
CONTENTS

18. Terrestrial Environments	18-1
18.1 Introduction	18-1
18.2 Legislative Context	18-1
18.3 Terrestrial Flora	18-1
18.3.1 Methodology	18-1
18.3.1.1 Field Survey	18-1
18.3.1.2 Vegetation Mapping	18-2
18.3.2 Existing Environment	18-4
18.3.2.1 Vegetation Communities	18-4
18.3.2.2 Flora of Conservation Significance	18-4
18.3.3 Potential Impacts and Mitigation Measures	18-9
18.3.3.1 Impacts to Vegetation Communities	18-9
18.3.3.2 Impacts to Significant Flora	18-10
18.3.3.3 Weeds and Pests	18-12
18.3.4 Mitigation Measures	18-13
18.3.4.1 Vegetation Management Offsets Strategy	18-13
18.3.4.2 Revegetation Strategy	18-13
18.3.4.3 Revegetation of Dam Margins	18-18
18.3.4.4 Native Timber Plantations	18-18
18.3.4.5 Approval Conditions	18-18
18.3.4.6 Downstream Impacts	18-19
18.4 Terrestrial Fauna	18-19
18.4.1 Methodology	18-19
18.4.1.1 Database Searches	18-19
18.4.1.2 Fauna Survey	18-19
18.4.1.3 Frog Survey	18-20
18.4.1.4 Invertebrate Fauna Survey	18-21
18.4.2 Existing Environment	18-23
18.4.2.1 Fauna of Conservation Significance	18-23
18.4.2.2 EPBC Migratory and Significant Fauna	18-39
18.4.2.3 Other Birds	18-42
18.4.3 Potential Impacts and Mitigation Measures	18-42
18.4.3.1 Impacts to Significant Fauna	18-42
18.4.3.2 Road Traffic Impacts	18-61
18.4.3.3 Loss of Tree Hollows	18-61
18.4.3.4 Climate Change Impacts	18-62
18.4.3.5 Impacts of Melliferous Plantings for Apiculture Industry	18-64
18.4.3.6 Impacts on Riparian Linkages and Rainforest Obligate Fauna	18-64
18.4.3.7 Impacts of Meadvale Quarry Operation on Faunal Movement	18-65
18.4.3.8 Competition for Resources	18-65
18.4.4 Mitigation Measures	18-66
18.4.4.1 Rehabilitation Areas	18-66
18.4.4.2 Fauna Relocation	18-67

18.4.4.3 Weed Management	18-68
18.4.4.4 Environmental Management Plan	18-68
18.4.4.5 Corrections	18-68

FIGURES

Figure 18-1 Location of significant flora species in the study area	18-6
Figure 18-2 Vegetation communities known to support significant flora species	18-7
Figure 18-3 Frog survey sites	18-22
Figure 18-4 Location of Southern Barred Frog (<i>Mixophyes iteratus</i>) records in the study area	18-25
Figure 18-5 Location of significant fauna species	18-29
Figure 18-6 Location of native fig trees in the regional area	18-50
Figure 18-7 Location of foraging habitat for the Swift Parrot in the study area	18-54
Figure 18-8 Location of foraging habitat for the swift parrot in the local Mary Valley region	18-55
Figure 18-9 Location of foraging habitat for the regent honeyeater in the study area	18-59
Figure 18-10 Location of foraging habitat for the regent honeyeater in the local Mary Valley region	18-60

TABLES

Table 18-1 (Table 7-10 EVR flora species with potential to occur in the study area)	18-8
Table 18-2 (Table 7-28 Potential impacts on EVR flora known from the study area)	18-10
Table 18-3 (Table 7.29 Potential impacts on significant flora possible to occur in the study area)	18-11
Table 18-4 (Table 7.21 EVR fauna identified from the search area and an evaluation of the likelihood of occurrence within the study area)	18-30
Table 18-5 (Table 7-22 EPBC Act listed migratory and marine species identified from study area and an evaluation of the likelihood of occurrence within the study area)	18-40
Table 18-6 Area of swift parrot foraging habitat impacted by the Project with comparisons against area within the Mary Valley region	18-52
Table 18-7 Area of Regent Honeyeater foraging habitat impacted by the Project	18-57

18. TERRESTRIAL ENVIRONMENTS

18.1 Introduction

This chapter addresses the issues raised in submissions received on the Traveston Crossing Dam Environmental Impact Statement (EIS) relating to terrestrial flora and fauna values of the study area.

18.2 Legislative Context

A submission claimed that Section 7.2 in Chapter 7 Terrestrial Environments of the EIS is missing reference to the Environmental Protection Policy (Water) Schedule 1 Mary Basin/Great Sandy Region.

The key legislation covering terrestrial biodiversity and nature conservation issues was described in Section 7.2 of the EIS. The Environmental Protection (Water) Policy 1997 is applicable to aquatic ecological values and water quality and was referred to in Section 3.4.10 of Chapter 3 Relevant Legislation and Approvals.

A submission has questioned whether it is the intention of QWI to designate the project area a nature refuge under the *Nature Conservation Act 1992* (NC Act). It should be noted that Sections 3.4.21 and 7.2.2 provide a description of the NC Act and its governing provisions. It is not the intention of QWI to designate the project area (including vegetation management offsets and native hardwood plantations) a protected area under the NC Act.

An agency submission has requested that reference to the *Land Protection (Stock and Pest Route Management) Act 2002* and the *Land Protection (Pest and Stock Route Management) Regulation 2003* is changed to provide for weed and pest animal management in Queensland, including yellow crazy ants. This is agreed.

18.3 Terrestrial Flora

18.3.1 Methodology

18.3.1.1 Field Survey

Several issues were raised in submissions that the field surveys undertaken for terrestrial flora were inadequate and did not consider seasonal or yearly variability. There was also the issue that the flora study only researched species that have been documented in the past.

The Final Terms of Reference (ToR) requested flora surveys be undertaken at an appropriate number of sites, allowing for seasonal factors. The field survey methodology was explained in Section 7.3.1.3 of the EIS and in further detail in the 3D Terrestrial Flora Study Report provided in Appendix F-4.1 of the EIS. As discussed, field survey locations were chosen from a careful appraisal of aerial photography to ensure the field survey targeted a representative range of habitats within the study area and directed detailed sampling towards those communities that were considered critical to a range of Endangered, Vulnerable or Rare (EVR) species. Stratification of vegetation types and sampling was conducted across each stratification unit in proportion to the size of the unit. Further sites were added opportunistically during the field survey to provide a more complete data coverage. In total 140 flora survey sites were established across the study area, including 38 secondary sites, 6 tertiary sites, 56 quaternary sites and 40 observation sites.

The field survey was completed in two stages, in November 2006 and March 2007, to target the spring and summer seasonal periods. Spring and summer are considered the optimal seasons to conduct flora census as many plant species, particularly rainforest plants, display fertile material

(i.e. flowers and fruits) during this period and are therefore more easily identifiable. There was no requirement under the Final ToR to conduct yearly surveys.

18.3.1.2 Vegetation Mapping

Some submissions suggested that vegetation mapping has been undertaken at an inappropriate scale and should be undertaken at a scale of 1:5 000 not 1:10 000.

The spatial scale of sampling meets the minimum standard for 1:10 000 scale vegetation mapping as defined by Neldner *et al.* (2005). This is in accordance with the Terms of Reference which requested 1:10 000 scale vegetation mapping. In vegetation survey, scale is determined by sampling intensity, influenced by vegetation complexity and the areal extent of remnant vegetation. Spatial scale of data collection was at 1:25 000 due to the scale of aerial photography used for data capture, although this has no bearing on the scale of field sampling.

It should be noted that vegetation mapping undertaken by 3D Environmental covered the QWI land purchase boundary only (“the study area”) and does not map vegetation on surrounding properties.

Several submissions claimed that the Environmental Protection Agency (EPA) Regional Ecosystem (RE) mapping represents a more accurate representation of vegetation in the study area than the 3D vegetation mapping.

The 3D vegetation mapping is based on extensive ground-truthing of over 140 survey sites (including 38 secondary sites, 6 tertiary sites, 56 quaternary sites and 40 observation sites), which is a considerable advancement over the EPA RE mapping which is based on only one secondary site within the study area and a limited number of quaternary sites located along the existing road network. The degree of site specific ground-truthing conducted for the EIS suggest that the data has a higher degree of confidence than the original RE mapping for the same site.

The reclassification of vegetation under the *Vegetation Management Act 1999* (VM Act) is not an unusual process and involves submitting an RE map amendment request to the EPA, which is then subject to Queensland Herbarium field verification and EPA approval. This process is currently being undertaken for the Project. The provision of vegetation management offsets (VMOs) for the project will in accordance with the EPA’s RE mapping with certified amendments.

Several issues were raised in the submissions that the ‘endangered’ regional ecosystems (RE) 12.3.1 was inappropriately reclassified from the EPA RE mapping to ‘Of Concern’ RE’s (12.3.2 or 12.3.7) or non-remnant vegetation. Submitters have requested that the process of RE reclassification needs to be far more transparent and will require independent verification.

The methodology adopted by 3D Environmental for the sampling and mapping of vegetation communities in the study area is detailed in the methods section of the 3D Terrestrial Flora Study Report provided in Appendix F.4.1 of the EIS. To ensure a robust, rigorous and defensible flora survey the following methods were employed:

- survey sites were chosen from an initial stratification of the study area and careful appraisal of 1:25 000 scale aerial photography (May, 2006) as well as on-ground scrutiny, in order to sample sites that were representative of full the range of habitats present within the study area and to provide a reference condition for disturbed vegetation communities (benchmark sites). Detailed sampling was directed towards those communities that could not be adequately categorised through API, or were considered critical to a range of EVR species. Further sites were added during the field survey to provide a more complete data coverage and allow verification of the mapping units;

- field survey methods followed Queensland Herbarium standards as identified in the EPA's *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al.*, 2005) using a combination of formalised secondary, tertiary and quaternary level sampling procedures, as well as site observations. Standardised transect sampling was completed in representative vegetation types, providing accurate and repeatable measurements of canopy height and cover to satisfy standard Queensland Herbarium procedure. The focus for these transects was to establish benchmark information through numerous reference sites across the entire study area. It should be noted that sampling was undertaken at all sites where reclassification of the endangered RE 12.3.1 has been proposed;
- benchmark sites were established in undisturbed or lightly disturbed vegetation communities within the study area to form a basis for the assessment of remnant/non remnant status of a specific vegetation community. The 3D methodology for establishing benchmark sites complied with Queensland Herbarium standards. Further, the methods used were also in accordance with the *Vegetation Management Act 1999* which uses the integrity of a vegetation community in reference to its original condition to assess remnant status. Classification of the remnant/non-remnant status of vegetation communities relied heavily on the establishment of benchmark sites in communities where disturbance has been minimal and environmental conditions are typical of the community across the broader study area ("best type" example). These sites allowed relative canopy height and canopy cover data to be compared between community reference condition, varying degrees of disturbance, and varying seral stages of regrowth. From this comparison a tightly defined and consistent definition of non-remnant vegetation communities could be ascertained through thorough field measurement;
- vegetation structure was classified using industry standard vegetation structural classification schemes developed by Specht (1970) and Walker and Hopkins (1990). These vegetation classification systems were adopted to be consistent with classification descriptions used by the Queensland Herbarium and as outlined in the EPA's *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al.*, 2005). Remnant/non-remnant vegetation was classified consistently with the remnant definitions defined by Neldner *et al.* (2005); and
- vegetation communities were mapped as vegetation units rather than regional ecosystems to recognise the occurrence of heterogeneous ecosystems (which are not recognised in the EPA RE mapping). The 3D vegetation mapping also represents variations in sub-canopy layers through a number of appended symbols.

In the case of the reclassification of RE 12.3.1 along Happy Jack Creek, the 3D study established suitable reference sites for RE 12.3.1 as benchmarks in communities considered from aerial photographic interpretation (API) and ground-truthing to be the least disturbed examples of rainforest on alluvium within the study area. These were established in the absence of EPA benchmark standards for RE 12.3.1. It has been argued in one of the submissions that RE 12.3.2 is a considerably taller community than RE 12.3.1. In the majority of cases throughout its distribution this is likely to be true, however in the case of the Mary River canopy heights of RE 12.3.1 were consistently measured to be greater than 40 m in a number of sites.

The reclassification of sections of Happy Jack Creek by 3D as non-remnant vegetation was based on data collected for canopy height and cover as well as a significant proportion of the canopy consisting of the exotic camphor laurel (*Cinnamomum camphora*) (i.e. >40%) in measured transects. The loss of the original canopy by past timber extraction, as evidenced by stumps in the field, was used as a clear indication of the height of the original canopy. The emergent eucalypts removed from the system were in fact the true canopy layer, indicating that the pre-clearing remnant vegetation along the creek line was RE 12.3.2. There are several examples within the study area, where remnant *Eucalyptus grandis* towers above a sub-canopy of *Waterhousea floribunda* (sub-canopy of 15 to 20 m) with projected canopy cover of 80% or greater. These are

not the emergent trees at the sections along Happy Jack Creek and undoubtedly represent the parent types to the highly fractured communities along Happy Jack Creek.

The 3D study was supported by data gained through accurate structural measurement utilising standard Queensland Herbarium techniques, which uses 70% of the original canopy height as its standard for determining remnant status. The benchmark sites (TS48 and 49) on Happy Jack Creek were chosen to be representative locations in a broad study area. As such the study draws on information from the entire project area and has not treated Happy Jack Creek as an isolated pocket singled out for an individual assessment.

It should be noted that the reclassification of 'endangered' RE 12.3.1 to 'of concern' RE 12.3.2 makes no difference in terms of VMO requirements, as the Offsets Policy applies equally to endangered, of concern and riparian vegetation.

The provision of VMOs will be based on the EPA's RE mapping with certified amendments. QWI is submitting a RE map amendment request to the EPA, which will provide the EPA with the supporting data to make an informed decision on the reclassification of vegetation to reflect 3D's vegetation mapping. This will be subject to rigorous field verification and approval by the EPA. It should be noted that only those areas that have been ground-truthed are being considered for a map amendment request.

18.3.2 Existing Environment

18.3.2.1 Vegetation Communities

A submission questioned the significance of the terminology 'Above Flood Level' in Appendix F.4.1 Figure 8d.

The terminology 'Above Flood Level' is used on Figures 8a-8f and 9a-9f in the 3D Terrestrial Flora Study (Appendix F.4.1). The correct terminology should read 'Outside Project Area'. The project area used in the 3D Terrestrial Flora Study to define the study area was the Stage 2 inundation area plus a 200m buffer. Anything at elevations above this 200m buffer was given the term 'Above Flood Level'.

18.3.2.2 Flora of Conservation Significance

Nationally and State Significant Flora

Two submissions claimed that ball nut (*Floydia praealta*) was recorded at Frayne Road in vine forest approximately 100 metres north west from the project area boundary.

A site visit by the project team on the 26 February 2008 verified the occurrence of *Floydia praealta* from a site located just outside the project area in Lot 1RP57331, within hillslope vine forest, RE 12.11.10 (Notophyll vine forest ± *Araucaria cunninghamii* on metamorphics ± interbedded volcanics). *Floydia praealta* is listed as vulnerable under the NC Act and the EPBC Act. Figures 7.6 and 7.7 of the EIS have been updated to show the location of this site (**Figure 18-1**) and the extent of the vegetation community known to support this species (**Figure 18-2**). The Terrestrial Flora Study Report (Appendix F.4.1 of the EIS) refers to the potential for *Floydia praealta* to occur in RE 12.3.1 and 12.11.10 based on 26 records from Imbil, Amamoor SF and Kenilworth area and good quality potential habitat for this species in hillslope vine forest. Table 7.10 from the EIS has also been updated below to reflect the potential occurrence of *Floydia praealta* within the project area (see **Table 18-1** below). The likelihood of this species occurring in the project area has been reassessed as high.

In an independent field survey undertaken along Happy Jack Creek, the rare hairy hazel wood (*Symplocos harroldii*) was recorded in riparian vegetation at a location upstream of the inundation area (Lot 3 RP817214).

The 3D Terrestrial Flora Study Report (Appendix F.4.1) refers to the potential for *Symplocos harroldii* to occur in RE 12.3.1 and 12.11.10 based on a record from Araucaria SF, Imbil SF (W.J. McDonald 3823) in Hoop pine plantation.

Due to restricted landholder access, 3D were unable to verify the occurrence of *Symplocos harroldii* on Happy Jack Creek, and the record remains unconfirmed. *Symplocos harroldii* is listed as rare under the NC Act and the occurrence of this species in the study area would be valuable for a species which is otherwise mainly associated with coastal and hinterland areas with numerous nearby records from Noosa Shire. Figure 7.6 from the draft EIS have been updated to show the unconfirmed record of *Symplocos harroldii* (**Figure 18-1**) along Happy Jack Creek. As the record is outside the project area and unconfirmed, the likelihood of this species occurring in the project area is still assessed as low (see **Table 18-1** below). The potential impact on this species has been considered in Section 18.3.3.2.

In an independent field survey undertaken along Belli Creek, two potentially threatened flora species, *Acacia bakeri* and *Isoglossa eranthemoides*, were recorded.

Acacia bakeri was recorded during the flora survey undertaken by 3D at several locations across the study area. In total 8 individuals were recorded in RE 12.3.1, RE 12.3.2, RE 12.11.10 and non remnant vegetation. *Acacia bakeri* is not a species of Commonwealth, State or Local conservation significance and was therefore not included in the assessment of potential impacts on flora species of conservation significance in Section 7.5.2 of the EIS.

Isoglossa eranthemoides is listed as endangered under the EPBC Act. *I. eranthemoides* is a herb that grows to 50cm in height. It has a very restricted distribution in north-east NSW from the Tweed to the Lismore area, with a single uncertain historical report from south-east Queensland (DEC NSW, 2008). It occurs in the understorey of lowland subtropical rainforest, in moist situations on floodplains and slopes (DEC NSW, 2008). *I. eranthemoides* was not recorded during the flora survey undertaken by 3D, nor are there any database records for this species in the search area. The record from the independent field survey is unconfirmed and it is considered highly unlikely to occur in the study area due to it being outside of its known distribution.

Table 18-1 (Table 7-10 EVR flora species with potential to occur in the study area)

Species Name	Common Name	NC Act Status	EPBC Act Status	Likelihood of Occurrence
<i>Arthraxon hispidus</i>	hairy-joint grass	NL	V	Likely (low)
<i>Bosistoa transversa</i>	three-leaved bosistoa	NL	V	Likely (low)
<i>Bulbophyllum globuliforme</i>	miniature moss-orchid	NL	V	Likely (low)
<i>Choricarpia subargentea</i>	giant ironwood	R	NL	Present
<i>Cossinia australiana</i>	-	E	E	Likely (low)
<i>Floydia praelta</i>	ball nut	V	V	Likely (high). Recorded just outside the project area in vine forest along Frayne Rd.
<i>Fontainea rostrata</i>	A fontainea	V	V	Likely (low)
<i>Macadamia integrifolia</i>	macadamia nut	V	V	Likely (low). Cultivar seedling observed within Bruce Hwy realignment.
<i>Macadamia ternifolia</i>	small-fruited Queensland nut	V	V	Likely (low)
<i>Marsdenia coronata</i>	slender milkvine	V	V	Present
<i>Picris conyzoides</i>	-	R	NL	Likely (high)
<i>Plectranthus omissus</i>	A plectranthus	E	E	Likely (low)
<i>Plectranthus torrenticola</i>	A plectranthus	E	E	Likely (low)
<i>Pouteria eerwah</i>	shiny-leaved coodoo	E	E	Likely (low)
<i>Ricinocarpos speciosus</i>	-	V	NL	Likely (low)
<i>Romnalda strobilacea</i>	-	V	V	Likely (low)
<i>Sophora fraseri</i>	brush sophora	V	V	Likely (low)
<i>Symplocos harroldii</i>	hairy hazel wood	R	NL	Likely (low). Unconfirmed record along Happy Jack Creek within the study area.
<i>Thesium australe</i>	austral toadflax	V	E	Likely (low)
<i>Xanthostemon oppositifolius</i>	southern penda	V	V	Likely (low)

E – Endangered, V – Vulnerable, R – Rare, M – Migratory, NL – Not listed

Please note that only those flora species listed under the EPBC Act and evaluated as known or likely to occur within the study area in **Table 18-1** have been assessed in the MNES Chapter.

