularly sandy banks and slow moving pools which are preferred by this species. Not recorded despite ideal survey conditions.
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat	V (A)	EPBC	This species is insectivorous and roost in caves and disused mines (Churchill 1998). Utilises a variety of drier eucalypt forest habitats for feeding.	**Unlikely**. The Large-eared Pied 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 is suboptimal for this species.
Dasyurus maculatus maculatus	Spotted-tail quoll	E (A)	EPBC	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.

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence
Petrogale penicillata	Brush-tailed rock-wallaby	V (A)	EPBC	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.
Phascolarctos cinereus	Koala	V (Q) SE Qld bioregion	FS	Widespread in Eucalypt forests and woodlands, with peak abundance reached in conjunction with the occurrence of preferred feed trees.	**Present**. Observed in open eucalypt forest habitat on western side of dam during field surveys. Evidence of Koala presence (scats and scratches) widespread in study area.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V (A)	EPBC	Inhabits coastal heath and dry and wet sclerophyll forests. Thick groundcover is a major habitat requirement and it displays a preference for areas were soil is light and sandy (Johnstone 1995).	**Unlikely**. No suitable habitat present and no records in area.
Pteropus poliocephalus	Grey-headed flying-fox	V (A)	EPBC, QM, FS	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					
Coeranoscincus reticulatus	Three-toed snake-tooth skink	V (A)	EPBC	Inhabits rainforest and wet eucalypt forests.	**Possible**. Small areas of suitable habitat present within sheltered gullies of the study area.
Invertebrates					
Phyllodes imperialis		E (Q&A)	EPBC	The southern subspecies of Phyllodes imperialis is found in the thick primary lower montane rainforests from south-eastern Queensland to northern NSW. The vine Carronia multisepalea, which provides food for the larvae, is only found in south-eastern Queensland.	**Possible.** The larval food plant of this species is relatively widespread in the study area.
Ornithoptera richmondiana	Richmond Birdwing Butterfly	V (Q)		This species occurs in subtropical rainforest where its preferred larval food plant, Pararistolochia praevenosa occurs.	**Possible.** The larval food plant of this species is relatively widespread in the study area.

Key to Status:

E – Endangered

V – Vulnerable

R – Rare

MT – Migratory terrestrial species

Ma – Marine species

Q – Queensland *Nature Conservation Wildlife Regulation 1994*

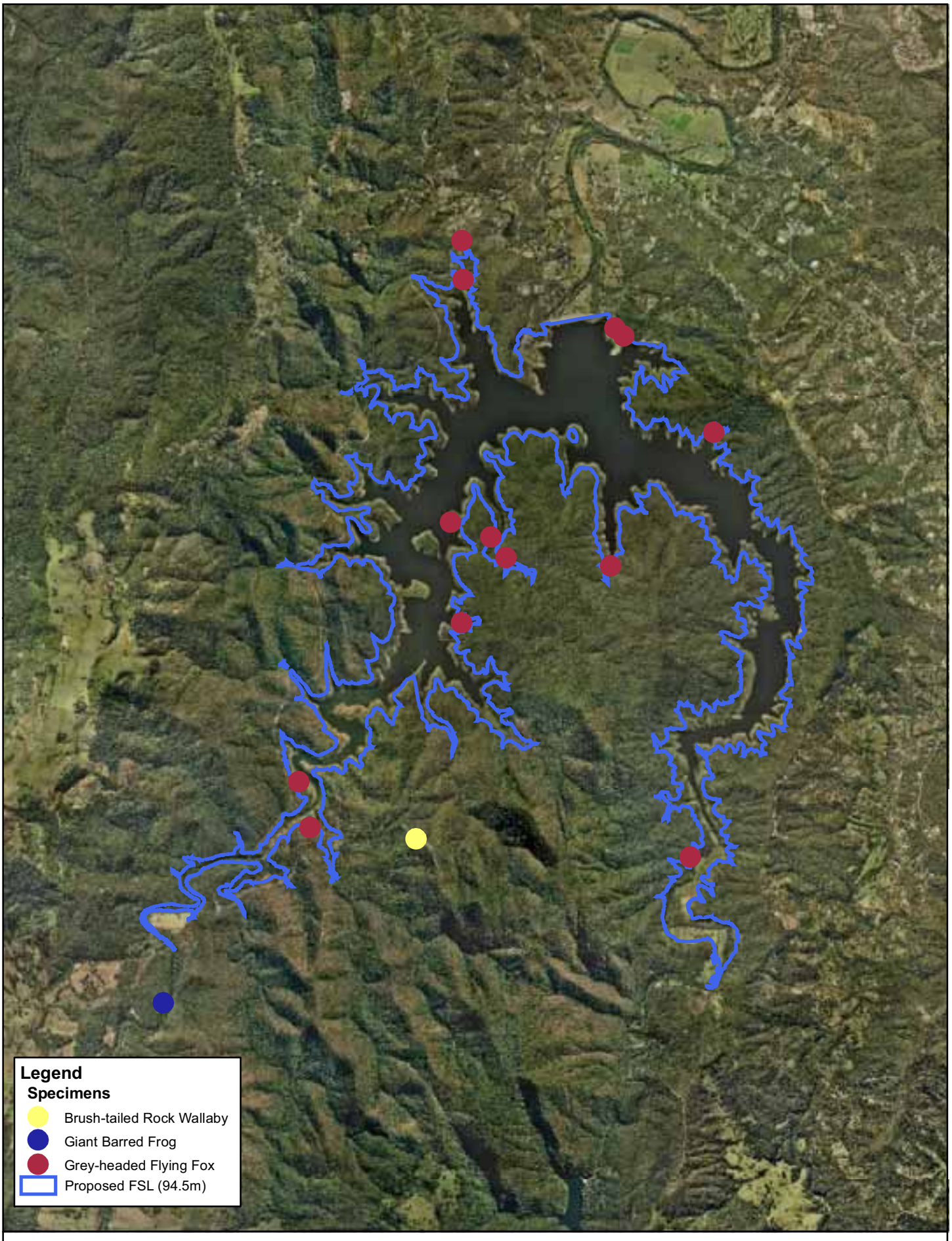
A – Commonwealth Environment Protection and Biodiversity Conservation Act 1999

