



Australian Rail Track Corporation

Maitland to Minimbah Third Track Project

Submissions Report including Preferred Project Report

September 2010

H8R-REP-S2G-ENV-0019-0



Appendix C Terrestrial Fauna Study





Appendix C

Terrestrial Fauna Study

SUPPLEMENTARY TERRESTRIAL FAUNA IMPACT ASSESSMENT

FOR THE PROPOSED THIRD RAILWAY TRACK BETWEEN MAITLAND AND MINIMBAH



SUPPLEMENTARY REPORT

Prepared for
HUNTER 8 ALLIANCE



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EEC PROJECT No. 0759GHD

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EXECUTIVE SUMMARY

This supplementary Fauna Impact Assessment report has been undertaken by Ecotone Ecological Consultants Pty Ltd for the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) for the Maitland to Minimbah third track project (referred to as 'the Project'). This report has been prepared as a supplementary report addressing additional investigation areas and should be read in conjunction with the final Terrestrial Fauna Impact Assessment report prepared by Ecotone Ecological Consultants dated December 2009.

The additional areas are the result of proposed project modifications and are detailed in chapter 5 of the Submissions Report. The modifications result in revisions to the construction impact zone that are described in Section 7.8 and shown in Figure 7.1 of the Environmental Assessment.

Eight threatened species in the schedules of the TSC Act (squirrel glider, grey-crowned babbler, eastern freetail-bat, eastern bent-wing bat, grey-headed flying fox, varied sittella, large-footed myotis and speckled warbler) and one species listed in the schedules of the EPBC Act (grey-headed flying fox), were identified in the additional investigation areas during supplementary field surveys.

Potential habitat for a further threatened species, (freckled duck) listed on the TSC Act was identified within the investigation area. Many of the above nine species have previously been assessed in the final Terrestrial Fauna Impact Assessment report dated December 2009. As 8 of the above species were recorded during field surveys in the additional investigation areas they have been re-assessed under the EP&A Act and the EPBC Act. While the grey-headed flying fox was previously assessed in the final Terrestrial Fauna Impact Assessment report dated December 2009, this was prior to the introduction of the Draft National Grey-headed Flying Fox Recovery Plan (DECCW 2009). In this supplementary report consideration was given to the assessment of foraging habitat critical to the survival of the grey-headed flying fox and consistency with the actions of the recovery plan.

Fauna Assessments under Part 3A of the EP&A Act and fauna assessments under the EPBC Act found that the proposed Project modifications would result in the removal of foraging habitat for many of the threatened woodland species identified. Foraging habitat critical to the survival of the grey-headed flying fox would also be removed. However given the lineal and patchy nature of the vegetation clearing and the formation of mitigation measures such as the Compensatory Habitat Strategy, the project would be unlikely to significantly impact on any threatened and/or migratory fauna species listed on the TSC Act and/or the EPBC Act. These results are consistent with the final Terrestrial Fauna Impact Assessment report dated December 2009.

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GLOSSARY OF TERMS

Chainage	The chainage at a location along a rail line is the distance of that point in relation to Sydney (NSW only) based on 0.000 kilometres being located at the end of Central No. 1 Platform.
Culvert	A totally enclosed drain under a road or railway.
Cumulative impact	The sum on the environment resulting from the successive effects of several different impacts.
Cut	An excavation for constructing below the natural ground level.
Cut batters	The side slopes of cuttings.
Director-General's Requirements	Requirements for an environmental assessment issued by the Director-General of the NSW Department of Planning in accordance with the Environment Planning and Assessment Act 1979.
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle.
Fauna	The animals of a given region or period, taken collectively.
Flora	Plants of a particular region that make up the vegetation of a site.
Fill	Earth used to construct an embankment.
Groundwater	Subsurface water stored in pores of soil or rocks.
Hunter 8 Alliance	Hunter 8 Alliance, which has been formed to deliver a new third track and ancillary infrastructure between Maitland and Minimbah.
Key threatening process	A process specified in Schedule 3 of the NSW Threatened Species Conservation Act 1995 that adversely affects threatened species, populations or ecological communities, or could cause those that are not threatened to become so.
Level crossing	A crossing provided at grade across the railway corridor.
Mitigation	Reduction in severity.
Option	A concept design alternative developed for consideration.
Overbridge	Where a road or pedestrian footway is situated over the railway line.
Proponent	Australian Rail Track Corporation (ARTC).
Rail corridor	The area of land dedicated to the ARTC between Maitland and Minimbah.
Scats	Animal droppings.
Site compound	Area enclosing construction machinery, stockpiles and site offices usually adjacent to construction sites.
Spoil	Excess of rock and/or earth material resulting from construction activities.
Study area	The Study Area for this project is defined as the <i>investigation area</i> shown in Figure 2 .
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 of the NSW Threatened Species Conservation Act 1995.
Underbridge	Where a road or pedestrian underpass is situated under the railway line.

1.0 INTRODUCTION

This supplementary terrestrial fauna impact assessment report has been undertaken by Ecotone Ecological Consultants Pty Ltd as part of the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) for the Maitland to Minimbah third track project (referred to as ‘the Project’). This report has been prepared to supplement the Terrestrial Fauna Impact Assessment prepared by Ecotone Ecological Consultants dated December 2009.

This report has been prepared to assess how proposed modifications to the design, construction and operation of the Project may amend or increase the potential ecological impacts identified in the Environmental Assessment, and develop any additional mitigation measures required to address such amended or increased potential impacts.

