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Broad-scale Ecological Assessment Report

Fairview Optimisation and Electrification project.

Compiled by BOOBOOK for Santos

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Executive Summary

This report provides the results of an ecological assessment undertaken by BOOBOOK Ecological Consulting (BOOBOOK) within the proposed disturbance footprint of the planned Fairview Optimisation and Electrification project in the Santos Fairview gas field tenements PL91, PL92, PL232 and PL100, located northeast of Injune, south central Queensland.

The field survey was undertaken in September 2020, October 2020 and February 2021. The field assessment included identification and mapping of remnant and regrowth regional ecosystems (RE) across the Site, vegetation condition assessment (using the BioCondition methodology) and fauna habitat values assessment. Searches were made for threatened flora and fauna and an inventory was compiled of all flora and fauna encountered. A total of 48 BioCondition and habitat quality assessments were conducted within 20 assessment units (AU).

The Site covers 1657.01 ha, comprising 741.51 ha remnant, 107.61 ha of regrowth and 807.89 ha of non-remnant vegetation (including plantations). Fifteen RE types were recorded within the Site, with remnant vegetation comprising 14 RE types and six RE types comprising regrowth. Remnant and regrowth vegetation includes three Threatened Ecological Communities (TEC), with 8.33 ha of Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC, 0.76 ha of Poplar Box Grassy woodland on Alluvium TEC and 0.99 ha of Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions TEC. The combination of remnant and regrowth across fifteen RE types gives a total of 20 assessment units for BioCondition and Fauna Habitat Value Assessment. The average BioCondition score across all assessment localities was 0.71 indicating largely functional ecosystem condition with none of the 48 BioCondition sites classed as dysfunctional (BioCondition score < 0.4).

Ten threatened flora species, listed under federal and/or state legislation, were considered potentially present or likely to occur at the Site based on desktop assessments. Two species listed under the Queensland (QLD) *Nature Conservation Act 1992* (NC Act) were detected at the Site: *Melaleuca irbyana* and *Sannantha brachypoda*. No *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened flora species were found.

No comprehensive fauna surveys were performed under this Scope of Works. Fauna surveys were limited to incidental observations and active searches at BioCondition/habitat quality assessment sites. Two threatened fauna species listed under the EPBC Act were detected during the field survey, with Squatter Pigeon observed at several locations and White-throated Snapping Turtle observed at Hutton Creek. Another seventeen threatened fauna species, listed under the EPBC Act and/or the NC Act, were considered potentially present within the Site. Up to 24 Migratory and/or Marine species (EPBC Act) were confirmed as present or potentially present at the Site.

Predicted suitable habitat was mapped for each of the nineteen EPBC and/or NC Act listed fauna species known or potentially present at the Site. Fauna habitat quality assessments were conducted for thirteen EPBC Act listed terrestrial and arboreal species assessed as present or potentially occurring at the Site. All remnant and regrowth vegetation within the Site, encompassing 849.12 ha, was considered to be of moderate to high habitat quality for some of these species. Habitat quality scores (maximum = 10) were: Northern Quoll – 3.9; Koala – 4.8; Greater Glider – 4.1; Large-eared Pied Bat – 4.6; South-eastern Long-eared Bat – 7.0; Red Goshawk – 3.7; Squatter Pigeon (Southern) – 6.1; Black-breasted Button-quail – 1.3; Collared Delma – 5.1; Yakka Skink – 5.3; Dunmall's Snake – 4.9; White-throated Snapping Turtle – 0.0; and, Fitzroy River Turtle – 0.0. These scores reflect the average habitat quality for each species across the Site and may not be applicable to species that require localised, specialised habitat and do not disperse through unsuitable areas, such as aquatic species. White-throated Snapping Turtle is resident within the Site, but this species received a low habitat quality score, reflecting the very small area of suitable habitat for this species.

Analysis of the likely consequences of the proposed development suggests that, with the exception of the White-throated Needletail and two turtle species (White-throated Snapping Turtle, Fitzroy River Turtle), there will be a Significant Residual Impact (SRI) for the EPBC Act and/or NC Act threatened fauna species. These impacts would occur through reductions in population size primarily due to loss of foraging and breeding habitat. Impacts of habitat fragmentation may also occur but would be moderated by remnant vegetation in the surrounding landscape. The Site is connected to a vast tract of remnant woodland and forest north of the Dawson River and large fragments of potential habitat south and east of Hallett State Forest (SF). No SRI is predicted for migratory or marine species (EPBC Act) known or predicted to occur at the Site.

There are no mapped wetlands within the Site. The Site traverses Hutton Creek near its junction with the Dawson River. Hutton Creek is a 6th order watercourse and a permanent, spring-fed stream. Permanent pools in Hutton Creek, including those within the Site, provide a critical refuge for aquatic fauna within the upper Dawson system. Mapped springs were also present at “Yebna”, in or in close proximity to the Site.

List of Abbreviations

ALA	Atlas of Living Australia (database)
AU	Assessment Unit
AoO	Area of Occupancy (the area of habitat used by a species)
Biosecurity Act	*Biosecurity Act 2014 (Queensland)*
CDZ	Construction Disturbance Zone
CSG	Coal seam gas
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DEHP	Department of Environment and Heritage Protection (State)
DES	Department of Environment and Science (State)
DNRME	Department of Natural Resources, Mines and Energy (State)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
E	Endangered
EH	Essential Habitat
EoO	Extent of Occurrence (the geographic range of a species, including areas of unsuitable habitat)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (*Commonwealth*)*
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare (s)
km	Kilometer (s)
LC	Least Concern
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992 (Queensland)*
NCAP	No Concern at Present
OC	Of Concern
PMST	Protected Matters Search Tool
RE	Regional Ecosystem (s)
REDD	Regional Ecosystem Description Database
SEVT	Semi-evergreen vine thicket
SRI	Significant Residual Impact
SF	State Forest
TEC	Threatened Ecological Community (ies)
TSSC	Threatened Species Scientific Committee

1. Introduction

1.1. Site Description

This report provides a description of an ecological assessment undertaken for the proposed Fairview Optimisation and Electrification project on the Santos Fairview gas field (PL91, 92, 100 and 232) comprising parts of the following land parcels:

Maranoa Regional Council:

- Waddy Brae: Lot 5 on Plan SP261934;
- Fairview: Lot 6 on Plan CP908635;
- Moonah: Lot 20 on Plan WT32, Lot 13 on Plan WT18;
- Beilba State Forest: Lot 20 on Plan FTY1805.

Banana Shire Council:

- Springwater: Lot 8 on Plan 261936;
- Yebna: Lot 2 on Plan AB247;
- Hallett State Forest: Lot 55 on Plan FTY1153, Lot C on Plan AB203, Lot D on Plan AB117;
- Stephenton State Forest: Lot 62 on Plan 1809;
- Strathblane: Lot 9 on Plan 262435.

Collectively the proposed construction disturbance zone (CDZ) footprint and associated survey buffers is hereafter referred to as 'the Site'. (Appendix A). The area to be assessed was defined by spatial data supplied by the Client.

The Site is located approximately 45 km east northeast of Injune, south central Queensland. The northern part of the Site (Waddy Brae, Fairview, Moonah and Beilba State Forest) is within the Maranoa Regional Council area; the remainder of the Site is within Banana Shire. It is accessed in the north via Fairview Road, in the south via the Injune-Taroom and Bonnie Doon Roads, and internally via private roads throughout the Site.

The Site is located entirely within Subregion 24 (Carnarvon Ranges) of the Brigalow Belt bioregion (Sattler and Williams 1999). Geologically the Site is located at the northern edge of the Surat Basin, which coincides with the Great Artesian groundwater basin in this area. The Site is in the Dawson River catchment, within the Fitzroy drainage basin, and is traversed by Hutton Creek, a permanent stream in a landscape with few reliable water sources. North of Hutton Creek the topography is dominated by elevated plateaux, abrupt scarps and gorges formed from erosion of the massive, coarse-grained Precipice Sandstone, interspersed with more gentle slopes and valley basins. South of Hutton Creek the topography is more subdued, with lower plateaux and basins transitioning south to a wooded landscape of undulating rises and low hills underlain by sandstones and mudstone of the Hutton Formation.

