Great Northern Highway
Muchea to Wubin Upgrade Stage 2

MAIN ROADS WESTERN AUSTRALIA

Miling Straight EPBC Act Referral – Supporting Information

GNH-WP09-E-EA-AS-0002_0

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MUCHEA TO WUBIN

Great Northern Highway - Muchea to Wubin Upgrade Stage 2

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1. Introduction

1.1 Great Northern Highway: Muchea to Wubin Upgrade Stage 2

Main Roads Western Australia (Main Roads) has established the Muchea to Wubin Integrated Project Team (M2W Team), comprising Main Roads and industry partners Jacobs and Arup to conduct a comprehensive planning review of the full Muchea to Wubin link along the Great Northern Highway (GNH). This planning review is a critical component of the GNH: Muchea to Wubin Upgrade Stage 2, which has been funded with $450 million from the Federal and State Governments. In addition, a further $35 million has been made available for improvements to 11km through the Bindi Bindi curves, which was completed in 2015. Among the improvements to be considered are more passing lanes, flattening crests and easing curves, safer roadsides, more rest stops and additional facilities for heavy vehicles.

The review examined the previous upgrade strategy developed in the 1990s and, having carefully considered current requirements for the movement of people and freight, delivered a revised upgrade strategy. The M2W team has identified and prioritised construction packages to be delivered over the four-year period from 2015/16 to 2018/19. The construction programme includes the currently funded sections (Muchea to Chittering (eight kilometres (km)), Bindoon South (2 km), New Norcia Bypass (6 km), Lyons East Road to Pithara (46 km, including Miling), and Wubin realignment (2 km)) and identifies additional priority packages to be constructed as funding becomes available. The New Norcia Bypass and a section between Miling and Pithara (known as the Miling Straight) have progressed towards pre-construction activities, including detailed design and procurement, with construction expected to commence in early 2016.

1.2 Scope and Purpose of this Document

This document has been prepared as part of the referral of the proposed action under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) in order to provide additional supporting information and assist the Commonwealth Department of the Environment (DoE) in determining if formal assessment of the proposed action is required. Its purpose is to present an environmental impact assessment of the proposed action on Matters of National Environmental Significance (MNES). The scope of the proposed action is limited to construction and operation of the Miling Straight.

1.3 The Proposed Action: Miling Straight

The proposed action involves upgrading of the existing GNH between straight line kilometre (SLK) 185.6 and SLK 207.9, referred to as the Miling Straight. The proposed action is located approximately 175 km north east of Perth in the Wheatbelt region of Western Australia. The first portion of Miling Straight (between SLK 185.6 and approximately SLK 200) is within the Shire of Moora, with the remainder in the Shire of Dalwallinu.

A planning review of the current GNH and feedback from community consultation has identified a number of deficiencies along the Miling Straight. These deficiencies include:

- Narrow and substandard road width. The original GNH was constructed with a 6.8m wide seal on a 9 m formation. Current Main Roads standards require at least a 9 m seal on an 11 m formation;
- Areas with non-compliant horizontal and vertical geometry. To allow vehicle speeds of 110 km/h, these geometry issues enquire rectification;
- No overtaking lanes and inadequate roadside stopping facilities;
- A number of intersections with poor sight distance or inadequate turning provisions including Miling North Road; and
- Insufficient clear zone.

A detailed description of the works to be undertaken along Miling Straight is provided in Section 2. The coordinates defining the boundary of the proposed action (Approval Boundary) are provided in Appendix A.

1.4 Proponent

The proponent for the proposal is:

Main Roads Western Australia

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2. Description of the Proposed Action

2.1 Overview

Main Roads proposes to upgrade and improve the section of GNH referred to as the Miling Straight (the proposed action) approximately 175 km north east of Perth. The works will be constructed between SLK 185.6 and SLK 207.9. Due to the age and condition of the current GNH, and to minimise the environmental impact of the upgrade, the upgrade will largely involve the construction of a new road adjacent to the existing road. The proposed alignment is mainly to the south of the existing GNH between SLK 185.6 to SLK 200. At approximately SLK 200, the alignment crosses over to the north of the existing GNH. A small section between SLK 193.0 to SLK 196.5 will be upgraded on the existing alignment. The proposed action will include:

- approximately 19 km of new carriageway and 3.5 km of upgraded carriageway;
- redesign of the following eight intersections with GNH:
    - Miling North Road – Northern side (SLK 187.31);
    - Miling North Road – Southern side (SLK 187.55);
    - Arkells Road (SLK 190.11);
    - Richardson Road (SLK 194.17);
    - Nadji Mia Road (SLK 200.05);
    - Pipe McNeil Road (SLK 203.06);
    - Dickins Road (SLK 203.08); and
    - Gatti Road (SLK 206.71).
- a new northbound overtaking lane (SLK 196.120 – SLK 198.015);
- a new southbound overtaking lane (SLK 197.56 – SLK 199.455);
- installation of a boundary fence along the edge of the road reserve;
- a northbound rest stop at SLK 193.65; and
- a southbound rest stop at SLK 200.08.

The majority of the new alignment passes through open farmland with very little associated native vegetation (Figure 2.1). Additional areas required for construction such as laydown areas, stockpile areas, water storage and vehicle turn around will be located in cleared paddocks. No clearing of native vegetation or Black Cockatoo habitat, including isolated trees, will be required in these areas.

An Approval Boundary for the proposed action has been identified (Figure 2.1). The Approval Boundary encompasses an area of 317 ha, which is larger than required for the construction footprint to provide a degree of flexibility and allow for minor changes in alignment during detailed design. It is anticipated that the development footprint will comprise 101 ha within the Approval Boundary of which 19 ha is native vegetation, 11 ha is planted vegetation, and 71 ha is pasture/paddock, cleared land or road.

Clearing for the proposed action will be undertaken using bulldozers with vegetation stockpiled or used in accordance with the Landscape Management Plan for the proposed action. Topsoil will be stripped and stockpiled separately to vegetation. Where required, topsoil and vegetation stockpiles will be segregated according to their weed status.

Equipment likely to be used to construct the road and associated infrastructure includes:

- bulldozers and graders;
- front end loaders, excavators and dump trucks;
- compactors and rollers;

- batching/mixing plants for asphalt and concrete;
- pavers and curb machines;
- low loaders to transport plant and machinery to the work area; and
- light vehicles.

2.2 Excluded items

Construction materials will be sourced from local borrow pits. The exact locations of these are yet to be determined and as such these have been excluded from the scope of this referral. Preliminary sites are located in existing extraction areas and additional clearing of native vegetation is unlikely to be required. As such, use of these areas is considered unlikely to result in significant impacts to MNES.

Construction water will be sourced from existing water sources, such as dams or tanks, which may be located offsite. Exact sources will be identified during pre-construction activities. No significant impact to MNES is anticipated as a result of the use of these water sources and as such this component has been excluded from this referral.

Construction workers will be housed at purpose built construction camps along the alignment. The exact location(s) and potential layout of the camp(s) has not yet been determined. Construction contracts will stipulate that camps will be built in cleared locations. As such, it is unlikely that there will be significant impacts from the construction, use and decommissioning of the construction camp(s) and they are therefore excluded from this referral.

In order to construct the road, side tracks may be required to allow movement of vehicles along the alignment. Where these occur within the proposed road reserve, these areas are allowed for in the clearing estimate. Additional side tracks may be required outside of the proposed road reserve. The locations of these tracks are yet to be determined however, given the highly cleared nature of the surrounding landscape, it is unlikely that additional clearing of native vegetation or habitat for Carnaby's Black Cockatoo will be required. As such, any side tracks required outside of the proposed road reserve are excluded from the scope of this referral.

While locations of these components are yet to be finalised, they may be outside of the Approval Boundary for the proposed action. Once locations are finalised, the assessment of potential impact to MNES will be revisited. If significant impacts to MNES are considered likely, a separate referral under the EPBC Act will be submitted.

Figure 2.1 : Location of the Proposed Action

(refer to Fig2-1_GNH-WP06-E-EA-GD-0009-B.pdf)

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2.3 Road Design

The proposed action has been designed to support the overall project objectives to allow vehicles to travel safely through the Miling Straight at 110km/h (100 km/h for heavy vehicles). The road design parameters adopted to achieve this are provided in Table 2.1. At the time of writing, design for the road had been progressed to 85% and it is this stage of design that forms the basis of this referral.

In order to achieve the required horizontal geometry, some cut and fill will be required. Fill embankments will be constructed of materials that consist of granular soils such as sand and gravel, but may also include aggregate, rock, or crushed paving material.

Drainage design for the proposed action is based on design flood estimation carried out in accordance with Australian Rainfall & Runoff, A Guide to Flood Estimation 2001. Culverts have been designed up to a 50 year Annual Recurrence Interval (ARI) level of serviceability, as specified by Main Roads to manage road safety and limit the probability of flood damage to the road and/or properties and any associated costs.

The road reserve boundary has been developed on the basis of achieving a 60 m reserve along the entire corridor. This has been generally adopted along the Miling Straight, although in some locations it has been widened to include any earthworks that extend beyond the initial 60 m reserve and to provide for straight boundary fence lines.

