Bathurst Regional Council

Chifley Dam Pipeline Routes Terrestrial Flora and Fauna Study

Additional threatened fauna surveys

April 2014

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Appendix A – Locations of threatened and migratory species recorded during surveys

1. Introduction

1.1 Background

Bathurst Regional Council (Council) engaged GHD Pty Ltd (GHD) to undertake a Terrestrial Flora and Fauna Study (TFFS) to assess the ecological constraints and potential impacts of two possible pipeline routes connecting Chifley Dam to the Bathurst Water Filtration Plant (WFP). Flora and fauna surveys were conducted in November 2012, and a preliminary impact assessment prepared for the proposal (GHD 2013). Based on the results of the survey, recommendations were made for additional targeted surveys for two threatened fauna species, the the Booroolong Frog (*Litoria booroolongensis*), listed as an endangered species under both the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the Koala (*Phascolarctos cinereus*), listed as vulnerable under both the TSC Act and the EPBC Act. These recommendations were:

- Further survey for the Booroolong Frog at pebbled riverbanks on Campbells River near Chifley Dam and the proposed crossing location if the crossing is to be trenched. Further survey along the Macquarie River would also be beneficial in determining the extent of potential habitat for this species, and the distribution of the population.
- Further survey to determine whether any woodland in the study area constitutes core Koala habitat.

GHD was subsequently engaged by Council to undertake these surveys. The purpose of this report is to detail the methodology and results of the additional surveys.

1.2 Location of the study area

The study area investigated for the route options assessment is located mainly to the south of Bathurst, with the northernmost part of the study area being the WFP in east Bathurst (Figure 1). The pipeline route options run between Chifley Dam and the WFP, with one option mainly following road reserves and the other mainly traversing paddocks near the Macquarie River and Campbell's River. Two river crossings would be required across Campbells River.

The study area for the additional surveys included a wider area than that investigated for the route options study. The wider study area incorporated additional vegetated areas to the south-west, in order to further investigate Koala habitat and corridors in the area. Surveys for the Booroolong Frog were focussed along Campbells River and the Macquarie River within the study area.

The study area is located mainly in the Bathurst local government area (LGA), with a small area near Chifley Dam within the Oberon LGA. It is within the Bathurst subregion of the Central West Catchment Management Area (CMA) andwithin the South Eastern Highlands Bioregion.

1.3 Scope and limitations

This report: has been prepared by GHD for Bathurst Regional Council and may only be used and relied on by Bathurst Regional Council for the purpose agreed between GHD and the Bathurst Regional Council as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Bathurst Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of vegetation and steep river banks, as well as access constraints. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Booroolong Frog

2.1 Introduction

An individual Booroolong Frog (*Litoria booroolongensis*) was identified during the GHD 2012 surveys (hereafter 'previous surveys') at one location on the Macquarie River (GHD, 2013) west of Montavella Road, Gormans Hill (Figure 1). The previous surveys identified cobbled habitat for this species, in a number of locations along both the Macquarie River and Campbell's River between the Water Filtration Plant and Chifley Dam. Further surveys for the Booroolong Frog at pebbled riverbanks on Campbell's River near Chifley Dam and along the Macquarie River were recommended to determine the extent of potential habitat as well as the distribution of the population of this species.

2.2 Background

2.2.1 Distribution and population information

The Booroolong Frog is restricted to New South Wales and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range (OEH 2013; Anstis 2002; Hunter 2007). Since the mid-1990's, this species has disappeared from more than 50 per cent of its former known range, and is rare throughout the remainder of its range (Heatwole et al. 1995; Gillespie and Hines 1999; Hunter 2007; OEH 2013). While recent surveys have identified persistent populations in a number of streams, particularly in the Namoi catchment, there is limited information on the extent of these populations (OEH 2013). Further, little is known about the specific habitat requirements of the species, beyond their general association with wet and dry forest, woodland and permanent rocky stream habitat (Hunter 2007; Anstis 2002).

The Booroolong Frog is known to occur in 28 populations (a river or creek connected by habitat, which supports a population) (DotE 2013). Location information for the species is provided in the Commonwealth Department of the Environment (DotE) species profile. Table 1 provides details regarding known populations in the Central West catchment area from the species profile (DotE). Interestingly, the list of local population information for this species does not include the Macquarie River. Conservation works, including stock restrictions in the riparian zone, weed control/eradication and re-establishment of native riparian vegetation (Hunter 2013), are being carried out for some populations in NSW, however none are being carried out for populations in the Central West (DotE 2013).

Table 1 Population information for the Central West catchment management area (DotE 2013)

Population	Streams occupied	Length of stream occupied (km)	Length in conservation reserve (%)	Threats	
				Drying	Weeds and sedimentation
Sewells Creek	Campbell River	2.5	0		X
	Chain of Ponds Creek	3	0	X	X
	Native Dog Creek	3.5	0	X	X
	Captain Kings Creek	7	0	X	X
	Wisemans Creek	2	0	X	X

Population	Streams occupied	Length of stream occupied (km)	Length in conservation reserve (%)	Threats Drying	Weeds and sedimentation
	Sewells Creek	20	0	X	X
Upper Fish River	Fish River	1.5	0	X	X
	Duckmaloi River	> 1	0	X	X
Lower Fish River	Fish River	2	0	X	X
Turon River	Coolamigal Creek	3.5	100	X	X
	Turon River	40	30	X	X
	Round Swamp Creek	> 2	0	X	X

2.2.2 Habitat requirements

The Booroolong Frog requires extensive rocky structures along a stream, with some fringing vegetation. Adults occur on or near cobble banks and other rock structures within stream margins, or near slow-flowing connected or isolated pools that contain suitable rock habitats. Females deposit eggs in the crevices of the rock structures within the shallow slow, to medium flowing sections of a stream or in adjacent slow flowing connected or isolated rock pools (Hunter, 2007; Antsis 2002; DotE 2013). Studies by Hunter (2007) have found a negative relationship between the proportion of canopy cover and the species occurrence, likely relating to thermoregulatory requirements (e.g. attaining warmer body temperatures enhance growth and development).

The dispersal capabilities and non-breeding habitats of the species are unknown, but the species is relatively sedentary (DotE 2013). Hunter (2001) found that the majority of recaptured individuals moved less than 50 metres within a season, with maximum movements of up to 300 metres being recorded across seasons (DotE 2013).

The Booroolong Frog has been found to persist in sections of streams that have been highly modified, denuded of native vegetation and open to stock access, as well as within artificial structures such as weirs, but such high levels of disturbance are unlikely to be conducive to long term persistence (Hunter 2007; Antsis et al 1998; DotE 2013).

2.3 Methods

2.3.1 Desktop assessment

Previous records of the Booroolong Frog held in the NSW Atlas of Wildlife and Council's threatened species database were reviewed in order to determine the species' distribution in the locality.

Aerial photographs of the two rivers were reviewed to identify areas where cobbled habitat was likely to be present. Some areas were already identified during the 2012 field surveys, however additional reaches of this habitat type were also identified. Identification of cobble habitat was used to assist with focussing survey effort (see below).

2.3.2 Field survey

The investigation areas for the targeted Booroolong Frog surveys are shown on Figure 1 and comprised sections of rocky bank habitats along Campbell's River near Chifley Dam and along various locations on the Macquarie River.

Surveys were conducted with reference to the survey guidelines for the species (DEWHA 2010). These methods recommend conducting surveys over four nights between October and March, during warm and windless weather conditions following rainfall. Surveys were undertaken between 25 to 29 November 2013. Weather was mild at the beginning of the week and hot at the latter end of the week. Daytime highs ranged from 23.4°C to 32.1°C. Overnight lows ranged from 5.5°C to 16.8°C (BOM 2013). No rain fell during the week, however there had been heavy rain the previous Friday (9.4mm). There was little wind in the evenings during surveys.