Regionally and Locally Significant Flora

In an independent field survey undertaken on Happy Jack Creek, the locally rare *Mallotus megadontus* was recorded in riparian forest at two locations upstream of the inundation area on Lot 46 RP805811 and Lot 3 RP817214.

Mallotus megadontus was recorded during the flora survey at Site TS48 (located at the upper limit of the inundation area along Happy Jack Creek) and acknowledges that riparian vegetation (remnant and non-remnant) along Happy Jack Creek provide habitat for populations of *Mallotus megadontus*. Although not listed under the NC Act or EPBC Act, this species is locally rare and is being considered for listing as ‘vulnerable’ under the NC Act. The conservation value of this

species was identified in Section 7.3.3.6 of the EIS. The potential impact on this species has been assessed in Section 18.3.3.2 (**Table 18-2**).

A submission claimed that the local/regional significance of the bunya pine (*Araucaria bidwillii*) was not assessed in the EIS.

Araucaria bidwillii was assessed as having local and regional significance in Section 7.3.3.6 of the EIS due to its Indigenous cultural significance. Six individuals of bunya pine were recorded in the study area during the 3D flora survey, in RE's 12.3.7, 12.11.2, 12.11.10, 12.11.11 and non-remnant vegetation. Only potential impacts on those species of state and national significance were assessed in the EIS. *Araucaria bidwillii* is an emergent rainforest species and occurs between Nambour and Gympie and west to the Bunya Mountains, with a small occurrence in north Queensland on Mt. Lewis and at Cunnabullen Falls. This species is not considered to be threatened, and the loss of individuals within the project impact area is not expected to have a significant impact on regional populations of this species.

18.3.3 Potential Impacts and Mitigation Measures

18.3.3.1 Impacts to Vegetation Communities

A submission stated that “the loss of 60 ha of endangered RE 12.3.1, which equates to 75% of the total extent of this RE in the SEQ bioregion, would be an ecological disaster”.

This is a misunderstanding. Section 7.2.5.1 of the EIS stated “The most significant impact of the dam on vegetation will be the loss of nearly 60 ha of the endangered RE 12.3.1 and its constituent vegetation communities (A1b, A1bx, A1c and A1ex). This represents **0.75%** of the total extent of RE 12.3.1 in the SEQ bioregion, in comparison with the State Wide Statistical Review (Accad *et al*, 2006).”

Several submissions questioned the legal ability of QWI to clear ‘endangered’ and ‘of concern’ regional ecosystems.

The VM Act regulates the clearing of native vegetation in Queensland. For relevant clearing purposes, native vegetation may still be cleared under a permit, or in some situations, an exemption. Under Section 22A of the VM Act, clearing for a project declared as significant under the *State Development and Public Works Organisation Act 1971* is considered a relevant purpose. The clearing of remnant ‘not of concern’ vegetation is exempt if the purpose is to establish necessary infrastructure.

An Ongoing Purposes Clearing Permit will be required from DNRW for the clearing of regional ecosystems associated with the project. The Regional Vegetation Management Code (RVMC) for the Southeast Queensland Bioregion (‘Part S’) is used for the assessment of clearing applications for significant projects. It sets out performance requirements that applications for clearing native vegetation must meet. For significant projects, the RVMC allows the development of a vegetation management offset (VMO) as a means of meeting relevant performance requirements of the RVMC. VMOs will be provided as a solution to meet a number of the performance requirements. Further detail on the VMO strategy is provided in Section 0.

Some submissions suggested there is confusion on the reporting/tabulation of scale and detail of vegetation loss.

There are no conflicting statements on the scale and detail of vegetation loss, and the areas of remnant and non-remnant to be impacted by the project are clearly detailed in Table 7.24 of the EIS for the dam construction area, Tables 7.25 and 7.26 for the inundation area and Table 7.27 for the road realignments. As stated in Section 7.3.2.1 of the EIS, “85% of the study area and 75% of

the inundation area comprises cleared grazing, residential and agricultural land (as represented in the certified RE mapping and recent aerial photography)".

18.3.3.2 Impacts to Significant Flora

Table 7.28 of the EIS has been updated to assess the potential impacts on EVR flora known from the project area, based on additional records of *Mallotus megadontus* in the project area (see **Table 18-2** below). It should be noted that these species were already identified in the project area.

Table 18-2 (Table 7-28 Potential impacts on EVR flora known from the study area)

Species	Status	Potential Impact
Mallotus megadontus	Not listed	<p><i>Mallotus megadontus</i> is under consideration for vulnerable listing under the NC Act and is locally significant to conservation on the basis of the population being at its northern limit of geographical distribution.</p> <p><i>Mallotus megadontus</i> has been recorded on Happy Jack Creek on a property immediately upstream of the FSL in riparian vegetation and at its headwaters at Ridgewood. The species was recorded during the flora survey at the upper limit of the inundation area along Happy Jack Creek and the EIS acknowledged that additional populations along other reaches of Happy Jack Creek would be present. Flooding and/or clearing of riparian vegetation will result in the direct attrition of individual plants along Happy Jack Creek.</p> <p>To mitigate the loss of <i>Mallotus megadontus</i> within the inundation area, propagated individuals will be planted within rehabilitated riparian areas and VMOs. A translocation management plan will be developed for this species, which will identify suitable translocation sites, planting methodologies and management and monitoring measures.</p>

Table 7.29 of the EIS has been updated to assess the potential impacts on EVR flora possible to occur in the project area, based on an unconfirmed record of *Symplocos harroldii* in the project area and a confirmed record of *Floydia praealta* outside the project area (see **Table 18-2** below). It should be noted that these species were already assessed as likely to occur in the project area in the EIS.

Table 18-3 (Table 7.29 Potential impacts on significant flora possible to occur in the study area)

Species	Status*	Potential Impact
ball nut (<i>Floydia praealta</i>)	Vulnerable (NC Act, EPBC Act)	<p>Several individuals of ball nut were recorded at a location on the periphery of the study area within a patch of remnant vine forest, RE 12.11.10 (see Figure 7.1). These individuals are outside the study area and will not be impacted by inundation, the dam wall or road infrastructure.</p> <p>Good quality potential habitat for the ball nut occurs in hillslope vine forest (RE 12.11.10) within the study area at survey site Q23. The project will result in the inundation of 7.36 ha of potential habitat (RE 12.11.10 and 12.11.11) for this species.</p> <p>If individuals are recorded during future works, the mitigation approach will involve a combination of actions including protection (in part) and management of existing populations, translocation (or propagation and planting) to establish an ex situ population in VMOs prior to any site disturbance, and development of management and monitoring programs. The overarching objective would be to ensure no net loss of individuals from the study area.</p>
hairy hazel wood (<i>Symplocos harroldii</i>)	Rare (NC Act)	<p><i>Symplocos harroldii</i> was recorded in an independent flora survey undertaken along Happy Jack Creek on a property upstream of the inundation area. This record is located outside the inundation area and will not be impacted by the project. Due to restricted landholder access, 3D Environmental were unable to verify the occurrence of this species. As such, the likelihood of occurrence of this species still remains as 'low likelihood'.</p> <p><i>Symplocos harroldii</i> occurs in riparian rainforest (RE 12.3.1) and Araucarian vine forest (REs 12.11.10 and 12.11.11). Remnant communities within the project area are unlikely to contain these species, as the habitat is sub-optimal and there have been no records of individuals within the study area, despite extensive searches. The project will result in the loss of approximately 67 ha of potential habitat for this species in the project impact area (RE's 12.3.1, 12.11.10 and 12.11.11).</p> <p>It is uncertain whether this species occurs along Happy Jack Creek. However, if present the loss of this species from the inundation area would be significant for a species which is otherwise associated with coastal and hinterland areas.</p> <p>If individuals are recorded during future works, the mitigation approach will involve a combination of actions including protection (in part) and management of existing populations, translocation (or propagation and planting) to establish an ex situ population in VMOs prior to any site disturbance, and development of management and monitoring programs. The overarching objective would be to ensure no net loss of individuals from the study area.</p>

*Conservation Status under the *Environment Protection and Biodiversity Conservation Act 1999* (A) or the *Nature Conservation Act 1992* (Q): E – endangered, V – vulnerable, R - rare

A submission claims that the EIS proposes mitigation for the nationally-listed slender milkvine (*Marsdenia coronata*) but no other scheduled EVR flora.

To offset the loss of other EVR flora in the project area, translocation plans will be developed for *Marsdenia coronata*, *Choricarpia subargentea*, *Floydia praealta* and *Mallotus megadontus*. Suitable translocation sites will be identified in Vegetation Management Offset (VMO) and revegetation areas and propagated and/or removed individuals will be planted at suitable sites. These sites will be subject to ongoing management, i.e. planting maintenance, weed and pest management to reduce the threat from weeds, pests, fire and drought and monitoring to determine the success of translocation and management actions. Pilot propagation and planting trials should be initiated as soon as practicable to determine the translocation potential of these species.

Prior to any vegetation clearing operations, all remnant and non-remnant vegetation will be inspected on-site by a qualified botanist for EVR flora. If any EVR flora species are identified,

suitable management measures will be implemented, such as translocation of the target species and associated management.

18.3.3.3 Weeds and Pests

Several issues were raised in the submissions regarding the potential for weeds and pest animals, such as dogs and foxes to proliferate by the presence of the dam. Further clarification on the ongoing control of terrestrial weeds and pest animals has been requested.

The EIS recognised that there is potential for the spread of weeds into cleared and disturbed areas from construction of the project, and for the increased proliferation of weeds and pest animals from the presence of the dam. In particular weeds may proliferate around the banks of the dam and pigs may be attracted to a permanent water supply.

To minimise the potential for the spread and introduction of weeds from the outset of construction, a weed management plan will be developed. Management measures will include:

- weed inspection across the project area, targeting VMOs, rehabilitated areas and dam edges, to identify the density and distribution of weed infestations;
- weed control of new and existing weed infestations identified. Control methods may include physical (e.g. machinery or hand-pulling), chemical (e.g. herbicides) or cultural (e.g. replanting of native species). Specific control methods for all identified weeds in the project area will be identified in the weed management plan;
- weed monitoring (weed density and distribution) of weeded areas to determine effectiveness of treatments and identify areas requiring additional applications; and
- management methods for declared weeds must be consistent with recommendations in DPI&F Pest Fact sheets.

Weed management will be undertaken by a suitably qualified officer and will focus on controlling and reducing weed species diversity and density.

A submission requested further information on how the lease conditions would be enforced in regards to weed management on QWI owned land. The local government weed management guidelines will apply equally to QWI owned land. QWI has, in all of its leases, a requirement that the lessee/tenant has responsibility for maintaining the property including the control of weeds. QWI has a weed management plan which involves six-monthly inspections of vegetation and weed growth on its properties, after which, if the tenant is not meeting their responsibility to control weeds, they will be advised to do so. Furthermore, local governments have the power to enforce weed management on these leases under the *Land Protection (Pest and Stock Route Management) Act 2002*.

A pest management plan will also be developed for the project and will propose measures for the ongoing control of foxes, wild dogs and pigs throughout the project area. These pests currently occur throughout the project area, and the presence of the dam may result in the increased proliferation of pest animals, including pigs. Specific control methods for pest animals will be identified in the pest management plan and may include baiting, trapping or ground shooting. The pest management plan will be developed by qualified wildlife ecologists and will take into account potential impacts of control methods, such as 1080 baiting on non-target species.

18.3.4 Mitigation Measures

18.3.4.1 Vegetation Management Offsets (VMO) Strategy

A submission raised the claim that the proposed VMOs fall short of meeting a best practice overall outcome of 'no net loss of remnant vegetation'. They also claim that there is no commitment to ongoing monitoring of VMOs and that VMOs should be integrated with efforts to mitigate impacts on EVR species.

As detailed in Section 7.5.4 of the EIS, a VMO strategy is being developed for the project. This strategy will be developed to comply with the legislative requirements of the *Vegetation Management Act 1999* (VM Act) and the guidelines detailed in the DNRW's 'Policy for Vegetation Management Offsets' (September 2007) in order to meet relevant performance requirements under the Regional Vegetation Management Code (RVMC) for SEQ Bioregion (DNRW, 2006).

Under the VM Act, significant projects declared under the *State Development and Public Works Organisation Act 1971* must meet the performance requirements of Part S of the RVMC, which include maintaining the current extent of Endangered and Of Concern REs (PR S7), Essential Habitat (PRS8), Threshold REs (PRS9) and Riparian REs (PRS3). There is no legislative requirement to achieve a no net loss of remnant vegetation. There are no Threshold REs or Essential Habitat within the project area.

The Project will result in the loss of approximately 156 ha of Endangered and Of Concern regional ecosystems (REs 12.3.1, 12.3.2, 12.3.11 and 12.11.14), as well as an additional 102 ha of riparian vegetation (REs 12.3.1, 12.3.2 and 12.3.7). This includes riparian areas that will not be cleared within 1.5 m of the FSL. In accordance with the VMO Policy, QWI will provide VMOs to offset the loss of this significant vegetation. There is no legislative requirement to provide offsets for Not of Concern REs. VMOs will incorporate relevant aspects of landform, geology and plant community to ensure the VMO Policy is met. VMOs will be in addition to the carbon offsets (native forestry plantations).

The EIS (Appendix F.4-1 - 'Desktop Assessment of Potential Vegetation Offsets' completed by 3D) provided preliminary information on the opportunities for VMOs within the LPA and regional area. It should be noted that the estimated offset is indicative of the minimum area required based on 3D's vegetation mapping and only considers offsets required for remnant vegetation impacted by inundation. It does not take into account the total area of offset required for the Project (i.e. from areas impacted by road corridors and dam wall construction). Summary results of the VMO potential for significant RE's and riparian vegetation within the LPA are provided in **Table 18-4** below.

Table 18-4 Summary VMO Potential for Significant REs in the Land Purchase Area (LPA)

Significant RE	VM Act Status	Area impacted by Inundation (EPA mapping)	Area impacted by Inundation Area (3D mapping)	Area impacted by Project (3D mapping)	Area in LPA potentially available for VMO (3D mapping)	Area in LPA potential available for VMO through rehabilitation (3D mapping)
12.3.1*	Endangered	252.7	59.9	60.4	19.1	10.0
12.3.2*	Of Concern	2.2	54.9	55	66.6	5
12.3.11	Of Concern	3.8	14.6	16.97	23.3	2.5
12.11.14	Of Concern	1.3	14.7	27.4	132.4	24.0
12.3.7*	Not of Concern	5.3	100.5	102.24	84.3	17.8

* Riparian vegetation for special consideration

** Requires the area be subject to a valid clearing permit

A breakdown of the potential offset gains for significant RE's and riparian vegetation within the LPA, applying DNRW's Policy for Vegetation Management Offsets (September 2007) is provided in **Table 18-5** and **Table 18-6**, respectively. Options for VMOs are complicated by the presence of riparian vegetation. Regional Vegetation Management Code 6 (RVMC 6) requires offsets to remnant riparian vegetation at a clearing to offset ratio of 1:2. This effectively doubles the offset required for REs 12.3.1, 12.3.2, as well as requiring offset to RE 12.3.7.

Table 18-5 Potential VMOs to Significant REs within the LPA

Significant RE	VM Act Status	Offset Required	Potential VMO - Policy Option 2.3	Potential VMO - Policy Option 2.4*	Potential VMO - Policy Option 3.3	Potential VMO - Policy Option 3.4*
12.3.1	Endangered	59.9	10.0	19.0	NA	NA
12.3.2	Of Concern	54.9	NA	NA	5.0	66.0
12.3.11	Of Concern	14.6	NA	NA	2.5	23.3
12.11.14	Of concern	14.7	NA	NA	24.0	132.4

*Available for Vegetation Management Offset only if held under a valid clearing permit

Table 18-6 Potential VMOs to Riparian Vegetation within the LPA

Riparian Vegetation	Offset Required (ha)	Potential VMO (ha) within LPA through retention of remnant vegetation	Potential VMO (ha) within LPA through management of non-remnant vegetation	Potential VMO (ha) within LPA under RVMC 6*
12.3.1	119.8	19.0	10.0	29.0
12.3.2	109.8	66.0	5.0	71.0
12.3.7	200.0	84.3	17.8	101.1
Total	430	169.3	32.8	201.1

* Area for offset under RVMC 6 considers remnant vegetation only. The use of rehabilitated non-remnant vegetation as an alternative offset solution requires further consideration with DNRW.

The desktop offset study also identifies areas outside the LPA as suitable VMOs. The total VMOs applicable to this Project will be a result of consultation with the DNRW and will be aimed at improving vegetation connectivity and wildlife corridors and meeting the VMO Policy objectives.

It is intended to adopt an integrated approach to environmental management of the area surrounding the dam and other project components. This includes the VMO strategy, revegetation strategy, rehabilitation of non-remnant riparian vegetation, EVR species management and native plantation forestry. For example rehabilitation of non-remnant riparian vegetation to provide habitat for *Mixophyes iteratus* and other threatened frog species, and translocation (or propagation and planting) of EVR flora (i.e. *Marsdenia coronata*, *Choricarpia subargentea*, *Floydia praealta*, *Symplocos harroldii*) into appropriate VMOs would form part of the VMO strategy and would provide habitat for EVR species. While the RVMC requires remnant vegetation for offset, the potential to use rehabilitated riparian vegetation as an acceptable solution will be discussed with DNRW. QWI understands that components of the VMOs must be legally binding, but other components of the overall environmental strategy can be voluntary.

Revegetation of VMOs will be undertaken at the commencement of project construction so that VMOs are established at inundation stage to provide habitat for displaced fauna. The majority of VMOs will comprise existing vegetation nearing remnant status and thus will comprise usable habitat in 5-10 years of regrowth.

A management plan will be developed for VMOs to ensure their long term success which will include measures for planting maintenance, weed and pest management and development of a monitoring program.

There were issues raised that the reclassification of the Endangered RE 12.3.1 will relieve the proponent of offset responsibilities. Analysis of the proposed RE changes by 3D indicate a reclassification of a broader area originally mapped as RE 12.3.1 into RE 12.3.7 and RE 12.3.2, specialist riparian communities which are subject to their own specific offset requirements. Therefore, reclassification of RE 12.3.1 will not result in any substantial change to QWI offset responsibilities.

The provision of VMOs will be based on the EPA's RE mapping with certified amendments. QWI is submitting a RE map amendment request to the EPA, which will provide the EPA with the supporting data to make an informed decision on the reclassification of vegetation to reflect 3D's vegetation mapping. This will be subject to rigorous field verification and approval by the EPA.

Several submissions have expressed their concern with the identification of land outside the QWI LPA (in the 3D 'Desktop Assessment of Potential Vegetation Offsets') as providing opportunity for VMOs, without any prior stakeholder consultation.

The 'Desktop Assessment of Potential Vegetation Offsets' provides initial strategic advice only for the purposes of the EIS and is not intended as a detailed VMO strategy for the Project which would be prepared only following project approval. The VMO strategy will be subject to detailed discussions with DNRW to ensure compliance with relevant legislation, codes and policies. Where possible, it is the intention of QWI to secure all VMO requirements within the LPA. Should further VMOs be required outside the LPA, then negotiations will be undertaken with the relevant landholders to establish voluntary covenants between the landholder and the proponent (QWI).