Table 2.1 : Adopted road design standards

Element	Standard adopted
Design speed	110 km/h
Desired posted speed	110 km/h (100km/h for heavy vehicles)
Carriageway width	10.0 m
Lane width	3.5 m
Sealed shoulder width	1.0 m
Unsealed shoulder width	0.5 m
Median width (wide centreline)	1.0 m
Cross fall	3%
Maximum superelevation	4%
Maximum gradient	3%
Desirable Horizontal Radius	1100 m
Pavement depth – Main Alignment	430 mm (200 natural gravel basecourse/200 natural gravel sub-base)
Pavement depth – Side Roads	300 mm (150 natural gravel basecourse/150 natural gravel sub-base)
Intersection design vehicle	As per Main Roads WA RAV network
Batter slopes - cut	1:4 forward slope / 1:3 back slope
Batter slopes - fill	1:4
Vertical clearances	10 m
Minimum K value - crest	83.6
Minimum K value - sag	53.0
Clearzone	As required by location

3. Description of the Environment

3.1 Regional Setting

Miling Straight is located in the Avon-Wheatbelt Bioregion as defined by the Interim Biogeographic Regionalisation for Australia (IBRA), version 7 (DoE, 2012). The western portion of Miling Straight lies within the Katanning subregion (AVW02) while the eastern portion lies in the Merredin subregion (AVW01). The Katanning subregion is an area of active drainage supporting woodlands of Wandoo, York Gum and Salmon Gum (*E. salmonophloia*) with Jam and Casuarina species (Beecham, 2001a). The Merredin subregion consists of lateritic uplands dominated by yellow sandplain with Proteaceous scrub-heaths rich in endemics and mixed eucalypt, *Allocasuarina huegeliana* and Jam (*Acacia acuminata*)-York Gum (*E. loxophleba subsp. loxophleba*) woodlands on alluvials and eluvials. (Beecham, 2001b).

The proposed action area experiences a semi-arid warm Mediterranean climate with warm dry summers and cool wet winters (Phoenix, 2015a). The Bureau of Meteorology (BoM) weather station at Miling (Station Number 008085) only records rainfall data. The closest BoM Station to Miling which provides records of temperature and rainfall is Walebing (Station Number 008151), which is approximately 28.6km south of Miling (BoM 2015a). The average annual rainfall for Walebing is 469.1 mm while the average annual rainfall measured at Miling is 369.3 mm (BoM, 2015a, 2015b). Average monthly temperatures at Walebing range from a minimum of 5.4 degrees Celsius in July to a maximum of 33.9 degrees Celsius in January.

The predominant land use in the Wheatbelt region is mixed agriculture, consisting of grain crops such as wheat, barley and oats, with mining (primarily iron ore) in the east (Western Australian Planning Commission (WAPC), 2011).

3.2 Physical Environment

Two land systems mapped by the Department of Agriculture and Food WA (DAFWA) occur within the proposed Approval Boundary:

- Burabidge Hill System – undulating rises to low hills with rock outcrop, granite, migmatite, gneiss. Brown and red loamy and sandy earths, yellow/brown shallow loamy duplex and some stony soil. York Gum-jam woodland.
- Goomalling System – poorly drained valley flats, in the northern Zone of Rejuvenated Drainage, with grey deep sandy duplex (sometimes alkaline) and saline wet soil. York Gum-Jam-Wandoo-Salmon Gum-Sheoak woodland.

The landscape in the west (Katanning subregion) consists of gently undulating rises to low hills with abrupt breakaways (Beecham, 2001a) while in the east (Merredin subregion) the landscape is characterised by an ancient peneplain with low relief (Beecham, 2001b).

There are no contaminated sites within or in close proximity to the proposed Approval Boundary and the potential for Acid Sulfate Soils (ASS) to occur has been assessed as low to extremely low. The area is partly within the Avon River System Proclaimed Surface Water Area (approximately SLK 203 to SLK 207.9) but is not within a proclaimed groundwater area.

3.3 Biological Environment

3.3.1 Flora

Phoenix Environmental Services Pty Ltd (Phoenix) completed an initial spring season flora and vegetation field survey in October 2014 covering an approximately 40 m wide survey area encompassing GNH from SLK 177.72 to SLK 207.22. A second field survey was undertaken on 20 - 22 May 2015 and included additional areas which had not been surveyed in spring 2014 but mostly within cleared pastures. A third field survey was undertaken on 16 – 17 June 2015 and covered an additional area within cleared pastures and patches of remnant and planted vegetation. The combined extent of all three surveys in relation to the proposed Approval Boundary for the action can be seen in Figure 3.1, where the vegetation mapping corresponds to the extent of the surveys. The surveys cover 95% of the Approval Boundary and 100% of the proposed alignment and anticipated disturbance footprint. For details on the methodology of these surveys refer to Section 3 of the Phoenix (2015) Flora and Fauna Report (Appendix B).

It should be noted that the area surveyed (SLK 177.72 to SLK 207.22) was greater than the Approval Boundary (SLK 185 to SLK 208) for this referral. Only data from the survey that falls inside the Approval Boundary has been used to inform this referral.

A total of 40 conservation significant flora species including 28 Threatened (26 taxa listed under the EPBC Act, four listed under the WC Act) and 15 priority flora species were identified in the desktop and literature review undertaken for the survey area (Phoenix, 2015). The field surveys undertaken by Phoenix (2015) did not record the presence of any flora species listed under the EPBC Act. A total of seven flora species listed under the State WC Act or on the Department of Parks and Wildlife (Parks and Wildlife) Priority Flora list were recorded, as detailed in Table 2.1 and shown on Figure 3.1.

Table 3.1 : Conservation Significant Flora Recorded during 2014 and 2015 Surveys (Phoenix, 2015)

Scientific Name (Common Name)	Conservation Category	Location (nearest SLK)	Number of records
Grevillea bracteosa subsp. *bracteosa*	**Threatened (WC Act Schedule 1)**	SLK 195.1 (Outside of Approval Boundary) SLK 201.3	Population of 64 plants Single plant
Dampiera glabrescens	**Priority 1**	SLK 204.4	Single plant
Grevillea pinifolia (Pine-leaved Grevillea)	**Priority 1**	SLK 200.4	Single plant
Chamelaucium sp. Wongan Hills	**Priority 3**	SLK 179.1 (Outside of Approval Boundary)	Population of seven plants
Frankenia glomerata (Cluster Head Frankenia)	**Priority 3**	SLK 178.7 (Outside of Approval Boundary)	Two populations of three and six plants
Grevillea asparagoides	**Priority 3**	SLK 185.2 and SLK 182.5 (Outside of Approval Boundary)	Two populations with 82 plants combined
Urodon capitatus	**Priority 3**	SLK 205.6	Single plant

The Priority 3 species *Melaleuca sclerophylla* was also expected to occur in the area surveyed, however a thorough search of the location provided by the Parks and Wildlife failed to locate any plants of this species. The location occurs within a small remnant patch in a cleared paddock and it appears as though the recorded population has been removed (Phoenix, 2015).

3.3.2 Introduced Flora

A desktop review was conducted to identify weed species potentially occurring in the wider area, and those classified as Declared Plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). A total of nine weed species were identified, of which one species previously recorded in the road reserve (**Echium plantagineum*) was identified as a Declared Plant. None of the weeds were classified as Weeds of National Significance (WoNS).

The field surveys recorded a total of 37 introduced flora species (Phoenix, 2015). Three of these species are Declared Plants (**Echium plantagineum* (Paterson's Curse), **Opuntia monacantha* (Barbary Fig) and **Tamarix aphylla* (Athel Pine)) while two (**Tamarix aphylla* and **Opuntia monacantha*) are also listed as a WoNS. **Opuntia monacantha* does not occur within the Approval Boundary.

3.3.3 Vegetation

Vegetation in the Approval Boundary comprises seven vegetation associations as detailed in Table 3.2 and shown on Figure 3.1.

Table 3.2 : Vegetation Types Mapping within the Approval Boundary

Code	Vegetation Description as per Shepherd et al. 2002	Area within Approval Boundary (ha)
8	Medium woodland; Salmon Gum (*Eucalyptus salmonophloia*) and gimlet (*E. salubris*)	2.5
142	Medium woodland; York Gum (*E. loxophleba*) and Salmon Gum	5.5
352	Medium woodland; York Gum	5.0
551	Shrublands; *Allocasuarina campestris* thicket	8.5
676	Succulent steppe; samphire	9.0
1024	Shrublands; mallee and casuarina thicket	18.5
1046	Succulent steppe with woodland; York gum and samphire	1.0

Five of the mapped vegetation types are considered to constitute remnant vegetation as the current extent of these is less than 30% of the pre-European extent (Table 3.3). Vegetation types 142, 352, 551, 676, 1024 and 1048 may be considered to be locally significant as they represent habitat for the conservation significant flora recorded in the study area (Phoenix, 2015).

3.3.3.1 Vegetation Condition

The condition of vegetation in the Approval Boundary ranged from completely degraded to excellent (Table 3.4; Figure 3.2). A large proportion of the Approval Boundary for the proposed action passes through paddocks which have been cleared for agricultural purposes, and has been classed as completely degraded. Of the total area bounded by the Approval Boundary, 2.8% (8.97 ha) has been recorded as being in excellent condition. The areas of the vegetation recorded to be in excellent condition may be considered locally significant as they represent patches of comparatively high native species diversity in otherwise degraded vegetation (Phoenix, 2015).

3.3.3.2 Threatened and Priority Ecological Communities

None of the vegetation types recorded within the Approval Boundary are considered to represent a Threatened Ecological Community (TEC). Sections of Vegetation Type 352 (Medium woodland; York Gum) west of SLK 192 and SLK 193 are considered representative of the Parks and Wildlife listed PEC “Eucalypt woodlands of the Western Australian Wheatbelt” (Phoenix, 2015). No disturbance is required in these areas.

Table 3.3 : Regional Pre-European and Existing Extents for Vegetation Types Recorded in the Proposed Approval Boundary.