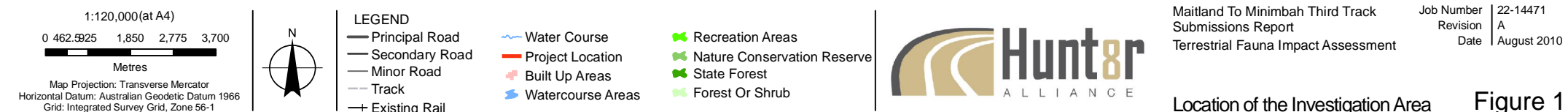
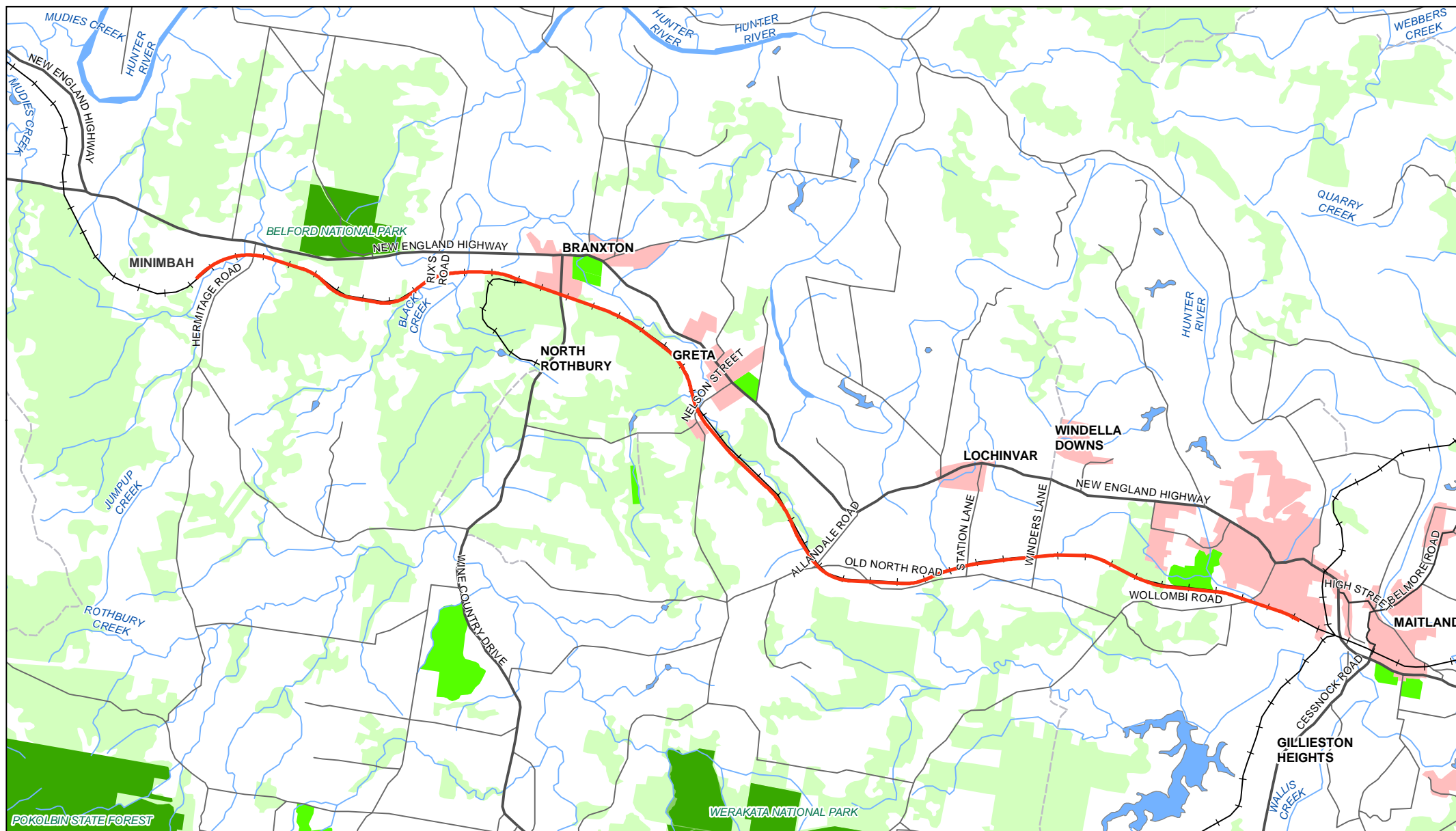
1.1 Investigation Area

The investigation area for this assessment is a linear corridor which follows the route of the Main Northern Railway and is shown in **Figure 1**. The investigation area captures the footprint of disturbance for the third track and other associated works, including construction compounds, haul roads and spoil disposal areas.

1.2 Report Objectives

The general objectives of this assessment are to:

- Provide a supplementary literature search of all possible threatened or migratory species that are known to occur or likely to occur on the investigation area.
- Undertake supplementary or additional field surveys to:
 - Survey representative habitat types.
 - Record the fauna species present within the dominant vegetation communities present.
 - Survey for threatened and migratory species that may be present (following the literature review).
- Identify the potential impacts of construction and operation of the Project for any threatened species or populations that occur or could be likely to occur in the investigation area.
- Assess the potential impacts of construction and operation of the Project on the fauna of the investigation area by application of the provisions of the relevant NSW and Commonwealth legislation.
- Assess whether or not the Project meets the ‘improve or maintain’ principle of the Part 3A assessment.
- Provide discussion on measures to manage potential impacts and effects of the proposal, using the principles of “avoid, minimise and mitigate” in that order of preference.



1.3 Report Structure and Terminology

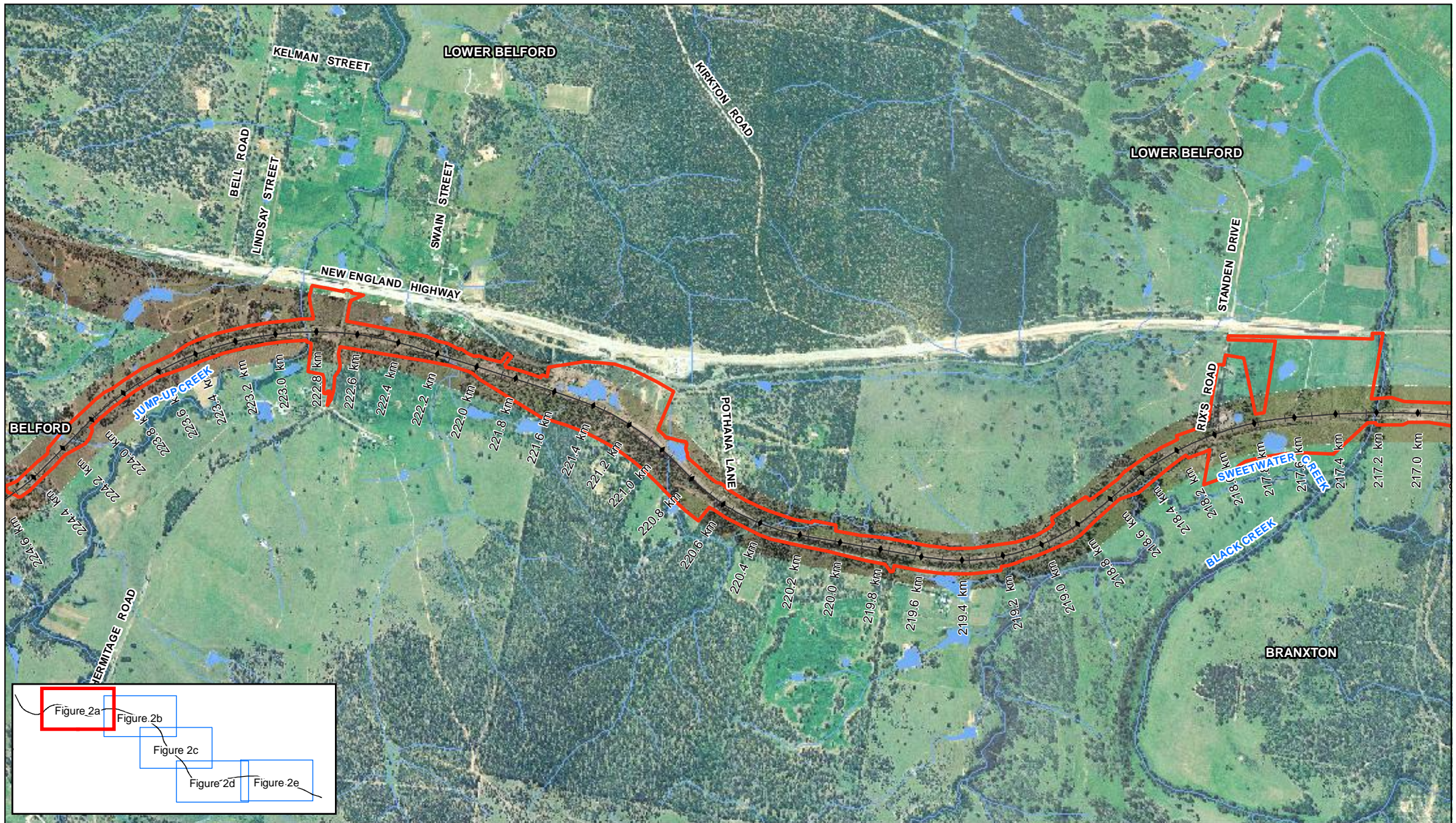
The environmental studies have been conducted in three stages:

1. A desktop review of available literature pertaining to the investigation area and surrounding locality.
2. A field survey of the investigation area.
3. Assessment of impact on fauna in accordance with the relevant NSW and Commonwealth legislation.

Within this report, reference is given to the relevant sections of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); NSW *Threatened Species Conservation Act 1995* (TSC Act); *National Parks and Wildlife Act 1974* (NP&W Act); *Environmental Planning and Assessment Act 1979* (EP&A Act); and subsequent amendments to these. Specific consideration is given to Part 3A of the EP&A Act.

For this report:

- The *study locality* is the area of land within ten kilometres (either side) of the 30 kilometre section of the proposed railway line (**Figure 1**).
- The *study area* consists of the investigation area plus the immediately surrounding land and watercourses that could potentially be affected, directly or indirectly by the Project.
- The *investigation area* is defined as the investigation area shown on **Figure 2**.



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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

LEGEND

— Existing Railway

— Watercourse

 Revised Investigation Area

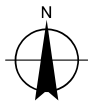
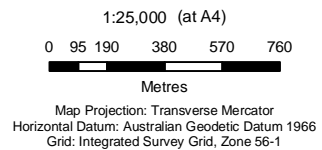
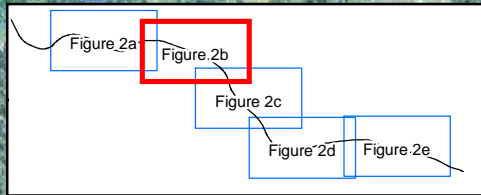
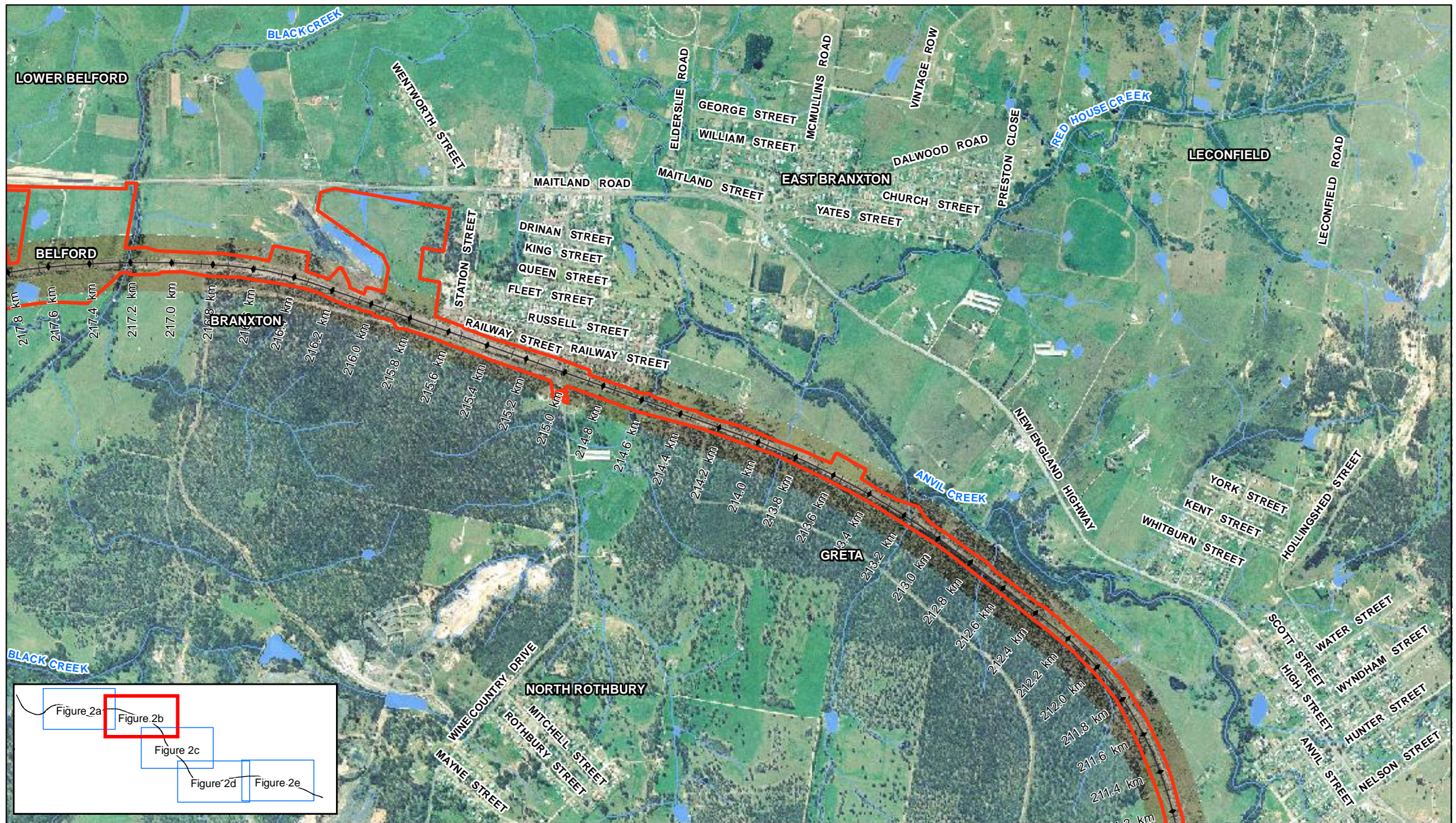
 Watercourse Area