Another submitter has raised the issue with probity of government decision making should a legally binding agreement between the State Government and the proponent, which happens to be a State Government owned company, be made to legally secure offsets.

In accordance with the VMO Policy, offsets for a 'state significant project', the DNRW will accept specified arrangements that guarantee the securing of a suitable offset prior to the development approval being issued.

For a Project which is undertaken by the State of Queensland an acceptable solution to ensure an offset is 'legally secured' would be for the applicant (QWI) to provide a 'letter of obligation', whereby the proponent would commit to identifying and securing an offset consistent with the VMO Policy within 12 months of the development approval. This option is for projects being undertaken by the State of Queensland (in this case QWI), where the State of Queensland cannot enter into a legally binding agreement with itself.

The proponent would then be required to enter into a 'legally binding agreement' with the landholder for all offset lands identified.

The Queensland Government Environmental Offsets Policy (QGEOP) came into effect on the 1st July 2008. The QGEOP provides principles and guidelines for environmental offsets and guides the content of new specific-issue offsets policies to reflect the QGEOP objectives. Queensland currently has three specific-issue offsets policies, including the Policy for Vegetation Management Offsets (DNRW, September 2007). The VMO Strategy for the Project will follow the guidelines detailed in the Policy for Vegetation Management Offsets as well as the principles and guidelines of the QGEOP.

18.3.4.2 Revegetation Strategy

It is a commitment by the proponent to undertake revegetation, including planting of native fig trees, at targeted locations throughout the QWI land purchase area to offset habitat loss. Greening Australia was commissioned to provide specialist information on methodology, monitoring and past success of fig tree planting (Greening Australia, 2008). Further details on the proposed planting are provided below.

Biological Information

Figs can be grown in most types of soils but grow best in well-drained, reasonably fertile soils. If the drainage is poor, it will restrict oxygen to the roots resulting in the stunting and in some cases, the eventual death of the tree. The root systems are shallow and reasonably extensive. Figs are generally very tolerant of alkaline soils and intolerant of highly acidic soils (i.e. under pH 6). They can, however, tolerate some degree of salinity, coping with water up to 1000 ppm. Conversely, too much nitrogen in the soil can cause excess leaf production and the slower ripening of the fruit.

Figs are a sub-tropical plant and do well in areas that have a relatively dry summer, such as SEQ. Although a fairly hardy tree, young immature trees can be susceptible to severe frost and need plenty of water and fertiliser to survive the first year. Figs do well in coastal areas, however if temperatures are too high in summer, the fruit may become pulpless and cool, and damp conditions may result in fungal attack.

It is anticipated that given the soil types and climate of the Mary Valley region, figs will likely grow and mature effectively with appropriate planting maintenance.

Species List

It is proposed to revegetate with local native species that complement the RE descriptions for the project area. In this way the area will be revegetated with the same diversity and ratio of species currently occurring in the project area. This will include at least 56 native fig trees to provide future foraging habitat. The final list of species will be identified in the revegetation plan.

Planting Methodology

The following guidelines are proposed to ensure successful revegetation:

- undertake soil analysis test prior to planting to provide information on the correct fertiliser or combination of fertilisers to best suit the specific soil requirements for optimum plant growth at the planting site. No new topsoil to be brought onto the site;
- undertake site preparation 10-12 weeks prior to planting. This will involve herbicide treatment, slashing of dead weeds, cross ripping the site to 300mm and planting in the rip lines;
- undertake planting in spring (after September) to avoid any severe frosts of winter/early spring and before the hot temperatures of summer impede growth;
- all plants will be a minimum of 70mm native tube stock, with established root systems and a minimum of 150mm of growth out of the tube;
- the planting interval will be five metre spacing for all trees, two metre spacing for shrubs and one metre spacing for sedges and grasses. Species will be placed randomly with at least 100mm of forest mulch between each plant.;
- undertake planting using the following technique:
 - plant in a hole only slightly deeper than the depth and width of the pot;

- provide plastic tree guard protectors with three bamboo sticks, to deter animals or frosts that may affect the tube stock in the initial stages;
- apply a paper or jute mulch mat to each plant; and
- water with a minimum of 10 litres of water immediately after planting.
- on-ground works will be undertaken by a suitably experienced contractor in landscaping;
- undertake maintenance of revegetation for a period of two years after planting to ensure a 90% survival rate of planted stock during the establishment phase. This will involve:
 - ongoing weed control on a quarterly basis;
 - watering of planting stock until established;
 - replacement of mulch if disturbed; and
 - replacement planting to replace any deaths within the planted stocks.
- monitoring of revegetation at four monthly intervals by a suitably experienced contractors to monitor:
 - plant establishment success;
 - maintenance performance;
 - weed presence;
 - required remedial action, if any; and
 - overall performance of the project with recommendations for improvement if required.

Likely risks to the success of revegetation include predation of plantings by wild and domestic animals, cattle grazing and flooding. Fencing will be erected around the revegetation site to prevent cattle access. The plantings will also have plastic tree guards to deter feeding by wild animals. Flooding is more likely in summer and early autumn, when heavier rains are experienced. Planting will occur in spring to ensure the root systems are sufficiently anchored to withstand flooding before summer.

During the establishment period, plants are also susceptible to other factors including frost, drought, fungal attacks and lack of or too many nutrients in the soil. These risks will be reduced by undertaking soil testing prior to planting and applying appropriate fertilisers/additives, undertaking regular maintenance, including watering and planting in spring to avoid any severe frosts.

A revegetation plan will be prepared for the project which will provide details on location and extent of revegetation, final species list, planting methodology, planting maintenance and monitoring. The revegetation strategy will complement the integrated approach to environmental management of the project area. It is proposed to revegetate riparian areas along the Mary River and its tributaries to “fill in” the gaps in the corridor, and revegetate areas between riparian and hillside areas.

It is intended to adopt an integrated approach to environmental management of the area surrounding the dam and other project components. This includes the VMO strategy, revegetation strategy, rehabilitation of non-remnant riparian vegetation, EVR species management and native plantation forestry. For example rehabilitation of non-remnant riparian vegetation to provide habitat for *Mixophyes iteratus* and other threatened frog species, and translocation (or propagation and planting) of EVR flora (i.e. *Marsdenia coronota*, *Choricarpia subargentea*, *Floydia praealta*, *Symplocos harroldii*) into appropriate VMOs would form part of the VMO strategy and would provide habitat for EVR species. While the RVMC requires remnant vegetation for offset, the potential to use rehabilitated riparian vegetation as an acceptable solution will be discussed with DNRW. QWI understands that components of the VMOs must be legally binding, but other components of the overall environmental strategy can be voluntary.

The planting methods described have been proven on a number of sites and should provide for a long-term survival rate of 90% after the initial establishment, provided the maintenance schedules are followed. Extreme weather events such as flood or bushfire would obviously affect these figures but normal seasons and weather patterns will allow for this survival rate to be achieved.

18.3.4.3 Revegetation of Dam Margins

Submitters have commented on the EIS relating to the establishment of fringing vegetation around the dam (between the FSL and the actual water level), claiming that on most dams this zone tends to be dominated by grasses and weeds. This is potentially the case in situations where the banks are steep and the water level highly variable, however, opportunities do exist to create more favourable (flatter) grades which would increase and stabilise the length of inundation, thereby enabling the establishment of fringing vegetation.

18.3.4.4 Native Timber Plantations

There is some confusion in the submissions with the provision of native timber plantations, VMOs and carbon emission offsets. Furthermore, the EIS did not provide a map showing the location and tenure of proposed native timber plantation. Submissions also claim there has not been a study on the projected greenhouse emissions from the project to justify the provision of carbon emission offsets.

The provision of VMOs is specifically related to compliance with the VM Act. It does not relate to carbon emissions per se, though it would afford some benefit. To deliver carbon sequestration benefits to offset those emitted during the project construction and operation, QWI have proposed to establish native timber plantations (QWI's target is to establish more than 2,000 ha over time). Initial calculations by Timber Queensland indicate that it could provide substantial carbon benefits for the project (the Timber Queensland report is provided in Appendix F of the EIS). Native timber plantations (carbon offsets) are in addition to the provision of VMOs for the project.

A greenhouse gas assessment was undertaken for the project (see Section 10.2.5 of the EIS) and following the Australian Greenhouse Office (AGO) Factors and Methods Workbook (AGO, 2006) and the AGOs National Carbon Accounting Toolbox.

The native timber plantations will be located on QWI owned land and areas identified in discussion with the landholders or lessees and the forestry company. QWI, with the assistance of Timber Queensland, will call for expressions of interest to participate. Participation will not be restricted to QWI lessees. QWI's preference would be for plantations to abut existing native timber areas, riparian zones or areas targeted for revegetation as this would maximise habitat values for native fauna species. QWI and Timber Queensland are confident that at least the target level of uptake will be achieved. QWI has already identified over 2000 ha of potentially suitable land within QWI owned land.

18.3.4.5 Approval Conditions

Some submissions have questioned the suitability of the proponent (QWI) to deliver the project due to the former involvement of QWI's senior management with Paradise Dam, where it was claimed that mandatory environmental conditions were not successfully implemented and maintained, including offset tree plantings,.

Approval conditions are a corporate responsibility of the operator, which in the case of Paradise Dam is Sunwater. Sunwater and the Paradise Dam construction entity retain contractual obligations with the re-vegetation subcontractor for the services, not Burnett Water Pty Ltd (the proponent for Paradise Dam).

18.3.4.6 Downstream Impacts

A submission claims that the EIS has ignored the importance of yearly freshwater flows to trigger flowering of certain mangrove species. It is also claimed the EIS has not assessed the impact of environmental flows on Illidge's Ant-blue Butterfly and other species that depend on mangrove flowers.

The changes in environmental flows as a result of the Project were discussed in Section 6.1.2.3 of the EIS. The changes to the flow regime downstream of the dam have further been clarified in Section 4 of the Supplementary EIS.

In summary, hydrological modelling predicts that the dam's impacts on flows within the Mary River will reduce rapidly with distance downstream of the dam as inflows from tributaries increase the overall flow in the river. In other words, combined with flows released from the dam, inflows from the remaining 78.5% of the catchment located downstream of the dam wall would continue to contribute flow such that water levels will become comparable to existing levels within a relatively short distance. Specifically, modelling indicates that by Fisherman's Pocket, the impact on the flow regime will be minimal. See Section 4.1.1 of the Supplementary EIS for further detail. At Fisherman's Pocket gauge station approximately 90% of existing flows are predicted to pass this location with the Dam in place, with 97% of existing flows predicted to pass at the Estuary.

Thus, the change in environmental flows is not anticipated to impact on mangroves within the Mary River estuary downstream of the project, nor on species dependent on these mangroves.

18.4 Terrestrial Fauna

18.4.1 Methodology

18.4.1.1 Database Searches

A submission claims that the Terrestrial Fauna Study should not rely on data from Birds Australia or the Mary River Catchment Coordinating Committee (MRCCC) surveys, as these are not scientific surveys and data should be treated as indicative.

The Terrestrial Fauna Study undertaken by Ecotone Environmental Services (EES) comprised standard EIS methodologies involving: 1) a desktop review of existing information and gap analysis; and 2) field surveys for terrestrial fauna. The existing information included database records of fauna presence (EPA Wildnet, Queensland Museum and Birds Australia databases). The gap analysis identified a number of areas where field studies were required to redress data deficiencies. In response to this, a comprehensive fauna survey program was designed by EES to characterise the overall terrestrial vertebrate fauna community utilising the habitats in the study area. The fauna survey provided current and accurate data on the terrestrial vertebrate fauna community, which enabled the verification of background data. At no point were existing datasets relied upon as an accurate representation of the fauna community of the study area and were verified with comprehensive fauna surveys conducted by qualified ecologists.

The frog surveys undertaken as part of the fauna survey program for the EIS were a combination of sites surveyed by EES and MRCCC. The location of the EES and MRCCC survey sites were co-ordinated during a meeting in November 2006 to ensure coverage of the entire project area. MRCCC were reimbursed by QWI to undertake this surveying and surveying was conducted by MRCCC staff, not volunteers.

18.4.1.2 Fauna Survey

Several submissions claimed that field surveys for terrestrial fauna are inadequate, no seasonal or yearly considerations, or surveying of the winter period. It was also claimed that no Population

Viability Analyses (PVA) or Population and Habitat Viability Assessment studies (PHVA) were conducted.

The Final TOR requested that fauna surveys be conducted at the appropriate time of day and year when species are known to be present on the site, so that identification and location of these species is optimal. There was no request for yearly surveys or PVAs/PHVAs.

One of the fundamental problems with PVAs is that they depend on knowledge that is often incomplete. We do not have basic population and life history information for most species, and this is certainly the case for the suite of threatened species recorded from the study area. For many species where data and knowledge are limited, it is not appropriate to use PVA methodologies since the risk of misleading results is high and often outweighs any benefit of conducting such analysis. Qualitative forms of assessment (such as expert assessment) are reasonable alternatives.

A thorough review of existing datasets, ecological literature and habitat assessment relating to the known and possible presence of threatened fauna was conducted prior to designing field surveys. The EES fauna survey comprised two survey events, a spring survey (November – December 2006) and a summer survey (February – March 2007). These survey periods were selected to provide survey effort prior to and following summer rainfall in the study area. The spring survey period was intended to coincide with the early wet season storms to provide good conditions for frog activity. The summer survey period was timed to coincide with elevated fauna abundance following the breeding season typical of the majority of SEQ fauna. The spring and summer survey events are considered the optimal times for detecting maximum diversity in the study area.

Whilst it is anticipated that the majority of terrestrial vertebrate fauna species that utilise the study area were recorded during the surveys, census of winter fauna usage was overcome by adoption of the precautionary approach to assume the presence of threatened species on the basis of suitable habitat. Targeted searches of potential habitat and consideration of database records was conducted to assess the likelihood of threatened and migratory fauna.

A submission claims that field surveys of the Coxen's fig parrot should cover all seasons, especially the fruiting period of the local *Ficus* sp. Furthermore, they claim that the assessment of impacts on the Coxen's fig parrot food source is inadequate.

As discussed above, the fauna surveys comprised a spring and summer survey. Census of the winter period for threatened and migratory species was overcome by assessing suitable habitat and consideration of database records. The Coxen's fig parrot is a highly cryptic and mobile species, hence specific survey effort was not directed to detection of the species as the probability of detecting the species even if present is regarded as too low to warrant survey effort. As a substitute, mapping of native fig trees (*Ficus* species) within both the inundation area and the surrounding regional area was conducted to assess the impact of the project on potential food resources for this species. A discussion of the methodology and results is provided in Section 18.4.3.1.

18.4.1.3 Frog Survey

Several submissions noted that drought conditions during the fauna survey period could have affected records of frog species and have requested details of previous studies/research conducted for the southern barred frog (*Mixophyes iteratus*) in the Mary River catchment. They also claim that survey effort along tributaries on the western side of the project area and downstream of the dam may be insufficient to determine the distribution of *Mixophyes iteratus* in the catchment and recommend that further surveying is carried out in the western tributaries.

Site specific data for *Mixophyes iteratus* has been obtained from the EPA's Wildnet database and Harry Hines (Queensland Parks and Wildlife Service (QPWS)) since the EIS. These records were derived from surveys and monitoring carried out by the QPWS and the MRCCC. This data has been supplied to SKM to address these comments and due to a data licence agreement between SKM and EPA we are unable to present this data to the public. EPA and QPWS records for *Mixophyes iteratus* have been presented to the relevant Government agencies as an annex to the Supplementary EIS.

The Terrestrial Fauna Study provided in Appendix F.4.1 of the EIS documents frog surveys conducted by EES and the MRCCC. This included a survey site downstream of the proposed dam wall (S6) and several other sites across the study area that was mistakenly omitted from Figure 7.10 of the Draft EIS. **Figure 18-3** has been updated to include these additional survey sites. In total there were 11 survey sites located on the western tributaries of the study area, providing coverage of Kandanga Creek (P4, M9, M10, M11, M14), Yabba Creek (F5, M16) and Coonoon Gibber Creek (P7, M2, M8).

An updated description of the distribution of *Mixophyes iteratus* taking into account the results of the EES and MRCCC frog surveys and the EPA and QPWS frog data is provided in Section 18.4.2.1.

As the EIS frog surveys provided coverage of the Mary River downstream of the Project and the western tributaries, and given the recent acquisition of site specific data from the EPA and Harry Hines, it is not considered necessary to conduct further surveying of *Mixophyes iteratus*.

18.4.1.4 Invertebrate Fauna Survey

Some submissions claimed that no dedicated field surveys for invertebrates were undertaken.

The fauna survey undertaken by EES in 2007 and 2008 involved survey methods to census the four terrestrial vertebrate groups, freshwater turtles, as well as terrestrial invertebrates listed under the NC Act and/or EPBC Act that are likely to occur in the study area. These include Australian Fritillary (*Argyreus hyperbius inconstans*), Richmond Birdwing (*Ornithoptera richmondia*) and Pink Underwing Moth (*Phyllodes imperialis* (southern subspecies)). The survey approach for these species involved liaison with the project botanists (3D) to locate food plants, with follow up survey and incidental observations during other survey activities. Close inspection of wetland habitats was also undertaken for the Australian Fritillary.

18.4.2 Existing Environment

18.4.2.1 Fauna of Conservation Significance

A submission identified inconsistencies in the Ecotone Fauna Report in Appendix F-4.3 of the EIS with regards to the number of EVR fauna species detected during the fauna surveys. The text under section 4.4 states that 11 EVR fauna species were identified while Table 4.6 listed only 10 EVR fauna species. It has been confirmed that the text in the Ecotone Fauna Report is incorrect, and that the table is correct as only 10 EVR fauna species were identified.

A submission raised the issue that for a number of bird species, the EES report unsatisfactorily stated that “it is not anticipated that the project area represents especially significant habitat for this species”.

The bird species identified in the EES report as potentially occurring within the project area were determined by multiple database searches, and such searches are generally performed on a coarse level and may identify species which are not actually present in the search area. There were a number of bird species which were identified from the database searches as occurring within the study area, which were also seen during the field surveys performed by EES. For some of these sighted species, it was anticipated that the project or inundation areas did not represent especially significant habitat, for one or more of the following reasons:

- lack of permanent habitat for the species present in the inundation area;
- the species is widely distributed and commonly encountered in northern Australia, southeast Queensland, Queensland, or other Australian states; therefore, the inundation area is not significant in terms of overall distribution of the species;
- it appears unlikely that the habitats within the inundation area would be relatively more significant than the similar Mary Valley habitat areas that occur extensively upstream and downstream of the inundation area;
- no nests for this species were detected;
- the eucalypt dominated habitats present within the inundation area are not the preferred habitats of the species;
- favoured water habitats are not abundant within the inundation area and occur elsewhere in the broader study region;
- the inundation area includes only small patches of forest habitat with prey species that could be utilised, and breeding pairs of the species are known to require several hundred hectares of feeding habitat;
- lowland vine forest patches occur as isolated remnant nodes along the tributaries of the inundation area and are not considered to provide prime habitat for the species;
- currently only sub-optimal habitat (or only small areas of sub-optimal habitat) is available for the species within the inundation area compared to more extensive upland habitat areas in the surrounding region; and/or
- the species is likely to be only an occasional visitor to habitats within the project area.

Southern Barred Frog (Mixophyes iteratus)

Agencies have requested details of previous studies/research conducted for *Mixophyes iteratus* in the Mary River catchment. They have also commented that there are records of *Mixophyes iteratus* from Doongul Creek, north of Maryborough and Tinana and Tagigan Creeks, north of the Project within the Mary River catchment. They have recommended rectifying statements on the northern distributional limit of *Mixophyes iteratus*.