Code	Vegetation Description as per Shepherd et al. 2002	Pre-European Extent (ha)	Current extent (ha)	% remaining[1]	Vegetation status
8	Medium woodland; Salmon Gum (*Eucalyptus salmonophloia*) and gimlet (*E. salubris*)	694,638.13	346,576.30	49.89	Depleted
142	Medium woodland; York Gum (*E. loxophleba*) and Salmon Gum	787,948.49	210,069.21	26.66	Vulnerable
352	Medium woodland; York Gum	724,272.97	143,677.92	19.84	Vulnerable
551	Shrublands; *Allocasuarina campestris* thicket	302,423.08	83,761.81	27.70	Vulnerable
676	Succulent steppe; samphire	2,063,413.94	1,963,874.72	95.18	Least concern
1024	Shrublands; mallee and casuarina thicket	742,950.55	87,341.95	11.76	Vulnerable
1046	Succulent steppe with woodland; York gum and samphire	861.78	83.71	9.71	Endangered

Table 3.4 : Vegetation Condition within the Approval Boundary by Vegetation Type

Code	Vegetation Description as per Shepherd et al. 2002	Vegetation Condition Rating			
		Degraded (ha)	Good (ha)	Very Good (ha)	Excellent (ha)
8	Medium woodland; Salmon Gum (*Eucalyptus salmonophloia*) and gimlet (*E. salubris*)	2.28	0.20		0.02
142	Medium woodland; York Gum (*E. loxophleba*) and Salmon Gum	3.60	1.70		0.20
352	Medium woodland; York Gum	4.00	0.65	0.30	0.05
551	Shrublands; *Allocasuarina campestris* thicket	2.40	0.10	2.50	3.50
676	Succulent steppe; samphire		3.20	1.20	4.60
1024	Shrublands; mallee and casuarina thicket	5.80	3.60	8.30	0.60
1046	Succulent steppe with woodland; York gum and samphire		0.35	0.65	

[1] Based on Parks and Wildlife (Government of Western Australia, 2013)

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Figure 3.1 : Vegetation Types and Conservation Significant Flora Records

(refer to Fig3-1_GNH-WP09-E-EA-GD-0017-A2.pdf Map 1 of 6)

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Figure 3.2 : Vegetation Condition

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3.3.4 Fauna

3.3.4.1 Overview

The desktop review identified eight conservation significant fauna species (excluding migratory species) that may occur in the vicinity of the proposed action[2] (Table 3.5). A likelihood of occurrence assessment for these species and has been included in Table 3.5. No direct evidence of conservation significant fauna has been recorded by Phoenix (2015).

Table 3.5 : Conservation Significant Fauna Species potentially occurring in the proposed action

Common Name	Scientific name	Status	Likelihood of occurrence (Phoenix, 2015a).
Birds			
Carnaby's Black-Cockatoo	*Calyptorhynchus latirostris*	Endangered (EPBC Act & WC Act)	**Likely**; within the known range of the species, suitable habitat trees and food species present within the study area, evidence of utilization of hollows.
Baudin's Black-Cockatoo	*Calyptorhynchus baudinii*	Endangered (EPBC Act & WC Act)	**Unlikely;** NatureMap record from New Norcia but outside modelled distribution; unlikely to roost or breed in study area; may occur primarily in woodland habitats of the study area
Australian Painted Snipe	*Rostratula australis*	Endangered; Migratory (EPBC Act & WC Act)	**Unlikely**; no suitable habitat present in study area.
Malleefowl	*Leipoa ocellata*	Vulnerable (EPBC Act & WC Act)	**Unlikely**; woodland and shrubland habitat within the study area fragmented and heavily degraded, often lacking understorey
Muir's Corella	*Cacatua pastinator pastinator*	Vulnerable (EPBC Act) Schedule 4 (WC Act)	**Possible;** may occur occasionally within the study area, particularly woodland habitat. Nesting may occur within the study area where suitable hollows present.
Mammals			
Chuditch, Western Quoll	*Dasyurus geoffroii*	Vulnerable (EPBC Act & WC Act)	**Unlikely**; long history of agricultural usage in the area has resulted in large scale clearing for pasture with any remnant vegetation being largely degraded and fragmented.
Reptiles			
Western Spiny-tailed Skink	*Egernia stokessi badia*	Endangered (EPBC Act) Vulnerable (WC Act)	**Unlikely**; woodland habitat within the study area heavily degraded and often lacking hollowed logs or branches and granite outcrops present within study area degraded and lacking suitable exfoliation or crevices for the species
Other			
Shield-black Trapdoor Spider	*Idiosoma nigrum*	Vulnerable (EPBC Act & WC Act)	**Possible**; may occur in shrubland and woodland habitat present within the study area; however, these habitats are often heavily degraded

[2] EPBC Act Marine species returned from the database searches have been excluded from the results as they are not relevant to the proposed action area, considering its geographical location, and are therefore not discussed further within this report.

In accordance with the DoE Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPaC, 2012), a targeted Black Cockatoo assessment was conducted by Phoenix in the form of a significant tree survey. An initial fauna habitat assessment and significant black cockatoo tree assessment was undertaken on 4 November 2014. This was followed up with a more comprehensive Level 1 fauna survey entailing further habitat assessment, targeted searches for evidence of conservation significant fauna and complete significant Black Cockatoo tree survey within the entire road reserve between SLK 177.30 and SLK 207.72 on 4 – 6 March 2015. A third field survey was undertaken from 20–22 May 2015 concurrent with the second flora and vegetation field survey in additional areas not previously surveyed, mostly within cleared paddock. A subsequent site assessment was undertaken with Tony Kirkby, a recognised subject matter expert on black cockatoos, on 18–19 June 2015 to inspect the recorded habitat trees for hollows suitable for breeding and evidence of use by Carnaby's Black Cockatoo and for evidence of feeding and roosting by the species. These surveys covered 95% of the area within the Approval Boundary and 100% of the proposed alignment and anticipated disturbance footprint.

As with the flora surveys, it should be noted that the area surveyed was greater than the Approval Boundary that is being applied for in this referral. Only data from the survey that falls inside the Approval Boundary has been used to inform this referral and base the assessment on.

The majority of the area within the Approval Boundary is completely degraded and consists of pasture, cleared and planted areas or existing road infrastructure. As such, it is of little to no value for fauna both in terms of habitat value and as ecological corridors (Phoenix, 2015).

While no conservation significant fauna were recorded during the surveys by Phoenix (2015), potential breeding habitat for Carnaby's Black Cockatoo was identified within the proposed Approval Boundary.

Carnaby's Black Cockatoo

While no direct evidence (residues) of feeding by Carnaby's Black Cockatoo was observed within the Approval Boundary (pers. comm. T. Kirkby, March 2015), the species is known to breed in the Wheatbelt area of WA from July/August to January/February (DSEWPaC, 2012a). A total of 127 potential breeding trees for Carnaby's Black Cockatoo were recorded from within the Approval Boundary during the 2014 and 2015 surveys, comprising *Eucalyptus camaldulensis, E. loxophleba, E. salubris,* of which 31 were observed with confirmed hollows (Figure 3.3) (Phoenix, 2015). Assessment of these trees by Tony Kirkby confirmed eight as having hollows suitable for breeding by Carnaby's Black Cockatoo and four of these showed signs of use by the species:

- Hollows with evidence of use by Carnaby's Black Cockatoo:
    - HT0132 (449576E, 6629650N) – *Eucalyptus salmonophloia*, contained a hollow of suitable size, evidence of Carnaby's Black Cockatoo recorded, well-worn and chewed entrance to hollow
    - HT0378 (445560E, 6629607N) – *Eucalyptus salmonophloia*, contained a hollow of suitable size, evidence of Carnaby's Black Cockatoo recorded, wear and chewings at entrance to hollow
    - HT0136 (444819E, 6629618N) – *Eucalyptus salmonophloia*, contained a hollow of suitable size, evidence of Carnaby's Black Cockatoo recorded, wear and chewings at entrance to hollow
    - HT4948 (449471E, 6629670N) - *Eucalyptus salmonophloia*, contained a hollow of suitable size, evidence of Carnaby's Black Cockatoo recorded, wear and chewings at entrance to hollow
- Hollows suitable for use by Carnaby's Black Cockatoo:
    - HT0124 (451135E, 6629638N) – *Eucalyptus salmonophloia*, contained a hollow of suitable size, possibly occupied by Galahs observed in tree, no evidence of Carnaby's Black Cockatoo observed
    - HT0125 (451215E, 6629655N) – *Eucalyptus salmonophloia*, contained a hollow of suitable size, no evidence of Carnaby's Black Cockatoo observed
    - HT0167 (443973E, 6629598N) – *Eucalyptus salubris*, contained a hollow of suitable size, no evidence of Carnaby's Black Cockatoo observed

- HT0474 (437636E, 6624157N) – *Eucalyptus salmonophloia*, contained a hollow occupied by Long-billed Corella which also looks suitable for Carnaby's Black Cockatoo, no evidence of Carnaby's Black Cockatoo observed

Approximately 41 ha of suitable Carnaby's Black Cockatoo habitat was mapped within the Approval Boundary by Phoenix (2015). Foraging habitat was assessed as being of low value generally due to little understorey remaining and limited presence of food species. No evidence of roosting by Carnaby's Black Cockatoo was recorded within the Approval Boundary; however, tree species that Carnaby's Black Cockatoo is known to roost in were recorded (Phoenix, 2015).

3.3.4.2 Migratory Species

Five migratory species[3] were identified in the EPBC Protected Matters search (Appendix C) as potentially occurring within 1 km of the Approval Boundary (Table 3.6). None of these species were recorded during the 2014 and 2015 surveys by Phoenix (2015).

Table 3.6 : Listed Migratory Species Potentially Occurring in the Proposed Approval Boundary.