Frog surveys were conducted over approximately four hours on each of four separate evenings along six reaches of the rivers within the investigation area (i.e. 16 person-hours of survey effort). The length of each reach surveyed depended on presence of cobbles or rock structures and access constraints.

Active streamside searches and spotlighting for frogs were undertaken at each survey site focussing on areas where cobble habitat was likely to be present. Creek banks and streamsides with connectivity to cobble (rock) banks and other rock structures within the stream margins were systematically searched and semi-aquatic vegetation was visually scanned. Frogs were identified by sight and call. Calls of the Booroolong Frog were also broadcast at each survey site, comprising a minimum of five minutes calling followed by at least a ten minute listening period.

Frogs were only hand captured if their identification required confirmation; particularly in areas were the frog had not been previously recorded. Individuals were handled for less than 30 seconds, in accordance with the survey guidelines and hygiene protocols (DEWHA, 2010; DECC 2008).

Opportunistic and incidental observations of other fauna species were recorded at all times during field surveys, as well as while travelling to and from survey sites.

2.4 Results

2.4.1 Survey results

Of the six reaches surveyed during the current survey, three were found to contain the Booroolong Frog. All records were from the Macquarie River. No Booroolong Frogs were recorded at the two survey locations on the Campbells River. Booroolong Frogs were recorded on three of the four survey nights at the six locations shown on Figure 1. Frogs observed and site specific habitat features are described below. Photos of frogs and associated habitat are provided in the photo plates.

- Twenty-nine Booroolong Frogs were recorded foraging, or traversing along the edge of open emergent cobble banks, sand banks and small areas of emergent vegetation at the three survey sites along the Macquarie River. Locations where Booroolong Frogs were recorded are provided in Appendix A.
- At two sites, observed individuals ranged in life stages from froglet, sub-adult to adult frog, suggesting breeding, or at least juvenile dispersal was taking place. Locations where juvenile and sub-adult individuals were observed comprised typical breeding habitat, including extensive and exposed cobble banks with rock crevices, adjacent pools with some fringing *Typha* and *Baumea* species. Tadpoles were noted at one location within a small pool adjacent to cobble banks and in close proximity to Booroolong Frog adults.

These were not identified, however are likely to be either Booroolong Frogs or Pobblebonks (*Limnodynastes terraereginae*), also recorded in the same locations as Booroolong Frogs.

- Frog sightings ranged from 1.2 to 2.6 kilometres apart along the river. While frogs were found at discrete locations along the river, the stream and presence of riparian vegetation provide connectivity, potentially enabling Booroolong Frogs to migrate and interact as a single population or meta-population.
- Booroolong Frogs were heard calling on three of the four survey nights, along the immediate bank inspected and on the opposite banks, in response to vocalisations. At all locations, individuals were also observed (ie, there were no locations where calls were heard but no individuals seen).
- Booroolong Frogs were not generally recorded at survey sites which had stream banks dominated by fine sediment or mud flats with little rock coverage or crevices. Individuals were not observed in areas heavily infested with weeds (particularly blackberry *Rubus sp*.). However, some individuals were recorded traversing, or sheltering in clumps of aquatic vegetation in modified areas or areas with some weed present. Booroolong Frogs were recorded in areas where stock had access to the river banks, however the largest numbers of individuals were recorded in a section where stock access had been restricted.
- The European Carp (*Cyprinus carpio*) was recorded in the stream section of the Macquarie River near Montavella Road and in the stream section closest to Chifley Dam. Carp are known to predate on tadpoles, including the Booroolong Frog (Hunter 2007).

No Booroolong Frogs were recorded at the locations surveyed along Campbells River. Cobble areas immediately downstream of Chifley Dam, including the proposed river crossing for the pipeline near the dam, were degraded by weeds, access by cattle, and infill by silt. Further downstream, the reach of Campbells River inspected was also subject to weed invasion and sedimentation of cobble areas. Carp were also observed near Chifley Dam. Weather conditions were similar to the nights either side, when Booroolong Frogs were recorded at the Macquarie River. It is possible that disturbance is too great at these locations, and the frog no longer occurs, however individuals were observed in the Macquarie River in locations that were also subject to weed invasion, livestock access and sedimentation.

No Booroolong Frogs were recorded in the small section of cobble located on the Macquarie River at Bicentennial River Park in Bathurst. This area is also subject to high levels of human disturbance and the species is unlikely to occur at this location.

Large numbers of Pobblebonks (*Limnodynastes terraereginae*), as well as some Common Eastern Froglets (*Crinia signifera*) and Peron's Tree Frog (*Litoria peronii*) were recorded in riparian vegetation and agricultural land adjoining the Macquarie River. Portions of the study area where these species were recorded appeared to support local breeding populations of these species.

Photo plates: Booroolong Frogs observed during current surveys on the Macquarie River and associated habitat features.

Photograph 1: Booroolong Frog observed in adjacent stream and rock habitat shown in photo 2.

Photograph 2: Rock outcrop where Booroolong Frogs were observed.

Photo 3: Booroolong Frog observed in rock habitat shown in photo 4.

Photo 4: Rock outcrop where Booroolong Frogs were observed.

Photo 5: Booroolong Frog observed on aquatic macrophytes amongst large emergent boulders as shown in photograph 6

Photograph 6: Boulder (rocky) habitat where a Booroolong Frog was observed.

Photograph 7: Booroolong Frog observed within a stagnant pool within a sand bank. Larger area shown in photograph 8. Area was heavily infested with weeds and dense mid-storey vegetation.

Photograph 8: Stagnant pool where a Booroolong Frog was observed.

Photograph 9: Booroolong frog observed traversing sand bank with sparse rocky cover as shown in photograph 10.

Photograph 10: Sand bar with sparse rock cover.

Photograph 11: juvenile Booroolong frog observed in stream and rock habitat. Several individuals of various life stages were observed in proximity to this individual. Habitat shown in photograph 12.

Photograph 12: Densely cobbled habitat adjacent to stream (to the right).

2.5 Discussion

2.5.1 Habitat

The supplementary surveys recorded Booroolong Frogs in numbers that would indicate there is a resident population (or metapopulation) along the Macquarie River. Suitable breeding and foraging habitat was recorded at a number of locations during surveys. The results of this survey are generally consistent with our understanding of this species' general ecology. All individuals observed were located on or near cobble banks or large boulders within the river banks.

Interestingly, this species appears to persist along sections of the stream that are highly modified. Many of the reaches along the Macquarie River are open to stock access, heavily infested with weeds, or where rocky structures have been substantially reduced by high sedimentation. Increased sediment loads entering the stream are likely to reduce the availability of rocky habitat structures as fine sediments fill the crevices used for shelter, and reduce food availability for tadpoles (Gillespie 2002). High weed infestation is likely to create surface mats which are also likely to fill available rock crevices.

Hunter (2007) suggests that the Booroolong Frogs capacity to cope with high levels of disturbance may be due to its primary habitat requirement being rock structures, which tend to remain intact even after riparian vegetation has been removed. However, disturbance and habitat modification are not conducive to the long-term persistence of the Booroolong Frog, with increasing fragmentation attributed to reduced population density and increased susceptibility to stochastic events.

Of critical importance for ensuring the longevity of Booroolong Frog populations is the protection of the species' rocky habitat along the stream. This particularly entails minimising sediment loads entering the streams and controlling invasive weeds. Increased sedimentation is likely to result from; inappropriate use of machinery in the riparian zone, vegetation removal, erosion from livestock or poor road construction. Weed infestation substantially reduces available breeding habitat, and a control/eradication program for weeds is likely to be very effective in ensuring the long-term conservation of the species.

2.5.2 Implications for the Chifley Dam pipeline project

As noted earlier, no Booroolong Frogs were recorded in the cobble areas of Campbells River immediately downstream of Chifley Dam, including the proposed river crossing for the pipeline near the dam. These habitat areas were degraded by weeds, access by cattle, and infill of cobble areas by silt, as well as the presence of Carp. Further downstream, the reach of Campbells River inspected was also subject to weed invasion and sedimentation of cobble areas. Large reaches of Campbells River appear to lack cobble beds, and it is possible that gaps in habitat together with degradation of habitat and historical disturbance from the construction of the dam may have led to the extinction of a local population at these locations.