Soils in the north vary from shallow, coarse-grained sandy soils derived from the Precipice Sandstone on crests and plateaux, with medium to fine-grained clay-loam soils derived from Evergreen Formation shales on slopes, interleaved with layers of Boxvale Sandstone. In the south there is a transition to fine-grained clay-loams derived from mudstones of the Westgrove Ironstone Member of the Evergreen Formation, and an extensive area of duplex soils derived from Hutton Formation sandstone and mudstone, including patches of clay-loam and pockets of deep sand. Rugged areas with sandy lithosols are largely covered in remnant woodland dominated by eucalypts (*Eucalyptus*, *Corymbia* and *Angophora* spp.) with abundant *Acacia* spp. Significant areas of Semi-evergreen Vine Thicket (SEVT) along with remnant and regrowth Brigalow (*Acacia harpophylla*) on sheltered slopes with clay-loam soils. The valleys and accessible areas of loamy soils on low hills are mainly cleared. Sandy soils in the south support extensive areas dominated by White Cypress Pine (*Callitris glaucophylla*) interspersed with patches of clay-loam soils supporting Poplar Box (*E. populnea*), Silver-leaved Ironbark (*E. melanophloia*) and small patches of Brigalow (*A. harpophylla*).

The Site has a long history of pastoral settlement and large areas of the Site have been cleared for cattle grazing, particularly in valleys and accessible areas of clay-loam soils on plateaux and hills. Much of this cleared area has been seeded with pasture grasses, in particular Buffel Grass (*Cenchrus ciliaris*). Introduced pasture grasses and other pastoral weeds have penetrated into remnant vegetation across the Site to varying degrees. Both remnant and non-remnant areas are used for cattle, with light to moderate grazing intensity. Recently, centre-pivot irrigated agricultural fields have been established on some plateau tops using water harvested from gas developments to grow stock feed. Timber has been harvested throughout the Site, with some extensive areas of remnant vegetation set aside for this purpose. The main forest products harvested are Spotted Gum (*Corymbia citriodora* subsp. *variegata*) from sandstone

plateau areas, such as in Beilba State Forest, and White Cypress Pine (*Callitris glaucophylla*) growing on sandy duplex soils, such as in Hallett State Forest. Additionally, thinning of woodland for grazing and harvesting of minor timber products such as fence posts is apparent throughout much of the Site. More recently, there has been extensive development of coal seam gas (CSG) infrastructure comprising the Fairview gas field along with associated processing facilities, pipelines and powerlines. There is an extensive network of roads, tracks, fences and cleared areas throughout the Site supporting pastoral, forestry and gas extraction industries. Periodic disturbance by fire is apparent within and around much of the remnant and regrowth vegetation throughout the Site. Evidence of severe fires resulting in loss of canopy integrity is apparent on sandstone plateaux and crests in the north. In some areas wildfires have penetrated into patches of SEVT and Brigalow. Extensive areas of post-fire regrowth were observed in logged cypress pine woodlands in the south of the Site. Elsewhere, some remnant woodland shows little evidence of fire in recent decades, allowing an understorey of fire sensitive SEVT trees and shrubs to grow within eucalypt dominated vegetation types.

In a regional context, the Site includes several large, blocks of remnant woodland, modified by a diversity of land uses, dissected by roads and permeated by a similar area of non-remnant vegetation. These interconnected areas of remnant vegetation within and around the Site form the southern fringe of a very large tract of remnant woodland and forest extending north and east of the Dawson River on the Expedition, Lynd and Murphy Ranges and north-westward to the Carnarvon Ranges. The Site is therefore adjacent and linked to an area of State significance for tract size, connectivity and special biodiversity values (DES 2020a). In addition, the Site crosses Hutton Creek near its junction with the Dawson River. Above this confluence the Dawson River is a 5th order watercourse with seasonal flows and few permanent waterholes. Hutton Creek is a 6th order watercourse and a permanent, spring-fed stream. Hutton Creek therefore provides a critical refuge for aquatic fauna in the upper Dawson River catchment.

1.2. Purpose and Scope

The results of the ecological assessment are based on an initial desktop assessment followed by a field survey to confirm the vegetation communities, flora/fauna species and habitat values present within the Site. Additionally, targeted searches for threatened flora and opportunistic observations of threatened fauna were made at the Site. The purpose of this report is to provide a summary of potential ecological constraints and values within the Site.

Santos (the Client) required the following services in relation to identifying ecological values and potential constraints within the Site:

- Regional ecosystem (RE) mapping using the functional RE condition thresholds;
- Quantification of Threatened Ecological Communities (TEC);
- Predictive habitat mapping and assessment for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Nature Conservation Act 1992* (NC Act) listed threatened fauna and flora species;
- Searches for the presence of EPBC Act and NC Act listed threatened flora;
- Incidental observations of EPBC Act and NC Act listed threatened fauna; and
- Documentation of springs and riverine habitat values.

1.3. Survey Team

A field survey of the Site was conducted by Craig Eddie (Principal Ecologist), Richard Johnson (Senior Ecologist), Michael Cunningham (Senior Ecologist), Eamon Amsters (Graduate Ecologist), Rosamund Aisthorpe (Botanist) and Courtney Andrew (Field Technician) in the periods 20-30th September, 6-14th October, 9-13th November 2020 and 26-28th February 2021.

The project supervisor (Craig Eddie) was approved by the Department of Agriculture, Water and the Environment (DAWE), formerly the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), in writing on the 28th of January 2011 for the purpose of undertaking ecological assessment works for the Gladstone Liquefied Natural Gas (GLNG) project. All aspects of the project including field survey and reporting were conducted under the supervision of Craig Eddie.

2. Methodology

2.1. Desktop Assessment

A desktop assessment was conducted to inform the field survey. Sources of information utilised during the desktop assessment included the following:

- Remnant RE and mature regrowth mapping – biodiversity status (DES 2020b, DNRME 2020a);
- Essential Habitat (EH) (DNRME 2020b) mapping;
- EPBC Act Protected Matters Search Tool (PMST) (DAWE 2020a);
- Wildlife Online fauna and flora records (DES 2020c);
- Protected Plants Flora Survey Trigger Map (DES 2020d);
- Wetlands and waterways mapping (DES 2020e, 2020f; DNRME 2020a);
- Landscape terrestrial and aquatic values (DES 2020a, e); and
- Regulated vegetation and other Matters of State Conservation Significance (MSES) (DES 2019e, DNRME 2020a, b); and
- Atlas of Living Australia (ALA) flora and fauna records within 10km of the approximate centre of the Site (ALA 2020).

2.2. Field Survey

In-field verification of desktop findings and additional findings of significance were undertaken in general accordance with the following:

- *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*. 2020);
- *Methodology for Conducting Ecological Assessments* – GLNG Areas Rev 4.1 (Santos 2014); and
- *Functional Thresholds for Assessing Regional Ecosystem Functionality* (Santos 2015).

Formal survey sites were established in a number of vegetation Assessment Units (AU), based on identifiable vegetation characteristics i.e. structure, floristics and condition. At each site quaternary vegetation structure and floristics, BioCondition and fauna habitat assessments were conducted concurrently. Methodologies that were employed for each element of the field survey are further described in the following sections.

2.2.1. RE and TEC Assessment

RE and TEC assessment was informed by both desktop review of earlier assessments where relevant (see Section 2.1) and by ground-truthing during field assessment. Where required, in the light of new field-based information, assessment included revision of previously reported mapping for some parts of the Site. Ground-truthing (and confidence level scoring) of the RE designation was undertaken using the quaternary level of data collection as described by Neldner *et al*. (2020). Forty-eight (48) quaternary vegetation assessments were conducted.

Assessments were undertaken within 50 m x 10 m plots for the purpose of typifying the vegetation community under assessment. The number of vegetation community assessments undertaken at each property depended on the diversity of vegetation communities present at each. Plots were chosen within representative areas of each vegetation type encountered. Locations of quaternary assessment sites are mapped in Appendix A.