Common Name	Scientific Name	Likelihood of occurrence
Fork-tailed Swift	*Apus pacificus*	**Possible;** may frequent the area on occasion, particularly over woodland habitat, unlikely to land or nest within the proposed action area
Great Eastern Egret	*Ardea modesta*	**Possible;** may occur occasionally within samphire habitat, particularly following rainfall
Rainbow Bee-eater	*Merops ornatus*	**Possible;** may occasionally occur within the proposed action area, particularly woodland habitat
Cattle Egret	*Ardea ibis*	**Possible;** may occur occasionally within samphire habitat, particularly following rainfall
Australian Painted Snipe	*Rostratula australis*	**Unlikely;** no suitable habitat present in proposed action area.

[3] EPBC Act Migratory Marine species returned from the database searches have been excluded from the results as the area of the proposed action scale and proximity to the ocean indicate a very low likelihood of any in-direct impacts to habitat for marine species. They are therefore not discussed further within this report.

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Figure 3.3 : Carnaby's Black Cockatoo Habitat

(refer to Fig3-3_GNH-WP09-E-EA-GD-0018-A3.pdf Map 1 of 6)

(refer to Fig3-3_GNH-WP09-E-EA-GD-0018-A3.pdf Map 2 of 6)

(refer to Fig3-3_GNH-WP09-E-EA-GD-0018-A3.pdf Map 3 of 6)

(refer to Fig3-3_GNH-WP09-E-EA-GD-0018-A3.pdf Map 4 of 6)

(refer to Fig3-3_GNH-WP09-E-EA-GD-0018-A3.pdf Map 5 of 6)

(refer to Fig3-3_GNH-WP09-E-EA-GD-0018-A3.pdf Map 6 of 6)

4. Matters of National Environmental Significance Impact Assessment

4.1 Listed Threatened Species and Ecological Communities

The only listed threatened species or ecological community likely to occur in the proposed Approval Boundary for the proposed action is Carnaby's Black Cockatoo (EPBC Act - Endangered). The proposed action will impact upon suitable foraging and breeding habitat for this species.

A total of 127 potential breeding trees for Carnaby's Black Cockatoo were recorded within the Approval Boundary during the 2014 and 2015 surveys, of which, four contained hollows with evidence of use by Carnaby's Black Cockatoo and 4 contained hollows identified as suitable for use by Carnaby's Black Cockatoo (Phoenix, 2015). The proposed action is likely to result in the removal of up 20 potential breeding trees (>50cm diameter at breast height)Four trees out of the 20 identified to be cleared, do contain hollows however, these hollows have not been identified as suitable for use by Carnaby's Black Cockatoo (Phoenix, 2015). The four trees with evidence of use and the four with hollows suitable for use by Carnaby's Black Cockatoo will not be cleared as a result of the proposed action.

Approximately 15 ha of suitable habitat for Carnaby's Black Cockatoo will be cleared for the proposed action. The 2014 and 2015 surveys (Phoenix, 2015) identified approximately 41 ha of Carnaby's Black Cockatoo breeding and foraging habitat within the Approval Boundary. Inspection of recent aerial photography for the wider area suggests that approximately 5,355 ha of similar suitable habitat occurs within 10 km of the proposed action. Based on vegetation mapping undertaken by Beard (1980) and Shepherd et al. (2002), the regional vegetation consists of medium woodland of York gum and salmon gum, succulent steppe with woodland and thicket of York Gum over *Melaleuca thyoides* and samphire, and medium woodland of York gum and wandoo. Based on this assessment, the area of habitat impacted by the proposed action is approximately13% of that mapped by Phoenix (2015) in the local area and 0.28% of the potentially suitable vegetation present within 10 km of the proposed action.

In comparison with the proposed action, if upgrades and improvement works were undertaken along the existing alignment, up to 27 ha of suitable habitat and 109 potential breeding trees would be cleared, including seven trees containing hollows suitable for use by Carnaby's Black Cockatoo of which two show evidence of use. By constructing the proposed offline alignment as described in Section 2, the amount of Carnaby's Black Cockatoo habitat cleared (as a percentage of that mapped by Phoenix (2015)) has been reduced by approximately 10.5%. Additionally, there is a 72% reduction in the number of potential breeding trees removed, and a 100% reduction in the number of trees containing hollows suitable for, or showing evidence of, use or by Carnaby's Black Cockatoo removed.

BirdLife Australia has undertaken an assessment of the country to identify Important Bird and Biodiversity Area (IBAs). IBAs are sites of international importance for bird conservation. The proposed Approval Boundary for the action does not fall within any identified IBAs. The nearest IBAs to the proposed action are:

- Walebing: approximately 24 km south of the proposed action. This IBA is known to support 15 to 20 nesting sites for Carnaby's Black Cockatoo
- Moora: approximately 37 km south west of the proposed action. This IBA is known to support 50 to 60 nesting sites for Carnaby's Black Cockatoo
- Calingiri: approximately 51 km south of the proposed action. This IBA is known to support 10 to 20 nesting sites for Carnaby's Black Cockatoo.
- Gillingarra: approximately 51.5 km south west of the proposed action. This IBA is known to support 19 to 20 nesting sites for Carnaby's Black Cockatoo.

The initial stages of design took into consideration the location of potential breeding trees and avoided these where practicable. The location of all potential Carnaby's Black Cockatoo breeding trees is shown on Figure 3.3 The following management actions will be implemented during the proposed action:

- The four trees known to contain hollows and identified as used for breeding by Carnaby's Black Cockatoo will not be cleared. These trees will be identified as "no-go" zones in the Construction Environmental Management Plan (CEMP).
- Trees with hollows suitable for use by Carnaby's Black Cockatoo within the Approval Boundary will be inspected to determine if there are any cockatoos resident prior to clearing beginning in these areas. If resident Black Cockatoos are found, the Superintendent will determine an appropriate course of action.
- The area to be cleared will be accurately pegged/marked on the ground.
- Where practicable, additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around will be located in cleared paddocks.
- Weed and hygiene control measures will be in place during construction. These will include certifying all plant and machinery as clean prior to arrival at site.
- During construction, vehicle speed on site will be limited to reduce dust lift off and the risk of vehicle-fauna collisions. Water carts will also be utilised during construction to reduce dust lift off.
- It is considered unlikely that construction activities will result in injury or death to Carnaby's Black Cockatoo. Any birds injured or killed as a result of construction or rehabilitation/revegetation activities will be reported to the site environmental officer who shall determine the necessary steps to be taken, such as reporting deaths to the appropriate regulatory authorities or arranging for transfer of injured animals to wildlife carers.
- A list of local wildlife rescue organisations and carers will be maintained on site.

Table 4.1 provides an assessment of the impact of the proposed action on Carnaby's Black Cockatoo against the criteria set out in the Significance Impact Guidelines 1.1 while Table 4.2 provides the same assessment against the criteria set out in the EPBC Act Referral Guidelines for Three threatened Black Cockatoo Species. The results of the assessment indicate the proposed action is unlikely to have a significant impact on the species.

Table 4.1 : Assessment Against Significant Impact Guideline 1.1 – Criteria for Endangered Species

Criteria	Assessment
Will the action lead to a long-term decrease in the size of a population?	**Unlikely** No Carnaby's Black Cockatoos were directly recorded in the proposed action area during any of the field surveys. Although suitable breeding habitat for this species has been identified in the area of the proposed action. A total of four known hollow bearing trees will be cleared as a result of the proposed action. None of these showed evidence of use by Carnaby's Black Cockatoo and have not been identified as suitable for the species. In addition, 16 potential (non-hollow bearing) trees will be cleared. Approximately 5,355 ha of native vegetation suitable for Carnaby's Black Cockatoo is present within 10 km of the proposed action. As such, the species is unlikely to rely on the habitat proposed to be cleared (15 ha) for the proposed action. Known breeding areas are also located outside of the proposed Approval Boundary for the proposed action. There will be no direct or indirect impacts to these areas from the proposed action.

Criteria	Assessment
Will the action reduce the area of occupancy of the species?	**Unlikely** Clearing for the proposed action includes 15 ha of potential habitat for Carnaby's Black Cockatoo. It is estimated that approximately 5,355 ha of similar suitable habitat occurs within 10 km of the proposed action. The area of potential habitat occupied by the species will be reduced by approximately 0.28% from that available within 10 km of the proposed action and it is therefore unlikely to significantly reduce the occupancy of the species within the regional area.
Will the action fragment an existing population into two or more populations?	**Unlikely** Clearing for the proposed action will not result in the fragmentation of an existing Carnaby's Black Cockatoo population. The required clearing will not significantly increase the current footprint of the GNH and any additional gaps created are unlikely to be sufficient to impact the movement of bird fauna.
Will the action adversely affect habitat critical to the survival of a species?	**Unlikely** The vegetation proposed to be cleared has been identified as low value foraging habitat. Three IBAs are located between 16 and 43 km from the proposed action. It is estimated that approximately 5,355 ha of similar suitable habitat occurs within 10 km of the proposed action. Given the known breeding sites found at the IBAs in the region and the availability of habitat with 10 km of the proposed action, the habitat to be cleared is not considered critical to the survival of the species.
Will the action disrupt the breeding cycle of a population?	**Unlikely** No hollow bearing trees that show evidence of use by Carnaby's Black Cockatoo are proposed to be cleared. Prior to clearing, hollow bearing trees close to construction woks will be inspected to determine if there are any cockatoos resident Approximately 5,355 ha of potentially suitable habitat occurs within a 10 km radius of the proposed action. As far as practicable, clearing activities near hollow bearing trees identified as suitable for or used by Carnaby's Black Cockatoo will occur outside of the known breeding season. Known breeding sites occur between 16 and 43 km from the proposed action. The proposed action is not likely to impact on Carnaby's Black Cockatoo breeding cycle within the locality.
Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is \likely to decline?	**Unlikely** Suitable habitat for Carnaby's Black Cockatoo was assessed by Phoenix (2015) as low quality. Clearing of 15 ha of low quality habitat is unlikely to result in species decline, particularly given approximately 5,355 ha of additional potentially suitable habitat is found within 10 km of the proposed action.