Maitland to Minimbah Third Track
Submissions Report
Terrestrial Fauna Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 2a



LEGEND

- Existing Railway
- Watercourse
- Revised Investigation Area
- Watercourse Area



Maitland to Minimbah Third Track
Submissions Report
Terrestrial Fauna Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 2b

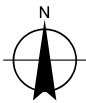


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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1



LEGEND

- Existing Railway
- Watercourse
- Revised Investigation Area
- Watercourse Area



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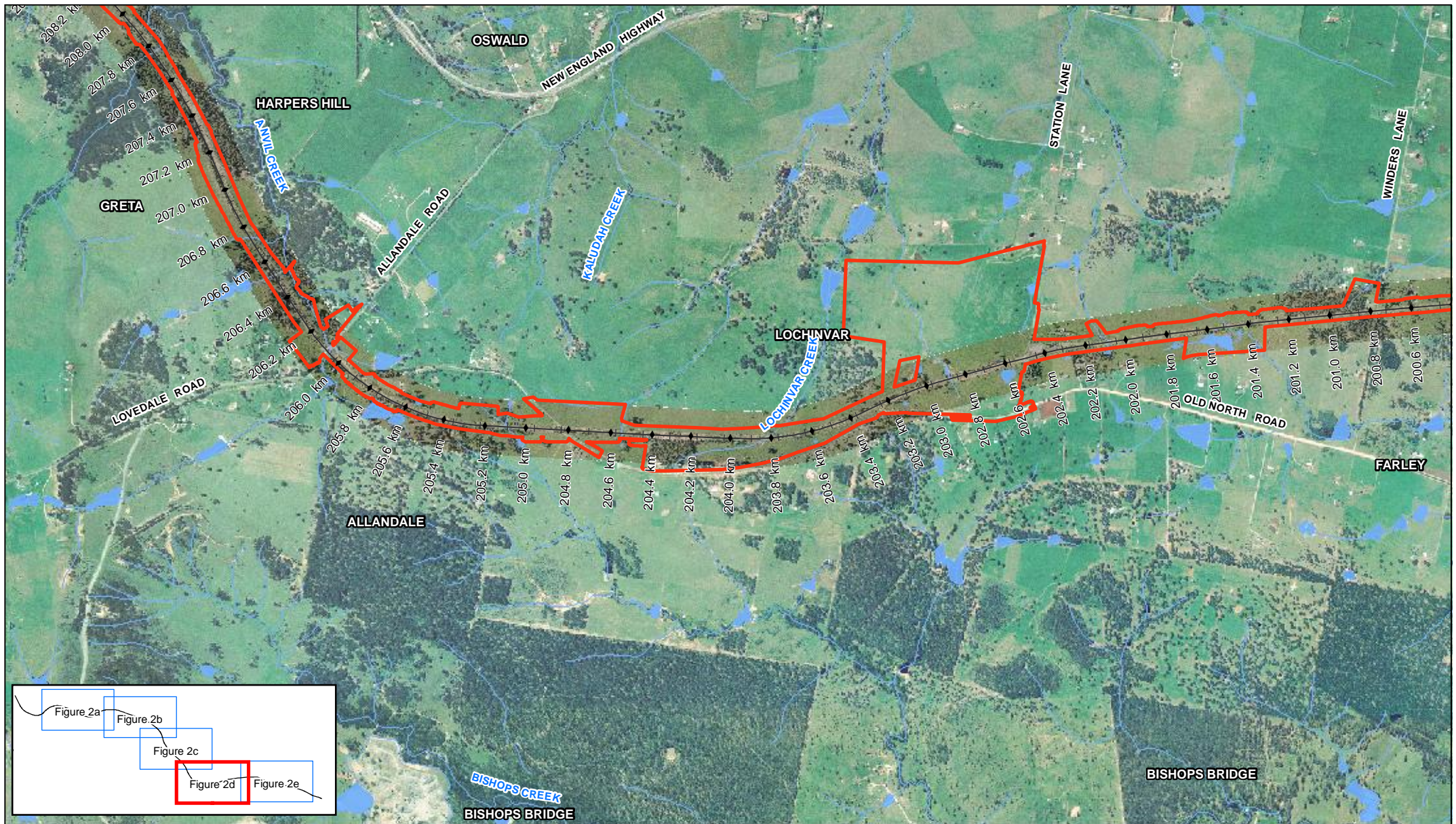
Revised Project Plan