Vegetation community polygons were verified in accordance with Queensland RE description and biodiversity status as per the Regional Ecosystem Description Database (REDD) (DES 2020g) and classified as remnant RE, vegetation consistent with RE (regrowth) or non-remnant vegetation (Santos 2014). For each area of potential TEC an assessment of vegetation survey data was made against TEC threshold criteria (e.g. TSSC 2013).

Vegetation community data was captured in the field and entered into Santos-specific data fields within spatial databases via GPS enabled Zebra tablet devices. Representative photographs were taken via a digital camera at each vegetation survey site and points as supporting evidence of the subject vegetation community where full documentation was not required. Capture and delineation of RE and TEC boundaries was undertaken using a

combination of mobile GIS devices, GPS and/or delineation from imagery. A minimum mappable width of 30 m for linear vegetation corridors (e.g. road corridors and shade lines) was applied. Patches were mapped to their full extent within the Site within practical limits (including land access constraints).

For identified regrowth (i.e. vegetation floristically equivalent to a RE but not meeting structural thresholds of remnant RE) an ecosystem functionality assessment was conducted. This assessed selected vegetation characteristics against the parameters described in Santos (2015).

Plant names used within this document conform to those given in Brown and Bostock (2020).

2.2.2. BioCondition Survey

BioCondition assessments were used to evaluate ecological functionality of vegetation at the Site. These assessments were completed at 48 sites, which were selected to include each mapped AU (RE combined with remnant or regrowth status). BioCondition assessments applied the methodologies described by Eyre *et al*. (2011, 2015). This involved the establishment of a 100 m x 50 m plot for measurements relating to canopy layer structure and diversity, a 100 m transect to measure canopy cover, a 50 m x 10 m subplot for measuring plant richness in shrub and ground layers, a 50 m x 20 m subplot for measuring coarse woody debris, and five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area. These values were used as indicators of ecosystem function relative to minimally disturbed benchmark sites within the same vegetation type.

The following information was recorded at each BioCondition site:

- Date;
- Observers;
- Description of location (bioregion, general description, co-ordinates for plot origin and centre, plot bearing and alignment);
- General habitat description and RE type;
- Median height for canopy, emergent and sub-canopy strata;
- Slope position/slope degree and slope aspect;
- Tree species richness (within 100 m x 50 m plot);
- Native plant species richness (within 50 m x 10 m plot);
- Non-native plant cover (within 50 m x 10 m plot);
- Total length of coarse woody debris (length >10 cm diameter and >0.5 m long within 50 m x 20 m plot);
- Number and average diameter at breast height (DBH) of large eucalypt and non-eucalypt trees (within 100 m x 50 m plot);
- Recruitment of canopy species (within the 100 m x 50 m plot);
- Tree and shrub canopy cover (within 100 m transect);
- Ground cover within 1 m x 1 m plots (native perennial grass and organic litter cover in the ground layer);
- Disturbances (severity, last event and observation type).

Large tree DBH thresholds for each RE were used where benchmark documents were available, otherwise the default ≥30 cm DBH for eucalypts and ≥20 cm DBH for non-eucalypts was applied.

Site photographs were taken using a digital camera in accordance with Eyre *et al*. (2011, 2015) (i.e. one photograph at plot origin and north, east, south and west photographs at the plot centre). Photograph numbers were recorded. Locations of BioCondition sites were determined using a handheld Global Positioning System (GPS) (Garmin GPSmap 78S) and BioCondition assessment data was captured by mobile GIS devices (Motion F5T tablet device).

Due to current and proposed land use (grazing, forestry and coal seam gas development) of the BioCondition sites, permanent 0 m and 50 m markers were not established using steel fence posts as described in the methodology Eyre *et al*. (2011, 2015).

Scores for BioCondition sites were calculated in accordance with Eyre *et al*. (2015) which compares the values obtained at each survey site with values in the benchmark document for that particular RE (Queensland Herbarium 2019). Sub-

scores are awarded to each site and landscape attribute then are added together and divided by the maximum possible score for that RE. This provides a numeric index along a continuum of biodiversity condition, where scores close to 0 indicate sites that are 'dysfunctional' and scores closer to 1 indicates increasing 'functional' integrity.

2.2.3. Fauna Habitat Quality Assessment

Habitat quality assessments were completed at each BioCondition site, using the methodologies described in DES (2020i). Habitat quality assessment included three elements: a site condition assessment, based on the BioCondition methodologies described by Eyre *et al*. (2011, 2015) and above in section 2.2.2; a site context assessment of landscape level features relating this patch to adjacent habitat and the surrounds; and a fauna species habitat index score (DES 2020i) as described in Section 2.2.3.3.

2.2.3.1. Site Condition

Although the BioCondition assessment measures some aspects of microhabitat, such as length of coarse woody debris, and leaf litter cover, not all habitat features likely to be utilised by threatened fauna are measured under the BioCondition methodology. Presence/absence, abundance or density of habitat features was recorded within a 50 m x 50 m plot at each survey site including:

- embedded and loose rocks and boulders (estimated % cover);
- logs (abundance);
- trees >18m height (abundance);
- logs with hollows (abundance);
- trees with hollows (abundance);
- trees and/or logs with loose bark (abundance);
- burrows, sinkholes and tunnel erosion (abundance);
- fallen bark (estimated % cover);
- shrub layer (estimated % cover);
- ground cover (estimated % cover);
- leaf litter (estimated % cover);
- termite mounds (abundance);
- mistletoe (abundance);
- rock structures (caves, overhangs and crevices);
- cliffs, escarpments and steep rocky slopes within 5km (presence);
- watercourses with permanent water, pools and riffles and abundant woody/rock cover (presence);
- cracking clays soils (presence);
- gilgai and ephemeral wetlands (presence); and
- canopy dominated by Myrtaceae species (presence).

2.2.3.2. Site Context

The value of a given patch of vegetation as faunal habitat is influenced by patch size, disturbance regimes, fragmentation of the surrounding landscape, and the degree to which this patch is connected to other habitat. In the rangelands of northern and western Queensland, where native vegetation is largely intact (> 70% remnant), proximity to permanent water is used as an indirect estimate of grazing pressure (DES 2020i). The Carnarvon Ranges biogeographic subregion (Sattler and Williams 1999), is also considered an intact area of Queensland. However, in this rugged landscape disturbance from stock is affected by topography and soils and is not a simple function of proximity to water points. Furthermore, the landscape in and around the Site includes large areas of cleared land and diverse sources of disturbance impacting remnant vegetation. Many of these disturbances are not correlated with distance to water. Consequently, the Site was assessed as a fragmented landscape (Dr T. Eyre pers. comm.).

Desktop GIS analysis was used to determine patch size and calculate connectedness and context as defined in DES(2020i). Proximity to mapped ecological corridors was calculated by interrogation of 'Riparian' and 'Terrestrial' features in the Queensland biodiversity and vegetation offsets special features map, as per DES (2020i).

2.2.3.3.Species Habitat Index

A qualitative index of habitat value (DES 2020i) was derived for each EPBC listed fauna species assessed as present or potentially occurring at the Site, through ecologist field assessment of site characteristics (detailed in 2.2.3.1) and knowledge of species ecology. At each assessment site within each AU, a ranking was assigned for each of the following criteria: quality and availability of food and foraging habitat; quality and availability of shelter and breeding habitat; quality of habitat required for species mobility; and the absence of threats to the species at the assessment site.

2.2.4. Threatened Species Habitat Assessment and Mapping

Microhabitat assessments were undertaken in conjunction with vegetation community surveys at each survey plot, or as required where significant variation in the type and abundance of habitat features occurred. The results of these assessments, combined with published information and ecologist knowledge of fauna distribution and habitat use, were used to predict habitat suitability for nominated EPBC Act listed threatened flora and fauna. These results were used to develop GIS-based mapping of potential habitat for these species within the Site.

2.2.5. Threatened Flora Survey

Targeted surveys for threat-listed flora were informed by the desktop search results and local experience. Searches for threat-listed flora under the EPBC and/or NC Act were carried out at vegetation assessment sites and in random meanders in targeted habitat types, including remnant and non-remnant vegetation.