Further survey would need to be undertaken to confirm the presence or absence of the species at these locations on Campbells River. As recommended in GHD (2013), directional drilling of the pipeline would minimise any impacts of the proposal on potential habitat for the Booroolong Frog along Campbells River.

All individuals recorded during field surveys were identified along the Macquarie River, between Bathurst and the confluence of the Fish River and Campbells River. The proposed pipeline from Chifley Dam to the Bathurst Water Filtration Plant may be located in paddocks adjacent to the Macquarie River, and habitat for the Booroolong Frog. There are no crossings proposed for the Macquarie River. The proposed pipeline would not directly impact any habitat identified on the Macquarie River. The proximity of the population to the proposed pipeline increases the

potential risk of secondary impacts during the construction of the proposal, such as erosion and sedimentation of downstream Booroolong Frog habitat. Mitigation measures to prevent impacts on water quality and habitat quality are imperative for protecting the population of Booroolong Frogs identified along the Macquarie River. Potential mitigation measures, including the provision of sedimentation basins, are recommended in Section 5 of GHD (2013). Given the distance of the proposal site from known populations of the Booroolong Frog and the use of appropriate environmental controls, the risk of impacts on the species is low in these areas.

2.5.3 Other recommendations

The results of the targeted Booroolong Frog surveys indicate the presence of a relatively large population along the Macquarie River despite high levels of modification and disturbance of habitat. Habitat for the species is subject to high levels of modification and degradation from human activities, including the presence of weeds, livestock and sedimentation of breeding and shelter habitat. The habitat is at risk of further degradation, which is recognised as key threat to the continued persistence of the species.

Management measures that could be considered by Council to improve habitat values and minimise potential for further degradation include

- Weed control programs along the Macquarie River
- Restriction of access of livestock to the Macquarie River
- Appropriate revegetation of riparian areas with native flora species.

Further surveys of the Macquarie, Fish and Campbells Rivers are also recommended to increase understanding of the numbers and distribution of the Booroolong Frog in the locality. This may lead to a better understanding of the habitat type and condition required by the species and assist with future management considerations for the species generally.

Bathurst
HOPE STREET
PEEL STREET
STEWART STREET
KEPPEL STREET
RUSSELL STREET
RANKIN STREET
HOWICK STREET
DURHAM STREET
ELIZABETH STREET
STANLEY STREET
STEPHENS LANE
CHURCH LANE
RIVER ROAD
LIONS CLUB DRIVE
GILMOUR STREET
MIRIYAN DRIVE
BOYD STREET
VIEW STREET
KENDALL AVENUE
SYDNEY ROAD
STOCKLAND DRIVE
WILLIAM STREET
BENTINCK STREET
GEORGE STREET
PIPER STREET
SEYMOUR STREET
HAVANNAH STREET
MACQUARIE RIVER
TORONTO STREET
LEE STREET
HAMPD
ROCKET STREET
LAMBERT STREET
CROSS STREET
BRILLIANT STREET
OAKES STREET
ALPHA STREET
UPFOLD STREET
ZAGREB STREET
WATERWORKS LANE
Water Filtration Plant
FISH PARADE
WALLAROI CLOSE
BUSBY STREET
VINE STREET
PINE STREET
PROSPECT STREET
BANT STREET
DEES CLOSE
ALMA STREET
LLOYDS ROAD
CURRAWONG STREET
VALE ROAD
QUARRY ROAD
BLUE RIDGE
ETHELTON AVENUE
COLLEGE ROAD
WHITE ROCK ROAD
FRYS LANE
GORMANS HILL ROAD
MONTAVELLA ROAD
GHD (2012) observation

Fauna of conservation significance

- Black-faced Monarch
- Booroolong frog
- Brown Treecreeper
- Diamond Firetail
- Little Eagle
- Scarlet Robin

Legend

- Route 1 - Alternate
- Route 1
- Route 2
- Roads
- Railway
- Watercourse

Survey transects

- Booroolong Frog
- Koala

Broad Vegetation Type

- 4, Mountain Gum - Red Stringybark open-forest at high altitudes
- 5, Red Stringybark (+/- Brittle Gum) open-forest
- 6, Scribbly Gum woodland
- 17, Blakely's Red Gum - Rough Barked Apple woodland on flats and alluvial terraces
- 29, River Oak riparian woodland/forest of the slopes and tablelands
- 41, Stringybark - Box - Gum Woodland
- 43, Scribbly Gum - Brittle Gum - Box woodland
- 44, Apple Box - Yellow Box - Mountain Gum open-woodland on flats and low hills of the central tablelands
- Planted Blakely's Red Gum - Yellow Box woodland - EEC
- 45, Red Stringybark - Blakely's Red Gum - Yellow Box woodland
- 46, Blakely's Red Gum - Yellow Box open-woodland of the tablelands
- 1001, Water

1:20,000 (at A3)

0 115 230 460 690 920

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

Bathurst Regional Council
Chifley Dam Pipeline Routes
Terrestrial Flora and Fauna Study - Additional Surveys

Job Number 21-21844
Revision A
Date 31 Jan 2014

Threatened biota, vegetation and survey effort

Figure 1.a

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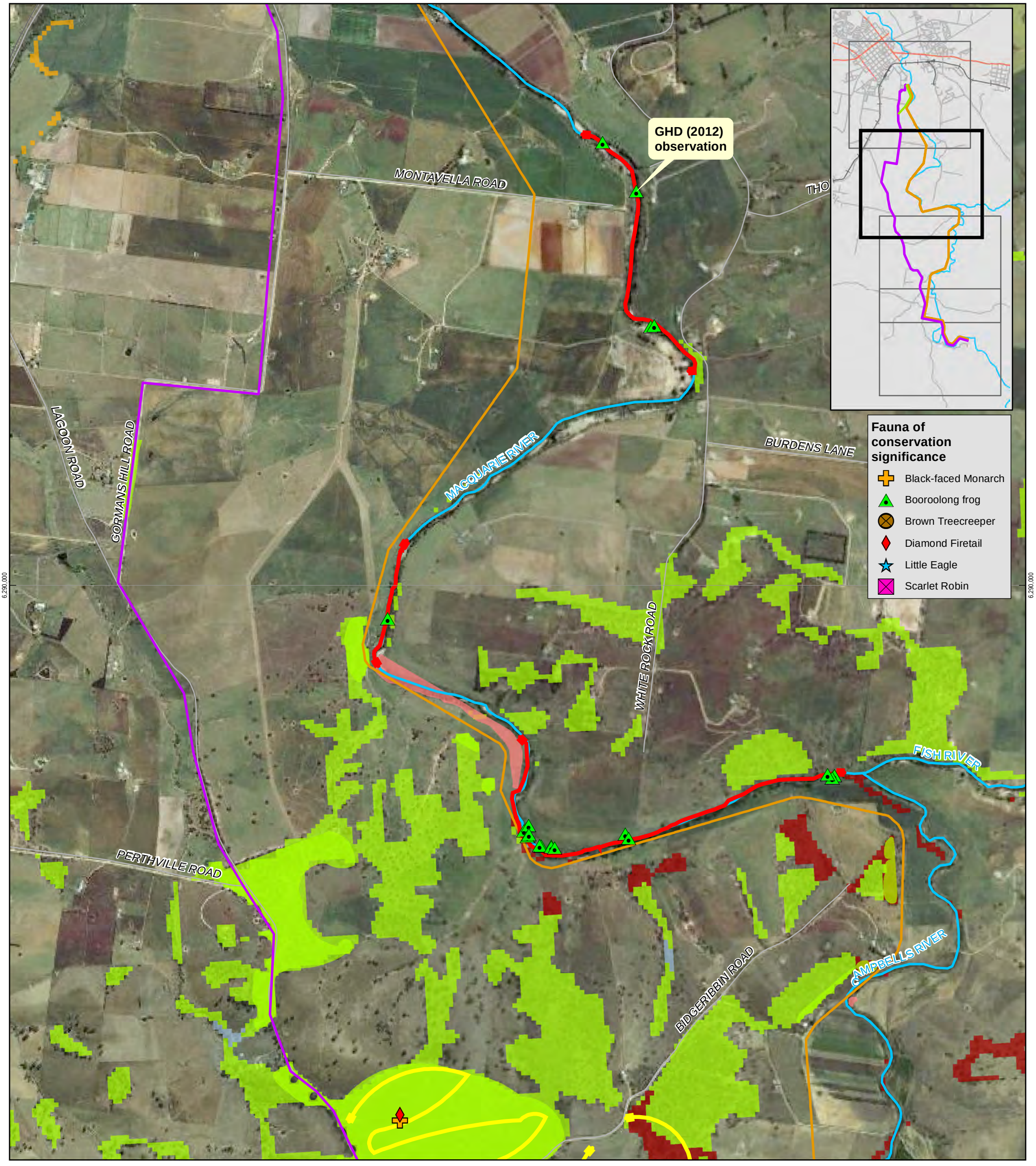
Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Cadastre - Jan 2010, Topographic Data - March 2012; Route Alignment provided by Bathurst City Council; Aerial Impagery: Google Earth Pro 2014. Created by: NAHANSEN