Criteria	Assessment
Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?	**Unlikely** Weed and hygiene control measures will be in place during construction including all plant and machinery to be certified clean prior to arrival at site and segregation of topsoil according to weed/disease status. Construction of the proposed action is unlikely to increase the threat of weeds being spread within or introduced to the proposed Approval Boundary for the action.
Will the action introduce disease that may cause the species to decline?	**Unlikely** *Phytophthora* dieback is not known to occur in the proposed Approval Boundary for the proposed action. Weed and hygiene control measures will be in place during construction including all plant and machinery to be certified clean prior to arrival at site and segregation of topsoil according to weed/disease status. Construction of the proposed action is unlikely to increase the threat of *Phytophthora* dieback being introduced to the proposed Approval Boundary for the action.
Will the action interfere with the recovery of the species?	**Unlikely** The proposed clearing of 15 ha of suitable breeding and foraging habitat is not likely to impact on the recovery of the species due to the presence of a large amount of similar habitat within 10 km and IBAs within 16 and 43 km of the proposed action. Clearing will not remove any hollow bearing trees that show evidence of use by or are suitable for Carnaby's Black Cockatoo and will be undertaken outside of the known breeding season as far as practicable.

Table 4.2 : Assessment Against Referral Guidelines for Black Cockatoos

Criteria	Assessment
High Risk of Significant Impact	
Clearing of any known nesting tree.	**Significant Impact Unlikely** No known nesting trees will be cleared. Known nesting trees close to the construction area will be identified as No Go zones and appropriately marked in the field to avoid accidental clearing or disturbance.
Clearing or degradation of any part of a vegetation community known to contain breeding habitat	**Significant Impact Possible but Unlikely** Approximately 15 ha of potential breeding and foraging habitat will be cleared. However, as noted above, it is estimated that approximately 5,355 ha of similar suitable habitat occurs within 10 km of the proposed action with several of these patches in the order of 300 to 500 ha in size. The largest intact patch of vegetation along the proposed alignment is approximately 68 ha in area. The area of potential breeding habitat occupied by the species will be reduced by approximately 0.28% from that available within 10 km of the proposed action.
Clearing of more than 1 ha of quality foraging habitat.	**Significant Impact Unlikely** An assessment of the quality of the vegetation in relation to foraging habitat for Black Cockatoo was undertaken by Tony Kirby in 2015 (Phoenix, 2015). This assessment determined that the habitat present was degraded and did not represent quality foraging habitat.

Criteria	Assessment
Clearing or degradation (including pruning the top canopy) of a known night roosting site.	**Significant Impact Unlikely** No known night roosts occur within the Approval Boundary for the proposed action.
Creating a gap of greater than 4 km between patches of black cockatoo habitat (breeding, foraging or roosting).	**Significant Impact Unlikely** Clearing will not create a gap of greater than 4 km.
Uncertainty of Impact	
Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat.	**Significant Impact Unlikely** The assessment undertaken by Tony Kirkby in 2015 (Phoenix, 2015) determined foraging habitat present was of low quality, the proposed action is unlikely to increase the level of degradation in relation to Black Cockatoo foraging habitat.
Clearing or disturbance in areas surrounding black cockatoo breeding, foraging or night roosting habitat that has the potential to degrade habitat through introduction of invasive species, edge effects, hydrological changes, increased human visitation or fire.	**Significant Impact Unlikely** The assessment undertaken by Tony Kirkby in 2015 (Phoenix, 2015) determined that the habitat present within the application area was of low quality. As such, the proposed action is unlikely to increase the level of degradation in relation to Black Cockatoo habitat. Weed and hygiene control measures will be in place during construction and drainage will be designed to reduce the risk of scouring or erosion.
Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows.	**Significant Impact Unlikely** As only a small number of hollow bearing trees will be cleared (none of which have been assessed as suitable for or used by Carnaby's Black Cockatoo), no permanent water sources will be created, and there will be a negligible change to the overall landscape character, the proposed action is considered unlikely to result in the introduction of or increase in competitors for nest hollows.
Actions with the potential to introduce known plant diseases such as *Phytophthora* spp. to an area where the pathogen was not previously known.	**Significant Impact Unlikely** The proposed action is located outside of the area where *Phytophthora* dieback is known to occur. Weed and hygiene control measures will be in place during construction.

4.2 Listed Migratory Species

There is the potential for terrestrial migratory bird species such as the Fork-tailed Swift (*Apus pacificus)* and the Rainbow Bee-eater (*Merops ornatus*) to transit the area. The Great Eastern Egret (*Ardea modesta*) and Cattle Egret (*Ardea ibis*) may occur in the samphire habitats following rainfall.

The Fork-tailed Swift is almost exclusively aerial and found to occur in the majority of Australia over inland plains however; this species does not breed in Australia (DoE, 2015a). The species may potentially fly over the proposed action area however, it is unlikely that this species will utilise habitat within the proposed Approval Boundary and any impacts will be negligible.

The Rainbow Bee-eater is one of the most common and widespread birds in Australia and is found to inhabit the majority of Australia (DoE, 2015b). The species may utilise habitat within the proposed action area however, any impacts are expected to be minor due to the limited amount of disturbance to preferred habitat required and presence of additional habitat within the local area.

Both the Great Eastern Egret and Cattle Egret are known to use a variety of habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands, salt pans and salt lakes; salt marshes; estuarine mudflats, and temperate grasslands (DoE, 2015c, d). These species may inhabit the samphire habitats following rainfall, however they would be intermittent visitors rather than permanent residents of the area.

Table 4.3 provides an assessment of the impact of the proposed action on Migratory species against the criteria set out in the Significance Impact Guidelines 1.1. The results of the assessment indicate that the proposed action will not have a significant impact on the species.

Table 4.3 : Assessment Against Significant Impact Criteria for Migratory Species

Criteria	Assessment
Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species?	**Unlikely** None of the listed migratory species were directly recorded in the proposed action area during the field surveys. These species would most likely occur as vagrants or transients through the proposed action area and as such, significant impacts are not expected. Habitat within the proposed action area is not considered important habitat for migratory species.
Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?	**Unlikely** It is considered unlikely that the Approval Boundary represents important habitat for migratory species as it is of low quality in terms of value for fauna populations, does not fall within any identified IBAs and all species are widely distributed. Weed and hygiene control measures will be in place during construction including all plant and machinery to be certified clean prior to arrival at site and segregation of topsoil according to weed/disease status. Construction of the proposed action is unlikely to increase the threat of weeds being spread within or introduced to the proposed Approval Boundary for the action.
Will the action seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species?	**Unlikely** The migratory species identified as possibly occurring within the proposed action area are all widely distributed across Australia. Given habitats in the proposed Approval Boundary are of low quality in terms of value for fauna populations, that small area of disturbance required and the presence of additional habitat in the vicinity, the proposed action is unlikely to disrupt the lifecycle of these species.

5. Conclusions

Based on the assessment presented within this document and the referral form, the proposed action is unlikely to result in significant impacts to MNES, namely Listed Threatened Species and Ecological Communities and Listed Migratory Species.

The only listed threatened species likely to occur in or near to the proposed Approval Boundary for the proposed action is Carnaby's Black Cockatoo. The proposed action will impact upon suitable foraging and breeding habitat for this species.

It is estimated that 15 ha of foraging and breeding habitat and 20 potential breeding trees for Carnaby's Black Cockatoo will be cleared for the proposed action. No hollow bearing trees assessed as suitable for or used by Carnaby's Black Cockatoo will be cleared. Examination of recent aerial photography indicates that approximately 5,355 ha of potentially suitable habitat for Carnaby's Black Cockatoo exist within 10 km of the proposed action. The clearing required represents approximately 0.28% of this identified habitat. In addition, areas identified by Birdlife Australia as IBAs, which contain known nesting sites for Carnaby's Black Cockatoo, occur between 24 and 51.5 km from the proposed action. These areas are likely to have a higher importance for the survival and recovery of the species than the area of the proposed action.

Assessment of the impact of the proposed action on Carnaby's Black Cockatoo against the criteria set out in the Significance Impact Guidelines 1.1 and the EPBC Act Referral Guidelines for Three threatened Black Cockatoo Species indicates the proposed action is unlikely to have a significant impact on the species.

There is the potential for terrestrial migratory bird species such as the Fork-tailed Swift (*Apus pacificus)* and the Rainbow Bee-eater (*Merops ornatus*) to transit the area. The Great Eastern Egret (*Ardea modesta*) and Cattle Egret (*Ardea ibis*) may occur in the samphire habitats following rainfall. Assessment against the criteria set out in the Significance Impact Guidelines 1.1 indicates that the proposed action will not have a significant impact on these species.

All activities associated with the proposed action will be managed in accordance with the Construction Environmental Management Plan, which will include the management measures outline in Section 4.1.