The survey sites where *Mixophyes iteratus* was recorded from the frog surveys conducted by EES and MRCCC in 2006 and 2007 are shown in **Figure 18-3**. A description of the occurrence of *Mixophyes iteratus* within the inundation area and the Mary River catchment has been updated to reflect the frog survey records and the site specific data obtained from the EPA and QPWS for *Mixophyes iteratus*.

Occurrence in the Study Area

Mixophyes iteratus was detected from stream sites within both vine forest (RE 12.3.1) and riparian forest (RE12.3.7 and 12.3.2) habitat types on Belli Creek, Happy Jack Creek, Skyring Creek, Mary River and Coonoon Gibber Creek during the ESS and MRCCC frog surveys.

This species was found more often along tributaries than the Mary River itself; however it was located on the Mary River at two locations, in proximity to the confluence with tributaries where this species occurs. Consequently, it does not appear that *Mixophyes iteratus* occurs along the entire length of the Mary River within the inundation area due to the unsuitability of the habitat, only near tributary end points where suitable habitat exists along these tributaries.

Mixophyes iteratus was concentrated on the eastern tributaries on Belli Creek, Happy Jack Creek and Skyring Creek. Surveys in riparian forest habitat on Gheerulla Creek by both EES and MRCCC did not locate this species, however it is likely to occur in the upper reaches of the Mary River catchment on the Blackall Range.

Mixophyes iteratus was also detected at two sites on Coonoon Gibber Creek and is known from a third location on this creek (Eva Ford, pers. comm.). Coonoon Gibber Creek was the only western tributary upon which *Mixophyes iteratus* was found to occur. The species was not located on Kandanga or Yabba Creeks despite the occurrence of suitable habitat. Given the successful location of individuals on eastern tributaries during the surveys, it is anticipated that the data indicates a genuine absence or restricted occurrence of the species along Kandanga and Yabba Creeks. The location of *Mixophyes iteratus* records from the EES and MRCCC frog surveys are shown in **Figure 18-4**.

Occurrence in Mary River catchment

The known distribution of *Mixophyes iteratus* across the Mary River catchment is shown in Appendix D. This displays records of *Mixophyes iteratus* from 1995 to present sourced from the EPA's Wildnet database and Harry Hines. Downstream (north) of the proposed Traveston Crossing Dam, this species has been recorded from Tinana Creek, Tagigan Creek, Six Mile Creek and Doongul Creek, north of Maryborough. Upstream (south) of the proposed dam, *Mixophyes iteratus* has been recorded from tributaries of the Mary River, including Gheerulla Creek, Cedar Creek, East Cedar Creek and Cherry Tree Creek draining the Blackall Ranges and Boolumba Creek, Bundaroo Creek and North Boolumba Creek draining the Conondale Range. This range particularly downstream of the project is a significant expansion from that presented in the EIS. *Mixophyes iteratus* has also recently been recorded in the Maroochy catchment, where it was thought to be extinct.

Mixophyes iteratus has experienced major declines in abundance and distribution in the southern half of its known range (i.e. NSW). During the early 1980's *Mixophyes iteratus* declined and disappeared from stream localities in the Conondale Range where it was well known, and the occurrence of the species in upland areas of the upper Mary River catchment remains depressed due to the Chytrid fungus.

Historically, *Mixophyes iteratus* was distributed from Belli Creek near Eumundi in South East Queensland, south to Warrimoo in the Blue Mountains of New South Wales (Hines *et al.*, 1999). In recent years, the known northern distributional limit of *Mixophyes iteratus* in coastal lowland South East Queensland has been extended to Doongul Creek, north of Maryborough.

On the basis of the EES and MRCCC survey results and the Wildnet records and given the poor riparian habitat condition upstream of the inundation area, it is unlikely that *Mixophyes iteratus* would occur along the Mary River upstream of the inundation area, apart from in the vicinity of confluences with larger rainforest tributaries, such as Obi Obi Creek and Little Yabba Creek. With respect to tributaries of the Mary River, *Mixophyes iteratus* occurs on the eastern tributaries draining the Blackall Range and Walli area, including Gheerulla and East Cedar Creeks and is likely to occur on others (e.g. Coolabine, Obi Obi and Walli Creeks). Further upstream, the smaller upper tributaries south of the Conondale also support this species including Bundaroo Creek, Booloumba Creek and North Booloumba Creek. However, this area is approaching the upland habitat areas from where this species has declined.

Given the decline of *Mixophyes iteratus* in previous upland habitat areas such as the Conondale Range, occurrences of *Mixophyes iteratus* in lowland habitat areas have gained greater conservation significance. In this respect, the lower Mary River catchment including the inundation area where this species persists is significant habitat for this species.

Cascade Tree Frog (Litoria pearsoniana)

Submitters have noted that the Cascade Tree Frog (*Litoria pearsoniana*) is present in the inundation area. The historical distribution of this species was from Kandanga State Forest south-east Queensland (26° 26'S, 152° 24'E) south to Gibraltar Range north-east New South Wales (29° 31'S, 152° 25'E) (Hines *et al* 1999). This species was not recorded during fauna surveys for the project, however, it was noted as a possible occurrence on small sections of Belli Creek. The historical record from Kandanga State forest is more than 20km upstream of the full supply level. The presence of this species in the inundation area remains unconfirmed.

Green-thighed Frog (Litoria brevipalmata)

Litoria brevipalmata has been recorded from a property at Bruce Highway, Coles Creek (Lot 130 M37940). The frog was observed within an area of remnant vegetation, RE 12.11.3, which is Eucalypt open forest dominated by *Eucalyptus propinqua* (small-fruited grey gum) and *Corymbia intermedia* (pink bloodwood). This is located within the project area within the Bruce Highway realignment north of the inundation area.

Litoria brevipalmata is listed as rare under the NC Act. More recently it has become recognised as 'Endangered' on the IUCN Red List because whilst the species has a broad distribution the population is severely fragmented.

Three-toed Snake-tooth Skink (Coeranoscincus reticulatus)

A dead skink specimen has been observed from a property in the vicinity of the study area (Lot 1 RP57331). It has been positively identified by the Queensland Museum as the three-toed snake-tooth skink (*Coeranoscincus reticulatus*).

A site visit by the project team on the 26 February 2008 has verified that the specimen as *Coeranoscincus reticulatus*. This specimen was found on a property (Lot 1 RP57331) located just outside the study area on Frayne Road, the location of which is shown on **Figure 18-5**. *Coeranoscincus reticulatus* is listed as vulnerable under the EPBC Act.

Grey-headed flying-fox (Pteropus poliocephalus)

A flying fox colony has been reported in Hynes Estate Road.

A site visit by the project team on the 28 March 2008 has verified the occurrence of a large (several thousand individuals) grey-headed flying fox colony on the western side of Hynes Estate Road in vine forest (RE 12.11.10). The species mix of the colony is 90% grey-headed flying-foxes and 10% black flying foxes. The location of the colony is shown on **Figure 18-5**. It is located outside of the project impact area.

Richmond Birdwing (Ornithoptera richmondia)

A submission claims that the Richmond Birdwing butterfly is known to breed in the Belli Creek catchment and has been recorded by the Richmond Birdwing Recovery Network from within the inundation area. It has been reported that the larval food plant (*Pararistolochia praevenosa*) may occur in the local rainforest area and that inundation of the area could interrupt the linkage between breeding sites.

Dr Don Sands from the Richmond Birdwing Recovery Network confirmed that a major breeding population of the Richmond Birdwing butterfly occurs at upper Belli Creek (at the Skyring Creek Rd creek crossing) which is above the study area. Dr Sands also reported that an adult specimen was recorded from a property (Lot 46 RP805811) along Happy Jack Creek. The location of the butterfly record is shown on **Figure 18-5** and is located just upstream of the inundation area. The larval food plant for this butterfly (*Pararistolochia praevenosa*) was not recorded during the flora survey. Based on an assessment undertaken by the Richmond Birdwing Butterfly Network using plants associated with *Pararistolochia praevenosa* as an indicator, there is a high chance of *Pararistolochia praevenosa* occurring within the lower Belli Creek catchment based on a scoring system (Dr Don Sands, pers. comm.). Despite surveying of several sites within riparian vegetation along Belli Creek during the flora survey, *Pararistolochia praevenosa* was not recorded to occur in the inundation area and the likelihood of the Richmond Birdwing as occurring in the study area was assessed as unlikely. However, in light of this new information the Richmond Birdwing has been reassessed as likely to occur in the study area.

Southern Pink Underwing Moth (Phyllodes imperialis)

Some of the submissions have claimed that *Phyllodes imperialis* was incorrectly named in the EIS and is commonly known as the Southern Pink Underwing Moth. One of the submissions also disagrees with the EIS conclusion that *Phyllodes imperialis* is not likely to occur in the study area, claiming that *Phyllodes imperialis* is known from the Happy Jack Creek area. They state that the only reliable way to get evidence of the moth breeding in an area is presence of larvae on the food plant (*Carronia multisepealea*).

Breeding habitat is considered to be restricted to areas where the larval food vine, *Carronia multisepealea*, grows in a collapsed shrub-like form in undisturbed old growth subtropical rainforest. The vine grows in habitats other than subtropical rainforest, but in these habitats it usually adopts an upright form. *Phyllodes multisepealea* has not been recorded from such habitats. *Carronia multisepealea* was recorded from two sites within the inundation area during the flora survey in Araucarian notophyll vine forest (RE 12.11.10) and simple-complex vine forest (RE 12.3.1). At both these sites the growth form was sparse and dense thickets were not observed. Both sites comprised small isolated patches of rainforest habitat and are not anticipated to provide suitable habitat for *Phyllodes imperialis*. The likelihood of this species occurring in the study area is still assessed as unlikely (see **Table 18-3**).

Square-tailed Kite (Lophoictinia isura)

Lophoictinia isura was not included in the list of EVR fauna identified from the search area, although it was detected in the EES fauna surveys downstream of the Mary River.

Lophoictinia isura was observed as Site 6 (downstream of the proposed dam wall) during the EES fauna surveys. It is listed as rare under the NC Act and it is anticipated that it would occur throughout the inundation area, predominantly in associated with riparian habitat areas.

Black-breasted Button-quail (Turnix melanogaster)

One of the submissions has claimed that *Turnix melanogaster* is known from the Frayne Road area. This is an unconfirmed sighting located outside the inundation area. This species is most frequently recorded from vine scrubs and adjacent open forest vegetation and prefers closed canopy vegetation with a moist deep litter layer. Optimal habitat for *Turnix melanogaster* was not observed within the study area. The likelihood of this species occurring in the project area is still assessed as unlikely.

Spotted-tail Quoll (Dasyurus maculatus maculatus (SE mainland))

One of the submissions has claimed that the spotted-tail quoll is known from the Chinaman's Creek area in the study area. This is an unconfirmed sighting located outside the inundation area. The spotted-tail quoll is known to utilise rainforest, wet and dry sclerophyll forest and woodland and may occasionally visit the riparian forest habitat. The likelihood of this species occurring is still assessed as low.

An evaluation of the likelihood of occurrence of EVR fauna in the study area, including evidence from field survey and database records was presented in Table 7.21 of the EIS. This table has been updated to account for the additional data that became available after the EIS was produced (see **Table 18-3**).

Table 18-7 (Table 7.21 EVR fauna identified from the search area and an evaluation of the likelihood of occurrence within the study area)

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
Insects					
<i>Phyllodes imperialis</i> (southern subspecies)	southern pink underwing moth	NL	E	<p>This subspecies is known from 5 locations in lower montane rainforests with all but one of the locations in south-eastern Queensland. Currently known to be distributed from Nambour to northern NSW and occurring in undisturbed old growth subtropical rainforest below 600 m altitude.</p> <p>Only one location, Mary Cairncross Park (approximately 30km southeast of the inundation area) is confirmed breeding habitat. Breeding habitat is considered to be restricted to areas where the vine, <i>Carronia multisepealea</i>, grows in a collapsed shrub-like form in undisturbed old growth subtropical rainforest. It is thought that larvae of this subspecies feed only on this vine, and adults require the darkness supplied by the vine and rainforest vegetation in order to breed. This vine grows in habitats other than old growth rainforest, but in these habitats it usually adopts an upright form. The upright form appears to be more common than the collapsed form of the vine. The southern subspecies of <i>Phyllodes imperialis</i> has not been recorded from such habitats.</p>	<p>Unlikely. <i>Carronia multisepealea</i> was recorded from two sites within the inundation area during the flora survey; within <i>Araucarian notophyll</i> vine forest on metasediments (RE12.11.10), and simple-complex vine forest on alluvium (RE12.3.1). At both of these sites the growth form was sparse and wiry and dense thickets were not observed. The former site was disturbed by cattle while the latter site was in good condition with a closed canopy. Both sites comprised small isolated patches of rainforest habitat and it is not anticipated that they provided suitable habitat for <i>Phyllodes imperialis</i>.</p> <p>These unmistakable adult individuals were not sighted during the fauna survey.</p>
<i>Argyreus hyperbius inconstans</i>	Australian fritillary	E	NL	A species of open sedgeland, wetlands and swamps in coastal areas. Occurs in the Tweed Coast and Sunshine Coast areas. Larval food plant comprises <i>Viola betonicifolia</i> . Adults most often observed in winter but can also be abundant in summer.	Unlikely. The larval food plant was not detected during flora survey, and good condition wetland habitats not present.
Ornithoptera richmondia	Richmond birdwing	V	NL	Occurs in upland and lowland rainforest in northeast NSW and southeast Queensland where the larval food plant (<i>Pararistolochia praevenosa</i>) grows. One record within the WildNet search area. Known from isolated lowland rainforest areas in the upper Mary River catchment.	Likely (low). Major breeding population known from upper Belli Creek (at creek crossing) upstream of the study area. One record of an adult specimen from Happy Jack Creek in May 2007 outside of the inundation area. The larval food plant was not detected within the inundation area despite extensive surveying within riparian zones of Belli Creek and Happy Jack Creek,

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
					however the Richmond Birdwing Recovery Network consider there is a high chance of the larval food plant occurring in the lower Belli Creek using associated plants as an indicator of occurrence (Dr Don Sands, pers. comm.). Adult individuals not detected during fauna survey.
Amphibia					
Adelotus brevis	tusked frog	V	NL	A species of streams and static water bodies predominantly in moist forest situations but may also be found in disturbed habitats. Widespread in southern coastal Queensland and northern NSW. Appears to have suffered declines in elevated habitat areas.	Present. Detected at a number of survey sites within inundation area during frog surveys. Also recorded during MRCCC frog surveys in the inundation area and adjoining areas.
Mixophyes iteratus	southern barred frog	E	E	Occurs in moist riparian forests in association with streams between Doongul Creek, near Maryborough and central coastal NSW. Numerous records from the WildNet database for the Mary River catchment coming mainly from frog surveys conducted in recent years by MRCCC. Appears to have suffered declines in elevated habitat areas.	Present. Detected at a number of survey sites within the inundation area along Belli Creek, Skyring Creek, Happy Jack Creek, Coonoon Gibber Creek and Mary River during EES and MRCCC frog surveys.
Litoria pearsoniana	cascade treefrog	E	NL	Occurs in rainforest areas in association with flowing streams. Number of records in WildNet search area. Currently known from flowing sections of upper Mary Valley tributaries including Obi Obi Creek.	Likely (high). This species was not detected during the frog surveys, however may occur on small sections of Belli Creek. There are unconfirmed records of the species in the inundation area.
Litoria brevipalmata	Green-thighed frog	R	NL	Occurs in wet and dry sclerophyll forest habitats. A little known species that may occur in eucalypt open forest following flooding rains. Known from a number of localities extending from Bundaberg, Qld into central coastal NSW and west into the Yarraman district in southern Qld. No records from the WildNet search area.	Present. A single record from a property at Bruce Highway, Coles Creek (Lot 130 M37940) north of the inundation area in the Bruce Hwy realignment. May occur within the inundation area in eucalypt habitats in inundated grassy areas following rainfall events.
Reptiles					
Delma torquata	collared delma	V	V	Known predominantly from rocky areas on both heavy basalt soils and light sandy soils. In the Brisbane area, requires rocky areas but may also inhabit areas away from rocks where there is deep leaf litter for cover. Also	Unlikely. Very little eucalypt habitat occurs within the inundation area. None of the eucalypt habitat present includes rocky areas due to its lower topographic situation.

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
				records from eucalypt forest without rocks.	
<i>Coeranoscincus reticulatus</i>	three-toed snake-tooth skink	NL	V	Known from rainforest habitats in southeast Queensland and sandy coastal forest with deep leaf litter in the Cooloola region. In the vicinity of the inundation area known from the Conondale Ranges. No records from within the WildNet search area. A secretive cryptic species.	Likely (low). A record of this species from a property on Frayne Road just outside the north western side of the study area. Not detected during fauna survey, but may occur in vine forest habitats on hillslopes (RE 12.11.10 and 12.11.11).
<i>Erotoscincus graciloides</i>	elf skink	R	NL	A small skink occurring in shaded forest habitats in southeast Queensland. This species has recently been found to be rather widespread in the Sunshine Coast area and hinterland.	Present. Detected at numerous sites during fauna survey.
<i>Saproscincus rosei</i>		R	NL	Occurs in rainforest and adjacent moist eucalypt forests in coastal ranges of southeast Queensland and northeastern NSW. No records within the WildNet search area.	Present. Detected at a few sites during fauna survey.
<i>Acanthophis antarcticus</i>	common death adder	R	NL	A species encountered in many different habitat types throughout its range but prefers areas with relatively deep leaf litter. Rarely encountered but concentrations of individuals can be found in evidently optimal habitat. In southeast Queensland most often found in montane eucalypt forest areas. One record within the WildNet search area.	Likely (moderate). May utilise eucalypt open forest or riparian areas but unlikely to be common.
Birds					
<i>Accipter novaehollandiae</i>	grey goshawk	R	NL	Known from closed forest, tall wet forest, and riparian forest amid disturbed areas. In southeast Queensland Known to undertake winter migration from nest sites in the ranges to coastal plains. Tends to utilise lowland riparian forest during winter. A small number of records from the WildNet search area.	Present. Observed within the inundation area during the fauna survey.
<i>Calyptorhynchus lathami</i>	glossy black-cockatoo	V	NL	Predominantly open forest and woodland habitats containing she-oak (<i>Casuarina/Allocasuarina</i>) upon which it feeds exclusively. A small number of records from the WildNet search area.	Likely (high). Not observed during the fauna survey, but abundant food plants (<i>Casuarina cunninghamiana</i>) occur throughout the inundation area.