Legend

Route 1 - Alternate
Route 1
Route 2
Roads
Railway
Watercourse

Survey transects

Booroolong Frog
Koala

Broad Vegetation Type

4, Mountain Gum - Red Stringybark open-forest at high altitudes
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Terrestrial Flora and Fauna Study - Additional Surveys

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Revision A
Date 31 Jan 2014

Threatened biota, vegetation and survey effort

Figure 1.b

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BIDGERIBBIN ROAD
CAMPBELLS RIVER
GLAZEBROOKS ROAD
SAMUEL WAY
LAGOON ROAD
YOUNG STREET
RYANS ROAD
O'CONNELL PLAINS ROAD
SINCLAIRS ROAD
DAYMONDS LANE

Fauna of conservation significance

- Black-faced Monarch
- Booroolong frog
- Brown Treecreeper
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- Little Eagle
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Legend

- Route 1 - Alternate
- Route 1
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- Watercourse

Survey transects

- Booroolong Frog
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Broad Vegetation Type

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0 115 230 460 690 920

Metres

Map Projection: Transverse Mercator
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Grid: Map Grid of Australia 1994, Zone 56

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Bathurst Regional Council
Chifley Dam Pipeline Routes
Terrestrial Flora and Fauna Study - Additional Surveys

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Threatened biota, vegetation and survey effort

Figure 1.c

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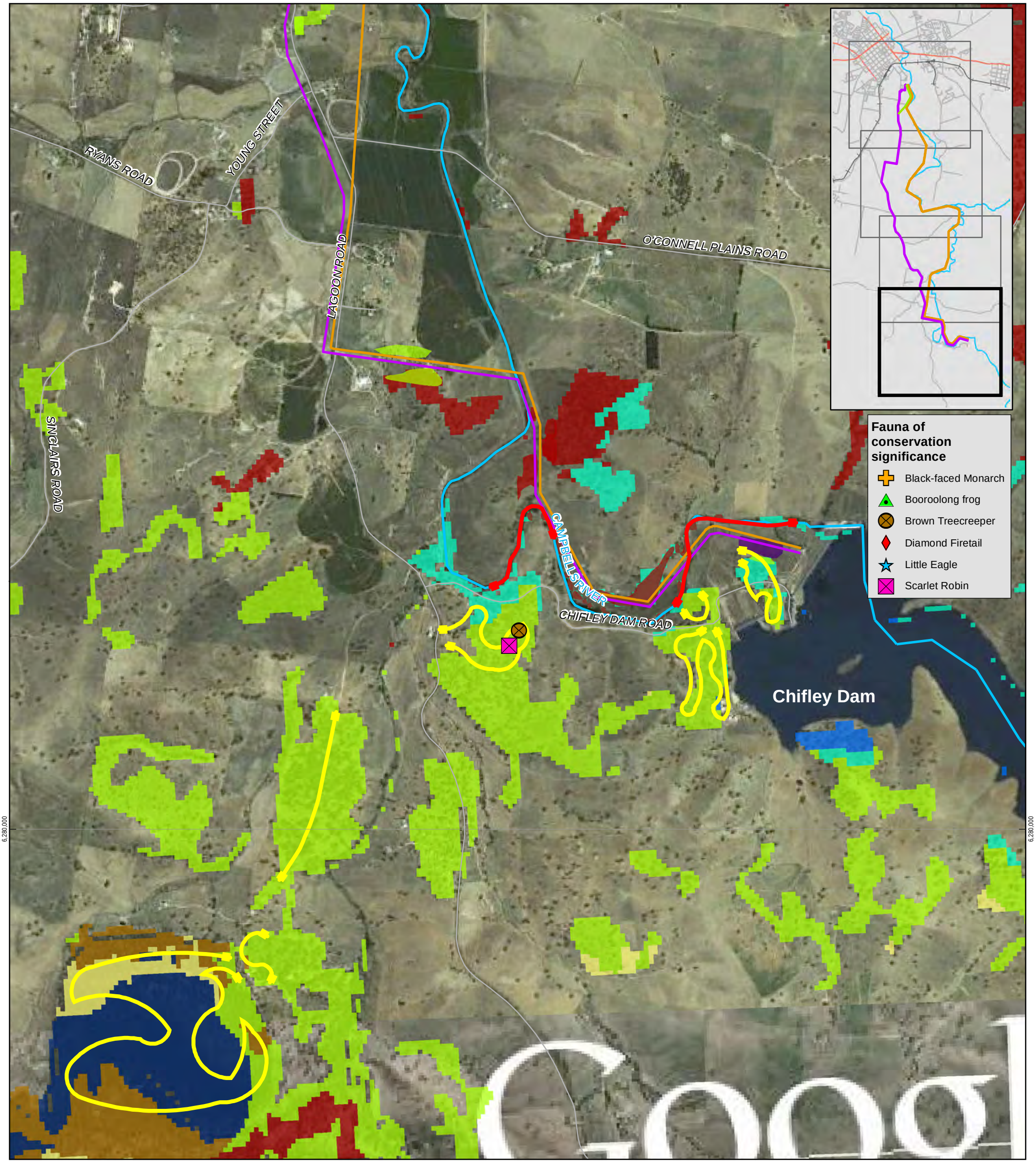

Legend

Route 1 - Alternate
Route 1
Route 2
Roads
Railway
Watercourse

Survey transects

Booroolong Frog
Koala

Broad Vegetation Type

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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GHD

Bathurst Regional Council
Chifley Dam Pipeline Routes
Terrestrial Flora and Fauna Study - Additional Surveys

Job Number 21-21844
Revision A
Date 31 Jan 2014

Threatened biota, vegetation and survey effort

Figure 1.d

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Data Source: NSW Department of Lands: Cadastre - Jan 2010, Topographic Data - March 2012; Route Alignment provided by Bathurst City Council; Aerial Impagery: Google Earth Pro 2014. Created by: NAHANSEN

3. Koala

3.1 Introduction

Most native vegetation in the study area was identified as potential Koala habitat by GHD (2013). No Koalas were observed during the previous field surveys. Further survey was recommended by GHD (2013) to determine whether the potential habitat constitutes Core Koala Habitat as defined under State Environmental Planning Policy 44 – Koala Habitat (SEPP 44).

3.2 Background

3.2.1 Distribution and population information

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to South Australia. The highest densities of the Koala in NSW occur on the North Coast and Central Coast (OEH 2013). Scattered records are present throughout the Central Tablelands, including populations in Bathurst. The distribution of Koalas in the Central Tablelands is poorly understood (DECC 2008).