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Appendix A. Approval Boundary Coordinates

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Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
1	-30	28	26.617	116	22	34.73
2	-30	28	30.81	116	22	26.263
3	-30	28	32.837	116	22	22.838
4	-30	28	33.375	116	22	21.929
5	-30	28	39.123	116	22	15.187
6	-30	28	37.285	116	22	13.342
7	-30	28	33.716	116	22	19.7
8	-30	28	31.124	116	22	23.178
9	-30	28	30.22	116	22	24.39
10	-30	28	30.067	116	22	24.596
11	-30	28	30.016	116	22	24.628
12	-30	28	29.845	116	22	24.756
13	-30	28	29.689	116	22	24.907
14	-30	28	29.551	116	22	25.08
15	-30	28	29.433	116	22	25.271
16	-30	28	29.336	116	22	25.478
17	-30	28	29.276	116	22	25.656
18	-30	28	28.949	116	22	26.095
19	-30	28	26.547	116	22	29.317
20	-30	28	24.816	116	22	30.952
21	-30	28	22.75	116	22	32.905
22	-30	28	22.475	116	22	33.164
23	-30	28	16.66	116	22	38.658
24	-30	28	14.835	116	22	40.382
25	-30	28	6.661	116	22	48.104
26	-30	28	3.122	116	22	51.447
27	-30	27	58.945	116	22	55.393
28	-30	27	58.837	116	22	55.253
29	-30	27	58.69	116	22	55.103
30	-30	27	58.529	116	22	54.974
31	-30	27	58.355	116	22	54.869
32	-30	27	58.172	116	22	54.789
33	-30	27	57.981	116	22	54.735
34	-30	27	57.787	116	22	54.708
35	-30	27	57.59	116	22	54.708
36	-30	27	52.929	116	22	55.038
37	-30	27	52.759	116	22	55.06
38	-30	27	52.591	116	22	55.104
39	-30	27	52.428	116	22	55.167
40	-30	27	52.272	116	22	55.25
41	-30	27	52.124	116	22	55.352

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
42	-30	27	47.14	116	22	59.212
43	-30	27	41.068	116	23	0.663
44	-30	27	40.871	116	23	0.725
45	-30	27	40.683	116	23	0.815
46	-30	27	40.506	116	23	0.931
47	-30	27	40.342	116	23	1.073
48	-30	27	40.196	116	23	1.236
49	-30	27	40.069	116	23	1.42
50	-30	27	39.962	116	23	1.621
51	-30	27	39.878	116	23	1.835
52	-30	27	39.818	116	23	2.06
53	-30	27	39.783	116	23	2.292
54	-30	27	39.773	116	23	2.527
55	-30	27	39.789	116	23	2.762
56	-30	27	39.807	116	23	2.863
57	-30	27	39.802	116	23	2.891
58	-30	27	39.785	116	23	3.012
59	-30	27	39.775	116	23	3.135
60	-30	27	39.771	116	23	3.257
61	-30	27	39.775	116	23	3.38
62	-30	27	39.786	116	23	3.502
63	-30	27	39.804	116	23	3.623
64	-30	27	39.828	116	23	3.742
65	-30	27	39.859	116	23	3.859
66	-30	27	39.897	116	23	3.974
67	-30	27	39.941	116	23	4.085
68	-30	27	39.991	116	23	4.193
69	-30	27	40.048	116	23	4.297
70	-30	27	40.11	116	23	4.397
71	-30	27	40.177	116	23	4.492
72	-30	27	40.25	116	23	4.581
73	-30	27	40.328	116	23	4.664
74	-30	27	40.41	116	23	4.742
75	-30	27	40.497	116	23	4.813
76	-30	27	40.587	116	23	4.878
77	-30	27	40.681	116	23	4.935
78	-30	27	40.778	116	23	4.985
79	-30	27	40.877	116	23	5.028
80	-30	27	40.979	116	23	5.064
81	-30	27	41.083	116	23	5.091
82	-30	27	41.174	116	23	5.109

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
83	-30	27	43.411	116	23	5.464
84	-30	27	43.425	116	23	5.466
85	-30	27	43.531	116	23	5.478
86	-30	27	43.637	116	23	5.481
87	-30	27	43.743	116	23	5.477
88	-30	27	43.781	116	23	5.473
89	-30	27	47.06	116	23	5.125
90	-30	27	47.127	116	23	5.116
91	-30	27	47.232	116	23	5.096
92	-30	27	47.335	116	23	5.068
93	-30	27	47.437	116	23	5.032
94	-30	27	47.536	116	23	4.989
95	-30	27	47.633	116	23	4.938
96	-30	27	47.727	116	23	4.879
97	-30	27	47.817	116	23	4.814
98	-30	27	47.903	116	23	4.743
99	-30	27	47.985	116	23	4.665
100	-30	27	48.062	116	23	4.581
101	-30	27	48.135	116	23	4.491
102	-30	27	48.202	116	23	4.396
103	-30	27	48.263	116	23	4.296
104	-30	27	48.319	116	23	4.192
105	-30	27	48.369	116	23	4.083
106	-30	27	48.413	116	23	3.971
107	-30	27	48.45	116	23	3.856
108	-30	27	48.48	116	23	3.739
109	-30	27	48.504	116	23	3.619
110	-30	27	48.521	116	23	3.498
111	-30	27	48.531	116	23	3.376
112	-30	27	48.534	116	23	3.261
113	-30	27	51.41	116	23	3.265
114	-30	27	51.413	116	23	19.642
115	-30	27	51.413	116	23	20.184
116	-30	27	51.414	116	23	25.632
117	-30	27	51.416	116	23	37.104
118	-30	27	51.418	116	23	54.023
119	-30	27	51.418	116	23	57.74
120	-30	27	51.418	116	23	58.136
121	-30	27	51.419	116	24	10.943
122	-30	27	51.42	116	24	19.771
123	-30	27	51.42	116	24	24.718

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
124	-30	27	51.42	116	24	25.402
125	-30	27	51.42	116	24	35.421
126	-30	27	51.314	116	24	35.425
127	-30	27	51.208	116	24	35.437
128	-30	27	51.104	116	24	35.458
129	-30	27	51	116	24	35.486
130	-30	27	50.899	116	24	35.522
131	-30	27	50.799	116	24	35.565
132	-30	27	50.703	116	24	35.616
133	-30	27	50.609	116	24	35.674
134	-30	27	50.519	116	24	35.739
135	-30	27	50.433	116	24	35.811
136	-30	27	50.357	116	24	35.882
137	-30	27	50.204	116	24	36.037
138	-30	27	49.12	116	24	36.134
139	-30	27	49.03	116	24	36.145
140	-30	27	48.925	116	24	36.166
141	-30	27	48.822	116	24	36.194
142	-30	27	48.72	116	24	36.23
143	-30	27	48.621	116	24	36.273
144	-30	27	48.524	116	24	36.324
145	-30	27	48.431	116	24	36.382
146	-30	27	48.341	116	24	36.447
147	-30	27	48.255	116	24	36.519
148	-30	27	48.173	116	24	36.597
149	-30	27	48.095	116	24	36.681
150	-30	27	48.023	116	24	36.771
151	-30	27	47.956	116	24	36.866
152	-30	27	47.894	116	24	36.966
153	-30	27	47.838	116	24	37.07
154	-30	27	47.788	116	24	37.178
155	-30	27	47.745	116	24	37.29
156	-30	27	47.708	116	24	37.405
157	-30	27	47.677	116	24	37.523
158	-30	27	47.653	116	24	37.642
159	-30	27	47.636	116	24	37.763
160	-30	27	47.626	116	24	37.885
161	-30	27	47.623	116	24	38.008
162	-30	27	47.626	116	24	38.13
163	-30	27	47.629	116	24	38.165
164	-30	27	47.601	116	24	38.274

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
165	-30	27	47.577	116	24	38.393
166	-30	27	47.56	116	24	38.514
167	-30	27	47.55	116	24	38.637
168	-30	27	47.547	116	24	38.759
169	-30	27	47.551	116	24	38.882
170	-30	27	47.561	116	24	39.004
171	-30	27	47.579	116	24	39.125
172	-30	27	47.603	116	24	39.244
173	-30	27	47.634	116	24	39.361
174	-30	27	47.672	116	24	39.476
175	-30	27	47.716	116	24	39.588
176	-30	27	47.766	116	24	39.696
177	-30	27	47.823	116	24	39.8
178	-30	27	47.885	116	24	39.899
179	-30	27	47.952	116	24	39.994
180	-30	27	48.025	116	24	40.083
181	-30	27	48.103	116	24	40.167
182	-30	27	48.185	116	24	40.244
183	-30	27	48.272	116	24	40.315
184	-30	27	48.362	116	24	40.38
185	-30	27	48.456	116	24	40.437
186	-30	27	48.51	116	24	40.466
187	-30	27	49.952	116	24	41.208
188	-30	27	50.215	116	24	41.547
189	-30	27	50.279	116	24	41.625
190	-30	27	50.357	116	24	41.709
191	-30	27	50.439	116	24	41.786
192	-30	27	50.526	116	24	41.858
193	-30	27	50.616	116	24	41.922
194	-30	27	50.71	116	24	41.98
195	-30	27	50.807	116	24	42.03
196	-30	27	50.907	116	24	42.073
197	-30	27	51.008	116	24	42.108
198	-30	27	51.112	116	24	42.136
199	-30	27	51.217	116	24	42.155
200	-30	27	51.322	116	24	42.167
201	-30	27	51.42	116	24	42.171
202	-30	27	51.421	116	24	46.872
203	-30	27	51.422	116	24	55.288
204	-30	27	51.423	116	24	57.843
205	-30	27	51.425	116	25	16.424