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
<i>Climacteris erythroptus</i>	red-browed treecreeper	R	NL	Known from a wide range of habitats including rainforest, eucalypt woodland and forest, and riparian habitats. No records from the WildNet search area but recorded from the Tewantin area.	Likely (moderate). May utilise forest habitat within the inundation area but not regarded as prime habitat.
<i>Collocalia spodiopygius</i>	white-rumped swiftlet	R	NL	An aerial feeder encountered over a range of habitat types. Distributed throughout the Queensland coast. No records within the WildNet search area.	Likely (moderate). May forage above natural and disturbed habitats within the inundation area.
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's fig-parrot	E	E	Known to inhabit rainforest and adjacent eucalypt forest but also may visit isolated food trees in grazing land, parks and gardens. A cryptic species that has declined significantly. Thought to utilise lowland rainforest preferentially during winter but not confirmed. Dependent on a diversity of native fruits with a preference for native figs (<i>Ficus</i> spp.).	Likely (low). Very difficult to detect without intensive survey effort. May utilise feed trees (especially <i>Ficus</i> spp.) within inundation area.
<i>Ephippiorhynchus asiaticus</i>	black-necked stork	R	NL	Inhabits river pools, swamps, wetlands and intertidal flats.	Likely (moderate) to utilise farm dams, alluvial wetlands and Mary River channel.
<i>Erythrorhynchus radiatus</i>	red goshawk	E	V	Occurs in coastal and sub-coastal forests and riparian forests. In southeast Queensland known to undertake winter migration from nest sites in the ranges to coastal plains, where they are associated with wetlands and prey upon waterbirds.	Likely (moderate). Pairs known from Mary Valley region and likely to utilise riparian forest and wetland areas within the inundation area.
<i>Lathamus discolor</i>	swift parrot		E, M	A migratory species known to utilise narrow-leaved ironbark (<i>Eucalyptus crebra</i>)/ Queensland blue gum (<i>E. tereticornis</i>) forests and yellow box (<i>E. melliodora</i>) forests on coastal lowlands of southeast Queensland. Is known to utilise remnant patches of mature eucalypts amongst agricultural land. Movements on mainland Australia are poorly understood. Does not breed on mainland Australia. Requires winter flowering eucalypts on the mainland. No records from the WildNet search area.	Likely (low). May be an occasional visitor to flowering eucalypts in RE 12.11.14, 12.3.11 and 12.3.7 during winter.
<i>Lophoictinia isura</i>	Square-tailed kite	R	NL	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. It is found in a variety of timbered habitats including dry	Present . Detected during the fauna survey on a riparian site downstream of the proposed dam wall. Likely to occur throughout the inundation area, predominantly in associated with riparian habitat areas

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
				woodlands and open forests and shows a preference for timbered watercourses. It appears to occupy large hunting ranges of more than 100km ² and nests generally along or near watercourses, in a tree fork or on large horizontal limbs. Records from the Birds Australia database within the search area.	
Melithreptus gularis	black-chinned honeyeater	R	NL	Inhabits eucalypt open forest and temperate savannah woodland, especially riparian areas. A couple of records from the WildNet search area.	Likely (moderate). May utilise riparian gallery forest or eucalypt open forest habitat within the study area.
Menura alberti	Albert's lyrebird	R	NL	Inhabits dense subtropical rainforest. Not known to occur north of Mistake Range near Gatton. A single WildNet record of the species within the search area regarded as spurious.	Unlikely . Suitable habitat not present and beyond known distribution.
Nettapus coromandelianus albipennis	Australian cotton pygmy-goose	R	M	Most commonly encountered in association with deep lagoons, wetlands and dams with floating macrophytes. No records within the WildNet search area.	Present . Detected during the fauna survey on a large farm dam.
Ninox strenua	powerful owl	V	NL	Inhabits wet and dry sclerophyll forest, especially within gullies. Requires large tree hollows for nesting and availability of prey species comprising predominantly small sized possums and gliders including the Squirrel Glider (<i>Petaurus norfolcensis</i>) and Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>). No records within the WildNet search area.	Likely (low). Could utilise upstream riparian areas closer to Conondale and Blackall Ranges.
Podargus ocellatus plumiferus	plumed frogmouth	V	NL	Inhabits pockets of closed sub-tropical rainforest especially palm gullies. Known from the Conondale Ranges. A few records from the WildNet search area.	Likely (moderate). Optimal habitat not present but may occur in areas of vine forest in upstream areas, especially Belli Creek.
Rallus pectoralis	Lewin's rail	R	NL	Inhabits dense rank vegetation amongst wetlands, woodlands and disturbed areas. A couple of records within the WildNet search area.	Likely (moderate). Could utilise alluvial wetland areas and riparian areas where cattle have not affected rank growth.

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
<i>Sterna albifrons</i>	little tern	E	NL	Inhabits a range of coastal waters including estuaries, lakes and wetlands. Breeds only in beach areas. No records within the WildNet search area.	Unlikely. Suitable coastal aquatic habitat not present.
<i>Stictonetta naevosa</i>	freckled duck	R	NL	Predominantly inhabits inland waters with populations fluctuating on the basis of occurrence of optimal breeding conditions. May utilise southeast Queensland as a drought refuge.	Unlikely. Suitable wetland habitat not present.
<i>Turnix melanogaster</i>	black-breasted button-quail	V	V	Most frequently recorded from vine scrubs and adjacent open forest vegetation, including brigalow scrub communities. Prefers closed canopy vegetation (>70% cover) with a moist deep litter layer. Presence in an area is indicated by the occurrence of characteristically shaped feeding platelets (also produced by the Painted Button-quail, <i>Turnix varia</i>). A few records within the WildNet search area.	Unlikely. Optimal habitat not present. Not detected in the most likely areas of occurrence during the fauna survey.
<i>Tyto tenebricosa</i>	sooty owl	R	NL	This species inhabits older moist forest areas containing emergent trees and favours gullies and valley slopes. It may also venture into younger forest areas but avoids cleared areas. It requires the presence of large tree hollows for nesting and roosting. Takes a wide array of prey including small ground mammals and arboreal mammals. Known from the Conondale and Blackall Ranges. No records from the WildNet search area.	Likely (medium). Not detected during the fauna survey but may utilise taller vine forest patches and riparian gallery forest in the vicinity of the Conondale and Blackall Ranges, especially Belli Creek.

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
<i>Xanthomyza phrygia</i>	regent honeyeater	E	E, M	<p>A highly mobile migratory species that inhabits mainly box-ironbark open forests and riparian forests on the inland slopes and valleys of the Great Dividing Range. They also visit coastal forests of NSW and eastern Victoria. May utilise wet lowland coastal forests dominated by <i>Eucalyptus robusta</i> and <i>Corymbia maculata</i> as drought refuge.</p> <p>Favoured eucalypt feed species include <i>Eucalyptus sideroxylon</i>, <i>E. melliodora</i>, and <i>E. albens</i> and <i>E.leucoxylon</i>. Requires the availability of reliable nectar resources or another form of sugary plant exudates such as lerps or honeydew. Recent record in the Gympie area. Historic record in Pomona.</p>	Likely (low). May occasionally use riparian forests dominated by <i>Casuarina cunninghamiana</i> (RE 12.3.7) within the inundation area but not anticipated to occur in large numbers. Only sporadic records from the region.
Mammals					
<i>Chalinolobus dwyeri</i>	large-eared pied bat	NL	V	A poorly known species that inhabits a range of coastal and inland habitats. Most commonly recorded from dry eucalypt forests and woodlands but may also occur at rainforest and wet sclerophyll forest margins. A cave roosting species that forages at low or medium canopy height. Uncertain whether this species is common east of the Great Dividing Range. No records within the WildNet search area.	Likely (low). Not detected during the fauna survey, but a poorly known species that cannot be discounted from occurring in the study area within riparian and eucalypt forest areas.
<i>Chalinolobus picatus</i>	little pied bat	R	NL	A species commonly encountered in inland southern Queensland. Commonly recorded in drier woodland and riparian areas and softwood scrubs of the Brigalow Belt. No records within the WildNet search area	Likely (high). Identified from Anabat analysis during the fauna surveys as probable at one site and possible at a further five sites.
<i>Dasyurus maculatus maculatus</i> (SE mainland)	spotted-tailed quoll	V	E	Known to utilise rainforest, wet and dry sclerophyll forest, and woodland. Formerly distributed as far west as Chinchilla but now largely restricted to coastal ranges. Favours areas with caves, rock outcrops, logs, or tree hollows. One record from within the WildNet search area.	Likely (low). Unlikely to be permanently present but may occasionally visit habitats in the inundation area, particularly riparian corridors.
<i>Phascolarctos cinereus</i>	koala (SEQ)	V (SEQ)	NL	Utilises habitats where favoured food trees are present. In southeast Queensland favours eucalypt open forest.	Present . Detected during the fauna survey at a few sites.

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
<i>Potorous tridactylus tridactylus</i>	long-nosed potoroo (SE)	V	V	Open and closed forest with a dense understorey, often heathy. In southeast Queensland area generally restricted to wetter or higher altitude habitats in thick wet sclerophyll forest. Requires dense vegetation for cover and adjacent more open areas for foraging. Requires the availability of hypogean fungi for feeding. Known from Blackall and Conondale Ranges. No records in the WildNet search area.	Unlikely. Suitable extensive areas of preferred dense habitat not present.
<i>Pseudomys oralis</i>	Hastings River mouse	V	E	This species is found predominantly in association with eucalypt open forest. Key factors determining the species' presence appear to be an open canopy and shrub layer between 410 and 1100m elevation. The ground cover at known localities varies from almost no cover to a dense, rank cover of grasses, herbs and sedges. Recently burned areas are also utilised. Sedges, particularly <i>Carex</i> , <i>Juncus</i> and <i>Cyperus</i> spp. are common to most sites and typically occur beside creeks (permanent and ephemeral) and soakages, but the species is also found on ridges and grassy plains. No records within the WildNet search area. Recovery Plan does not indicate any sites for the species north of Warwick-Beaudesert, although indicated as present within Maroochy Shire (possibly an old record; pre 1980).	Unlikely. The species was not detected during the fauna survey and the preferred habitat of the species is not present. Significantly, the elevation of the inundation area is well below 100m a.s.l.

Scientific Name	Common Name	NC Act Status	EPBC Status	Habitat/Distribution	Likelihood of occurrence in study area
Pteropus poliocephalus	grey-headed flying Fox	NL	V	This species uses a range of habitats for feeding including rainforest, eucalypt forest and woodland, mangroves, Melaleuca wetlands and cultivated areas. The species is known to eat the fruit or blossom of over 80 plant species. The species forms large breeding camps during summer (typically in dense gullies) with adults generally dispersing during winter although they may also join juvenile individuals in winter camps. A couple of records from within the WildNet search area.	Present. A large roosting colony is present on the western side of Hynes Estate Road in vine forest (RE 12.11.10) outside the project impact area.
E - Endangered V - Vulnerable R - Rare M – Migratory NL – Not listed		+ - recorded in study area or in locality surrounding study area i.e. in search area as follows: Latitude between: -26.32 and -26.59 Longitude between: 152.62 and 152.83			

18.4.2.2 EPBC Migratory and Significant Fauna

There were issues raised in some submissions that some EPBC Act listed bird species in Table 7-22 of the EIS were not considered in the assessment on Matters of National Environmental Significance (MNES) in Chapter 9 and that EPBC Act listed Overfly Marine Area (OFMA) species should be assessed.

Table 7-22 of the EIS has been updated to include all listed migratory and marine species identified from the database searches and fauna survey results for the study area (refer **Table 18-5**).

EPBC Act listed marine species, including those classed as OFMA, are not required to be assessed under the EPBC Act Policy Statement 1.1 'Significant Impact Guidelines' (DEWHA, 2006). Several listed marine species were included in the assessment of potential impacts on migratory species in Section 7.5.3.1, page 7-85. These include magpie goose and Australian cotton pygmy goose. These species have been omitted and the assessment has been amended as follows.

The Project will involve the loss of habitat for a number of migratory species recorded from the study area, including the fork-tailed swift, great egret, cattle egret, white-bellied sea eagle, white-throated needletail, rainbow bee-eater, black-faced monarch, spectacled monarch, satin flycatcher and rufous fantail. The Project will also involve the loss of potential habitat for a number of migratory species assessed as likely to occur in the study area, including Coxen's fig parrot, Latham's snipe, bar-tailed godwit, whimbrel, painted snipe and regent honeyeater. The impact on known and likely species has been assessed against the EPBC Act Significant Impact Guidelines in Chapter 9 – MNES. In summary, the study area is not known to contain any area of important habitat for these migratory species, or an ecologically significant proportion of the population of any migratory species, and as such, the Project is not considered to have a significant impact on these species. Furthermore, the majority of migratory species known or likely to occur in the study area are generalist inhabitants of swamps margins and wetlands, and will benefit from the creation of a lake perimeter associated with the dam.

The issue was raised that Table 7.22 of the EIS included several wader birds (i.e. eastern curlew, grey-tailed tattler, lesser sand plover, terek sandpiper, greenshank and grey plover) that were not seen in the inundation area. This infers that the Great Sandy Strait Strait should be included in the study area, as that is where these birds were seen.

The EPBC Act listed migratory and significant fauna species were identified from the database search results for the study area, which included searches of the Commonwealth's EPBC Act Online Protected Matters Search Tool and the Environmental Protection Agency's (EPA) Wildnet database. As the EPBC Act Online Protected Matters database is based solely on species distributions rather than site records, it is generally considered an unreliable indication of actual species presence. The identification of wader birds in the database search results for the study area is an example of this.

Table 18-8 (Table 7-22 EPBC Act listed migratory and marine species identified from study area and an evaluation of the likelihood of occurrence within the study area)

Scientific Name	Common Name	EPBC Act Status ¹	Reported in locality ²	Likelihood of occurrence in the study area
Birds				
Anseranas semipalmata	magpie goose	O	+	Present. Occurs on farm dams, likely to utilise inundation alluvial areas following substantial rainfalls.
Apus pacificus	fork-tailed swift	M, O	+	Present. One record in Wildnet, likely to fly over a wide range of habitats.
Ardea alba	great egret	M, O	+	Present. Occasionally observed in the Mary River and tributaries.
Ardea ibis	cattle egret	M, O	+	Present. Widespread in cleared grazing areas.
Charadrius mongolus	lesser sand plover	M, O		Not likely. Species occurs predominantly in coastal and estuarine habitats and occasionally on inland lakes; suitable habitat does not occur for the species within the study area.
Cyclopsitta diophthalma coxeni	Coxen's fig parrot	E, M		Low likelihood. Very difficult to detect without intensive survey effort. May utilise feed trees (especially Ficus species) within inundation area.
Gallinago hardwickii	Latham's snipe	M, O	+	Moderate likelihood of occurring at the periphery of farm dams and alluvial wetlands and in temporarily inundated areas following heavy rainfall.
Haliaeetus leucogaster	white-bellied sea-eagle	M, O	+	Present. Occurs in association with deeper pools in the Mary River.
Heteroscelus brevipes	grey-tailed tattler	M, O		Not likely. Species occurs predominantly in coastal and estuarine habitats and in association with shallow river margins; suitable habitat does not occur for the species within the study area
Hirundapus caudacutus	white-throated needletail	M, O	+	Present. Forages over all habitat types.
Lathamus discolor	swift parrot	E, O		Moderate likelihood. May be an occasional visitor to flowering eucalypts during winter.
Limosa lapponica	bar-tailed godwit	M, O		Moderate likelihood. Species occurs predominantly in coastal and estuarine habitats and in association with flooded grasslands and shallow river margins; may occur within the study area on alluvial areas following flooding rain.
Merops ornatus	rainbow bee-eater	M, O	+	Present. Widespread throughout the study area particularly at forest edges and near riparian areas.
Monarcha melanopsis	black-faced monarch	M, O	+	Present. Occurs within eucalypt open forest and riparian gallery forest.
Monarcha trivirgatus	spectacled monarch	M, O		Present. Occurs within eucalypt open forest and riparian gallery forest.

Scientific Name	Common Name	EPBC Act Status ¹	Reported in locality ²	Likelihood of occurrence in the study area
<i>Myiagra cyanoleuca</i>	satin flycatcher	M, O	+	Present. Occasionally observed in drier riparian gallery forest.
<i>Nettapus coromandelianus albipennis</i>	Australian cotton pygmy-goose	O	+	Present. Observed on a farm dam may also visit deeper pools in the Mary River.
<i>Numenius madagascariensis</i>	eastern curlew	M, O		Not likely. Species occurs predominantly in coastal and estuarine habitats and occasionally on inland lakes and flooded grasslands; suitable habitat does not occur for the species within the study area.
<i>Numenius phaeopus</i>	whimbrel	M, O		Low likelihood. Species occurs predominantly in coastal and estuarine habitats and on flooded grasslands; may occur within the study area on alluvial areas following flooding rain.
<i>Pluvialis squatarola</i>	grey plover	M, O		Not likely. Species occurs predominantly in coastal and estuarine habitats; suitable habitat does not occur for the species within the study area.
<i>Rhipidura rufifrons</i>	rufous fantail	M, O	+	Present. Widespread in all forested habitat types.
<i>Rostratula benghalensis s. lat.</i>	painted snipe	M, O		Moderate likelihood. May occur at the periphery of farm dams and alluvial wetlands and in temporarily inundated areas following heavy rainfall.
<i>Tringa nebularia</i>	greenshank	M, O		Not likely. Species occurs predominantly in coastal and estuarine habitats and occasionally on inland lakes; suitable habitat does not occur for the species within the study area.
<i>Xenus cinereus</i>	terek sandpiper	M, O		Not likely. Species occurs predominantly in coastal and estuarine habitats; suitable habitat does not occur for the species within the study area.
<i>Xanthomyza phrygia</i>	regent honeyeater	E, M		Low likelihood. May occasionally use eucalypt forest or riparian gallery forest within the inundation area but not anticipated to occur in large numbers.

1 The status of the species under the Environment Protection and Biodiversity Conservation Act 1999: M – migratory, O - marine

2 The species recorded in study area or in locality surrounding study area i.e. in area as follows:

Latitude between: -26.3244 and -26.5907

Longitude between: 152.6188 and 152.83

18.4.2.3 Other Birds

A “Twitch for Mary” bird survey (an independent bird survey undertaken by 82 volunteers over a 12 hour period between Conondale to the mouth of the Mary River) recorded 155 species and 13 breeding birds within the inundation area. Several resident species of birds, particularly breeding birds, were not included in the EES fauna survey results.

The “Twitch for Mary” bird survey recorded a further 27 bird species within the inundation area. These are listed in Appendix C12. None of these species are listed as EVR under the NC Act and/or EPBC Act.

18.4.3 Potential Impacts and Mitigation Measures

18.4.3.1 Impacts to Significant Fauna

Southern Barred Frog (Mixophyes iteratus)

Submissions have raised the issue that the loss of habitat for *Mixophyes iteratus* within the inundation area will impair populations of *Mixophyes iteratus* and that the mitigation measures proposed (rehabilitation of areas upstream) are not considered adequate to ensure the survival of this species. The submitters have requested more quantitative data on the relative importance of the population and suitable habitat of *Mixophyes iteratus* within the study area, and on the extent of impacts the project is likely to have is required. They have also requested further details on the extent, management and past success of rehabilitation works proposed are also required.

The assessment of potential impacts on *Mixophyes iteratus* from Table 7-30 of the EIS has been updated to account for the site specific data obtained from the EPA and QPWS on *Mixophyes iteratus* after the EIS was produced. This additional data expanded the range of the species in the lowland habitat to the north of the project area.