3.2.2 Habitat requirements

Habitat requirements of the Koala are set out in the *Recovery plan for the Koala* (*Phascolarctos cinereus*) (DECC 2008). The most important factor influencing Koala occurrence is the suite of tree species available. In any one area, Koalas rely primarily on regionally specific primary and/or secondary food tree species. If primary food tree species are not present or occur in low density, Koalas will rely on secondary food tree species (DECC 2008).

Koala activity has been found to be greater in structurally diverse forest with the majority of trees 50–80 cm diameter at breast height (dbh). Vegetation on more fertile soils provides the most suitable habitat for Koalas due to the greater availability of nutrients within leaves. Topography may also indicate the suitability of habitat for Koalas, as steeper land tends to support lower quality soils. In some areas, Koalas were found to utilise gullies more often than ridges. Similarly, where rainfall is low, such as in western New South Wales, Koalas primarily occur in areas of higher soil moisture in the vicinity of waterways, which also tend to have a higher nutrient content (DECC 2008).

The carrying capacity of the habitat (i.e. number of animals per hectare) is lower in areas where secondary feed trees are dominant. Small, fragmented or highly disturbed habitats are also less likely to be able to support Koalas in the long term due to edge effects, limited resource availability and increased predation (DECC 2008). Koalas will utilise scattered trees in largely cleared environments, and have been recorded travelling over two kilometres across open land (White 1999). Vegetated links are important to support continued Koala movement; where dispersal and recruitment are impeded by barriers such as large areas of open ground and roads, populations would be expected to decline (DECC 2008).

3.2.3 Categories of Koala habitat

SEPP 44

State Environmental Planning Policy 44 (SEPP 44) aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus)* to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'. SEPP 44 is relevant to projects being assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Schedule 1 of SEPP 44 lists the local government areas to which SEPP 44 applies. The site is within the Greater Taree LGA which is listed under Schedule 1. SEPP 44 requires that before granting consent for development on land over 1 hectare in area, a consent authority must be satisfied as to whether or not the land is 'potential' and 'core' koala habitat:

- Potential Koala habitat is defined as 'an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component'.
- Core koala habitat is defined as 'an area of land with a resident breeding population of Koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population'.

Where core koala habitat is found to occur, SEPP 44 requires that a site-specific Koala Plan of Management (KPoM) be prepared, unless a LGA-based KPoM exists. Bathurst Regional Council has not prepared a comprehensive KPoM for the LGA, however site-specific plans have been prepared in accordance with the requirements of the SEPP.

Recovery plan

The recovery plan for the Koala (DECC 2008) includes two options for defining Koala habitat based on the combination of primary, secondary and supplementary feed trees present. It is noted in the recovery plan that other options may be available, and these two may not necessarily be appropriate in all circumstances. The two options are detailed in Table 2.

Table 2 Categories of Koala habitat defined in the Recovery Plan

Category	Phillips (2002b in DECC 2008)	Callaghan (unpublished in DECC 2008)
Primary	Areas of forest and/or woodland wherein primary food tree species comprise the dominant (i.e. ≥ 50%) overstorey tree species. **Capable of supporting high density Koala populations (≥ 0.75 koala/ha).**	Areas of forest or woodland where primary Koala food tree species comprise at least 50% of the overstorey trees. **Capable of supporting high-density Koala populations.**
Secondary habitat (Class A)	Primary food tree species present, usually (but not always) growing in association with one or more secondary food tree species. **Capable of supporting medium density Koala populations (≥ 0.10 koala/ha but < 0.75 koala/ha)**.	Areas of forest or woodland where primary Koala food tree species comprise less than 50% but at least 30% of the overstorey trees; or Areas of forest or woodland where primary Koala food tree species comprise less than 30% of the overstorey trees, but together with secondary food tree species comprise at least 50% of the overstorey trees; or Areas of forest or woodland where secondary food tree species alone comprise at least 50% of the overstorey trees (primary Koala food tree species absent). **Capable of supporting high to medium-density Koala populations.**
Secondary habitat (Class B)	Primary food tree species absent, habitat comprised of secondary and supplementary food tree species only. **Capable of supporting viable, low density populations (< 0.10 Koala/ha).**	Areas of forest or woodland where primary Koala food tree species comprise less than 30% of the overstorey trees; or Areas of forest or woodland where primary Koala food tree species together with secondary food tree species comprise at least 30% (but less than 50%) of the overstorey trees; or Areas of forest or woodland where secondary food tree species alone comprise at least 30% (but less than 50%) of the overstorey trees (primary Koala food tree species absent). **Capable of supporting medium to low-density Koala populations.**
Secondary habitat (Class C)	Not included.	Areas of forest or woodland where Koala habitat is comprised of secondary and supplementary food tree species (primary koala food tree species absent), where secondary food tree species comprise less than 30% of the overstorey trees. **Capable of supporting low-density Koala populations.**
Tertiary habitat	Not included.	Areas of forest or woodland where primary and secondary Koala food tree species are absent, but which have important supplementary Koala habitat values such as habitat buffers and habitat linking areas. Such areas are considered to be necessary components of habitat for the overall conservation of Koala populations. **Not capable of supporting Koala populations in the absence of primary or secondary habitat.**

EPBC Act referral guidelines

The Commonwealth Department of the Environment (DotE, formerly the Department of Sustainability, Environment, Water, Population and Communities, DSEWPaC) has issued two documents in recent years that deal with defining habitat critical to the survival of the Koala. These provide proponents with guidance on whether a proposal is likely to significantly impact the Koala. As both are draft documents, they are both considered here.

The DSEWPaC (2012) interim koala referral advice considered habitat critical to the survival of the Koala to be areas of forest or woodland where:

- primary koala food tree species comprise at least 30% of the overstorey trees,
- primary koala food tree species comprise less than 30% of the overstorey trees, but together with secondary food tree species comprise at least 50% of the overstorey trees,
- primary food tree species are absent but secondary food tree species alone comprise at least 50% of the overstorey trees
- the above qualities may be absent in a forest or woodland but other essential habitat features are present and adjacent to areas exhibiting the above qualities (e.g. koalas in the Pilliga are known to escape the heat of the day by taking refuge in white cypress pines, which are not food trees),
- a relatively high density of koalas is supported, regardless of the presence of food tree species, or
- any form of landscape corridor which is essential to the dispersal of koalas between forest or woodland habitats.

Draft referral guidelines for the Koala (DotE 2013b) have also been published in recent months. Habitat considered critical to the survival of Koalas is set out in the guidelines and includes a scoring system to determine whether habitat to be impacted is considered critical habitat. Categories include:

- Koala occurrence: Koalas recorded in the impact area within the last five years (score 2), within 5 km of the edge of the impact area within the last ten years (score 1), or none (score 0).
- Vegetation composition: forest or woodland with two or more known Koala feed tree species (score 2), forest or woodland with only one Koala feed tree species present (score 1); no Koala feed tree species present (score 0).
- Habitat connectivity: area is part of a contiguous landscape >1000 ha (score 2), area is part of a contiguous landscape between 500-1000 ha (score 1); none of the above (score 0).
- Key existing threats: little or no evidence of Koala mortality from vehicle strike or dog attacks (score 2); evidence of infrequent or irregular Koala mortality from vehicle strike or dog attacks (score 1); Evidence of frequent or regular Koala mortality from vehicle strike or dog attacks (score 0).
- Recovery value: Habitat is likely to be important for achieving the interim recovery objectives for the relevant context (score 2); uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context (score 1); habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context (score 0).

3.2.4 Koala feed trees in the Bathurst LGA

Koala feed trees are identified in SEPP 44 and the recovery plan (DECC 2008). The SEPP 44 list contains 10 species that are known to be used by Koalas within NSW. As noted above, Koalas rely on different trees in different regions. The recovery plan lists primary, secondary and supplementary trees that are used by Koalas in the 'Central and Western Slopes Management Region'. These trees are detailed in Table 3, with those that are also listed on SEPP 44 noted.