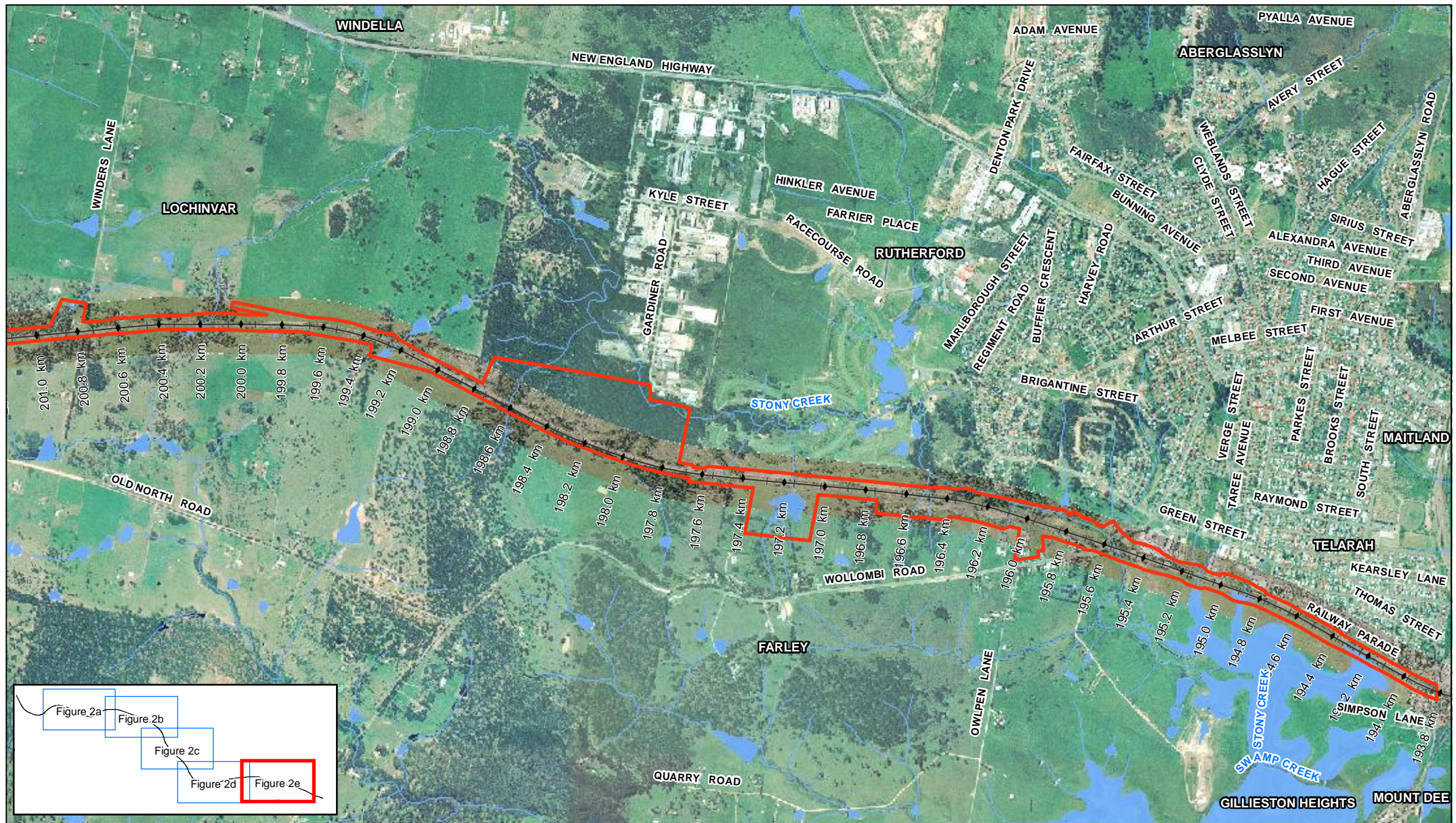
Figure 2c

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Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton



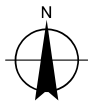


1:25,000 (at A4)

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1



LEGEND

- Existing Railway
- Watercourse
- Revised Investigation Area
- Watercourse Area



Maitland to Minimbah Third Track
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Terrestrial Fauna Impact Assessment

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Revision A
Date August 2010

Revised Project Plan

Figure 2e

2.0 EXISTING ENVIRONMENT

2.1 General Description of the Study Area

A broad description of the prominent natural and developed features of the study area and study locality is provided in **Table 1**.

Table 1. Description of the Investigation area, Study Area and Locality

Client	THE HUNTER 8 ALLIANCE on behalf of ARTC.
Location	The proposed third track would commence in Farley, approximately two kilometres west of Maitland, at approximate chainage 194.500 kilometres and would run adjacent to the Main Northern Railway for approximately 30 kilometres concluding at Minimbah at approximate chainage 224.220 kilometres. 9132 Cessnock and 9232 Newcastle 1:100 000 map sheets
LGA	Maitland, Cessnock and Singleton
Bioregion	Sydney Basin
Botanical Subregion	North Coast
Local Catchment Management Authority	Hunter-Central Rivers
Elevation	Fifteen metres ASL in the east to 110 metres ASL near Allandale, to 65 metres ASL at the western end of the investigation area.
Investigation Area Description	The investigation area is approximately 30 kilometres long and between 50 and 200 metres wide along most parts. The study area is a mix of cleared areas, areas of scattered tree cover, areas of remnant woodland vegetation, residences and local townships.
Current Land Use	The investigation area comprises several land use types. The majority of the study area is agricultural grazing land, either cleared or containing areas of remnant woodland and/or riparian vegetation. Several rural residences occur within the study area, as do parts of the townships of Branxton, Greta, Farley and Maitland.
Watercourses, Drainage and Catchment	The following creek lines occur within the study area <ul style="list-style-type: none"> • Stony Creek • Anvil Creek • Sawyers Creek • Black Creek • Sweetwater Creek • Jump-up Creek All of the above creek lines flow directly or indirectly into the Hunter River.
Significant Ecological Features	Creek lines along the investigation area are significant riparian habitat areas which provide linkages throughout the landscape for many species. Several medium and large remnant woodland blocks occur along or adjacent to the investigation area and provide significant habitat areas for species within the region.

3.0 DATABASE SEARCHES AND LITERATURE REVIEW

3.1 Database Searches

3.1.1 Review of Threatened and/or Migratory Species within the Study Locality

A review was undertaken of the documented records of the locations of threatened fauna species within the study locality. A 10 kilometre radius search area was undertaken over the entire investigation area. Threatened species records were accessed from the DECCW Atlas of NSW Wildlife Database for the Cessnock (9132) and Newcastle (9232) 1: 100,000 map sheets (updated to June 2010). Threatened and migratory species protected under the EPBC Act likely to occur within the study locality were determined from a Protected Matters Database search (June 2010).

3.1.2 Threatened Fauna Species on the TSC Act recorded within the Study Locality

A total of 64 threatened and or migratory terrestrial fauna species listed on the TSC Act have previously been recorded within the study locality on the Atlas of NSW Wildlife Database (**Table 2**).

- 6 species (green and golden bell frog, black-necked stork, swift parrot, little tern, painted snipe and regent honeyeater) are listed as endangered on the TSC Act
- 44 species are listed as vulnerable on the TSC Act.
- 24 species are also listed on the EPBC Act,
 - 2 as endangered (swift parrot and spotted-tailed quoll),
 - 1 as endangered and migratory (regent honeyeater) and
 - 4 as vulnerable (green and golden bell frog, grey-headed flying-fox, painted snipe and large-eared pied bat).
 - 16 as migratory species.

Table 2. NSW Atlas of Wildlife Threatened Species Records in the Study Locality.

Scientific Name	Common Name	Status (TSC)	Status (EPBC)	Earliest/Latest Records	Number of Records 10km	Number of Records 2km
Amphibians						
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	-	2009	1	1
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	1976-2008	10	7
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	-	1970	2	2
Birds						
<i>Anseranas semipalmata</i>	Magpie Goose	V	-	1978	1	-
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	2004-2005	3	-
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	1977-2001	3	1
<i>Circus assimilis</i>	Spotted Harrier	V	-	1983	2	2
<i>Climacteris picumnus</i>	Brown Treecreeper	V	-	2003-2005	6	-
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	2008	1	1
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	2004-2010	8	2
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	1987-2004	10	3
<i>Epthianura albifrons</i>	White-fronted Chat	V	-	1995	1	-
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	2002-2009	18	5
<i>Grantiella picta</i>	Painted Honeyeater	V	-	1977	1	-
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	2000	1	-
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V	-	1990	1	-
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	2000-2005	2	-
<i>Lathamus discolor</i>	Swift Parrot	E	E	2000-2009	8	-
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	2006	1	-
<i>Melanodryas cucullata</i>	Hooded Robin	V	-	1986	1	-
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-	2005	4	-
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	2006	1	-
<i>Ninox connivens</i>	Barking Owl	V	-	1977-2005	2	-
<i>Ninox strenua</i>	Powerful Owl	V	-	1977-2004	7	2
<i>Oxyura australis</i>	Blue-billed Duck	V	-	1987-2005	6	4
<i>Pandion haliaetus</i>	Osprey	V	M	1992	1	-
<i>Petroica boodang</i>	Scarlet Robin	V	-	1986-2005	6	-
<i>Petroica phoenicea</i>	Flame Robin	V	-	2007	1	-
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern)	V	-	1988-2009	94	40