If detected, counts and extent of each population of threat-listed flora were made as well as structural characteristics and representative photographs taken. Data were recorded using the Santos-specific Notable Species - Flora Point or Region data capture layer.

2.2.6. Incidental Threatened Fauna Records

No comprehensive fauna surveys, i.e. those using trapping or acoustic techniques, were undertaken under this Scope of Works. Any incidental records of threatened fauna obtained during vegetation assessments and general property traverses to and between sites (on foot and driving) were fully documented including species name, location (with site co-ordinates or area of extent), habitat and number detected.

2.2.7. Survey Limitations

Individual mapped vegetation polygons have been assigned a confidence level (high, moderate, low) for both boundary accuracy and vegetation attributes within the polygon as per Neldner *et al*. (2020). Within the spatial database confidence ratings are designated as 'A' for high, 'B' for moderate and 'C' for low. The schema outlined in Tables 1 and 2 was applied to vegetation polygons.

Table 1: Boundary accuracy confidence ratings applied to mapped polygons.

Boundary Accuracy			
Confidence	**Range of Accuracy**	**Homogenous Patches**	**Heterogeneous Patches**
High (A)	<1 - <10 m	Ground-truthed on site, or viewed at a distance	Ground-truthed on site
Moderate (B)	>10 - <50 m	Not ground-truthed (image interpretation only)	Portion ground-truthed on site
Low (C)	>50 - >200 m	nil	No ground truthing: vegetation viewed at a distance or image interpretation only

Table 2: Vegetation attribute confidence ratings applied to mapped polygons.

Vegetation Attributes		
Confidence	Homogenous Patches	Heterogeneous Patches
High (A)	Ground-truthed on site	Ground-truthed on site
Moderate (B)	No ground truthing: vegetation viewed at a distance	Portion ground-truthed on site
Low (C)	Image interpretation only	Viewed at a distance or image interpretation only

In practice, most vegetation within the Site was inspected in the field (ground-truthed) so that mapped polygons have a High rating for boundary accuracy and vegetation attributes. Where Endangered or Of Concern RE types were encountered the full extent of the patch (i.e. its extent beyond the buffered CDZ) was mapped where this was physically practicable. For some very large areas of semi-evergreen vine thicket (Endangered RE 11.9.4) the mapping relied in part on imagery interpretation such that a lower level of accuracy was assigned to the mapped polygon.

In some instances, vegetation communities could not be readily assigned to a RE, even when ground-truthed, as their floristics and structure reflected historical disturbance patterns such as clearing, thinning and fire history. In these cases, RE have been allocated on the basis of 'best fit' with current RE descriptions.

Microhabitat assessments were conducted at representative sites within each ground-truthed AU present at the Site. Though the presence and abundance of microhabitat features e.g. hollow logs likely varies within and between patches (mapping polygons) of a given RE, for the purposes of predictive fauna habitat mapping it is assumed that the results of microhabitat assessment for a RE are applicable throughout the Site. That is to say, a conservative approach has been taken with regard to mapping of species habitat where ground-truthing of the entire RE patch is impractical. Where patches have not been ground-truthed, relevant fauna microhabitat features were assumed to be present and patches have been mapped as habitat until further assessments can be undertaken. Similarly, where predictive mapping of flora habitat is based on known RE associations it is assumed that suitable habitat exists in all patches of the RE at the Site.

Threatened fauna searches were confined to incidental observations only (i.e. no trapping or targeted search techniques were employed). Additional survey effort would be required to provide a more comprehensive inventory of threatened fauna species present at the Site.

The timing (season) of most of the survey, during mid-spring 2020, coincided with mediocre conditions for germination, growth and flowering of herbaceous plant species and shrubs. Despite some winter rain, and widespread flowering in early August 2020, a subsequent warm dry spell resulted in loss of fruit and flowers, senescence of fertile parts, and stress induced withering of vegetative growth. This would have reduced the number of forb species detected and reduced specificity of identification of grasses, forbs and some shrubs. Conditions were generally suitable for identification of most perennial woody plants. Similarly, the paucity of fruit and flowers would have impacted on the abundance and detectability of fauna.

3. Results & Discussion

3.1. Vegetation Mapping

3.1.1. Desktop RE Mapping

State government mapped remnant RE and mature regrowth (DES 2020b, DNRME 2020a) is shown in Appendix B.

3.1.2. Ground-truthed RE Mapping

Ground-truthing identified fifteen RE types within the Site. Fourteen of these RE were present as remnant vegetation and six RE were present as regrowth. One RE type was only present as regrowth vegetation. Mapping of ground-truthed remnant and regrowth RE based on field surveys is presented in Appendix C.

The extent (total area) of each mapped remnant and regrowth RE within the Site is summarised in Table 3. A total of 849.12 ha of native vegetation (741.51 ha of remnant and 107.61 ha of regrowth) was mapped within the Site. This vegetation covers about half of the Site, which has a total area of 1657.01 ha.

Table 3: Summary of extent of individual mapped REs from ground-truthing and imagery analysis within the Site.

RE Code	*VM Act* Class	Biodiversity Status	Short Description (DES 2019f)	Extent – remnant (ha)	Extent – regrowth (ha)
11.3.2	OC	OC	*Eucalyptus populnea* woodland on alluvial plains	0.76	7.44
11.3.19	LC	NCAP	*Callitris glaucophylla, Corymbia spp.* and/or *Eucalyptus melanophloia* open forest to woodland on Cainozoic alluvial plains	Nil	0.42
11.3.25	LC	OC	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	5.06	Nil
11.9.2	LC	NCAP	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on fine-grained sedimentary rocks	6.94	Nil
11.9.4	OC	E	Semi-evergreen vine thicket or *Acacia harpophylla* with a semi-evergreen vine thicket understorey on fine-grained sedimentary rocks	0.99	Nil
11.9.5	E	E	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.	4.28	6.17
11.9.7	OC	OC	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	3.02	Nil
11.9.10	OC	E	*Eucalyptus populnea* open forest with a secondary tree layer of *Acacia harpophylla* and sometimes *Casuarina cristata* on fine-grained sedimentary rocks	25.20	Nil
11.10.1	LC	NCAP	*Corymbia citriodora* woodland on coarse-grained sedimentary rocks	99.35	Nil
11.10.3	LC	NCAP	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks. Crests and scarps	0.81	Nil
11.10.7	LC	NCAP	*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks	108.89	28.62
11.10.8	OC	OC	Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks	0.56	Nil
11.10.9	LC	NCAP	*Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	358.82	49.77
11.10.11	LC	NCAP	*Eucalyptus populnea, E. melanophloia* +/- *Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	78.66	Nil
11.10.13	LC	NCAP	*Eucalyptus* spp. and/or *Corymbia* spp. open forest on scarps and sandstone tablelands	48.19	15.19

E = Endangered; OC = Of Concern; LC = Least Concern; NCAP = No Concern at Present

3.2. TEC Assessment

PMST search results predicted the potential presence of five threatened ecological communities (TECs) within the Survey Area these being:

- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- Poplar Box Grassy Woodlands on Alluvial Plans;
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; and
- Weeping Myall Woodlands.

The field survey confirmed the presence of three TEC, these being: Brigalow (*Acacia harpophylla* dominant and co-dominant) (hereafter Brigalow TEC); Poplar Box Grassy Woodland on Alluvial Plains (hereafter Poplar Box TEC); and Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (hereafter SEVT TEC).

All remnant RE 11.9.5 was mapped as Brigalow TEC, where *Acacia harpophylla* was dominant in the canopy and the vegetation otherwise met the condition criteria (TSSC 2013). Regrowth patches of RE 11.9.5 were also mapped as TEC, excepting some extensively disturbed patches where non-native plant cover exceeded 50%. Patches dominated by *A.*

harpophylla also occur in RE 11.9.10, which was present on gently undulating areas of clay-loam soil in the south of the Site. However, RE 11.9.10 is not a listed component of the Brigalow TEC (TSSC 2013).