Table 3 Koala feed trees of the Central and Western Slopes Management Region

Category	Species	Common Name	SEPP 44
Primary feed tree	*Eucalyptus camaldulensis*	River Red Gum	Yes
	Eucalyptus viminalis	Ribbon Gum	Yes
Secondary feed tree	*Eucalyptus albens*	White Box	Yes
	Eucalyptus bicostata	Eurabbie	
	Eucalyptus blakelyi	Blakely's Red Gum	
	Eucalyptus bridgesiana	Apple-topped Box	
	Eucalyptus camphora	Broad-leaved Sally	
	Eucalyptus cinerea	Argyle Apple	
	Eucalyptus dalrympleana	Mountain Gum	
	Eucalyptus dealbata	Tumbledown Gum	
	Eucalyptus goniocalyx	Bundy	
	Eucalyptus maidenii	Maiden's Gum	
	Eucalyptus mannifera	Brittle Gum	
	Eucalyptus melliodora	Yellow box	
	Eucalyptus microcarpa	Western Grey Box	
	Eucalyptus nortonii	Large-flowered Bundy	
	Eucalyptus ovata	Swamp Gum	
	Eucalyptus pauciflora	Snow Gum	
	Eucalyptus polyanthemos	Red Box	
	Eucalyptus rubida	Candlebark	
Supplementary feed tree	*Eucalyptus macrorhyncha*	Red Stringybark	
	Eucalyptus muelleriana	Yellow Stringybark	

3.3 Methods

3.3.1 Desktop assessment

Previous records of the Koala held in the NSW Atlas of Wildlife and Council's threatened species database were reviewed in order to determine the species' distribution in the locality.

Aerial photographs and regional vegetation mapping (DEC 2006) were reviewed to identify larger areas of native vegetation for potential survey.

3.3.2 Field surveys

Koala surveys were undertaken over four days between 25 and 29 November 2013. Days were warm to hot with some wind. There was no rain during surveys. Limited rain had fallen over recent months, leaving the ground very dry. Dry conditions are conducive to locating Koala scats as the scats persist for longer periods of time.

The Koala field surveys were developed with reference to the recovery plan (DECC 2008) and the interim referral guidelines (DSEWPAC 2012). These have since been replaced by the draft referral guidelines (DotE 2013). Initially, representative spot assessments were undertaken in

woodland patches during the GHD 2012 surveys along the pipeline routes. Current surveys entailed strip transects in larger habitat patches near Bidgeribbin Road, Lagoon Road (near Bidgeribbin Road), and Chifley Dam Road (Figure 1). Spot assessments were undertaken in conjunction with each transect. ,Survey methods are described below:

- Strip transects were surveyed according to the methodology described in Dique et al (2003). This technique involved a two-person survey team searching within 15 metres of a transect line, which was randomly located within the study site. Transect direction and shape depended on the size and orientation of the habitat patch. Both team members acted as Koala observers. Feed trees located on or near the transect line were searched by sight in order to detect any Koalas. If Koalas were observed, the following would be recorded: age class, reproductive status (presence of young), health status, tree species, and GPS location.
- Additional spot assessments according to the methodology of Philips and Callaghan (as described in DECC 2008) were undertaken in conjunction with the strip transects. This included searches for scats under at least 30 Koala feed trees to determine Koala activity levels (number of trees with scats divided by total number of trees searched).

3.4 Results

3.4.1 Koala observations in the study area

The majority of Koala records in the Bathurst LGA are centred on the Rockley Mount area, between Rockley Road and Trunkley Road, south-west of Chifley Dam. Scattered records are located throughout the remainder of the LGA, although there are large areas with no records present (OEH 2014).

No Koalas were observed and no Koala scats identified during the 2012 or 2013 surveys undertaken by GHD. Large scratches were observed on some tree trunks, some of which may be attributable to Koalas. Common Brush-tailed Possums (*Trichosurus vulpecula*) were recorded in the study area, and many scratches are likely to be from this species.

Local residents near Bidgeribbin Road, The Lagoon and Chifley Dam mentioned seeing Koalas in the area on occasion. One resident near Chifley Dam noted that they had observed Koalas five times in ten years near the Chifley Dam cabins. Koalas are likely to forage in the larger woodland patches in the study area, and may use the study area for dispersal.

3.4.2 Vegetation mapping

Regional vegetation mapping (DEC 2006) was provided by Council for the TFFS. Based on the fine-scale vegetation mapping and flora sampling performed by GHD in 2012, five native vegetation types identified in the regional mapping were identified during field surveys. Additional vegetation types are present in the wider study are for the recent surveys. Vegetation types mapped within the study areas are summarised in Table 4.

Table 4 Vegetation types in the study area

Vegetation Type	Map Unit	Recorded in the TFFS study area (GHD 2012)	Recorded in the wider study area (GHD 2013)
Mountain Gum – Red Stringybark open forest at high altitudes	BVT 4		Yes
Inland Scribbly Gum Woodland	BVT 6		Yes
Blakeley's Red Gum – Rough-barked Apple woodland on flats and alluvial terraces	BVT 17	Yes	Yes

Vegetation Type	Map Unit	Recorded in the TFFS study area (GHD 2012)	Recorded in the wider study area (GHD 2013)
River Oak riparian forest	BVT 29	Yes	Yes
Stringybark – Box – Gum Woodland	BVT 41		Yes
Apple Box – Yellow Box – Mountain Gum open woodland on flats and low hills of the tablelands	BVT 44	Yes	Yes
Blakeley's Red Gum – Yellow Box open woodland of the tablelands	BVT 46	Yes	Yes
Wetlands	BVT 1005	Yes	

Native vegetation in the study area occurs as isolated remnant or regrowth patches, surrounded by existing disturbance, including cleared grazing land, cropland, water storages, roads and other infrastructure. The largest remnant vegetation patches in the TFFS study area are on the slopes above Chifley Dam (See Figure 1d) and near the intersection of Bidgeribbin Road and Lagoon Road (see Figure 1c). The largest patches of vegetation in the wider study area occur in the vicinity of Rockley Mount, to the west of Chifley Dam and south-west of The Lagoon (see Figure 1d). All other native vegetation in the study area occurs as patches less than ten hectares in size. These patches are moderately to severely degraded by weed infestation, grazing and edge effects. Limited leaf litter and fallen timber is present in most of these small patches. Occasional paddock trees provide linkages across mostly cleared agricultural land.

3.4.3 Koala habitat in the study area

The majority of vegetation in the study area is dominated by secondary Koala food tree species (*Eucalyptus blakelyi, E. bridgesiana* and *E. melliodora)* with a very sparse shrub layer (<5% foliage projective cover) and a grassy understorey. The primary food tree *Eucalyptus viminalis* occurs in the southern part of the study area near Chifley Dam. The supplementary feed tree *Eucalyptus macrorhyncha* occurs on the hills near Rockley Mount. No feed trees listed under SEPP 44 are present in the study area.

Assessment of Koala habitat according to the recovery plan

The native vegetation types mapped in the study area were assessed against the Koala habitat categories defined in the recovery plan (DECC 2008), as detailed in section 3.2.3.