	subspecies)					
<i>Pyrholaemus sagittatus</i>	Speckled Warbler	V	-	1981-2008	17	8
<i>Rostratula benghalensis australis</i>	Painted Snipe (Australian subspecies)	E	V	1992	2	-
<i>Sterna albifrons</i>	Little Tern	E	M	1983	1	-
<i>Stictonetta naevosa</i>	Freckled Duck	V	-	1983-1985	4	-
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	1970	2	2
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E P,CE	E, M	1977-2009	5	-
<i>Merops ornatus</i>	Rainbow Bee-eater	-	M	1986-2009	10	3
<i>Numenius minutus</i>	Little Curlew	-	M	1985-1991	2	-
<i>Tringa glareola</i>	Wood Sandpiper	-	M	1985-1986	3	-
<i>Tringa nebularia</i>	Common Greenshank	-	M	1986-1990	4	-
<i>Tringa stagnatilis</i>	Marsh Sandpiper	-	M	1986-1992	4	-
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	M	1983-1996	22	-
<i>Calidris ferruginea</i>	Curlew Sandpiper	-	M	1983	19	-
<i>Calidris melanotos</i>	Pectoral Sandpiper	-	M	1982-1986	4	-
<i>Calidris ruficollis</i>	Red-necked Stint	-	M	1983-1996	3	-
<i>Chlidonipterus leuco</i>	White-winged Black Tern	-	M	1988	1	-
<i>Cuculus saturatus</i>	Himalayan Cuckoo	-	M	1986-1992	2	-
<i>Gallinago hardwickii</i>	Latham's Snipe	-	M	2005-2009	2	1
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	M	1986-2009	12	3
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M	1993-2005	5	3
Mammals						
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	2005-2007	2	-
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	1980-2006	15	5
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	2002-2009	5	1
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	1994-2009	27	6
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	1994-2009	57	17
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	1994-2009	37	10
<i>Myotis macropus</i>	Southern Myotis	V	-	1994-2009	16	5
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	2003-2005	2	-
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	1998-2009	54	21
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	1994-2009	9	-
<i>Phascolarctos cinereus</i>	Koala	V	-	1970-2009	13	2
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	1999-2010	44	9
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	2002-2007	4	1

<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	1999-2009	13	5
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	2006-2008	5	2

Notes: V = Vulnerable, E = Endangered, M = Migratory, P (CE/E/V) = Preliminary listing (Critically Endangered/Endangered/Vulnerable)

These records are based on information supplied by the Department of Environment, Climate Change and Water, and may contain errors or omissions.

An assessment of the likelihood of each of the species listed in **Table 2** occurring within the study area will be undertaken in **Section 6.1**.

3.1.3 Threatened and Migratory Species predicted to occur in the Study Locality by the EPBC Act Protected Matters Search Tool

The EPBC Protected Matters Search Tool was accessed in June 2010 via the Australian Government Department of Environment, Water, Heritage and the Arts (DEWHA) website to generate a list of species protected under the EPBC Act that may occur in or nearby to the study locality (10kilometre radius). 24 Potentially relevant species are listed in **Table 3** below.

Table 3. Threatened and Migratory Fauna Species predicted to occur in the study locality under EPBC modelling

Scientific Name	Common Name	Status EPBC
Birds		
<i>Anthochaera Phrygia</i> <i>Xanthomyza phrygia</i>	Regent Honeyeater	Endangered & Migratory
<i>Lathamus discolor</i>	Swift Parrot	Endangered
<i>Rostratula australis</i>	Australian Painted Snipe	Endangered
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory
<i>Hirundapus caudacutus</i>	White-throated Needle tail	Migratory
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory
<i>Monarcha melanopsis</i>	Black-faced Monarch	Migratory
<i>Monarcha trivirgatus</i>	Spectacled Monarch	Migratory
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Migratory
<i>Rhipidura rufifrons</i>	Rufous Fantail	Migratory
<i>Ardea alba</i>	Great Egret, White Egret	Migratory
<i>Ardea ibis</i>	Cattle Egret	Migratory
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe	Migratory
<i>Rostratula benghalensis s. lat.</i>	Painted Snipe	Migratory
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory
Amphibians		
<i>Litoria aurea</i>	Green and Golden Bell Frog	Vulnerable
<i>Mixophyes balbus</i>	Stuttering Frog	Vulnerable
<i>Mixophyes iteratus</i>	Southern Barred Frog, Giant Barred Frog	Endangered
Mammals		
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat, Large Pied Bat	Vulnerable

<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, (southeastern mainland population)	Endangered
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Vulnerable
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (SE mainland)	Vulnerable
<i>Pseudomys oralis</i>	Hastings River Mouse	Endangered
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable

3.1.4 Endangered Fauna Populations

No endangered fauna populations have been recorded in the NSW Wildlife Atlas in the study locality.

3.1.5 Critical Habitat

No areas of critical habitat were identified within the study locality following a search of the Atlas of NSW Wildlife Database.

3.1.6 EPBC Act Protected Matters Report

The EPBC Protected Matters Search Tool is accessed via the Australian Government Department of the Environment Water Heritage and the Arts (DEWHA) website and generates a list of matters protected under the EPBC Act that may occur in or nearby the search area. Potentially relevant matters are listed in Table 4. The full protected matters report can be seen in Appendix 2.

Table 4. Table Summary of Potentially Relevant Matters under the EPBC Act 1999

Protected Matter	Details	Potentially Relevant
World Heritage Properties	None	No
National Heritage Places	None	No
Wetlands of International Significance (Ramsar sites)	One: Hunter Estuary Wetlands	Yes
Threatened Ecological Communities	1, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Yes
Commonwealth Marine Areas	N/A	No
Commonwealth Lands	Six - Commonwealth Lands identified within the study locality do not occur in the vicinity of the study area.	Yes
Commonwealth Heritage Places	-	No
Places on the Register of the National Estate	42	No
Listed Marine Species	13	No
Whales and Other Cetaceans	N/A	No
Critical Habitats	None	Yes
Commonwealth Reserves	None	Yes
State and Territory Reserves	1, Werakata National Park, NSW	
Other Commonwealth Reserves	None	Yes
Regional Forest Agreements	1, Lower North East NSW RFA, NSW	Yes

3.2 Summary of Local Threatened and/or Migratory Species

From a literature review and database searches, the following 75 threatened and/or migratory species have previously been identified or are predicted to occur within the study locality:

- | | | |
|---|---|---|
| ○ Giant Burrowing Frog | ○ Green and Golden Bell Frog | ○ Littlejohn's Tree Frog |
| ○ Magpie Goose | ○ Gang-gang Cockatoo | ○ Glossy Black-Cockatoo |
| ○ Spotted Harrier | ○ Brown Treecreeper | ○ Brown Treecreeper (eastern subspecies) |
| ○ Varied Sittella | ○ Black-necked Stork | ○ White-fronted Chat |
| ○ Little Lorikeet | ○ Painted Honeyeater | ○ Little Eagle |
| ○ Comb-crested Jacana | ○ Black Bittern | ○ Swift Parrot |
| ○ Square-tailed Kite | ○ Hooded Robin | ○ Black-chinned Honeyeater (eastern subspecies) |
| ○ Turquoise Parrot | ○ Barking Owl | ○ Powerful Owl |
| ○ Blue-billed Duck | ○ Osprey | ○ Scarlet Robin |
| ○ Flame Robin | ○ Grey-crowned Babbler (eastern subspecies) | ○ Speckled Warbler |
| ○ Painted Snipe (Australian subspecies) | ○ Little Tern | ○ Freckled Duck |
| ○ Masked Owl | ○ Regent Honeyeater | ○ Rainbow Bee-eater |
| ○ Little Curlew | ○ Wood Sandpiper | ○ Common Greenshank |
| ○ Marsh Sandpiper | ○ Sharp-tailed Sandpiper | ○ Curlew Sandpiper |
| ○ Pectoral Sandpiper | ○ Red-necked Stint | ○ White-winged Black Tern |
| ○ Himalayan Cuckoo | ○ Latham's Snipe | ○ White-bellied Sea-Eagle |
| ○ White-throated Needle-tail | ○ Large-eared Pied Bat | ○ Spotted-tailed Quoll |
| ○ Eastern False Pipistrelle | ○ Little Bentwing-bat | ○ Eastern Bentwing-bat |
| ○ Eastern Freetail-bat | ○ Southern Myotis | ○ Yellow-bellied Glider |
| ○ Squirrel Glider | ○ Brush-tailed Phascogale | ○ Koala |
| ○ Grey-headed Flying-fox | ○ Yellow-bellied Sheath-tail-bat | ○ Greater Broad-nosed Bat |
| ○ Eastern Cave Bat | ○ Great egret | ○ Cattle egret |
| ○ Spotted-tailed quoll | ○ Stuttering Frog | ○ Giant barred frog |
| ○ Long-nose potoroo | ○ Brush tailed rock wallaby | ○ Hastings river mouse |

- Spectacled monarch
- Black faced monarch
- Satin flycatcher

An assessment of the current likelihood of each of these threatened and/or migratory species occurring within the investigation area will be undertaken in **Section 6.1**.

4.0 METHODOLOGY

The survey results presented in this report are supplementary to those that were completed in 2009 for the Terrestrial Fauna Impact Assessment dated December 2009. Assessment areas covered in this report were chosen for their apparent likely habitat in respect to the modified project footprint.

The level of survey and methods undertaken were designed using the Department of Environment and Conservation (now Department of Environment, Climate Change and Water [DECCW]) threatened biodiversity survey and assessment guidelines (DEC, 2004). The methods employed were tailored to the habitat types and site characteristics of the investigation area. Due to the long linear nature of the investigation area, intensive trapping survey was not undertaken and was considered unlikely to add additional threatened species not detected by non-trapping techniques. A targeted fauna survey (non-trapping) and habitat assessment was selected as the most appropriate and feasible method to identify the species occurring within the investigation area.

4.1 Survey Site Selection

Key habitat areas were selected using aerial photograph interpretation of the subject locality. Key habitat areas are those areas that provide the highest quality habitat within the area of study.

Twenty one sites were selected for assessment from aerial photograph interpretation (**Figure 3**) Survey Sites. Each of these potential sites was assessed in the field for habitat features and an appropriate survey effort was adopted.

Aerial photograph interpretation identified the important forest or riparian areas supplementary to those along the investigation area (**Table 5**).

Table 5. Regionally Important Habitat Areas along the Investigation Area

Site No	General Area	Habitat	Coordinates MGA (GDA 94)	
			Easting	Northing
S1	Rutherford Wollombi rd	Small disturbed site, ex stockpile area. Cleared with scattered trees.	361593	6378019
S2	Rutherford Wollombi rd	Disturbed site, small patch of remnant red gum open forest woodland and spotted gum iron bark open forest.	360869	6378093
S3	Rutherford, Kyle St Industrial Area	Remnant woodland behind industrial estate. Spotted gum iron bark open forest.	359388	6378333
S4	New England Hwy Station Lane	Predominately cleared, grazed area, some scattered spotted gum iron bark forest persists.	352963	6378072
S5a	New England Hwy Allendale Rd	Woodland ranging from spotted gum iron bark to with some swamp oak riparian and remnant red gum open forest. Dense to patchy with cleared paddocks.	351148	6379009
S5b	New England Hwy Allendale Rd	NO ACCESS	351093	6378986
S6	New England Hwy Allendale Rd	LIMITED ACCESS, dense woodland.	350519	6380139
S7a	East of Greta, Access via John St	Swamp oak riparian forest ranging from dense to patchy.	349777	6380864
S7b	Other side of tracks from S7a	LIMITED ACCESS, small patch of woodland.	349717	6380787
S8	East of Greta, Access via John St	Swamp oak riparian forest ranging from dense to patchy.	349351	6381253
S9	Other side of tracks	LIMITED ACCESS, Patchy woodland surrounded by	349162	6381318

	from S8	pasture.		
S10	East of Greta, Access via John St	Swamp oak riparian forest ranging from dense to patchy.	349150	6381519
S11	Southern side of Northern Railway	Small patch of red gum open forest.	348478	6381946
S12	Greta, Mansfield St	NO ACCESS	348718	6382330
S13	Greta New England Hwy	NO ACCESS	348745	6382612
S14	Greta New England Hwy	NO ACCESS	348745	6382612
S15	South of Branxton off Wine Country Drive	Open spotted gum iron bark forest.	344945	6384874
S16	Branxton South of Branxton off Wine Country Drive	Cleared pasture for agriculture with some remnant spotted gum open forest.	345421	6384704
S17a	New England Hwy approximately 1.2km east of Branxton	Predominately open pasture with some dams, small remnant spotted gum iron bark forest.	344066	6385312
S17b		NO ACCESS	342462	6385271
S18		NO ACCESS	342428	6384970
S19	New England Hwy - Hermitage lane	Open pasture.	338218	6385633
S20	New England Hwy - Hermitage lane	Open pasture.	338130	6385632
S21	New England Hwy - Hermitage lane	Small patch of red gum open forest.	338137	6385216
		NO ACCESS	338133	6385372

Access restrictions prevented the sampling of habitat areas S5b, S6, S7b, S9, S12, S13 S15, S17a, S17b and S21 (**Table 5**). Habitat areas S1, S18, S19, and S20 were not considered as potential sampling sites due to being predominately cleared or due to lack of potential habitat. Sites S2, S3, S4, S5a, S7a, S8, S9, S10, S11, S14, and S16 were considered to have good representative vegetation and no accessibility issues.