RE 11.3.2 is listed as a component of the Poplar Box TEC. All remnant RE 11.3.2 within the Site was mapped as Poplar Box TEC, Category B (Good quality) (TSSC 2019), being patches 5 ha or larger with at least 10% crown cover, at least 50% native perennial vegetation cover in the ground layer, and at least 10 large trees (≥ 30 cm dbh) per ha. Small areas of regrowth RE 11.3.2 were mapped in sandy valleys in the central and southern parts of the Site. In each case these areas did not meet the native cover and mature tree thresholds for recognition as this TEC.

All RE 11.9.4 was assigned to the SEVT TEC. Note that RE 11.10.8 is not a listed component RE for this TEC (TSSC 2001).

The mapped extent of TEC at the Site is shown within Appendix D. Table 4 shows the extent (total area) of TEC mapped within the Site.

Table 4: Description and ground-truthed extent of TEC within the Site.

TEC Description	RE Code	Extent of TEC (ha)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	11.9.5	8.33
Poplar Box grassy woodland on alluvial plains	11.3.2	0.76
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	11.9.4	0.99

3.3. BioCondition Assessment

Vegetation condition was assessed using the BioCondition methodology of Eyre *et al*. (2015). Assessments were completed at 48 locations within or adjacent to the Site (Appendix A), these being representative samples of the twenty AU (i.e. remnant and regrowth RE) described in Table 3. Raw data for BioCondition assessment sheets have been provided separately to this report. BioCondition site characteristics and scores are summarised in Table 5.

Table 5: Summary of BioCondition assessment sites and results within the Site.

*based on fragmented subregion assessment (DES 2020i)

AU	RE	Structural condition	Assessment sites	Averaged BioCondition score
1	11.3.2	remnant	768-S21	0.88
2	11.3.2	regrowth	768-S39, 768-S40	0.72
3	11.3.19	regrowth	B33-EXRR	0.55
4	11.3.25	remnant	768-S18, 768-S41	0.74
5	11.9.2	remnant	768-S13	0.77
6	11.9.4	remnant	768-S17, BBKFL9	0.63
7	11.9.5	remnant	768-S35	0.80
8	11.9.5	regrowth	768-S22, 768-S23, 768-S25, 768-S27	0.56
9	11.9.7	remnant	768-S45	0.74
10	11.9.10	remnant	768-S30, 768-S31, 768-S38, 768-S42	0.85
11	11.10.1	remnant	768-S05, 768-S08, 768-S11, 768-S14	0.80
12	11.10.3	remnant	WB02	0.85
13	11.10.7	remnant	786-S01, 768-S03, 768-S06, 768-S19	0.75
14	11.10.7	regrowth	768-S10, 768-S16, 768-S26	0.63

AU	RE	Structural condition	Assessment sites	Averaged BioCondition score
15	11.10.8	remnant	768-S12	0.87
16	11.10.9	remnant	768-S20, 768-S28, 768-S29, 768-S33, 768-S37	0.81
17	11.10.9	regrowth	768-S36, 768-S43	0.66
18	11.10.11	remnant	768-S24, 768-S32, 768-S34	0.80
19	11.10.13	remnant	768-S02, 768-S04, 768-S07, 768-S15	0.71
20	11.10.13	regrowth	768-S09, 768-S44	0.56

Five AU had high averaged BioCondition scores (>0.80) indicating minimally disturbed native vegetation with high ecological function at the assessed sites. Twelve AU had BioCondition scores (0.60 – 0.80) indicating substantially intact, functional ecosystems with moderate levels of disturbance. Three AU had BioCondition scores (0.40 – 0.60) suggesting increasing disturbance and loss of ecosystem integrity. No AU received low scores (<0.40) thus indicating that none of the Sites displayed 'dysfunctional condition'.

3.4. Flora

3.4.1. Threatened Flora

PMST search results (DAWE2020a) predicted the potential occurrence of six EPBC Act-listed threatened flora species within the Site, these being: Hairy-joint Grass (*Arthraxon hispidus*); Broad-leaved Bertya (*Bertya opponens*); Ooline (*Cadellia pentastylis*); Bean's Ironbark (*Eucalyptus beaniana*); Slender Tylophora (*Tylophora linearis*); and *Xerothamnella herbacea*. Desktop assessment (ALA 2020, DES 2020c) indicated that *Bertya opponens* was the only EPBC Act listed flora species historically recorded within the desktop search area (within 10 km of the centre point of the Site). Records exist within this area for five species listed under the NC Act these being: Cracow Wattle (*Acacia calantha*); Isla Gorge Wattle (*Acacia islana*); Western Rosewood (*Acacia spania*); Swamp Tea-tree (*Melaleuca irbyana*); and *Sannantha brachypoda*. A likelihood of occurrence assessment of threatened flora for the Site is presented within Table 6.

Table 6: Assessment of likelihood of occurrence at the Site of EPBC and/or NC Act threatened flora at the Site.

Key to Status: CE = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened, C = Least Concern.

Family	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Acanthaceae	*Xerothamnella herbacea*	E	E	This is a low, sprawling herbaceous species that occurs in Brigalow (*Acacia harpophylla*) dominated communities in shaded situations, often in leaf litter and is associated with gilgais (shallow ground depressions) and/or minor drainage lines (DES 2020h). *Xerothamnella herbacea* is known from a number of widely scattered sites ranging from near Yelarbon northward to Kokotungo, west of Gladstone, and including Lonesome Holding in the Arcadia Valley *ca*. 15km north north-west of the Site (ALA 2020).	**Potentially present.** Small areas of Brigalow-dominated open forest occurring along drainage lines are present within the Site, with gilgais forming in at least one area. Conditions were poor for detection of this species during the field survey.

Family	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Apocynaceae	*Tylophora linearis* Slender Tylophora	E	E	Found in drier open forests and woodlands of *Eucalyptus, Callitris* and *Allocasuarina* species (DAWE 2020b). It has been collected at numerous localities in NSW, principally on the western slopes of the Great Dividing Range from Temora to the Linton - Yetman area (ALA 2020). It is known in Queensland from one specimen collected near Glenmorgan in 1960 (ALA 2020) and a recent collection near Miles (BOOBOOK unpubl. data).	**Unlikely to be present.** Although potentially suitable habitat is present the Site is outside the known range of this species.
Eriocaulaceae	*Eriocaulon carsonii* Salt Pipewort	E	E	This herbaceous species is endemic to flowing discharge springs of the Great Artesian Basin and has been recorded from spring complexes in Queensland, New South Wales and South Australia (DAWE 2020b). In south central Queensland this species is confined to artesian discharge springs in the Injune and Taroom areas (DES 2020h).	**Unlikely to be present.** Suitable habitat (artesian discharge springs) is not present within the Site. Springs associated with Hutton Creek are recharge springs.
Euphorbiaceae	*Bertya opponens*	V	C	In Queensland this species is widely distributed within an area bounded by Emerald in the north and Charleville in the west, with outliers near Moranbah and Charters Towers (ALA 2020, DAWE 2020b). *Bertya opponens* has been recorded growing in a variety of community types including mixed shrubland, lancewood woodland, mallee woodland, eucalypt/acacia open forest with shrubby understorey, *Eucalyptus*/*Callitris* open woodland and the margins of semi-evergreen vine-thicket (SEVT) on shallow and rocky or much deeper and well-drained soils (DAWE 2020b, DES 2020h). The species has been recorded at several locations within the Fairview gas field and at Lonesome Holding at the southern end of the Arcadia Valley (ALA 2020).	**Likely to be present.** Suitable habitat exists on sandstone hills within the Site. The species is known from Fairview.
Fabaceae	*Daviesia discolor*	V	V	Disjunct populations occur within Blackdown Tableland, Salvator Rosa section of Carnarvon National Park and Mt. Walsh near Biggenden (ALA 2020, TSSC 2008a) where it grows on sandy to clay loam soils, typically well drained, on sandstones, laterite and metamorphic or acid volcanic rocks (DES 2020h). This species grows in open forest dominated by *Eucalyptus* and/or *Corymbia* spp. or mixed shrubland with scattered *Triodia* sp. hummocks and *Angophora* sp. trees (TSSC 2008a).	**Potentially present.** Suitable habitat is present on sandstone hills and plateaux in the central and northern part of the Site. However, there are no previous records in the region of the Site.