Key to Source:

EPBC – Environment Protection and Biodiversity Conservation Act Protected Matters database search records for the study area

QM – records from the Queensland Museum database

FS – recorded during the field surveys



N

0 0.5 1 2

Kilometres

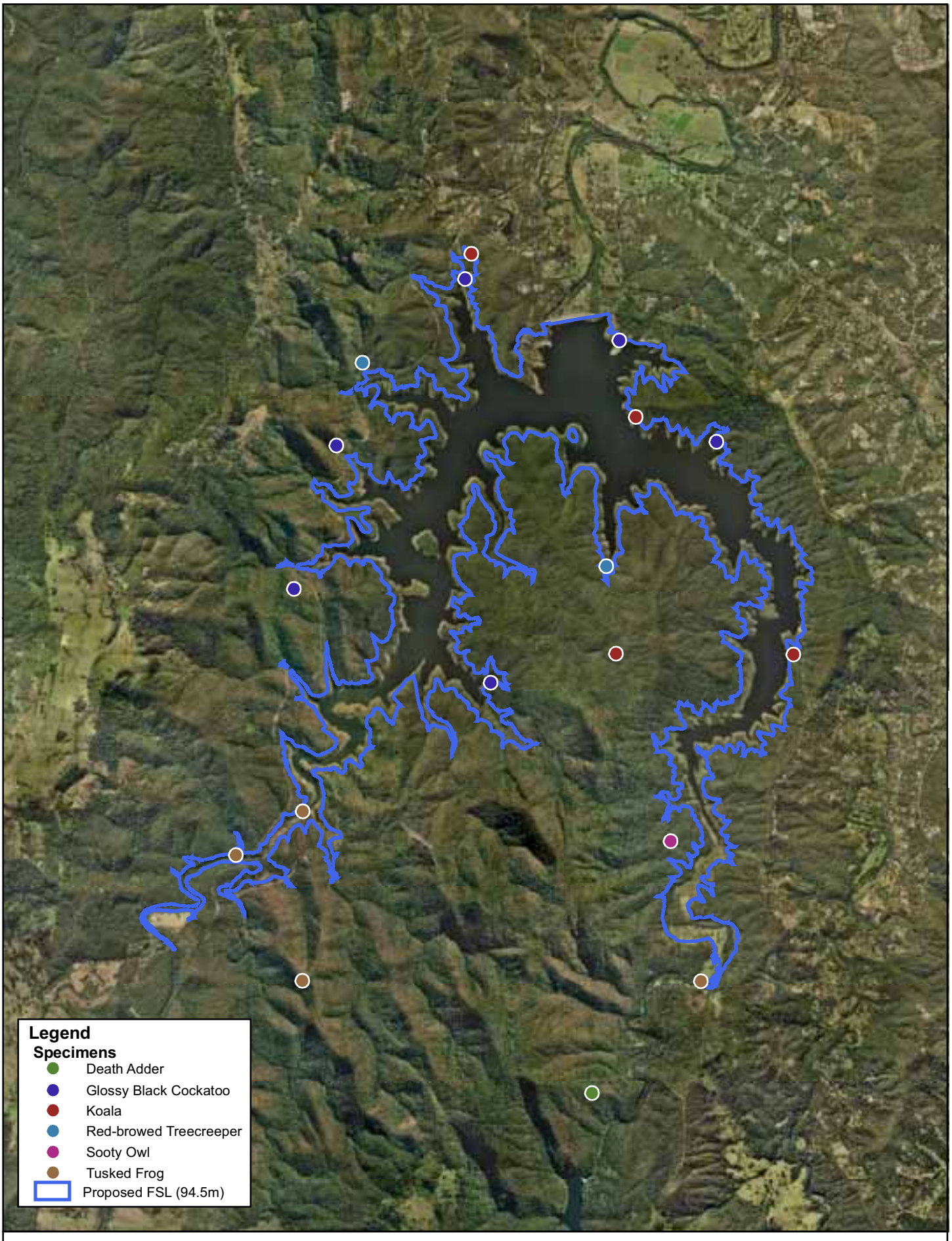
Scale - 1:60,000

Projection: MGA Zone 56

Figure 9-8

Location of EPBC Listed Fauna

Hinze Dam Stage 3 EIS



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Kilometres

Scale - 1:60,000

Projection: MGA Zone 56

Figure 9-9

Location of NCA Listed Fauna

Hinze Dam Stage 3 EIS

Table 9-18 Migratory and Other EPBC Listed Fauna

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence along the study corridor
Birds					
Anseranas semipalmata	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.
Amaurornis olivaceus	Bush hen	Ma	FS	Restricted to densely vegetated margins of rivers, streams and lakes.	**Present**. Observed during the field survey.
Apus pacificus	Fork-tailed swift	Ma	EPBC	Aerial habitat over inland regions.	**Possible**. May forage over study area.
Ardea alba	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.
Ardea ibis	Cattle egret	M, Ma	EPBC, Wildnet, FS	Pasture especially among cattle, occasionally wetlands.	**Present**. Observed during the field survey.
Ardea intermedia	Intermediate egret	Ma	FS	Margins of natural and artifical wetlands, lakes and swamps.	**Present**. Observed during the field survey.
Chrysococcyx minutillus	Little Bronze-Cuckoo	Ma	FS	Variety of forest types including wet sclerophyll forest and rainforest.	**Present**. Observed during the field survey.
Circus approximans	Swamp Harrier	Ma	FS	Dense grasslands, sedgelands, wet heathlands and open swampy margins.	**Present**. Observed during the field survey.
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Coracina papuensis	White-bellied Cuckoo-shrike	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	**Present**. Observed during the field survey.
Coracina tenuirostris	Cicadabird	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	**Present**. Observed during the field survey.
Dicrurus bracteatus	Spangled Drongo	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Eudynamys scolopacea	Common Koel	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Eurostopodus mystacalis	White-throated Nightjar	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	**Present**. Observed during the field survey.