Table 5 Koala feed trees and habitat value in the study area

Map unit	Dominant tree species in the study area	Koala Habitat Category (DECC 2008)
BVT 4	*Eucalyptus dalrympleana* (secondary feed tree) *Eucalyptus macrorhyncha* (supplementary species) *Eucalyptus mannifera* (secondary feed tree) *Eucalyptus rossii*	Varies between Secondary habitat Class B and C depending on the dominance of Inland Scribbly Gum (*Eucalyptus rossii*), which is not a Koala feed tree. In some locations near Davys Creek, this species consisted of more than 80% of the canopy species. In other locations, the supplementary species Red Stringybark (*Eucalyptus macrorhyncha*) was the dominant species.
BVT 6	*Eucalyptus rossii* *Eucalyptus macrorhyncha* (supplementary species)	Tertiary habitat

Map unit	Dominant tree species in the study area	Koala Habitat Category (DECC 2008)
BVT 17	*Eucalyptus blakelyi* (secondary feed tree) *Eucalyptus. albens* (secondary feed tree)	Secondary habitat (Class A)
BVT 29	*Casuarina cunninghamii*, with occasional *Eucalyptus viminalis*	Tertiary habitat
BVT 41	*Eucalyptus polyanthemos* (secondary feed tree) *Eucalyptus goniocalyx* (secondary feed tree) *Eucalyptus macrorhyncha* (supplementary species) *Eucalyptus rossii* *Eucalyptus mannifera* (secondary feed tree) *Occasional Eucalyptus melliodora* (secondary feed tree)	Secondary habitat (Class A)
BVT 44	*E. bridgesiana* (secondary feed tree) *E. melliodora* (secondary feed tree) *E. viminalis* (primary feed tree) dominant near Chifley Dam	Secondary habitat (Class A) except in south near Chifley Dam where *E. viminalis* is dominant (Primary Koala habitat)
BVT 46	*E. blakelyi* (secondary feed tree) *E. melliodora* (secondary feed tree) *E. bridgesiana* (secondary feed tree)	Secondary habitat (Class A)
BVT 1005	No canopy trees present	Not Koala habitat

As shown above, the majority of native vegetation in the study area is Secondary Habitat Class A (areas of forest or woodland where secondary food tree species alone comprise at least 50% of the overstorey trees). Patches of Secondary habitat Class B occur in the south-west, near Rockley Mount, along with some patches of Tertiary habitat. Isolated patches of riparian vegetation along Campbells River and the Macquarie River also comprise tertiary habitat. Scattered paddock trees would provide linkages between larger patches of Secondary habitat. Very limited areas of primary Koala habitat are present. According to the definitions detailed in Table 2, Secondary Habitat Class A can support a medium to high density of Koalas. Based on results of these surveys and vegetation mapping by DEC (2006), highest densities of Koalas in the locality occur where large areas of relatively intact vegetation is present. Scattered and degraded patches would support a low density of Koalas.

Patches of Koala habitat in the Chifley Dam pipeline routes study area are moderately to severely degraded. Ground cover in many patches is highly disturbed and has only a low diversity of native flora species. There are high levels of invasion of environmental weeds (mainly pasture species) in all patches. Most patches show signs of stress, including presence of mistletoe, borers, dieback and senescence of trees (GHD 2013). These are unlikely to support high or medium densities of Koalas. Given the lack of evidence of Koalas during field surveys, and anecdotal evidence of only occasional sightings, Koalas are likely to occur in very low densities in these areas.

Assessment of Koala habitat according to SEPP 44

No trees listed on schedule 2 of SEPP 44 are present in the study area. Native vegetation in the study area therefore does not meet the criteria for 'Potential Koala habitat' under SEPP 44. As noted above, native vegetation study area is mainly Secondary habitat (Class A) according to the definitions in the recovery plan (DECC 2008).

No evidence of Koalas was observed during surveys. Based on anecdotal evidence of only occasional sightings, Koalas are likely to occur in very low densities in the study areas. The study area does not therefore constitute core Koala habitat. Core Koala habitat is likely to be restricted to the larger patches of intact vegetation in the area of Rockley Mount, further to the

west of the study area. Koalas that occur in the study area are likely to be dispersing from the main population centred around Rockley Mount.

Assessment of Koala habitat according to the draft guidelines for defining habitat critical to the Koala

Habitat in the study area was assessed using both definitions of critical Koala habitat recently published by DotE, as a final version has not yet been finalised. According to the DSEWPaC (2012) interim koala referral advice, habitat in the study area is considered habitat critical to the survival of the Koala as secondary feed tree species comprise at least 50% of the overstorey species. The habitat in the study area also meets the criteria set out in the draft referral guidelines (DotE 2013b) as it would score between 5 and 8 based on the following scores (refer to section 3.2.3):

- Koala occurrence: 1-2
- Vegetation composition: 2
- Habitat connectivity: 0
- Key existing threats: 1-2
- Recovery value: 1-2.

Scores may change depending on further surveys or information that becomes available in the future.

3.4.4 Implications for the Chifley Dam pipeline project

Native vegetation in the study area for the Chifley Dam pipeline routes TFFS is not considered Core Koala Habitat according to the definition in SEPP 44. No Koalas were recorded during surveys, and based on anecdotal records from residents, Koalas occur only occasionally. Vegetation in the study area is mainly Secondary habitat Class A, due to the lack of primary feed trees. Secondary habitat Class A in the study area occurs as scattered patches connected by isolated paddock trees. Koalas are likely to disperse through the area, and forage in the area on occasion, but the study area is unlikely to support breeding individuals due to the lack of primary feed trees and the scattered and degraded nature of the vegetation in much of the study area. Core Koala habitat is instead likely to be centred around Rockley Mount, where less clearing of vegetation has taken place. The majority of historical records of Koalas are from this area.

Koala habitat in the study area meets the criteria for ‘habitat critical to the survival of the Koala’ according to the interim referral guidelines (DSEWPAC 2010) and the draft referral guidelines for the species (DotE 2013b). Any removal of critical Koala habitat is likely to require referral of a proposal to the Commonwealth Minister for the Environment. Note that the definition of habitat critical to the survival of the Koala may change once the referral guidelines are finalised.

The main recommendation therefore for the Chifley Dam pipeline project would be to minimise clearing of Koala habitat wherever possible. If Koala habitat is to be cleared, fauna management measures would need to be included in the Construction Environment Management Plan to avoid disturbance or injury of any Koalas that may be present in the impact area during construction. The significance of the impact would depending on the amount of vegetation that removed, If a significant impact is likely, the proposal would need to be offset in accordance with the Commonwealth guidelines.

3.4.5 Recommendations

As discussed above, many patches of Koala habitat in the study area are moderately to severely degraded and show high levels of stress. Without significant bush regeneration effort, it is likely that some patches will have significant dieback over the next three decades or so (GHD 2013). Council may like to therefore consider bush regeneration programs in the area to ensure dispersal habitat for the Koala is not significantly reduced in area in the future as a result of dieback. Koalas are known to retreat to habitat in riparian areas during drought (Seabrook et al 2011). Focussing revegetation efforts in riparian areas where there are Koala feed trees is also therefore likely to be beneficial to the local population.

4. Other threatened and migratory species recorded

Opportunistic observations of other threatened and migratory fauna were made in the study area during the supplementary surveys for the Booroolong Frog and the Koala. Four threatened bird species and one migratory bird species were recorded. Two of the threatened bird species had previously been recorded in the study area by GHD (GHD 2013). The two additional threatened bird species were considered likely to occur, however the migratory species was not (GHD 2013). These records are discussed below and shown on Figure 1. Locations are provided in Appendix A.

4.1 Species recorded

4.1.1 Little Eagle

The Little Eagle is listed as a vulnerable species under the TSC Act. Two sightings of the Little Eagle were made during the supplementary surveys. One individual was observed flying over a woodland patch in the study area in the vicinity of Campbell's River. An individual was also observed roosting in a woodland patch, adjacent to agricultural land to the south of Glazebrooks Road in the southern portion of the study area. This species was recorded in the GHD (2013) survey, near the locality of The Lagoon. The proposal would remove limited potential foraging and breeding habitat resources for a local population of the Little Eagle.

4.1.2 Diamond Firetail

The Diamond Firetail is listed as a vulnerable species under the TSC Act. This species was observed foraging within a woodland patch, adjacent to farmland, on the corner of Lagoon Road and Bidgeribbin Road. The Diamond Firetail was previously recorded near Chifley Dam and Bidgeribbin Road (GHD 2013). The species is likely to forage and breed in woodland patches in the study area. The proposal would remove limited potential foraging and breeding habitat resources for a local population of the Diamond Firetail.