Family	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Mimosaceae	*Acacia calantha* Cracow Wattle	-	NT	*Acacia calantha* grows in sand to sandy-clay soil on the lower slopes of steep sandstone hills in dry sclerophyll forest and open forest. Associated with *Corymbia trachyphloia*, *C. maculata*, *Eucalyptus cloeziana*, *E. tenuipes*, *E. crebra*, *E. corynodes*, *C. citriodora*, *C. tessellaris*, *E. fibrosa*, *C. watsoniana*, *Lysicarpus angustifolius*, *Angophora leiocarpa*, *Acacia podalyriifolia*, *Acacia crassa*, *Acacia juncifolia*, *A. caroleae* and *Astrotricha biddulphiana* (DES 2020h). It occurs on sandstone uplands from about Lonesome Holding to Mulgildie and Allies Creek in southern Qld (ALA 2020).	**Likely to be present.** Suitable habitat occurs in the north of the Site and the species has previously been recorded from areas close to or within the Site in Fairview and Beilba SF.
Mimosaceae	*Acacia islana* Isla Gorge Wattle	-	V	This species occurs in inland Queensland from the Carnarvon Range eastward to the Allies Creek and Auburn areas (ALA 2020). It grows primarily on shallow soils of sandstone ranges, though it has been recorded growing on other soil types (DES 2020h).	**Likely to be present.** Suitable habitat occurs in the north of the Site and the species has previously been recorded in Beilba SF.
Mimosaceae	*Acacia spania* Western Rosewood	-	NT	Scattered occurrence across inland central Queensland from Idalia National Park to Biloela, and north to south from Moranbah to Roma (ALA 2020). The species has been recorded from two sites in the Fairview gas field (ALA 2020)	**Likely to be present.** Suitable plateau top habitat occurs in the north of the Site and the species has previously been recorded nearby on Waddy Brae and Fairview.
Myrtaceae	*Eucalyptus beaniana*	V	V	This is a poorly known species, recorded from southern inland Queensland between Allies Creek and Baroondah (ALA 2020). Occurs in shallow soils on sandstone ridges and cliff tops with diverse other *Eucalyptus* and *Corymbia* species (DoE 2008b). The closest record of the species, from Belington Hut State Forest near Baroondah, is *ca.* 28 km east of the Site (ALA 2020).	**Potentially present.** Suitable habitat is present on sandstone hills and plateaux in the central and northern part of the Site. However, this would be a western range extension for this species.
Myrtaceae	*Melaleuca irbyana*	-	E	This species has a patchy distribution, occurring in south-east Queensland, northern NSW, and north-east of Injune (ALA 2020). In the vicinity of the Site it occurs in periodically waterlogged areas on plateau tops (Boobook unpubl. data). The species has been recorded from several sites in the Fairview gas field.	**Confirmed present.** Suitable habitat occurs in the north of the Site and the species has previously been recorded nearby on Waddy Brae and Fairview.

Family	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Myrtaceae	*Sannantha brachypoda*	-	V	Confined to the Central Queensland portion of the southern Brigalow Belt (ALA 2020). Occurs on plateau tops in red-brown loams and on sandstone scarp crests (Boobook unpubl. data)	**Confirmed present.** Suitable habitat occurs in the north of the Site and the species has previously been recorded in Waddiy Brae, Fairview and Springwater.
Poaceae	*Arthraxon hispidus* Hairy-joint Grass	V	V	Outlying and disjunct populations of this species associated with springs or spring-fed wetlands occur in the Carnarvon Range and Taroom area (DES 2020h). In Queensland, this species has been recorded growing in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps (TSSC 2008c).	**Unlikely to be present.** Suitable habitat (permanent wetlands) within the Site is limited to a riparian fringe at the crossing point on Hutton Creek.
Surianaceae	*Cadellia pentastylis* Ooline	V	V	Occurs in northern NSW and southern Queensland (DAWE 2020b). Within Queensland it occurs patchily from near Rockhampton westward to near Blackall and southward to the State border (ALA 2020) where it occurs on undulating plains, valley slopes, hillsides and scarps, often in association with Brigalow and SEVT communities (DAWE 2020b, Santos 2012). The nearest confirmed records are within the Arcadia Valley *ca*. 30km northwest of the Site (ALA 2020)	**Potentially present.** Suitable habitat for the species occurs within the Site but the species, a large tree, is readily detected.

No EPBC Act threatened flora were detected within the Site. Two species of NC Act listed threatened flora were detected within the Site. The Swamp Tea-tree (*Melaleuca irbyana*) was found at several locations. The shrub *Sannantha brachypoda* was detected immediately adjoining the footprint at one site. Locations of threatened flora detected within the Site are shown within Appendix E and are included within the associated spatial data files.

3.5. Fauna

3.5.1. Threatened Fauna

PMST search results (DAWE 2020a) indicated eighteen EPBC Act-listed threatened fauna species that might occur within the Site. Wildlife Online and ALA searches (DES 2020c, ALA 2020) produced records within 10 km of a central point within the Site for two fauna species listed as threatened under the EPBC Act and/or NC Act. These were White-throated Needletail (*Hirundapus caudacutus*) (Vulnerable: EPBC Act, NC Act) and Golden-tailed Gecko (*Strophurus taenicauda*) (Near Threatened: NC Act). A likelihood of occurrence assessment for EPBC and/or NC Act-listed threatened fauna at the Site is presented in Table 7.

Table 7: Assessment of likelihood of occurrence for EPBC Act and/or NC Act-listed threatened fauna at the Site.