Eurystomus orientalis	Dollarbird	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Falco cenchroides	Nankeen Kestrel	Ma	FS	Wide variety of open habitats.	**Present**. Observed during the field survey.

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence along the study corridor
Gallinago hardwickii	Latham's Snipe	MW / Ma	EPBC	Open wetland areas.	**Possible**. Suitable habitat present within the study area.
Gallirallus philippensis	Buff-banded Rail	Ma	FS	Margins of natural and artifical wetlands, lakes and swamps.	**Present**. Observed during the field survey.
Grallina cyanoleuca	Magpie-lark	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Haliastur sphenurus	Whistling Kite	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Haliaeetus leucogaster	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.
Hirundapus caudacutus	White-throated Needle-tail	MT / Ma	EPBC	Aerial habitat over coastal regions and mountain ranges.	**Possible**. May forage over the study area.
Hirundo neoxena	Welcome Swallow	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Merops ornatus	Rainbow bee-eater	Ma	EPBC, FS	Most habitats apart from closed forest.	**Present**. Observed during the field survey.
Monarcha melanopsis	Black-faced Monarch	MT / Ma	EPBC / QM	Found in rainforests, eucalypt forests and riparian forests.	**Present**. Observed during the field survey.
Monarcha trivirgatus	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.
Myiagra cyanoleuca	Satin Flycatcher	MT / Ma	EPBC	Inhabits forests, riparian forests and woodlands.	**Possible**. Suitable open forest habitat present throughout the study area.
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-goose	MW / Ma	EPBC	Coastal wetlands, open water bodies and swamps.	**Possible**. May utilise open water habitat provided by the dam.
Pandion haliaetus	Osprey	M, MA	FS	Typically estuaries and coastal rivers. Subcoastal occurrences on major inland river systems and impoundments.	**Present**. Observed during the field survey.
Pelecanus conspicillatus	Australian Pelican	Ma	FS	Estuaries, rivers, creeks, wetlands, open water bodies and swamps.	**Present**. Observed during the field survey.
Pitta versicolor	Noisy Pitta	Ma	FS	Wet sclerophyll forest and rainforest.	**Present**. Observed during the field survey.
Porphyrio porphyrio	Purple swamphen	Ma	FS	Margins of natural and artifical wetlands, lakes and swamps.	**Present**. Observed during the field survey.