Species	Status	Potential Impact
southern barred frog (<i>Mixophyes iteratus</i>)	E (Q, A)	<p>Within the study area, <i>Mixophyes iteratus</i> was detected from stream sites within vine forest and riparian gallery forest habitat types on Belli Creek, Happy Jack Creek, Skyring Creek, Coonoon Gibber Creek and the Mary River. The species was concentrated on the eastern tributaries of the study area on Belli Creek, Happy Jack Creek and Skyring Creek. Coonoon Gibber Creek was the only western tributary upon which <i>Mixophyes iteratus</i> was found to occur. It was only recorded on the Mary River at two locations, in close proximity to the confluence with tributaries where this species occurs. Consequently, it appears that <i>Mixophyes iteratus</i> only occurs along the Mary River near tributary end points where suitable habitat extends along these tributaries. However, its presence along the entire length of the Mary River within the inundation area cannot be ruled out. It was not recorded immediately downstream of the proposed dam on the Mary River.</p> <p>In the Mary River catchment this species has been recorded from the upper eastern tributaries draining the Blackall Range and Walli area (including Gheerulla and East Cedar Creeks), the upper tributaries south of the Conondale (including Bundaroo, Booloumba and North Booloumba Creeks) and north of the proposed dam in the lower tributaries (including Tinana, Tagigan and Six Mile Creeks) down to Doongul Creek north of Maryborough, which is the northern distributional limit of this species.</p> <p>The southern barred frog prefers slow moving streams and sandy banks and all records within the study area have been from stream sites within either vine forest (RE 12.3.1) or riparian gallery forest (RE 12.3.2 and 12.3.7). The flooding of riparian habitat along the Mary River and its tributaries will disturb the key microhabitat attributes for <i>Mixophyes iteratus</i> and will inundate approximately 215 ha of REs 12.3.1, 12.3.2 and 12.3.7 within the inundation area, which provides known and potential habitat for this species.</p> <p>Given the decline of <i>Mixophyes iteratus</i> in previous upland habitat areas, such as the Conondale Range, occurrences in lowland areas including the inundation area have</p>

Species	Status	Potential Impact
		<p>gained greater conservation significance.</p> <p>Initial clearing activities across the inundation area will exclude riparian zones 1.5m below the FSL, such that the ultimate loss of individuals will be determined by the impact of flooding to FSL. The depth of water in upper Belli Creek, Happy Jack Creek, Coonoon Gibber Creek and Skyring Creek (main habitat areas for <i>Mixophyes iteratus</i>) will only increase by 1–2 m. In these areas, the riparian zone is expected to survive, as most is above FSL. Research has shown that <i>Mixophyes iteratus</i> make regular (daily) movements parallel to (and crossing) the stream, though rarely move outside the immediate riparian zone. Studies in Queensland found that frog movements are confined to an area 50m either side of the stream and 268m along the stream (Kock & Hero, 2007; Streatfield, 1999). Frogs are expected to be able to survive in these upper tributaries (Belli Creek, Skyring Creek, Happy Jack Creek, Coonoon Gibber Creek) as they will only have to move 1-2m vertically and they are out of the FSL as flooding occurs gradually. They will also be able to move (parallel) to the waterway to riparian habitat upstream of the FSL.</p> <p>The proposed rehabilitation of riparian habitat along tributaries above and upstream of the FSL will benefit the movement of frogs, by restoring vegetation connectivity and providing habitat for displaced frogs. Further details on proposed rehabilitation areas are provided in Section 18.4.4.</p> <p>It is unclear whether there is movement of individuals between tributaries although this is likely to happen occasionally and may be important for maintaining genetic diversity within the overall population and reinforcing local extinctions (due to low population size/genetic diversity). The dam will result in the fragmentation of populations between the upper and lower tributaries of the Mary River and the isolation of populations present on Happy Jack Creek, Skyring Creek, Belli Creek on the eastern side of the study area and Coonoon Gibber Creek on the western side. These populations appear to be fragmented by lack of suitable habitat along the Mary River and are likely to be self-sustaining populations.</p> <p>Research on the captive husbandry of frogs will be investigated as a potential mitigation measure to reintroduce individuals and maintain genetic diversity in isolated populations if monitoring reveals this to be a problem. This will ensure the long-term viability of these populations.</p> <p>Additional data on the distribution of <i>Mixophyes iteratus</i> within the Mary River catchment shows this species occurs from upland tributaries draining the Blackall and Conondale Ranges to lowland tributaries as far north as Doongul Creek, near Maryborough. Flooding of riparian habitat will impact on the occurrence of <i>Mixophyes iteratus</i> in the project impact area, but the species is expected to persist in riparian zones in upper Belli Creek, Skyring Creek, Happy Jack Creek, Coonoon Gibber Creek. Therefore, the distribution of this species in the Mary River catchment is not expected to retract, although the loss of habitat may lead to a decline in species abundance and fragmentation of populations within lowland areas.</p> <p>Further discussion of the impact on <i>Mixophyes iteratus</i> against the EPBC Act guidelines is provided in Chapter 20 – Matters of National Environmental Significance.</p>

Green-thighed Frog (*Litoria brevipalmata*)

A single specimen of *Litoria brevipalmata* was observed within the study area on a property on the Bruce Highway realignment on Coles Creek. The assessment of potential impacts on *Litoria brevipalmata* from Table 7-30 of the EIS has been updated to reflect the occurrence of this species within the study area.

Species	Status	Potential Impact
green-thighed frog (<i>Litoria brevipalmata</i>)	R (Q)	<p><i>Litoria brevipalmata</i> is not currently known from the inundation area but has been recorded from a single location at Coles Creek on the Bruce Highway realignment. <i>Litoria brevipalmata</i> is found in forests and swamps of the coast and adjacent ranges from central NSW to south-east Queensland (Hines et al 1999). Calling activity lasts for only a few days at a time, making the species difficult to detect (Nattrass and Ingram 1993, Ehmann 1997). Males are almost always associated with flooded semi-permanent or ephemeral pools (95% of all observations made by Lemckert et al 2002 were associated with ephemeral pools) with a leafy or shrubby substrate.</p> <p>The individual <i>Litoria brevipalmata</i> recorded was on top of a ridgeline and not associated with a particular watercourse or wetland. There are several waterways and a small property dam close to, or on the proposed alignment. As the species breeds in ephemeral pools, typically located off-stream, it is unlikely to attempt breeding in permanent waterbodies which contain a variety of potential predators.</p> <p>As the species is unlikely to be dependent on the property dam which falls within the road alignment, this feature is of limited significance. The area of vegetation to be dissected by the road realignment may be an area of non-breeding habitat, although this would be impossible to determine based on a single observation. The specimen recorded may have been dispersing between preferred habitats.</p> <p>The network of first order waterways which drain to Coles Creek and Coles Creek itself may be used as breeding sites and dispersal pathways by the species. The maintenance of connectivity between riparian systems and between the northern and southern fragments of ridgeline vegetation (post road construction) may be important to the local population. The feasibility of constructing fauna underpasses or overpasses to accommodate the dispersal of <i>Litoria brevipalmata</i> will be investigated at the detailed design stage of the road.</p> <p>A relatively small percentage of available non-breeding habitat in the locality will be impacted by the Bruce Highway re-alignment. No known breeding sites for the species will be disturbed and the property dam to be filled is not likely to be significant in this regard. Provided that habitat connectivity is maintained, impacts on <i>Litoria brevipalmata</i> are likely to be minimal.</p>

Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*)

A dead record of *Coeranoscincus reticulatus* has been confirmed from a property just outside the study area (Lot 1 RP57331). The assessment of potential impacts on *C. reticulatus* from Table 7-30 of the EIS has been updated to reflect this additional record.

Species	Status	Potential Impact
three-toed snake-tooth skink (<i>Coeranoscincus reticulatus</i>)	V (A)	<p><i>Coeranoscincus reticulatus</i> was not detected during the field surveys, however it has been recorded from a property just outside the north-western side of the study area. It is likely that the skink inhabits vine forest (RE 12.11.10) present on hillslopes on this property.</p> <p><i>C. reticulatus</i> occurs in the ranges and lowlands between Cooloola in south-eastern Qld and Grafton in north-eastern NSW (Greer & Cogger, 1985). It is generally recorded in moist layered forest on loamy basaltic soils, but also found in closed forest overlying silican sand dunes at Cooloola (Cogger et al., 1993). A specimen was recorded in an isolated stand of rainforest regrowth near Maleny, SEQ (Czechura, 1974). Within forests, the species is found in well-mulched, loose, friable rainforest soil in leaf litter, often immediately adjacent to fallen tree trunks (Ehmann 1987; Cogger et al., 1993).</p> <p><i>C. reticulatus</i> is known from the Conondale Range and given the record from the vicinity of the study area it is possible that the species occurs in the study area in hillslope vine forest on basaltic soils with good ground cover habitat. It is unlikely to occur in riparian vine forest communities (RE 12.3.1) due to lack of habitat complexity and basaltic soils in these areas.</p> <p>The habitat where the individual <i>C. reticulatus</i> was recorded is outside the study area and will not be impacted by the project. The project will result in the inundation of 7.36 ha of potential habitat for this species (RE 12.11.10 and 12.11.11), in comparison to a total of 63 ha present in the study area. This small loss of potential habitat is not expected to have a significant impact on <i>C. reticulatus</i>, as it was not recorded in the study area despite intensive survey effort and larger tracts of potential habitat (RE 12.11.10 and 12.11.11) will persist on hillslopes above the inundation area.</p> <p>Further discussion of the impact on <i>C. reticulatus</i> against the EPBC Act guidelines is provided in Chapter 20 – Matters of National Environmental Significance.</p>

Grey-headed flying-fox (*Pteropus poliocephalus*)

A large colony of the grey-headed flying fox has been confirmed as occurring in the study area on Hynes Estate Road. This colony is located outside the project impact area. The assessment of potential impacts on the grey-headed flying-fox from Table 7.30 of the EIS has been updated to reflect the presence of the colony in the study area. A submission commented that the EIS does not refer to strategies in the Recovery Plan for this species relating to preservation of key feeding and roosting habitat.

Species	Status	Potential Impact
<p>grey-headed flying fox (<i>Pteropus poliocephalus</i>)</p>	<p>V (Q)</p>	<p>A large (several thousand individuals) roosting colony of grey-headed flying-fox is present within the study area on Hynes Estate Road, approximately 183 m south west of Mary Valley Road in a patch of lowland vine forest (RE 12.11.10) surrounded by farmland (see Figure 18-5). The colony and associated vine forest habitat is located outside any area of impact by dam or road works and will not be directly impacted by the project. No roadworks are anticipated in Hynes Estate Road.</p> <p>The grey-headed flying-fox occurs from the Bundaberg region in Queensland to Melbourne, Victoria. Its current distribution has contracted about 300km south of its former distribution, and it is no longer found in the Rockhampton area (D. Vavryn and G. Simmonds pers. comm.), and was not found north of Hervey Bay in 1997, although small numbers may be irregularly present in the Bundaberg region (P. Birt and L. Hall, unpub.). The grey-headed flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. This species roosts in aggregations in rainforest, stands of Melaleuca, mangroves and riparian vegetation (Ratcliffe, 1931; Nelson, 1965), as well as vegetation in urban areas. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring (Lunney and Moon 1997; Augee and Ford 1999). They forage opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources (Augee and Ford 1999; Tidemann 1999).</p> <p>The proposed upgrade to the Gympie-Brooloo Road (Mary Valley Road) between Hynes Estate Road and Tuchekeoi Road, is located approximately 261 m east of the colony and may cause indirect impacts on the colony, in terms of construction noise. Roosting camps of the grey-headed flying-fox are known to occur along major roads and highways (i.e. Bruce Highway at Palmview), demonstrating its ability to cope with some traffic noise disturbance so at 261 m distance, the works should cause minimal disturbance.</p> <p>No works or stockpile areas were anticipated to be required in the patch of lowland vine forest occupied by the colony but this will now be mandated.</p> <p>To ensure impacts on the flying fox colony are minimised construction of the road will be restricted during the breeding season (i.e. Sept-Nov, during the last few weeks of pregnancy to after birth). This will ensure disturbance to pregnant females and young are avoided. Noisy activities will be restricted to evening hours (6pm to 10pm) (i.e. after the bats have left the roost) and will adhere to the construction noise goal of 55 dB(A) as set out in Chapter 22 Noise and Vibration. This will minimise impacts on bats roosting during the day. With the implementation of these mitigation measures, the breeding cycle of the grey-headed flying-fox colony is not expected to be disrupted.</p> <p>The grey-headed flying-fox would forage on all habitat types across the study area wherever suitable feeding resources (nectar blossom and fruit) are present. The project will also result in the loss of approximately 302 ha of foraging habitat, but such habitat is extensive across the Mary Valley region and the species is highly mobile.</p>

The recovery strategies for the grey-headed flying-fox have been considered in the assessment of impacts on Matters of National Environmental Significance (MNES) in Chapter 20 of the Supplementary EIS.

Richmond Birdwing (Ornithoptera richmondia)

The Richmond Birdwing Recovery Network has confirmed that a major breeding population of the Richmond Birdwing occurs in upper Belli Creek and that there is an adult record of the butterfly from a property along Happy Jack Creek upstream of the inundation area.

This species was assessed as unlikely to occur in the study area in the EIS. The assessment of potential impacts on the Richmond Birdwing has been provided below.

Species	Status	Potential Impact
Richmond Birdwing (Ornithoptera richmondia)	V (NC Act)	<p>A large breeding population of the Richmond Birdwing butterfly occurs in the upper Belli Creek catchment (at the Skyring Creek Rd crossing) outside the study area. An adult specimen has also been recorded from a property along Happy Jack Creek (46RP805811) in May 2007 upstream of the inundation area.</p> <p>The Richmond Birdwing occurs in upland and lowland rainforest in northeast NSW and southeast Qld where the larval food plant (<i>Pararistolochia praevenosa</i>) grows.</p> <p>The Richmond Birdwing Butterfly Network have assessed that there is a high chance of the larval food plant occurring in lower Belli Creek, using associated plants as an indicator (Dr Don Sands, pers. comm.). However, no larval food plants for this species were detected from either Belli Creek or Happy Jack Creek within the inundation area, despite extensive flora surveying within these riparian zones, and no adult individuals were detected during the fauna surveys. There is a low likelihood that a breeding population occurs within the inundation area along these lower tributaries.</p> <p>If present in the lower Belli Creek and Happy Jack Creek catchments, inundation is likely to result in the direct loss of larval food plants for this species, which may reduce the breeding capacity of the local rainforest area.</p> <p>To mitigate impacts on the Richmond Birdwing it is proposed to plant larval food plants within riparian rehabilitation areas, including along Belli Creek and Happy Jack Creek. This will provide a linkage between any as yet unknown breeding populations along lower Belli Creek with the major breeding population along upper Belli Creek. This proposal is in accordance with current actions being undertaken by the Richmond Birdwing Recovery Network. In line with the approach put forward in the EIS, QWI would fund local catchment and landcare groups to undertake this work.</p>

Square-tailed Kite (Lophoictinia isura)

The square-tailed kite was detected during the EES fauna surveys downstream of the Mary River, but was mistakenly omitted in the assessment. An assessment of potential impacts on the square-tailed kite has been provided below.

Species	Status	Potential Impact
square-tailed kite (<i>Lophoictinia isura</i>)	R (NC Act)	<p>The square-tailed kite was observed downstream of the proposed dam wall during the fauna surveys and is likely to occur throughout the study area, predominantly in association with riparian habitats.</p> <p>The square-tailed kite occurs in a variety of timbered habitats including dry woodlands and open forests and shows a preference for timbered watercourses. It has large hunting ranges of more than 100km² and nests along or near watercourses in trees (on a fork or large horizontal limbs).</p> <p>The project will result in a loss of foraging and nesting habitat for this species, in particular along the Mary River and its tributaries.</p> <p>The square-tailed kite is widely distributed across coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. Furthermore, riparian habitat extends upstream and downstream of the inundation area, which will continue to provide suitable habitat for this species.</p>

Coxen's fig parrot (Cyclopsitta diophthalma coxeni)

A Government agency has raised issues over the loss of fig tree foraging resources for the Coxen's fig parrot and the proposed planting of native fig trees to offset this loss. They have requested further information on the abundance and location of the foraging resource in the project area and elsewhere at the local and regional scales and on the proposed planting program.

The Coxen's fig-parrot occurs in south east Queensland and north east New South Wales where fig trees are present in lowland and upland forest types, riparian corridors, farmland and urban environments (Coxen's Fig Parrot Recovery Team, 2001). The Coxen's fig parrot may forage on native fig trees, including *Ficus watkinsiana* and *Ficus virens* that are present within the project area.

A study of native fig trees (*Ficus* species) in the region of the project was undertaken by 3D environmental in March 2008. This involved a desktop review and field survey. A stereoscopic review of available 1:25,000 scale aerial photography, completed in conjunction with an overview of certified regional ecosystem mapping (Version 5.1, 2005), was undertaken prior to field survey. This identified areas of suitable habitat and potential habitat trees, both within primary (remnant) vine forest communities as well as established trees in secondary habitats including regrowth and open paddocks. Vine forest is typical habitat for a range of fig species and such habitats identified during the review were highlighted for particular attention during the field survey.

Desktop review was followed by a three day reconnaissance of the regional area. This confirmed the location of fig trees identified during the desktop review, as well as providing a confirmation of the aerial photographic signatures of typical fig trees allowing remote sensing to be applied with a greater degree of confidence. Field reconnaissance involved traverse of accessible roads and binocular survey to identify trees remotely from suitable vantage points. The locations of individual fig trees were marked directly onto aerial photography during this phase. Wherever possible, fig trees were identified to species level.

Fig trees were identified as being either:

- primary trees within remnant habitat. Such trees typically emerged above the surrounding canopy and were readily identifiable in the field and on imagery;
- primary trees outside remnant habitat. These were well established trees, typically reaching heights of up to 30m with large spreading crowns; and
- secondary trees outside remnant habitat. This included a range of smaller trees scattered throughout paddocks and adjacent to houses. Immature trees were difficult to identify with any confidence due to obscure aerial photographic signatures.

Field survey was followed by a secondary phase of stereoscopic aerial photographic interpretation to identify additional trees not recognised in the desktop review or field survey. This secondary phase of interpretation was completed with a high degree of confidence, particularly concerning identification of the larger fig trees, generally possessing a distinctive aerial photographic signature. The location of fig trees was transferred onto spatially registered digital photography to generate a list of location co-ordinates. In total 305 fig trees were recorded in the regional area.

The location of fig trees within the region of the project is shown in **Figure 18-6**. A list of fig trees identified during the survey, including information on location, habit, habitat and species, is provided in Appendix C13.

As can be seen in **Figure 18-7** there is an abundance of fig trees across the Mary Valley region. It is uncertain whether the Coxen's fig parrot utilises this habitat due to lack of sightings in the area. The most recent sighting is 10 years ago from the Kenilworth area. As noted in the EIS, a

subpopulation is thought to exist in the Maleny/Imbil/Kin Kin Creek area. The project will result in the loss of an estimated 28 fig trees from within the inundation area, compared to 277 present in the regional area. The abundance of foraging resources for this species in the Mary Valley region is not expected to be a limiting factor, should the bird occur.

The assessment of potential impacts from Table 7-30 of the EIS has been updated to reflect additional information collected on the fig tree foraging resources for the Coxen's fig parrot in the region.

Species	Status	Potential Impact
Coxen's fig parrot (Cyclopsitta diophthalma coxeni)	E (Q, A)	<p>The Coxen's fig parrot was not detected during the field surveys and there are no database records of this species in the vicinity of the study area. Survey effort comprised searches beneath native fig trees for chewed fruit and mapping of native fig trees within the inundation area and the Mary Valley region. The survey period did not coincide with the seasonal fruiting period of local fig trees. However, some fig trees were carrying early mature fruits, which revealed some chewed fruits that were attributed to larger fruit eating birds that were present (i.e. figbirds).</p> <p>The Coxen's fig parrot may forage on food trees, especially <i>Ficus</i> species, including <i>Ficus watkinsiana</i> and <i>Ficus virens</i> that are present within the inundation area.</p> <p>This species was once widely distributed in upland and lowland forest habitats in north east NSW and southern Queensland, but has declined significantly due to extensive clearing of lowland forest in both states. The significance of remaining lowland habitat areas containing food trees is currently unknown. Lowland occurrences of native fig trees are likely to be significant for the Coxen's fig parrot as components of an annual feeding range or remnants of a once more extensive food supply for the species.</p> <p>A survey of the location of fig trees within the area has revealed that suitable fig trees are abundant across the Mary Valley. The project will result in the loss of an estimated 28 fig trees from a total of 277 in the regional area. It is uncertain whether the Coxen's fig parrot utilises this local habitat due to the lack of sightings in the area. A subpopulation is thought to exist in the Maleny/Imbil/Kin Kin Creek area. The abundance of foraging resources in the Mary Valley region is not expected to be a limiting factor should the bird occur.</p> <p>Native fig trees and other native fruiting trees will be planted at targeted areas as part of the revegetation strategy. A revegetation plan will be prepared for the project which will provide details on location and extent of planting, species list, planting methodology, planting maintenance and monitoring. QWI commits to plant and maintain at least 56 figs and fruiting trees as part of revegetation.</p>

Swift parrot (Lathamus discolor)

A submitter has raised issues over the loss of winter flowering foraging habitat for the swift parrot and has requested further information on the abundance and location of foraging habitat in the project area and elsewhere at the local and regional scales.