Key to status: CE/CR = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened; C = Least Concern.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Birds	*Calidris ferruginea* Curlew Sandpiper	CE	CR	A migratory species usually encountered on coastal and near-coastal saline and freshwater tidal and palustrine wetlands (DAWE 2020b). Passage migrants are occasionally present on inland wetlands, and the species is sparsely recorded across inland Queensland (ALA 2020).	**Unlikely to be present.** No suitable palustrine wetland habitat exists within the Site.
Birds	*Calyptorhynchus lathami* Glossy Black-Cockatoo	-	V	Queensland distribution of the nominate subspecies extends from the south-eastern border north to central coastal Qld with highest densities east of the Great Dividing Range and scattered occurrences inland. The species has been recorded in the Expedition Range (Holmes 2012, ALA 2020) and in the Fairview gas field (Boobook, unpubl. data). Dependent on the fruits of several species of *Casuarina* and *Allocasuarina* spp. and occurs in a variety of forest types (Pizzey and Knight 2010, Garnett *et al*. 2011). It will visit isolated trees and remnant patches where food trees are present (Holmes 2012). Nesting habitat is hollow-bearing live or dead trees (Higgins 1999).	**Likely to be present.** Suitable habitat exists within the site including Belah *Casuarina cristata* and Hairy Oak *Allocasuarina inophloia* food trees which are present but not abundant within the Site.
Birds	*Erythrotriorchis radiatus* Red Goshawk	V	E	A sparsely distributed species occurring in north-eastern and northern Australia. It is a highly mobile species with a large home range; breeding habitat is in intact tall forest associated with major drainage lines, especially near permanent water bodies and where there is high avian prey diversity, but the species could potentially forage much further away from these areas (Marchant and Higgins 1993). There are no recent records of this species in Southern inland Queensland (ALA 2020). However, based on past records the forested uplands of the Fitzroy and Dawson River catchments may potentially support this species.	**Potentially present.** Suitable breeding habitat (permanent water bodies and riparian habitat with tall trees) is absent within the Site but potential foraging habitat (open areas near water, forests and woodlands) is present at the Site.
Birds	*Falco hypoleucos* Grey Falcon	V	V	A rarely seen species, occurring at low densities throughout much of the semi-arid interior of Australia (TSSC 2020). This is a pursuit predator that hunts birds and other small prey in open woodland plains. The species nests in large trees along stream lines (TSSC 2020). The species is occasionally recorded in more mesic areas such as the Brigalow Belt (ALA 2020).	**Unlikely to be present.** The Site does not include the preferred habitat of this species, *Acacia* shrubland plains traversed by tree-lined watercourses (TSSC 2020). There are no confirmed records of the species within 100 km of the Site.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Birds	*Geophaps scripta scripta* Squatter Pigeon (southern subspecies)	V	V	Occurs in southern and central eastern Australia, being almost entirely confined to Queensland. It Inhabits grassy woodlands with open areas for foraging habitat usually near a water source (Higgins and Davies 1996). There are numerous records from the Fairview gas-field (ALA 2020, Santos unpubl.).	**Confirmed present.** Suitable habitat (grassy woodland) is present within the Site. The species has been recorded from Fairview Gas Field.
Birds	*Grantiella picta* Painted Honeyeater	V	V	In Queensland the species has been recorded from a wide area extending from the southern inland to the north-west (ALA 2020, DES 2020h). Breeding range extends from about Roma southward, while northern records represent the winter range. Lives and breeds in woodlands and open forests with high densities of suitable food plants (i.e. mistletoes, family Loranthaceae) (Higgins *et al*. 2001).	**Unlikely to be present.** Suitable habitat (mistletoe-rich woodland and open forest) is rare in sandstone upland environments of inland Queensland: none was recorded within the Site.
Birds	*Hirundapus caudacutus* White-throated Needletail	V	V	Summer visitor in small to very large flocks that travel with weather fronts, occurring mainly in eastern Australia (Pizzey and Knight (2010, ALA 2020). It feeds aerially over all natural and artificial environments. This is also a listed Marine species.	**Likely to be present.** The Site is within the known range of the species and it may forage aerially over all habitat types.
Birds	*Neochmia ruficauda ruficauda* Star Finch (eastern subspecies)	E	E	The range of this subspecies has contracted markedly and it may now be extinct (Maute and Legge 2012). It is considered to be no longer extant in the Fairview gas field area.	**Unlikely to be present.** The species is considered extinct within the Fairview gas field area.
Birds	*Ninox strenua* Powerful Owl	-	V	This, Australia's largest owl, occurs from South Australia to mid-eastern Queensland, where it lives in tall eucalypt forests on coastal and inland ranges and rivers where extensive areas of forest are present (Pizzey and Knight 2010, Debus 2012). It feeds principally on mammals including possums, gliders and flying foxes and also takes birds. It is known to occur in the Expedition and Carnarvon Ranges (ALA 2020).	**Potentially present.** Suitable habitat is present within the Site.
Birds	*Poephila cincta cincta* Black-throated Finch (southern subspecies)	E	E	The range of this subspecies has contracted markedly northward (Grice 2012, Garnett *et al*. 2011), occurring in a few locations in the northern Brigalow Belt of Queensland and it is considered to be no longer extant in the Fairview gas field area.	**Unlikely to be present.** The species is considered extinct within the Fairview gas field area.
Birds	*Rostratula australis* Australian Painted Snipe	E	E	Recorded over much of Australia other than the driest interior, but most frequently recorded within the Murray-Darling Basin (ALA 2020). Forages at shallow edges and adjacent vegetated margins of freshwater wetlands (DAWE 2020b) and is able to use both artificial and natural ephemeral and permanent wetlands (Marchant and Higgins 1993).	**Unlikely to be present.** Suitable habitat (permanent and ephemeral shallow palustrine wetlands) is not present within the Site.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Birds	*Turnix melanogaster* Black-breasted Button-quail	V	V	This bird lives in drier rainforest types (including SEVT), brigalow shrubby open forest and littoral shrublands from about Byfield, central Qld south to the Northern Rivers area of NSW, where it forages in deep leaf litter (Smith and Mathieson 2012). The species is recorded at Palmgrove NP, *ca*. 85km northeast of the Site and within a large tract of intact vegetation extending north and east from the Expedition Range (ALA 2020).	**Potentially present.** Suitable habitat (SEVT) is present within the Site.
Fish	*Maccullochella peelii* Murray Cod	V	-	In Queensland naturally occurring populations of this species are confined to permanent water in riverine environments in the Condamine, Maranoa-Balonne, Weir, Moonie and Macintyre River catchments (Lintermans 2007).	**Unlikely to be present.** Suitable riverine habitat exists within the Site but the species does not occur in the Dawson-Fitzroy drainage.
Gastropods	*Adclarkia dawsonensis* Dawson River Snail, Boggomoss Snail	CE	E	This snail is known only from riparian communities and boggomosses (mound springs) along the Dawson River between Taroom and Theodore (Stanisic *et al*. 2010, Stanisic 1996). Lives under logs and in leaf litter in woodland associated with alluvial soils (Stanisic *et al*. 2010, Stanisic 1996).	**Unlikely to be present.** Potentially suitable habitat associated with the Dawson River and its floodplain is present to a limited extent but the species has not been recorded within about 90 km of the Site (ALA 2020, DES 2020c).
Insects	*Jalmenus eubulus* Pale Imperial Hairstreak (butterfly)	-	V	This butterfly is essentially limited to the Brigalow Belt: its range extends from inland of Eungella, central Qld southward to the Carnarvon Range and Darling Downs, extending into far northern NSW (ALA 2020). Usually associated with mature Brigalow (*Acacia harpophylla*) open forests and woodlands (Valentine and Johnson 2012).	**Potentially present.** Habitat with suitable food plants (mature stands of Brigalow *Acacia harpophylla*) is present within the Site.
Mammals	*Chalinolobus dwyeri* Large-eared Pied Bat	V	V	This species occurs in inland to coastal areas of New South Wales and Queensland (ALA 2020). All known occurrences of this species are within or near forested landscapes with relatively high relief (DAWE 2020b). The species may be present in uplands with appropriate geology (usually sandstone) providing essential habitat (caves, crevices, holes) and associated foraging habitat. The species is known from Expedition Range NP and Belington Hut SF (ALA 2020).	**Likely to be present.** Potentially suitable habitat (i.e. caves and crevices in rocky hills and cliff lines) is present within the Site, which is within the known range of the species.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Mammals	*Dasyurus hallucatus* Northern Quoll	E	C	Formerly widespread in south-central Queensland this species has declined markedly and is now confined to rugged and remote areas throughout its distribution (Burnett 2012). Forested uplands with high relief and/or containing abundant rock outcrops may support the species. The nearest recent records are from the Carnarvon Range (ALA 2020).	**Potentially present.** The Site is within the species' historical range and areas of potentially suitable den sites (i.e. rock holes/crevices) are present within the Site.
Mammals	*Nyctophilus corbeni* South-eastern Long-eared Bat	V	V	The distribution and habitat preferences of this species are very poorly known but it has been reported from a wide variety of dry woodland and open forest types in south central Queensland (Reardon 2012). The species has been recorded in the Expedition Range, with a record within 50km of the Site (ALA 2020).	**Likely to be present.** Potentially suitable foraging and roosting habitat is present in remnant woodland within the Site, which is within the known range of the species.
Mammals	*Petauroides volans* Greater Glider	V	V	Occurs from central Victoria to northern Queensland, living in eucalypt woodlands and open forest particularly those with mature trees containing large hollows (TSSC 2016). It is frequently reported from forested uplands of the Great Dividing Range in Qld, including the Expedition and Carnarvon Ranges (ALA 2020).	**Likely to be present.** Potentially suitable habitat is present and widespread within the Site, which is within the known range of the species.
Mammals	*Phascolarctos cinereus* Koala	V	V	Occurs in coastal and inland areas from South Australia to northern Queensland. This species requires eucalypt woodland and forest habitat with suitable food trees (primarily *Eucalyptus* spp.) (DAWE 2020b). Woodlands containing food trees in riparian/alluvial areas are particularly favoured (Melzer *et al*. 2014). The Site is within the known range of the species (ALA 2020). Potential food trees occurring within the Site include *Eucalyptus tereticornis*, *E. populnea*, *E. melanophloia*, *E. crebra and Corymbia citriodora*.	**Likely to be present.** Suitable habitat (*Eucalyptus*-dominated woodlands and open forests) is present and widespread within the Site, which is within the known range of the species.
Reptiles	*Acanthophis antarcticus* Common Death Adder	-	V	A widespread but patchily distributed snake, recorded throughout Qld other than the far south-west, the Mitchell Grass Downs, western Cape York and the far northwest of the State: it is known to occur in the Carnarvon Ranges to the west of the Site (ALA 2020, DES 2020h). Lives in woodlands, open forests and heathlands; requires abundant shelter/ambush predation cover e.g. low shrubs, rocks, logs and dense leaf litter (Wilson 2015).	**Potentially present.** Suitable habitat with shelter sites (e.g. dense low shrubs, leaf litter and rocks) is present within parts of the Site.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Reptiles	*Delma torquata* Collared Delma	V	V	This lizard is endemic to sub-coastal and inland southern Queensland. Occupies a range of eucalypt woodlands and open forests; lives under surface rock and large woody debris (Wilson 2015). The Site is within the species' potential range with several records from locations north-west of Roma (ALA 2020).	**Likely to be present.** Eucalypt woodland with potentially suitable shelter sites (e.g. small rocks, woody debris) is present within the Site.
Reptiles	*Denisonia maculata* Ornamental Snake	V	V	This snake is endemic to Queensland. It occurs in lowlands associated with the Dawson and Fitzroy catchments (DAWE 2020b). Known southern distribution limit is approximately Lake Nuga Nuga, *ca.* 80 km northwest (ALA 2020). Lives in woodland and grassland with cracking clay soils, usually in close proximity to wet or seasonally wet areas e.g. billabongs, gilgais, floodplains, riparian corridors (DAWE 2020b).	**Unlikely to be present.** Habitat with preferred substrate (e.g. deep cracking clay, gilgais) and farm dams is scarce at the Site. Surrounding uplands and undulating sandy landscapes are considered unsuitable habitat for the species.
Reptiles	*Egernia rugosa* Yakka Skink	V	V	This lizard is endemic to inland southern Queensland, where it lives in a range of woodland and open forests dominated by *Eucalyptus*, *Acacia* and *Callitris* spp.; also grassland with regrowth trees (DAWE 2020b). Requires suitable soils for burrows or shelters in sinkholes, abandoned rabbit warrens or large fallen/piled woody material (Eddie 2012). There are historical records of the species from the Arcadia Valley, *ca.* 30km northwest (ALA 2020).	**Potentially present.** Eucalypt woodland and non-remnant areas with potentially suitable shelter sites (e.g. large logs, log piles) are present within parts of the Site.
Reptiles	*Elseya albagula* White-throated Snapping Turtle	CE	CR	Occurs only in the Burnett, Fitzroy and Dawson River catchments of Queensland where it requires permanent water in riverine environments (Limpus *et al*. 2011).	**Confirmed present.** Limited suitable riverine habitat is present in Hutton Creek within the Site.
Reptiles	*Furina dunmalli* Dunmall's Snake	V	V	This snake is almost endemic to southern-central Queensland, having been also reported in the far north of NSW. Occupies woodlands and open forests; may be reliant on presence of abundant fallen woody debris (Hobson 2012). The species has been recorded from the nearby Arcadia Valley (BOOBOOK unpubl. data).	**Likely to be present.** Potentially suitable foraging and shelter habitat is present and widespread in remnant and regrowth REs within the Site.
Reptiles	*Rheodytes leukops* Fitzroy River Turtle	V	V	The species is confined to the Fitzroy and Dawson River catchments of Queensland where it requires permanent water in riverine environments, preferentially foraging in shallow, well-oxygenated riffles (Limpus *et al*. 2011).	**Potentially present.** Limited suitable riverine habitat is present in Hutton Creek within the Site.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Reptiles	*Strophurus taenicauda* Golden-tailed Gecko	-	NT	In Queensland this gecko inhabits a variety of dry woodland and open forest habitats in the Brigalow Belt (DES 2020h). Within these habitats it lives in tree hollows and splits, and under loose bark on live and dead trees (DES 2020h, Wilson 2015)	**Likely to be present.** The species has been recorded nearby and potentially suitable habitat (dry woodland and open forest) is extensive at the Site.