Species	Common Name	Status	Source	Habitat	Likelihood of occurrence along the study corridor
Rhipidura rufifrons	Rufous Fantail	MT / Ma	EPBC	Inhabits dense rainforest and wet eucalypt forests.	**Present**. Recorded during field survey at Sites 7, E and G.
Rostratula benghalensis	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.
Scythrops novaehollandiae	Channel-billed Cuckoo	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Threskiornis molucca	Australian White Ibis	Ma	EPBC, FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Threskiornis spinicollis	Straw-necked Ibis	Ma	EPBC, FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.
Todiramphus macleayii	Forest Kingfisher	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	**Present**. Observed during the field survey.
Todiramphus sanctus	Sacred Kingfisher	Ma	FS	Eucalypt forests and woodlands, disturbed areas.	**Present**. Observed during the field survey.
Zosterops lateralis	Silvereye	Ma	FS	Ubiquitous, exploiting wide variety of habitat types including disturbed areas.	**Present**. Observed during the field survey.

Key to Status:

MT – Terrestrial species covered by migratory provisions of EPBC Act

MW – Wetland species covered by migratory provisions of EPBC Act

Ma – Species covered by marine provisions of EPBC Act

Key to Source:

EPBC – Environment Protection and Biodiversity Conservation Act Protected Matters database search records for the study area

QM – records from the Queensland Museum database

Wildnet – records from the EPA's Wildnet database

FS – recorded during the field surveys

9.4.4 Survey Limitations

Climatic Conditions

The average daily minimum tempterature during the fauna survey was 21 OC, whilst the average daily maximum was 28.4ºC. Data from the Gold Coast Seaway Automatic Weather Station (AWS) indicated that 168.4mm of rain fell in coastal districts during the first week of the fauna survey, whilst less than 5mm fell during the second week. Supplementary data from the Springbrook Road Weather Station indicated that 681mm rain fell during the month of February. Both temperature and rainfall data indicated that the fauna survey was completed during an ideal survey period with warm, wet days during the first week of survey (ideal for amphibian survey) and warm, dry days during the second week (better conditions for all other groups).

Seasonality

A late summer/autumn field survey program may have undersampled a suite of cryptic flora species which are only obvious during flowring in spring and early summer.

In relation to fauna, altitudinal winter migrants are likely to have been undersampled, although they comprise a relativelty minor percentage of the expected fauna assemblage. Summer latitudinal migrants such as Channel-billed Cuckoo, Dollarbird and Common Koel were adequately sampled.

General Survey Approach

The survey approach has several well recognised limitations. Firstly it assumes a single pass through an area, so that the intention is not to gain a complete or even nearly complete inventory of the flora or fauna at a site. From a fauna point of view, it is anticipated that species generally typical of the plant association will be found. Also, given the single pass approach, it is likely that local weather conditions will affect the activity levels and 'observability' of species meaning that some common species will be missed, and some rare ones will be found.

A second shortcoming of the vertebrate fauna survey is that the time spans are too brief to allow the gathering of quantitative as well as qualitative data. Thus there are no reasonable estimates possible for any population sizes of any fauna species.

Some quantitative data was gathered for significant flora, enabling course estimates of population sizes across the study area.

9.5 Potential Impacts

9.5.1 Nature and Extent of Impacts

The impacts of the Project will occur in the short-term and over the long-term. The short-term impacts are those which will occur as a direct result of the construction and operation of the Project, while the long-term impacts will occur over a more extended period of time (in the order of years).

The short-term impacts include:

- the loss of remnant and regrowth vegetation and habitat as a result of vegetation clearing for construction of the dam wall and associated infrastructure/facilities and within the area below the the proposed FSL ("inundation area");
- disturbance to fauna from construction activities, noise and vibration;
- traffic related wildlife mortality on roads within and around the Project area; and
- spread of weeds into cleared and disturbed areas.