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
206	-30	27	51.425	116	25	17.358
207	-30	27	51.425	116	25	25.768
208	-30	27	51.426	116	25	35.005
209	-30	27	51.426	116	25	42.397
210	-30	27	51.426	116	25	52.308
211	-30	27	51.426	116	25	54.78
212	-30	27	51.426	116	26	9.612
213	-30	27	51.426	116	26	11.499
214	-30	27	51.426	116	26	21.054
215	-30	27	51.426	116	26	25.796
216	-30	27	51.232	116	26	25.809
217	-30	27	51.032	116	26	25.852
218	-30	27	50.838	116	26	25.923
219	-30	27	50.653	116	26	26.022
220	-30	27	50.48	116	26	26.147
221	-30	27	50.323	116	26	26.295
222	-30	27	50.182	116	26	26.465
223	-30	27	50.062	116	26	26.655
224	-30	27	49.962	116	26	26.86
225	-30	27	49.886	116	26	27.078
226	-30	27	49.834	116	26	27.305
227	-30	27	49.807	116	26	27.538
228	-30	27	49.145	116	26	38.402
229	-30	27	49.141	116	26	38.523
230	-30	27	49.126	116	27	7.234
231	-30	27	49.097	116	27	7.283
232	-30	27	45.865	116	27	8.678
233	-30	27	45.679	116	27	8.775
234	-30	27	45.505	116	27	8.897
235	-30	27	45.345	116	27	9.043
236	-30	27	45.203	116	27	9.212
237	-30	27	45.08	116	27	9.4
238	-30	27	44.978	116	27	9.604
239	-30	27	44.937	116	27	9.718
240	-30	27	44.835	116	27	9.814
241	-30	27	44.695	116	27	9.985
242	-30	27	44.574	116	27	10.174
243	-30	27	44.475	116	27	10.379
244	-30	27	44.399	116	27	10.597
245	-30	27	44.347	116	27	10.824
246	-30	27	44.32	116	27	11.057

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
247	-30	27	44.319	116	27	11.292
248	-30	27	44.343	116	27	11.525
249	-30	27	44.392	116	27	11.753
250	-30	27	44.465	116	27	11.972
251	-30	27	44.562	116	27	12.179
252	-30	27	44.68	116	27	12.37
253	-30	27	44.818	116	27	12.543
254	-30	27	44.974	116	27	12.694
255	-30	27	45.145	116	27	12.822
256	-30	27	46.172	116	27	13.487
257	-30	27	46.327	116	27	13.574
258	-30	27	46.489	116	27	13.642
259	-30	27	46.656	116	27	13.689
260	-30	27	46.827	116	27	13.716
261	-30	27	49.123	116	27	13.932
262	-30	27	49.112	116	27	58.65
263	-30	27	49.113	116	27	58.669
264	-30	27	49.112	116	27	58.688
265	-30	27	49.496	116	28	20.964
266	-30	27	49.498	116	28	21.021
267	-30	27	49.777	116	28	27.438
268	-30	27	49.8	116	28	27.673
269	-30	27	49.848	116	28	27.903
270	-30	27	49.922	116	28	28.123
271	-30	27	50.018	116	28	28.332
272	-30	27	50.137	116	28	28.525
273	-30	27	50.276	116	28	28.699
274	-30	27	50.433	116	28	28.851
275	-30	27	50.605	116	28	28.979
276	-30	27	50.79	116	28	29.082
277	-30	27	50.984	116	28	29.156
278	-30	27	51.185	116	28	29.202
279	-30	27	51.389	116	28	29.218
280	-30	27	51.397	116	28	29.218
281	-30	27	51.395	116	28	36.368
282	-30	27	51.389	116	28	49.258
283	-30	27	51.26	116	28	49.197
284	-30	27	51.063	116	28	49.136
285	-30	27	50.861	116	28	49.103
286	-30	27	50.657	116	28	49.1
287	-30	27	50.455	116	28	49.127

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
288	-30	27	50.257	116	28	49.182
289	-30	27	50.066	116	28	49.266
290	-30	27	49.886	116	28	49.377
291	-30	27	49.72	116	28	49.513
292	-30	27	49.569	116	28	49.672
293	-30	27	49.438	116	28	49.851
294	-30	27	49.326	116	28	50.049
295	-30	27	49.237	116	28	50.26
296	-30	27	49.172	116	28	50.483
297	-30	27	49.131	116	28	50.714
298	-30	27	48.196	116	28	58.471
299	-30	27	48.183	116	28	58.615
300	-30	27	48.18	116	28	58.723
301	-30	27	48.147	116	29	9.654
302	-30	27	48.15	116	29	9.782
303	-30	27	48.163	116	29	9.925
304	-30	27	49.117	116	29	17.668
305	-30	27	49.156	116	29	17.889
306	-30	27	49.218	116	29	18.103
307	-30	27	49.302	116	29	18.307
308	-30	27	49.406	116	29	18.498
309	-30	27	49.53	116	29	18.673
310	-30	27	49.67	116	29	18.83
311	-30	27	49.827	116	29	18.966
312	-30	27	49.996	116	29	19.079
313	-30	27	50.176	116	29	19.168
314	-30	27	50.364	116	29	19.231
315	-30	27	50.557	116	29	19.268
316	-30	27	50.724	116	29	19.276
317	-30	27	50.719	116	29	28.455
318	-30	27	50.717	116	29	31.325
319	-30	27	50.714	116	29	37.799
320	-30	27	50.714	116	29	37.824
321	-30	27	50.71	116	29	44.144
322	-30	27	50.708	116	29	47.194
323	-30	27	50.702	116	29	56.563
324	-30	27	50.696	116	30	5.933
325	-30	27	50.693	116	30	10.445
326	-30	27	50.368	116	30	10.819
327	-30	27	50.367	116	30	11.574
328	-30	27	50.691	116	30	11.949

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
329	-30	27	50.688	116	30	15.881
330	-30	27	50.684	116	30	21.322
331	-30	27	50.677	116	30	28.874
332	-30	27	50.676	116	30	30.695
333	-30	27	50.668	116	30	40.068
334	-30	27	50.664	116	30	44.266
335	-30	27	50.623	116	30	44.264
336	-30	27	50.42	116	30	44.284
337	-30	27	50.22	116	30	44.334
338	-30	27	50.028	116	30	44.411
339	-30	27	49.845	116	30	44.516
340	-30	27	49.675	116	30	44.646
341	-30	27	49.521	116	30	44.8
342	-30	27	49.385	116	30	44.976
343	-30	27	49.269	116	30	45.169
344	-30	27	49.175	116	30	45.378
345	-30	27	49.104	116	30	45.598
346	-30	27	49.057	116	30	45.828
347	-30	27	49.036	116	30	46.062
348	-30	27	48.346	116	31	5.55
349	-30	27	48.345	116	31	5.592
350	-30	27	48.1	116	31	21.202
351	-30	27	48.1	116	31	21.239
352	-30	27	48.2	116	32	41.322
353	-30	27	46.843	116	32	41.663
354	-30	27	46.646	116	32	41.727
355	-30	27	46.459	116	32	41.82
356	-30	27	46.283	116	32	41.938
357	-30	27	46.121	116	32	42.081
358	-30	27	45.976	116	32	42.247
359	-30	27	45.85	116	32	42.432
360	-30	27	45.745	116	32	42.634
361	-30	27	45.663	116	32	42.849
362	-30	27	45.605	116	32	43.075
363	-30	27	45.572	116	32	43.307
364	-30	27	45.564	116	32	43.543
365	-30	27	45.583	116	32	43.777
366	-30	27	45.622	116	32	43.986
367	-30	27	45.612	116	32	44.052
368	-30	27	45.603	116	32	44.287
369	-30	27	45.62	116	32	44.522

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
370	-30	27	45.663	116	32	44.752
371	-30	27	45.73	116	32	44.975
372	-30	27	45.82	116	32	45.185
373	-30	27	45.933	116	32	45.381
374	-30	27	46.066	116	32	45.56
375	-30	27	46.218	116	32	45.717
376	-30	27	46.385	116	32	45.852
377	-30	27	46.566	116	32	45.961
378	-30	27	46.757	116	32	46.043
379	-30	27	46.955	116	32	46.097
380	-30	27	48.194	116	32	46.339
381	-30	27	48.024	116	33	8.076
382	-30	27	48.024	116	33	8.098
383	-30	27	48.111	116	33	49.212
384	-30	27	48.094	116	34	57.341
385	-30	27	47.854	116	34	57.401
386	-30	27	47.657	116	34	57.465
387	-30	27	47.47	116	34	57.557
388	-30	27	47.294	116	34	57.676
389	-30	27	47.132	116	34	57.819
390	-30	27	46.987	116	34	57.984
391	-30	27	46.861	116	34	58.169
392	-30	27	46.756	116	34	58.371
393	-30	27	46.674	116	34	58.587
394	-30	27	46.616	116	34	58.812
395	-30	27	46.583	116	34	59.045
396	-30	27	46.575	116	34	59.28
397	-30	27	46.593	116	34	59.514
398	-30	27	46.61	116	34	59.604
399	-30	27	46.59	116	34	59.709
400	-30	27	46.573	116	34	59.943
401	-30	27	46.581	116	35	0.178
402	-30	27	46.614	116	35	0.41
403	-30	27	46.673	116	35	0.636
404	-30	27	46.755	116	35	0.851
405	-30	27	46.861	116	35	1.053
406	-30	27	46.987	116	35	1.238
407	-30	27	47.132	116	35	1.403
408	-30	27	47.295	116	35	1.545
409	-30	27	47.471	116	35	1.663
410	-30	27	47.659	116	35	1.755

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
411	-30	27	47.855	116	35	1.819
412	-30	27	48.087	116	35	1.877
413	-30	27	48.037	116	35	35.419
414	-30	27	48.042	116	35	35.579
415	-30	27	48.06	116	35	35.739
416	-30	27	48.089	116	35	35.896
417	-30	27	49.878	116	35	43.799
418	-30	27	49.906	116	35	43.906
419	-30	27	49.959	116	35	44.069
420	-30	27	51.469	116	35	48.103
421	-30	27	52.959	116	35	47.36
422	-30	27	54.462	116	35	46.65
423	-30	27	54.798	116	35	46.491
424	-30	27	53.324	116	35	42.566
425	-30	27	52.239	116	35	37.814
426	-30	27	51.642	116	35	32.853
427	-30	27	51.666	116	35	16.41
428	-30	27	51.69	116	34	59.967
429	-30	27	51.691	116	34	59.213
430	-30	27	51.692	116	34	58.31
431	-30	27	51.701	116	34	51.664
432	-30	27	51.716	116	34	40.655
433	-30	27	51.741	116	34	22.097
434	-30	27	51.75	116	34	15.15
435	-30	27	51.765	116	34	3.54
436	-30	27	51.776	116	33	55.008
437	-30	27	51.776	116	33	54.909
438	-30	27	51.788	116	33	44.982
439	-30	27	51.804	116	33	31.988
440	-30	27	51.811	116	33	26.424
441	-30	27	51.823	116	33	16.372
442	-30	27	51.824	116	33	15.14
443	-30	27	51.833	116	33	7.867
444	-30	27	51.833	116	33	7.113
445	-30	27	51.85	116	32	52.127
446	-30	27	51.853	116	32	49.066
447	-30	27	51.861	116	32	41.405
448	-30	27	51.866	116	32	37.14
449	-30	27	51.884	116	32	19.703
450	-30	27	51.884	116	32	19.258
451	-30	27	51.888	116	32	15.488