4.1.3 Scarlet Robin

The Scarlet Robin is listed as a vulnerable species under the TSC Act. An individual male was observed perched on a stag in a small patch of woodland adjacent to farmland to the south of Chifley Dam Road. This species was not recorded during the previous survey but was considered likely to occur in the study area given other recent records in the locality (GHD 2013). The proposal would remove limited potential foraging and breeding habitat resources for a local population of the Scarlet Robin.

4.1.4 Brown Treecreeper

The Brown Treecreeper is listed as a vulnerable species under the TSC Act. A number of Brown Treecreepers were observed foraging in a woodland patch amongst other native birds, south of Chifley Dam Road. This species was not recorded during the previous survey but was considered likely to occur in the study area given other recent records in the locality (GHD 2013). The proposal would remove limited potential foraging and breeding habitat resources for a local population of the Scarlet Robin.

4.1.5 Black-faced Monarch

The Black-faced Monarch is listed as a migratory species under the EPBC Act. This species was observed foraging within a woodland patch, adjacent to farmland, on the corner of Lagoon Road and Bidgeribbon Road. According to OEH Wildlife Atlas, there are no historical records in the locality for this species which is typically recorded in coastal rainforests where breeding takes place. In New South Wales the species occurs around the eastern slopes and tablelands of the Great Divide. It occurs in 'marginal' habitats, including dry eucalypt woodland, during winter or during passage (migration). The movements are poorly known. The Black-faced Monarch spends spring, summer and autumn in eastern Australia, and winters in southern and eastern Papua New Guinea from March to August (DotE 2013). This species is likely to only be an occasional non-breeding visitor to the study area.

4.2 Implications for the Chifley Dam pipeline routes project

As noted in GHD (2013), the impacts of the proposal on the threatened bird species will depend on the final route, and amount of native vegetation that would be removed. All species recorded were either recorded previously or considered likely to occur. Based on the consideration of the factors presented in the 7 part tests and habitat assessment provided in GHD (2013), the proposal is unlikely to have a significant adverse effect on local populations of these threatened species given that only a small area of habitat would be removed, and the birds would continue to be able to forage and breed through the study area and surrounds.

The Black-faced Monarch has not been recorded in the LGA previously. It was not predicted to occur in the area in GHD (2013) due to the lack of records, non-coastal location and lack of preferred habitat. The loss of marginal, non-breeding habitat as a result of the proposal would not have a significant adverse impact on this species.

5. Summary

Additional targeted surveys for the threatened Booroolong Frog and Koala in the area between Chifley Dam and the Bathurst Water Filtration Plant were undertaken to provide more information on these species in respect to the proposed pipeline. Surveys were conducted between 25-29 November 2013.

Twenty-nine individual Booroolong Frogs were recorded at six locations along the Macquarie River in the study area. All individuals observed were located on or near cobble banks or large boulders within the river banks. Most areas were subject to disturbance, including a combination of weed infestation, livestock access and sedimentation of cobbled areas. No Booroolong Frogs were recorded at survey locations along Campbells River below Chifley Dam, despite the presence of cobbled habitat, albeit disturbed by weeds, livestock and sediment infill. Further survey would be required to determine whether these species are present in this area.

Populations of the Booroolong Frog identified along the Macquarie River are unlikely to be impacted by the proposed pipeline given that there would be no crossing of the river by the pipeline, and the distance between the pipeline and Booroolong Frog habitats. The implementation of appropriate mitigation to minimise potential for soil disturbance, erosion and sedimentation and spread of weeds would further minimise the risk of impacts on the species.

Koala habitat was assessed throughout the study area. The majority of native vegetation in the study area is Koala habitat with Secondary Habitat Class A being the dominant category. Patches of Secondary habitat Class B occur in the south-west, near Rockley Mount, along with some patches of Tertiary habitat. Isolated patches of riparian vegetation along Campbells River and the Macquarie River also comprise tertiary habitat. No Primary Koala habitat was identified in the study area. Scattered paddock trees would provide linkages between larger patches of Secondary habitat. The majority of native vegetation in the study area is patchy and degraded by historical clearing and grazing. This vegetation is likely to support only low densities of Koalas. Given the lack of evidence of resident breeding Koalas in the study area, the habitat is not considered Core Koala Habitat according to SEPP 44. Habitat in the study area is considered habitat critical to the survival of the Koala according to the Commonwealth guidelines.

The main recommendation for the Chifley Dam pipeline project in respect to Koala habitat would be to minimise clearing of Koala habitat wherever possible. Any removal of critical Koala habitat is likely to require referral of a proposal to the Commonwealth Minister for the Environment. The significance of the impact would depending on the amount of vegetation that removed, If a significant impact is likely, the proposal would need to be offset in accordance with the Commonwealth guidelines. Fauna management measures would need to be included in the Construction Environment Management Plan to avoid disturbance or injury of any Koalas that may be present in the impact area during construction.

Four additional threatened bird species were recorded during surveys. These included the Little Eagle, Diamond Firetail, Scarlet Robin and Brown Treecreeper. All species are listed as vulnerable species under the TSC Act. These species have been recorded in the study area and surrounds previously. The Black-faced Monarch, listed as a migratory species under the EPBC Act, was also recorded. This species has not been recorded in the LGA previously, but is recorded occasionally on the western slopes. Habitat in the study area is not its preferred habitat, and the species would be a non-breeding migrant only. Given the limited area of native vegetation that would likely be cleared for the pipeline proposal, the proposal is unlikely to have a significant impact on any of these threatened or migratory species.

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Appendices

Appendix A – Locations of threatened and migratory species recorded during surveys

Scientific Name	Common Name	Quantity	Easting	Northing
Litoria booroolongensis	Booroolong Frog	2	184471	6288648
Litoria booroolongensis	Booroolong Frog	1	184491	6288616
Litoria booroolongensis	Booroolong Frog	1	184567	6288564
Litoria booroolongensis	Booroolong Frog	2	184623	6288564
Litoria booroolongensis	Booroolong Frog	1	185030	6288629
Litoria booroolongensis	Booroolong Frog	2	183721	6289818
Litoria booroolongensis	Booroolong Frog	1	186183	6288951
Litoria booroolongensis	Booroolong Frog	5	184905	6292444
Litoria booroolongensis	Booroolong Frog	2	185171	6291427
Litoria booroolongensis	Booroolong Frog	2	185190	6291433
Litoria booroolongensis	Booroolong Frog	2	184498	6288677
Litoria booroolongensis	Booroolong Frog	1	184500	6288628
Litoria booroolongensis	Booroolong Frog	1	184557	6288568
Litoria booroolongensis	Booroolong Frog	1	184623	6288557
Litoria booroolongensis	Booroolong Frog	1	184642	6288553
Litoria booroolongensis	Booroolong Frog	1	185049	6288607
Litoria booroolongensis	Booroolong Frog	1	186171	6288941
Litoria booroolongensis	Booroolong Frog	1	186146	6288958
Litoria booroolongensis	Booroolong Frog	1	185091	6292175
Climacteris picumnus	Brown Treecreeper	1	185983	6281098
Stagonopleura guttata	Diamond Firetail	2	183787	6287083
Hieraaetus morphnoides	Little Eagle	1	185940	6286127
Hieraaetus morphnoides	Little Eagle	1	184991	6284712
Petroica boodang	Scarlet Robin	1	185930	6281014
Monarcha melanopsis	Black-faced Monarch	1	183788	6287049

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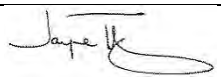
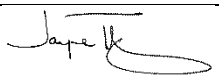
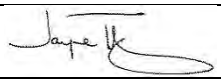
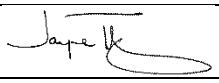
0	K. Crosby N. Hansen	J. Tipping		J. Tipping		31/01/2014
1	K. Crosby	J. Tipping		J. Tipping		04/04/2014

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