The swift parrot breeds only in Tasmania and migrates to mainland Australia in autumn. During winter it forages on lerps and nectar in flowering eucalypts predominantly in Victoria and New South Wales, particularly in box ironbark forests and woodlands. Certain forest types on the coastal plains along the eastern seaboard are also important foraging habitats. In south east Queensland and northern New South Wales, narrow leaved ironbark (*Eucalyptus crebra*) / Queensland blue gum (*Eucalyptus tereticornis*) forests and yellow box (*Eucalyptus melliodora*) forest are utilised.

Suitable winter-flowering foraging habitat for the swift parrot within the study area includes RE 12.11.14 (*Eucalyptus crebra*, *Eucalyptus tereticornis* woodland) and RE 12.3.11 (*Eucalyptus siderophloia*, *Eucalyptus tereticornis*, *Corymbia intermedia* woodland). It may also use RE 12.3.7 (*Eucalyptus tereticornis*, *Callistemon viminalis*, *Casuarina cunninghamiana* fringing forest). The location of these REs within the study area is shown on **Figure 18-7**.

Winter-flowering foraging resources for the swift parrot are also present in the wider area at the local and regional scales in *Eucalyptus crebra* / *Eucalyptus tereticornis* open forests. As 3D's vegetation mapping does not extend outside the project area, a review of the EPA's certified RE mapping within a 25km radius of the project area was undertaken to identify regional ecosystems containing suitable foraging resources in the local Mary Valley region. These include REs 12.11.6, 12.11.9, 12.11.14, 12.11.15, 12.12.3, 12.11.5, 12.12.12, 12.12.23, 12.2.11, 12.3.11, 12.3.3, 12.3.6, 12.3.7, 12.5.2, 12.8.14, 12.8.16, 12.8.24 and 12.9-10.7. The location of these REs is shown on **Figure 18-8**. It should also be noted that these ecosystems and their associated suitable foraging resource extend beyond this arbitrary 25km radius and throughout the SEQ Bioregion in which the swift parrot occasionally visits over winter.

The area of foraging habitat for the swift parrot impacted by the Project in comparison to the area present within the local Mary Valley region (within 25km radius of the project area) is presented in **Table 18-6**.

Table 18-9 Area of swift parrot foraging habitat impacted by the Project with comparisons against area within the Mary Valley region

Regional Ecosystem	Description	Area (ha) within FSL, dam wall site and road relocations	Area (ha) within Mary Valley region
12.3.7	Eucalyptus tereticornis, Callistemon viminalis, Casuarina cunninghamiana fringing forest.	102.24	1670.94
12.3.11	Eucalyptus siderophloia, Eucalyptus tereticornis, Corymbia intermedia on alluvial plains, usually near coast.	16.97	1396.73
12.11.14	Eucalyptus crebra, Eucalyptus tereticornis woodland on metamorphics and interbedded volcanics.	27.44	4162.33
12.2.11	Corymbia spp., Eucalyptus spp., Acacia spp. open forest to low closed forest on beach ridges in northern half of bioregion	-	354.85
12.3.6	Melaleuca quinquenervia, Eucalyptus tereticornis, Lophostemon suaveolens woodland on coastal alluvial plains	-	84.14
12.3.7	Eucalyptus tereticornis, Melaleuca viminalis, Casuarina cunninghamiana fringing forest	-	1670.94
12.3.11	Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia open forest on alluvial plains usually near coast	-	1396.73
12.5.2	Eucalyptus tereticornis, Corymbia intermedia on remnant Tertiary surfaces, usually near coast. Usually deep red soils	-	236.30
12.8.14	Eucalyptus eugenioides, E. biturbinata, E. melliodora open forest on Cainozoic igneous rocks	-	125.19
12.8.16	Eucalyptus crebra, E. tereticornis woodland on Cainozoic igneous rocks	-	45.26
12.8.24	Corymbia citriodora open forest on Cainozoic igneous rocks especially trachyte	-	45.13
12.9-10.7	Eucalyptus crebra woodland on sedimentary rocks	-	8.18
12.11.15	Woodland with Xanthorrhoea sp. on serpentinite	-	3802.08
12.11.5	Open forest complex with Corymbia citriodora, Eucalyptus siderophloia, E. major on metamorphics ± interbedded volcanics	-	3555.30
12.11.6	Corymbia citriodora, Eucalyptus crebra open forest on metamorphics ± interbedded volcanics	-	50.51
12.11.9	Eucalyptus tereticornis open forest on metamorphics ± interbedded volcanics. Usually higher altitudes	-	3153.76
12.12.3	Open forest complex with Corymbia citriodora, Eucalyptus siderophloia or E. crebra or E. decolor, E. major and/or E. longirostrata, E. acmenoides or E. portuensis on Mesozoic to Proterozoic igneous rocks	-	340.88
12.12.12	Eucalyptus tereticornis, E. crebra or E. siderophloia, Lophostemon suaveolens open forest on granite	-	1496.44
12.12.23	Eucalyptus tereticornis ± E. eugenioides woodland on crests, upper slopes and elevated valleys on Mesozoic to Proterozoic igneous rocks	-	1682.24
Total Foraging Habitat		146.65	60,173.23

The percentage of winter-flowering foraging habitat impacted by the Project comprises only 0.24% of the extent of suitable foraging habitat present in the local Mary Valley region. Given the very low abundance of foraging habitat for the swift parrot within the project impact area, in comparison to that in the region, it is not anticipated that the small loss of this resource will have an impact on the annual movements of the swift parrot as there are only a very small number of visiting birds to SEQ each year (only a few birds were observed in SEQ last year). Furthermore, it is highly mobile and can forage on available habitat in the region.

The assessment of potential impacts from Table 7-30 of the Draft EIS has been updated to reflect additional information collected for the swift parrot.

Species	Status	Potential Impact
swift parrot (<i>Lathamus discolor</i>)	E (A)	<p>The swift parrot was not observed during the field surveys and there are no database records of this species in the vicinity of the study area. Despite a recent lack of records of this species north of Brisbane (Barrett <i>et al.</i>, 2003), the swift parrot may be an occasional visitor to the study area, foraging on winter-flowering species such as <i>Eucalyptus tereticornis</i>, <i>Eucalyptus crebra</i> or <i>Eucalyptus melliodora</i> during the winter migratory period.</p> <p>Suitable winter-flowering foraging habitat for the swift parrot within the project area includes RE 12.11.14, 12.3.11 and 12.3.7, contain <i>Eucalyptus tereticornis</i> and <i>Eucalyptus crebra</i>. The project will result in the loss of approximately 146 ha of potential foraging habitat for this species. This represents only 0.24% of the extent of suitable foraging habitat for this species within 25 km of the project (7230 ha). Given the very low abundance of potential foraging habitat impacted by the project in comparison to that present in the region, it is not anticipated that this small loss will have an impact on the annual migratory movements of the swift parrot as they are very rare in SEQ, highly mobile and can forage on winter-flowering foraging habitat in the surrounding region.</p>

Regent Honeyeater (Xanthomyza phrygia)

A submitter has raised issues over the loss of habitat for the regent honeyeater and has requested further information on the abundance and location of habitat in the project area and elsewhere at the local and regional scales.

The regent honeyeater occurs mainly in box-ironbark open forests and riparian forests of river she-oak (*Casuarina cunninghamiana*) on the inland (western) slopes of the Great Dividing Range and the broad valleys extending into these ranges. They also visit the coastal forests of NSW and eastern Victoria. Wet lowland coastal forests dominated by swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Corymbia maculata*) are important as drought refuge when conditions on the inland slopes are unfavourable.

The regent honeyeater requires the availability of reliable nectar sources or another form of sugary plant exudate such as lerps or honeydew. Favoured eucalypt species include mugga ironbark (*Eucalyptus sideroxylon*), yellow box (*E. melliodora*), white box (*E. albens*) and yellow gum (*E. leucoxylon*). Needle-leaf mistletoe (*Amyema cambagei*) growing on river she-oak and swamp mahogany also provide nectar sources. The regent honeyeater occasionally occurs at sites where nectar is not readily available, where they feed on other sugary plant or insect exudates.

The favoured eucalypt species of the regent honeyeater do not occur within the project area, but the species may utilise riparian forests dominated by *Casuarina cunninghamiana* (RE 12.3.7) which occur within the inundation area along the Mary River and its tributaries. The location of RE 12.3.7 within the project area, according to 3Ds vegetation mapping, is shown on **Figure 18-9**.

In the wider area the regent honeyeater may utilise areas of open eucalypt forests containing swamp mahogany as well as riparian forests dominated by *Casuarina cunninghamiana* which occur in the Mary Valley region. A review of the EPA's certified RE mapping within a 25km radius of the study area was undertaken to identify regional ecosystems containing suitable habitat in the local Mary Valley region. These include REs 12.2.7, 12.3.4, 12.3.7, 12.9-10.1. The location of these REs within the Mary Valley region is shown in **Figure 18-10**. It should also be noted that these ecosystems and their associated suitable foraging resource extend beyond this arbitrary 25km radius and throughout the SEQ Bioregion in which the regent honeyeater occasionally occurs.

The area of potential foraging habitat for the regent honeyeater impacted by the Project in comparison to the area present within the local Mary Valley region (within 25km radius of the project area) is presented in **Table 18-7**.

Table 18-10 Area of Regent Honeyeater foraging habitat impacted by the Project

Regional Ecosystem	Description	Area (ha) within project impact area	Area (ha) within local Mary Valley region
12.3.7	Eucalyptus tereticornis, Callistemon viminalis, Casuarina cunninghamiana fringing forest	102.24	1670.94
12.3.4	Melaleuca quinquenervia, Eucalyptus robusta woodland on coastal alluvium.	-	1744.94
12.2.7	Melaleuca quinquenervia or M. viridiflora open-forest to woodland on sand plains. Other species include Eucalyptus tereticornis, Corymbia intermedia, E. bancroftii, E. latisinensis, E. robusta, Lophostemon suaveolens and Livistona decora.	-	1350.91
12.9-10.1	Shrubby open forest often with Eucalyptus resinifera, E. grandis, E. robusta, Corymbia intermedia on sedimentary rocks.	-	3491.46
Total Foraging Habitat		102.24	8258.25

There is a single recent record for the regent honeyeater from the vicinity of Gympie, which represents the northern most record of this species in recent years (Barrett et al., 2003). There is also a historic record from Pomona in 1998 (Regent Honeyeater Recovery Project database).

The regent honeyeater breeds west of the Great Dividing Range and moves coastward in the non-breeding period, particularly when dry conditions prevail on the inland slopes of the Great Dividing Range (Menkhorst et al, 1999). Although the project area does not occur within critical breeding habitat for this species (David Geering, pers. comm.), it is located within its historical range and the riparian forests dominated by *Casuarina cunninghamiana* provide some foraging habitat. However, more extensive forest areas containing swamp mahogany (*Eucalyptus robusta*) are located elsewhere in the Mary Valley region, which provide a reliable nectar source for this species.

The percentage of foraging habitat for the regent honeyeater impacted by the Project comprises only 1% of the extent of other suitable foraging habitat present in the local Mary Valley region. It is not anticipated that the small loss of this resource will have an impact on the regent honeyeater, as it is highly mobile and can forage on more extensive forests containing swamp mahogany and *Casuarina cunninghamiana* in the surrounding local and regional area.

The assessment of potential impacts from Table 7-30 of the EIS has been updated to reflect additional information collected for the regent honeyeater.

Species	Status	Potential Impact
regent honeyeater (<i>Xanthomyza phrygia</i>)	E (Q, A)	<p>The regent honeyeater was not detected during the field surveys, but there is a recent record of this species from the vicinity of Gympie, which represents the northern most record of this species in recent years (Barrett <i>et al</i>, 2003) and a historic record from Pomona.</p> <p>The favoured eucalypt species of the regent honeyeater do not occur within the project area, but the species may utilise riparian forests dominated by <i>Casuarina cunninghamiana</i> (RE 12.3.7) which occur within the inundation area along the Mary River and its tributaries. In the wider area the regent honeyeater may utilise areas of open eucalypt forests containing swamp mahogany (<i>Eucalyptus robusta</i>) as well as riparian forests dominated by <i>Casuarina cunninghamiana</i> (RE 12.3.7).</p> <p>The project will result in the loss of approximately 1% of the extent of suitable foraging habitat for this species in the local Mary Valley region. Given the low abundance of foraging habitat impacted by the project in comparison to that present in the region, it is not anticipated that this small loss will have an impact on the regent honeyeater, as it is highly mobile and can forage on more extensive forests containing swamp mahogany and <i>Casuarina cunninghamiana</i> in the surrounding region.</p>

Koala (Phascolarctos cinereus)

Submitters have raised issues at the minimal study, survey and reports to the koala in particular. The terrestrial fauna assessment prepared for the project provides a review of the occurrence of this species across the project area and stated that the species is “apparently common (on the basis of wildnet records) in the vicinity of the inundation area.” However, habitat assessment indicates that the vast majority of the inundation area does not currently provide suitable habitat for the species. Furthermore, the small areas of suitable habitat which are available within the inundation area do not appear to support stable, breeding populations of the species. There is no evidence to suggest that the inundation area is of particular importance to the Koala.

Species specific management practices will be employed where the project disturbs known koala habitat. For example, where the Bruce Highway realignment passes adjacent to or through koala habitat, exclusion fences will be installed to prevent road mortality. At all times during clearing operations spotter-catchers will be present and the requirements of the Koala Conservation Plan (as they relate to vegetation clearing) will be followed.

Grey Goshawk

A submitter claims that inundation of potential habitat for the Grey Goshawk is likely to bring about “a demonstrable state of decline which is likely to result in extinction” as quoted by the Department of Sustainability and Environment, Victoria.

As stated in Table 7.30 of the EIS, the Grey Goshawk is widely distributed in coastal and sub-coastal areas from Victoria northwards through NSW and Queensland and across the Northern Territory to Western Australia, and riparian habitat within the inundation area is not considered significant in terms of overall distribution of the species or as winter foraging areas. The project was concluded not to have a significant impact on the Grey Goshawk as it can continue to forage on suitable riparian habitat within the Mary River valley upstream and downstream of the dam. Due to the wide distribution of this species across Australia, the project would not lead to the decline or extinction of the Grey Goshawk.

18.4.3.2 Road Traffic Impacts

An issue has been raised in the submissions that the increase in heavy vehicle traffic will result in increased wildlife mortality of non-threatened species, including pretty faced wallabies, echidnas and birds.

The potential impacts on wildlife from increased traffic on haul routes and new roads were identified in Section 7.5.1 of the EIS. An increase in heavy vehicles associated with construction of the dam is likely to result in increased wildlife mortality on haul routes. To minimise impacts on wildlife the following mitigation measures will be incorporated in the proposed Construction Traffic Management Plan:

- limit construction vehicle movements at times of optimal fauna activity - dawn, dusk and night;
- reduce speed limits on haul routes (local and regional roads);
- signage and education; and
- wildlife rescue protocols.

18.4.3.3 Loss of Tree Hollows

Several issues were raised in submissions in relation to the loss of tree hollows across the project area, including the number and variety of tree hollows lost, the nature of and high cost associated with mitigation and the level of care required when clearing vegetation containing tree hollows. Specific issues have also been raised in relation to the conservation of all hollow dependent fauna in the riparian zone and the length of time required for trees to develop hollows, thereby limiting any attempt to replace this resource in the short term.

In relation to the availability of hollows across the impact area, it is noteworthy that eucalypt open forests (which are the most productive habitat type in terms of hollow variety and density) occur only as a few isolated patches at the periphery of the inundation area. The dominant habitat type to be impacted is riparian gallery forest of Water Gum, River Oak and Flooded Gum, none of which are hollow prolific species, i.e. they produce few hollows.

Approximately 150ha of Eucalypt dominated forest containing hollow prolific species such as Grey Gum, Tallowood and Northern Grey Ironbark will be impacted, and these areas are likely to contain hollows in a variety of size classes and configurations.

The installation of nest boxes and the removal/relocation of stags (old, dead trees containing hollows) are potential mitigation strategies available to the project to mitigate the impacts of tree clearing on hollow dependent fauna. The approach taken to the location, number and size of replacement hollows required will be based on a rigorous scientific approach to avoid unnecessary costs and the creation of unnatural habitats (in which hollow availability exceeds demand).

The Habitat Tree Technical Advisory Group DNRW prepared a technical report in 1998 titled "Managing Habitat Trees in Queensland Forests". They concluded that the maximum habitat tree densities required for the maintenance of hollow dependent fauna at natural densities are in the order of 8-12 habitat trees per hectare. Preferably these trees would be evenly spaced throughout the landscape.

The use of intensive hollow recruitment strategies such as nest boxes is unnecessary where natural habitat tree densities in retained habitats are in the order of 8-12 habitat trees per hectare. An increase above the level of natural demand is likely to promote the use of empty nest boxes by

European Honeybees and Indian Miners, rather than an increase in the density of endemic hollow using fauna.

A more worthwhile approach is a detailed assessment of the existing availability of habitat trees (on a case by case basis for separate vegetation patches or clearing areas) for a variety of fauna groups, whereby each habitat tree to be lost could be assigned to a use category, based on the entrance diameter of hollows. Where densities are observed to be in the order of 8-12 trees per hectare in habitats immediately adjacent to the clearing area there is no need to provide artificial nest boxes. Where densities are below this threshold, specific groups or species could be targeted (e.g. Microbats) and total density of available hollows could be increased to 10/ha.

There is little value in providing nest boxes/replacement tree hollows in patches of habitat incapable of supporting the target species. As such, an assessment of the residual habitat value of each patch post clearing/inundation would be required to determine the location and size of replacement hollows. The conservation benefit of installing nest boxes and shifting stags should be critically assessed at this stage as resources may be better allocated to other mitigation approaches.

A spotter/catcher will be present on site for all tree clearing operations. It is standard practice for the spotter/catcher to locate and search all hollow bearing trees prior to clearing. In this role, the spotter/catcher could also catalogue the loss of hollow bearing trees as clearing proceeds, and appropriate replacement ratios determined.

A Fauna Management Plan will be developed to establish vegetation clearing and fauna management protocols. This plan will include an assessment methodology for determining the need, location and design requirements for nest boxes in retained habitat. The process to be followed will include the following steps:

- spotter/catcher will document the number, size class and configuration of tree hollows lost in each clearing area. The numbers and types of species encountered in tree hollows will also be recorded. Where large stags are present, an assessment of habitat value, and value of shifting to alternative habitat should be made;
- spotter/catcher to determine the residual habitat value of the clearing area and immediately adjacent areas for species recorded from the clearing area, or likely to occur;
- assessment of the need for replacement hollows should be completed. This should consider the target species, accessibility for maintenance and specific designs required; and
- replacement ratio should be determined in consultation with relevant stakeholders.

18.4.3.4 Climate Change Impacts

Some submissions suggested that there was insufficient consideration of the effects of climate change on environmental flows, and resultant impacts on threatened species, including Queensland lungfish, Mary River cod, Mary River turtle and the southern barred frog.

Section 6.1.4 Water Resources of the Supplementary EIS details the approach adopted in the EIS to deal with the effects of climate change on the project. Due to the uncertainty regarding climate change predictions, a conservative approach was adopted, which developed a “prudent take” for the project.