4.2 Targeted survey sites

From the above assessment 10 sites were identified for targeted survey (**Table 6**) & (**Figure 3**).

Table 6. Targeted Survey Sites

Site No	General Area	Habitat	Coordinates GDA	
			Easting	Northing
S2	Rutherford Wollombi rd	Disturbed site, small patch of remnant red gum open forest woodland and spotted gum iron bark open forest.	360869	6378093
S3	Rutherford, Kyle St Industrial Area	Remnant woodland behind industrial estate. Spotted gum iron bark open forest.	359388	6378333
S4	Southern side of Northern Rail line, Old North Rd	Predominately cleared, grazed area, some scattered spotted gum iron bark forest persists.	352963	6378072
S5a	Station Lane Allendale Rd, Allandale	Woodland ranging from spotted gum iron bark to with some swamp oak riparian and remnant red gum open forest.	351148	6379009

		Dense to patchy with cleared paddocks.		
S7a	East of Greta, Access via John St	Swamp oak riparian forest ranging from dense to patchy.	349777	6380864
S8	East of Greta, Access via John St	Swamp oak riparian forest ranging from dense to patchy.	349351	6381253
S10	East of Greta, Access via John St	Swamp oak riparian forest ranging from dense to patchy.	349150	6381519
S11	Southern side of Northern Railway Greta, Mansfield St	Small patch of red gum open forest.	348478	6381946
S14	South of Braxton off Wine Country Drive	Open spotted gum iron bark forest.	344945	6384874
S16	New England Hwy approximately 1.2km east of Braxton	Predominately open pasture with some dams, small remnant spotted gum iron bark forest.	344066	6385312

4.3 Survey Effort

Targeted fauna surveys were undertaken at the 10 sites identified in Table 6 and Figure 3. All 10 sites in Table 6 were visited on a minimum of two occasions, for day and night surveys, except site S11 that was only visited during the day. Survey effort included 40 minute 2 hectare bird surveys, spotlighting, nocturnal owl and mammal call playback, and Anabat micro-bat survey (**Figure 4**). Reptile and amphibian searches were restricted to opportunistic searches due to the cool weather.

Table 7. Survey Effort

Survey Method (Hrs)	Site No										Total Hrs
	S2	S3	S4	S5a	S7a	S8	S10	S11	S14	S16	
Bird Surveys	20 min	20 min	20 min	40 min	40 min	40 min	40 min	40 min	40 min	40 min	5.6
Opportunistic	35 min	55 min	30 min	50 min	20 min	20 min	20 min	40 min	1hr	20 min	5.8
Diurnal Reptile and Amphibian Surveys	15 min	1hr	1hr	30 min	-	-	-	-	1hr	30 min	4.25
Nocturnal Reptile and Amphibian Surveys	-	-	-	-	-	-	-	-	-	-	-
Walking Spotlight Surveys	2hr	2hr	2hr	2hr	2hr	2hr	2hr	-	2hr	2hr	18
Opportunistic	-	30 min	-	30 min	-	-	-	-	-	30 min	1.5
Owl and Mammal Call Playback	0	1hr	1hr	-	1hr	-	-	-	1hr	-	4
Anabat Survey	1hr	4hr	1hr	1.5hr	4hr	1hr	1hr	-	3hr	3.5hr	20

4.3.1 Bird Surveys

Each bird survey comprised of at least 20 minutes of survey (**Table 7**) completed by one observer in a 2 hectare area, or as a 40 minute survey with 2 observers or as opportunistic surveys if the site was determined to be less than 2 hectares. Birds recorded outside of the 20 minute survey were recorded as opportunistic. Birds were identified using binoculars and from characteristic calls. One

bird survey was completed at each of the survey sites. Bird sightings were also recorded opportunistically during all other survey activities.

4.3.2 Diurnal Reptile and Amphibian Searches

Diurnal reptile and amphibian searches were undertaken during late morning and mid to late afternoon. Each survey comprised at least one person hour of survey (**Table 7**) completed by two observers for 30 minutes or one observer for an hour. Habitat features investigated during diurnal reptile and amphibian searches included fallen timber, rocks, tree trunks, leaf litter and grassland areas.

4.3.3 Nocturnal Reptile and Amphibian Searches

Nocturnal reptile and amphibian searches were undertaken during early evening. Nocturnal reptile and amphibian searches were restricted to terrestrial habitats at some sites due to a lack of water sources. All other nocturnal reptile and amphibian searches were undertaken at and around farm dams and watercourses. Each terrestrial survey comprised one person hour of survey completed by two observers. Nocturnal reptile and amphibian searches were undertaken with hand-held torches and head lamps.

4.3.4 Walking Spotlight Survey

Walking spotlight surveys were undertaken between dusk and 11 pm. Each survey comprised, at a minimum, a single person hour of survey (two observers). Walking spotlight surveys were undertaken with hand held Lightforce spotlights (50 Watt). One walking spotlight survey was completed at each of the open and riparian woodland survey sites (**Table 7**).

4.3.5 Nocturnal Call Playback

Call playback for owl species was undertaken at dusk at S3, S4, S7a and S14 survey sites (**Table 7**). The nocturnal calls of the following species were played using a TOA megaphone (model ER-409, 15W rated output):

- Bush stone-curlew
- Masked owl
- Barking owl
- Powerful owl
- Sooty owl

After listening for five minutes during dusk, the calls of the above species were broadcast for approximately four minutes each and were separated by a listening period of four minutes. At the end of each four minute listening period a brief spotlighting scan was made of surrounding trees for owls that may have approached silently. The calls were broadcast in the order shown above. At the completion of the final species call a listening period of five minutes was undertaken and followed by a final scan of the surrounding trees. Call playback surveys were not undertaken at the remaining 7 sites due to their proximity to homes or the size of the site was considered to be too small.

4.3.6 Micro-bat Survey

Anabat micro-bat detectors and recorders (hereafter referred to as 'Anabat detectors') were used to record the ultrasonic calls of micro-bats. Anabat detectors (in weather proof cases) were positioned

in suitable foraging corridors or around water bodies such as dams. All Anabat detectors began recording at dusk and recorded calls for the period that they were set up on the site. A hand held Anabat detector was also used during spotlighting activities. Anabat files were analysed in-house by Ecotone Ecological Consultants personnel with extensive Anabat file analysis experience.