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
452	-30	27	51.888	116	32	15.21
453	-30	27	51.901	116	32	2.266
454	-30	27	51.916	116	31	46.675
455	-30	27	51.917	116	31	44.829
456	-30	27	51.921	116	31	40.998
457	-30	27	51.933	116	31	27.77
458	-30	27	52.126	116	31	27.757
459	-30	27	52.324	116	31	27.714
460	-30	27	52.516	116	31	27.644
461	-30	27	52.698	116	31	27.546
462	-30	27	52.869	116	31	27.424
463	-30	27	53.026	116	31	27.278
464	-30	27	53.165	116	31	27.111
465	-30	27	53.286	116	31	26.925
466	-30	27	53.386	116	31	26.723
467	-30	27	53.463	116	31	26.509
468	-30	27	53.517	116	31	26.285
469	-30	27	54.868	116	31	18.934
470	-30	27	54.894	116	31	18.743
471	-30	27	54.903	116	31	18.55
472	-30	27	54.93	116	31	6.971
473	-30	27	54.922	116	31	6.775
474	-30	27	54.896	116	31	6.58
475	-30	27	54.852	116	31	6.39
476	-30	27	54.791	116	31	6.206
477	-30	27	54.714	116	31	6.031
478	-30	27	53.91	116	31	4.421
479	-30	27	54.257	116	30	54.634
480	-30	27	55.272	116	30	54.465
481	-30	27	55.447	116	30	54.425
482	-30	27	55.545	116	30	54.391
483	-30	27	56.347	116	30	54.088
484	-30	27	56.537	116	30	54.001
485	-30	27	56.715	116	30	53.887
486	-30	27	56.88	116	30	53.749
487	-30	27	57.028	116	30	53.587
488	-30	27	57.158	116	30	53.405
489	-30	27	57.267	116	30	53.206
490	-30	27	57.353	116	30	52.993
491	-30	27	57.416	116	30	52.769
492	-30	27	57.454	116	30	52.538

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
493	-30	27	57.466	116	30	52.303
494	-30	27	57.453	116	30	52.068
495	-30	27	57.43	116	30	51.932
496	-30	27	57.451	116	30	51.812
497	-30	27	57.466	116	30	51.578
498	-30	27	57.456	116	30	51.342
499	-30	27	57.421	116	30	51.111
500	-30	27	57.36	116	30	50.886
501	-30	27	57.276	116	30	50.672
502	-30	27	57.169	116	30	50.471
503	-30	27	57.041	116	30	50.288
504	-30	27	56.894	116	30	50.125
505	-30	27	56.731	116	30	49.984
506	-30	27	56.553	116	30	49.868
507	-30	27	55.754	116	30	49.418
508	-30	27	55.577	116	30	49.334
509	-30	27	55.393	116	30	49.273
510	-30	27	55.204	116	30	49.239
511	-30	27	54.47	116	30	49.154
512	-30	27	55.024	116	30	37.073
513	-30	27	55.026	116	30	36.985
514	-30	27	55.087	116	30	24.181
515	-30	27	55.231	116	29	31.662
516	-30	27	55.158	116	29	21.106
517	-30	27	55.143	116	29	20.871
518	-30	27	55.124	116	29	20.758
519	-30	27	55.148	116	29	20.619
520	-30	27	55.163	116	29	20.384
521	-30	27	55.319	116	29	0.916
522	-30	27	55.319	116	29	0.886
523	-30	27	55.159	116	28	34.121
524	-30	27	55.158	116	28	34.057
525	-30	27	54.689	116	28	20.791
526	-30	27	54.525	116	28	11.245
527	-30	27	54.396	116	27	59.876
528	-30	27	54.309	116	27	52.392
529	-30	27	54.315	116	27	29.341
530	-30	27	54.33	116	27	21.843
531	-30	27	54.326	116	27	17.836
532	-30	27	54.418	116	27	10.354
533	-30	27	54.418	116	27	10.3

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
534	-30	27	54.324	116	27	2.817
535	-30	27	54.337	116	26	38.696
536	-30	27	55.316	116	26	27.095
537	-30	27	55.32	116	26	27.026
538	-30	27	55.323	116	26	26.914
539	-30	27	55.341	116	25	12.044
540	-30	27	55.492	116	25	11.714
541	-30	27	55.576	116	25	11.499
542	-30	27	55.636	116	25	11.274
543	-30	27	55.671	116	25	11.043
544	-30	27	55.68	116	25	10.808
545	-30	27	55.664	116	25	10.573
546	-30	27	55.645	116	25	10.467
547	-30	27	55.672	116	25	10.272
548	-30	27	55.681	116	25	10.052
549	-30	27	55.666	116	25	9.833
550	-30	27	55.63	116	25	9.617
551	-30	27	55.572	116	25	9.407
552	-30	27	55.493	116	25	9.207
553	-30	27	55.339	116	25	8.872
554	-30	27	55.443	116	24	53.463
555	-30	27	55.443	116	24	53.458
556	-30	27	55.443	116	24	53.452
557	-30	27	55.494	116	24	20.201
558	-30	27	55.32	116	23	31.287
559	-30	27	55.303	116	23	24.262
560	-30	27	56.36	116	23	16.448
561	-30	27	58.06	116	23	10.134
562	-30	28	3.351	116	23	9.478
563	-30	28	3.517	116	23	9.448
564	-30	28	3.679	116	23	9.398
565	-30	28	3.836	116	23	9.328
566	-30	28	3.986	116	23	9.24
567	-30	28	8.654	116	23	6.146
568	-30	28	14.045	116	23	5.143
569	-30	28	14.243	116	23	5.091
570	-30	28	14.435	116	23	5.011
571	-30	28	14.616	116	23	4.904
572	-30	28	14.785	116	23	4.771
573	-30	28	14.937	116	23	4.615
574	-30	28	15.072	116	23	4.438

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
575	-30	28	15.186	116	23	4.243
576	-30	28	15.278	116	23	4.033
577	-30	28	15.347	116	23	3.811
578	-30	28	15.391	116	23	3.581
579	-30	28	15.409	116	23	3.347
580	-30	28	15.402	116	23	3.111
581	-30	28	15.376	116	23	2.923
582	-30	28	15.381	116	23	2.899
583	-30	28	15.398	116	23	2.778
584	-30	28	15.408	116	23	2.656
585	-30	28	15.411	116	23	2.533
586	-30	28	15.407	116	23	2.411
587	-30	28	15.396	116	23	2.289
588	-30	28	15.379	116	23	2.168
589	-30	28	15.354	116	23	2.049
590	-30	28	15.323	116	23	1.931
591	-30	28	15.285	116	23	1.817
592	-30	28	15.241	116	23	1.705
593	-30	28	15.191	116	23	1.597
594	-30	28	15.135	116	23	1.493
595	-30	28	15.073	116	23	1.394
596	-30	28	15.005	116	23	1.299
597	-30	28	14.932	116	23	1.21
598	-30	28	14.854	116	23	1.126
599	-30	28	14.772	116	23	1.049
600	-30	28	14.685	116	23	0.977
601	-30	28	14.595	116	23	0.913
602	-30	28	14.501	116	23	0.855
603	-30	28	14.404	116	23	0.805
604	-30	28	14.305	116	23	0.762
605	-30	28	14.203	116	23	0.727
606	-30	28	14.1	116	23	0.699
607	-30	28	14.037	116	23	0.687
608	-30	28	11.519	116	23	0.234
609	-30	28	11.477	116	23	0.227
610	-30	28	11.371	116	23	0.215
611	-30	28	11.265	116	23	0.211
612	-30	28	11.159	116	23	0.216
613	-30	28	11.102	116	23	0.221
614	-30	28	7.376	116	23	0.667
615	-30	28	7.327	116	23	0.673

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
616	-30	28	7.222	116	23	0.694
617	-30	28	7.119	116	23	0.722
618	-30	28	7.017	116	23	0.758
619	-30	28	6.918	116	23	0.801
620	-30	28	6.821	116	23	0.852
621	-30	28	6.728	116	23	0.91
622	-30	28	6.638	116	23	0.975
623	-30	28	6.552	116	23	1.047
624	-30	28	6.47	116	23	1.125
625	-30	28	6.392	116	23	1.209
626	-30	28	6.32	116	23	1.299
627	-30	28	6.253	116	23	1.394
628	-30	28	6.22	116	23	1.447
629	-30	28	6.068	116	23	1.487
630	-30	28	5.877	116	23	1.568
631	-30	28	5.695	116	23	1.676
632	-30	28	2.109	116	23	4.161
633	-30	28	0.559	116	23	4.314
634	-30	28	4.917	116	22	56.841
635	-30	28	9.346	116	22	50.975
636	-30	28	26.617	116	22	34.73

Appendix B. Flora and Fauna Assessment for Lyons East Road to Gatti Road Study Area

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Appendix C. EPBC Protected Matters Search Report

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