Historical rainfall and stream flow records from the past 117 years identify a dam of the type proposed could provide 97,300 ML/year at a reliability of 99%. The project adopts a “prudent take” of 70,000 ML/year, which represents a conservative take, and allows 27,300 ML/year to be available for climate change.

The most recent published estimates by the CSIRO predict a reduction in rainfall of 2.5 to 5% by 2030 and 2 to 10% by 2070 (CSIRO, 2007). This climate change allowance has more than enough capacity to deal with the projected change in rainfall and still meet all (EFOs) and (WASOs) for the project. These objectives are established to maintain environmental flows and provide for water entitlements, and by ensuring these objectives are still met with a conservative take, the environment and irrigators are protected in the event of reductions in rainfall as a result of climate change. Even so, Water Resource Plans (WRPs) are renewed every 10 years so the EFOs will be reassessed each time, taking into account any actual changes in climate.

Submissions claim that the EIS does not investigate the likely effects of climate change on biodiversity in the Mary River catchment against “The National Action Plan for Biodiversity and Climate Change 2004-2007”.

The National Action Plan for Biodiversity and Climate Change 2004-2007 outlines a nationwide strategic approach to protect Australia’s biodiversity from the impacts of climate change. Key strategies include promoting ecological connectivity to aid migration and dispersal of species, protecting refuges and creating specific management zones around important habitats.

The Intergovernmental Panel on Climate Change (IPCC), the world’s leading scientific organisation on climate change, has released its Fourth Assessment Report “Climate Change 2007” (IPCC, 2007). The report provides a comprehensive and up-to-date assessment of the current state of knowledge on climate change, and addresses climate change impacts, adaptation, vulnerability, as well as mitigation. In Australia, many species are at risk from rapid climate change because they are restricted in geographical and climate range. Bioclimatic modelling studies generally project reductions and/or fragmentation of existing climatic ranges. Climate change will also interact with other stresses such as invasive species. The most vulnerable areas include upland tropical rainforests (e.g. Wet Tropics), alpine areas, coral reefs (e.g. Great Barrier Reef), south-east Tasman Sea, coastal and freshwater wetlands (e.g. Kakadu wetlands) and south-west Australian heathlands (IPCC, 2007).

The following potential impacts on biodiversity are recognised in the National Action Plan for Biodiversity and Climate Change 2004-2007:

- reductions in the geographic range of species that have limited climatic ranges (survival would be threatened if they are near the upper limit of their temperature range or in areas where migration is impossible due to clearing, soil differences, topography etc.;
- changes to the timing of species lifecycles;
- changes in population dynamics and survival;
- changes in the location of species’ habitats - many species will tend to move south or upward in elevation (if suitable habitat exists) in order to keep pace with shifting climatic zones;
- increases in the risk of extinction for species that are already vulnerable – species with limited climatic ranges, limited dispersal ability, specialised habitat requirements, small populations and/or low genetic diversity are typically the most vulnerable to extinction;
- increased opportunity for range expansion of invasive species;
- changes in the structure and composition of ecosystems and communities; and
- changes in coastal and estuarine habitat due to rising sea levels.

The project area is not located within a region of particular vulnerability to climate change as identified by the IPCC. The project may provide a barrier to the movement of species restricted to the riparian corridor southwards (upstream of the project) to keep pace with shifting climatic zones. This is only likely to potentially threaten the survival of those species that have limited climatic

ranges. However, as none of the EVR species known or likely to occur in the project area have limited climatic ranges, this will not adversely affect them.

18.4.3.5 Impacts of Melliferous Plantings for Apiculture Industry

Submissions raised the issue that the provision of specialised plantings for the apiculture industry will cause ecological issues resulting from planting of environmental weeds and competition between feral honeybees with native fauna for tree hollows.

QWI and Timber Queensland have proposed to trial the planting of melliferous flora for the apiculture industry as part of the native hardwood timber plantation trial area. Further investigation into the suitability and potential of this area to be developed concurrently for both native hardwood plantations and apiculture is being undertaken. melliferous flora includes native honey flora such as Eucalyptus, Banksia and Eucryphia species. It is not the intention of QWI to trial plantings of melliferous flora that are environmental weeds in the Mary Valley region.

The provision of melliferous flora within the native hardwood plantations is in response to the Queensland Government's commitment to investigate the development of alternative resources required to maintain a sustainable apiculture industry. In 1995 to 1996, approximately 42% of the total apiary sites in SEQ were located in the Irbil and Gympie district with an average of 49% of these sites booked for use in these two districts (Winders, 2004).

The integration of melliferous flora within the native timber plantations would also partly offset the loss of native flora from the inundation area. In addition, QWI has committed funding to assist DPIF with research on alternative melliferous resources, i.e. bee nutrition, pollen supplementation and replacements (artificial pollen feed).

18.4.3.6 Impacts on Riparian Linkages and Rainforest Obligate Fauna

Submitters have claimed that the proposed Traveston Crossing dam will lead to the loss of an area of riparian rainforest complex and the loss of ecological corridors, including obligate rainforest fauna. They note this is despite there being other community projects nearby with government support aimed at reintroducing riparian vegetation e.g. Kin Kin Creek project.

In ecology, the term obligate refers to an organism that can survive only if a particular environmental condition is satisfied. A rainforest obligate species would therefore be completely dependent on rainforest, and no other habitat type for its survival. A review of the species inventories for the project revealed that only 1 species of amphibian (no reptiles, no birds and no mammals) recorded from the study area are truly rainforest obligate species. Almost all species occur across a range of habitat types. If the analysis is extended to include specialists of wet sclerophyll forests, the range of wet forest obligate species would include 2 amphibians (members of the *Mixophyes* genus), 2 reptiles (*Erotoscincus* and *Saproscincus*), 5 birds (Fruit doves/pigeons and Russet tailed Thrush) and one mammal (Fawn-footed Melomys).

The richness of wet forest dependent species across the study area is actually quite low, and the riparian rainforest to be lost is of greatest significance to the southern barred frog, elf skink and *Saproscincus rosei*. The potential impacts on these species, including impacts of fragmentation of habitat have been considered in detail in the EIS and Section 18.4.3.1.

Several riparian restoration projects are being undertaken in the Mary River catchment by the Mary River Catchment Coordinating Committee, the Noosa & District Landcare Group and the Richmond Birdwing Butterfly Network. These include the 2008 Mary Program of Rivercare, the Black Mountain Range Catchments Extension, Upper Kin Kin Creek Restoration Project, Kinmond Creek Riparian Improvement Project, Cooroora Creek Project, Kin Kin Rainforest Project, as well as

restoration of Richmond Birdwing Butterfly habitat. These projects are supported by landholders and the community and have funding by local and Australian governments.

None of the on-ground works completed for these restoration projects will be affected by the Project. However, in line with the approach put forward in the EIS, QWI will fund local catchment and landcare groups to undertake rehabilitation of riparian habitat upstream of the proposed FSL.

18.4.3.7 Impacts of Meadvale Quarry Operation on Faunal Movement

A submission noted that research studies are needed to support the assessment that faunal movement will not be affected by recommencement of extraction at Meadvale Quarry.

Meadvale Quarry is an existing quarry located approximately 8 km north east of the project site. It is proposed to develop a new quarry immediately north east of the existing quarry to provide dam wall concrete aggregate and road construction materials for the Project. A review of the EPA's regional ecosystem mapping and the Biodiversity Planning Assessment (BPA) mapping for the area shows that areas of remnant vegetation communities are located 100m to the north and south of the existing quarry. These regional ecosystems comprise:

- 1) RE 12.3.1 – Simple notophyll vine forest with *Waterhousea floribunda* - Endangered;
- 2) RE 12.11.3 – Open forest generally with *Eucalyptus siderophloia*, *Eucalyptus propinqua* on metamorphics and interbedded volcanic - Not of Concern;
- 3) RE 12.12.15 – *Eucalyptus siderophloia*, *E. propinqua*, *E. acmenoides* open forest on near coastal hills on Mesozoic to Proterozoic igneous rocks - Not of Concern.

These vegetation communities will not be impacted by the proposed quarry, however there is potential for noise and dust impacts from extraction of material from the quarry to have a short-term impact on the local fauna inhabiting this remnant vegetation. This could cause additional stress, causing animals to leave their home ranges, disruption to breeding cycles and restrictions in foraging behaviour. During operation of the quarry, it is expected that mobile fauna would temporarily shift into nearby habitat and would not be affected.

There is also the potential for the operation of the quarry to affect the movement of fauna between habitat patches. This is unlikely to have a significant impact on faunal movement as they can continue to traverse cleared areas between habitat patches to the east or west of the proposed quarry.

18.4.3.8 Competition for Resources

A submitter claims that the effect of 'competition for resources' has not been considered in the assumption that fauna requiring river edges can move into suitable habitat along tributaries upstream of the dam. They also claim that the dam would provide population concentrations that favour predators and large bird numbers.

At FSL, the depth of water in the upper reaches of the dam along Mary River, Belli Creek, Happy Jack Creek, Coonoon Gibber Creek and Skyring Creek will only increase by 1-2m. In these reaches, the riparian zone is expected to survive, as most is above the FSL. Furthermore, the proposed rehabilitation of riparian habitat along the Mary River and tributaries both above and upstream of the FSL will restore vegetation connectivity along these riparian corridors. Thus terrestrial fauna requiring river edges, including stream dwelling frogs and freshwater turtles, will also be able to move 1-2m vertically into the new riparian zone at the upper reaches of the dam. This should relieve the competition for resources in riparian habitat upstream of the FSL, where habitat is already utilised by terrestrial fauna.

It is true that the presence of the dam is likely to encourage larger concentrations of water birds to reside in the project area, including ducks, grebes, egrets, darters, cormorants and herons. This would be as a result of increased habitat and food resources and is not expected to have an ecological impact.

18.4.4 Mitigation Measures

18.4.4.1 Rehabilitation Areas

To offset the loss of riparian habitat within the inundation area, areas along Belli Creek, Happy Jack Creek, Skyring Creek, Coonoon Gibber Creek and the Mary River will be rehabilitated as part of the overall environmental management strategy for the project. These areas will be revegetated with local native rainforest species (including EVR flora and the Richmond Birdwing larval food plant, *Pararistolochia praevenosa*) and excluded from cattle grazing by fencing to encourage utilisation. Rehabilitation will provide habitat for *Mixophyes iteratus* and other local frog species.

As part of the VMO strategy for the project, the minimum offset required for riparian vegetation (REs 12.3.1, 12.3.2 and 12.3.7) under the RVMC 6 is 430 ha. Whilst the RVMC 6 considers remnant vegetation for offset only, the potential to use rehabilitated non-remnant riparian vegetation as an acceptable alternative solution should be discussed with DNRW. Potential VMOs created through both management of non-remnant vegetation and retention of remnant vegetation has been identified both within and outside the LPA in the 3D 'Desktop Assessment of Potential Vegetation Offsets' and is summarised in Section 18.3.4.1 of the Supplementary EIS.

It is unknown at this stage approximately how much area will be rehabilitated, however the intent will be to establish 430 ha of VMOs to offset the loss of 217 ha of riparian vegetation both within and outside the LPA through a combination of retention of remnant vegetation and rehabilitation of non-remnant vegetation. In the long term this will effectively double the area of riparian vegetation to be impacted by the Project. Non-remnant riparian vegetation will be rehabilitated to restore vegetation connectivity along upper tributaries above and upstream of the FSL to provide secondary habitat for displaced frogs. It is proposed that rehabilitation is undertaken at the commencement of project construction so that habitat is established at inundation stage for displaced fauna. It should be noted that given the shallow depth of water at FSL along upper Belli Creek, Happy Jack Creek, Coonoon Gibber Creek and Skyring Creek, the main habitat areas for *Mixophyes iteratus*, frogs are expected to be able to move vertically out of the FSL in to the riparian zone.

Management of rehabilitated areas will be undertaken by appropriately skilled contractors of the dam operator for a period of two years to ensure successful plant establishment. This will involve planting maintenance, weed control, watering of planted stock, replacement of mulch if disturbed and replacement planting if there are any deaths.

Long-term monitoring will also be undertaken to determine rehabilitation success and to identify if any follow-up maintenance is required. This will include monitoring of rehabilitated areas, weed infestations and frog populations (species richness, diversity and abundance).

A management plan will be prepared for *Mixophyes iteratus* which will provide details on:

- location and extent of rehabilitation areas;
- rehabilitation methodology - site preparation, species list and planting method;
- maintenance - actions, frequency, duration;
- monitoring - actions, frequency, criteria; and
- adaptive management strategies if rehabilitation is ineffective.

Research on the captive husbandry of frogs will be investigated as part of the Freshwater Species Conservation Centre as a potential mitigation measure to reintroduce individuals and maintain genetic diversity in isolated populations to ensure the long term viability of the species.

18.4.4.2 Fauna Relocation

A submission has sought further detail on the proposed “spotter-catcher” techniques for the relocation of fauna to determine the predicted success of the mitigation measure.

Details on the proposed “spotter-catcher” techniques to be implemented for the construction phase of the project are set out in Chapter 18 Environmental Management Plan of the EIS (Section 18.3.8). Fauna rescue operations will be undertaken by an appropriately qualified ecologist (i.e. Queensland Parks and Wildlife Service (QPWS) accredited spotter-catcher). This process will involve the following main stages:

- identification of habitat trees
- removal of tree hollows
- flushing of denning fauna
- spotter-catcher supervision during clearing operations
- management of fauna during/following clearing operations

The wildlife spotter/catcher has ethical responsibilities guided by the *Animal Care and Protection Act 2001* and NC Act to ensure the protection of the welfare of wild animals in respect of a development or activity for which they are acting in that role. A wildlife spotter/catcher also has an obligation to comply with the (draft) code of practice for the welfare of wild animals affected by land-clearing and wildlife spotter/catchers.

Wildlife spotter/catchers are expected to have specialised knowledge in the detection, identification and removal of wildlife; assessment of potential impacts of developments or activities on wildlife; an understanding of basic ecological principles; good animal handling and husbandry skills; local knowledge of appropriate release sites for wildlife; and a good general understanding of local, state, and federal statutes relating to wildlife, habitat and development issues.

A Fauna Management Plan will be developed for the project which will provide further detail on the fauna management strategies, including specific management strategies for the arboreal and avian fauna and microbats expected at the site. Prior to the onset of operational works or land-clearing, the wildlife spotter/catcher will have a briefing meeting with the project manager, site foreman and plant operators, for the purposes of discussing the requirements of the plan.

Habitat trees of high importance will be felled last, after surrounding less important vegetation has been cleared to allow easy access of special plant and equipment (such as cherry pickers), traps (such as koala traps), and to allow unhindered lowering of hollow-bearing limbs. It will not be acceptable to fell or push over hollow-bearing trees without first removing wildlife, due to the high risk of severe deceleration and/or crushing injuries to wildlife inhabiting such trees.

Where practical and determined necessary by the Spotter-catcher, hollow-bearing limbs will be cut and lowered gently to the ground using a variety of techniques, such as the use of cranes or special rigging.

Whenever possible, the integrity and structure of tree hollows contained in trees which are to be removed will be preserved. These will be relocated to appropriate habitat retained on the site, or to appropriate habitat close to the site. In the case of tree hollows containing wildlife that are particularly sensitive to translocation (such as greater gliders for example), special efforts will be

made to record the height and orientation of the hollow, and tree species from which it was obtained to enable it to be reproduced at the translocation site.

Other valuable habitat features such as large fallen logs, log piles, rock piles or outcrops etc will be preserved as much as possible, and translocated and re-established at appropriate habitat close to their site of removal if practical and appropriate.

The ideal outcome for wildlife removed from a site during operational works is to be relocated back to the same site at the completion of works, so long as suitable and sufficient habitat remains. This ensures that any potential adverse ecological consequences associated with translocation and the potential adverse effects (on the individual) of placement in unfamiliar territory are avoided. This is unlikely to be a suitable solution in most instances because the habitat will have been cleared.

If clearing of a site occurs adjacent to a large area of similar habitat, with little retention of habitat on site, native animals will be translocated into adjacent areas. If development of a site is such that habitats are completely removed, or retained habitats, (including habitats adjacent to the site) are insufficient to support retention of animals on or adjacent to the site, then animals inhabiting the site may be translocated to other areas of suitable habitat that may be distant to the site.

18.4.4.3 Weed Management

Submitters have raised the issue that Cooloola Shire Council is opposed to the burning of vegetation as a disposal method. It should be noted that all millable vegetation in the project impact area which requires clearing will be harvested by licensed contractors. Additional native vegetation which has no value as a source of timber will be mulched on site. The only vegetation to be burnt will be weed stockpiles if it is impractical to bury this material or transport it to a waste disposal facility.

18.4.4.4 Environmental Management Plan

Submissions commented that a large number of the recommendations in Chapter 7 Terrestrial Environments of the EIS do not appear in the final list of mitigation measures.

It appears that some of the mitigation measures proposed in Chapter 7 of the EIS were not picked up in Chapter 18 Environmental Management Plans. The EMP chapter has been updated to include additional mitigation measures proposed in the Supplementary EIS. Mitigation measures will be honoured by conditions placed on the project by Government agencies.

18.5 Corrections

A submission requests that reference to “DNRW Pestfact sheets” in the EIS be changed to read “DPIF Pestfact sheets”. This is agreed.

A submission identified an error in the Table of Contents of the Ecotone Fauna Report in Appendix F-4.3 of the EIS. It can be confirmed that the page reference for *Mixophyes iteratus* information is incorrect, and that *Mixophyes iteratus* information is provided on page 91, not 90.

On submission identified that the common name of 'southern barred frog' is usually applied to *Mixophyes balbus*. The EIS and terrestrial fauna report (Appendix F4.3) use the common name southern barred frog for *Mixophyes iteratus*. The common name for *Mixophyes iteratus* listed in the Queensland Nature Conservation (Wildlife) Regulation 1994 and the EPBC Act 1999 when found in Queensland is the giant barred frog.

While the submitter is correct with regards to the Queensland common name, to maintain consistency within the EIS the Federal Common name was adopted. Supplementary report has tried to use scientific name only to avoid confusion.

A submission identified some items requiring clarification in Table 2.2 of the Ecotone Fauna Report in Appendix F-4.3 of the EIS. With regards to the recommended survey approach for the Richmond Birdwing butterfly (*Ornithoptera richmondia*) they noted that MRCCC and CSIRO are already conducting surveys for the butterfly. Dr Don Sands from the Richmond Birdwing Butterfly Recovery Network was contacted. They have not undertaken surveys for the Richmond Birdwing butterfly within the project area, but have done an assessment of the likelihood of the larval food plant (*Pararistolochia praevenosa*) occurring in the lower Belli Creek catchment. Furthermore, MRCCC are working with the Richmond Birdwing Butterfly Recovery Network to restore habitat throughout the Mary River.

Secondly, the submitters claim that the conservation status of *Litoria pearsoniana* under the NC Act is incorrect. It is confirmed that its conservation status is correct as endangered under the NC Act.

Thirdly, the submitters noted "Tiaro Landcare" as being incorrectly referenced as "Tiaro Greening Australia". It has been noted that the Ecotone text is incorrect and that it should read "Tiaro Landcare".

Fourthly, one submission stated that *Ludwigia peruviana* is not known to occur in Queensland, however the DPI&F website says that *L. peruviana* is a Class 1 declared pest plant in Queensland.

Fifthly, a submission commented that *Litoria lesueuri* is now known as *L. wilcoxii*. It has been noted that the Ecotone text is incorrect; in 2004 this species was separated from *L. lesueuri* on the basis of genetic and allozyme analysis.

Lastly, the submitters have requested that the conservation status of *Euseya albagula* be advised. *Euseya albagula* is currently not listed under the NC Act of EPBC Act, however is considered of high conservation significance.