Two threatened fauna species were detected during the assessment these being White-throated Snapping Turtle (*Elseya albagula*) and Squatter Pigeon (*Geophaps scripta scripta*). White-throated Snapping Turtle was observed in a permanent pool within Hutton Creek. Several Squatter Pigeons were observed in Beilba State Forest and Hallett State Forest. The locations of threatened fauna recorded during the survey are shown in Appendix E.

3.5.1.1. Predictive Habitat Mapping

Forty-eight (48) microhabitat assessments were conducted as described at Section 2.2.3 and 2.2.4. The results of these assessments were then combined with ecologist knowledge to develop RE-based predictive habitat mapping for EPBC and NC Act-listed threatened fauna species confirmed, likely or potentially present at the Site.

Identified habitat RE were classified as Essential or General Habitat using the definitions provided in the Santos Fauna Habitat model (Aurecon 2014) as follows:

Essential habitat - is an area containing resources that are considered essential for the maintenance of populations of the species (e.g. potential habitat for breeding, roosting, foraging, shelter, for either migratory or non-migratory species). 'Essential Habitat' is defined from known records and/or expert advice (including the findings of preclearance surveys).

General habitat - consists of areas or locations that are used by transient individuals or where species have been recorded but there is insufficient information to assess the area as 'Essential/core habitat'. 'General Habitat' may be defined from known records or habitat that is considered to potential support a species according to expert knowledge of habitat relationships, despite the absence of specimen backed records. 'General Habitat' may include areas of suboptimal habitat for species.

Mapping rules and the estimated total availability of General Habitat within the survey area for each species are given in Table 8.

Table 8: Potentially suitable REs and estimated extent of Essential and General Habitat for EPBC and NC Act listed threatened fauna species potentially present at the Site.

Class	Species name	Potentially Suitable REs	Mapped extent of Habitat (ha)	Habitat Mapping Rules/Notes
Birds	*Calyptorhynchus lathami* Glossy Black-Cockatoo	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.9, 11.10.11, 11.10.13	General: 847.58	This species requires suitable *Casuarina* or *Allocasuarina* feed trees and large hollow-bearing eucalypts for nesting and roost sites. No Essential Habitat is mapped. Mapped General Habitat includes remnant and regrowth vegetation in all REs except Vine Thicket.

Class	Species name	Potentially Suitable REs	Mapped extent of Habitat (ha)	Habitat Mapping Rules/Notes
Birds	*Erythrotriorchis radiatus* Red Goshawk	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.4, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.8, 11.10.9, 11.10.11, 11.10.13	General: 849.12	Species requires tall trees close to permanent water for nest sites but may forage at a distance from this habitat. Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE.
Birds	*Geophaps scripta scripta* Squatter Pigeon (southern)	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.9, 11.10.11, 11.10.13	General: 837.14	The species nests and forages in a wide range of grassy woodland and open forest types. No Essential Habitat is mapped. Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE.
Birds	*Hirundapus caudacutus* White-throated Needletail	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.4, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.8, 11.10.9, 11.10.11, 11.10.13	General: 849.12	This species feeds aerially over all habitat types. No Essential Habitat is mapped. Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE.
Birds	*Ninox strenua* Powerful Owl	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.4, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.8, 11.10.9, 11.10.11, 11.10.13	General: 741.51	No Essential Habitat is mapped. Mapped General Habitat includes all potential shelter and foraging habitat in remnant vegetation of the nominated RE.
Birds	*Turnix melanogaster* Black-breasted Button-quail	11.9.4, 11.10.8	General: 1.54	Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE. The mapped area is contiguous with a much larger patch of the nominated RE outside the Site.
Insects	*Jalmenus eubulus* Pale Imperial Hairstreak (butterfly)	11.9.5,11.9.10	Essential: 29.47	Mapped Essential Habitat includes all areas of remnant of the nominated RE.
Mammals	*Chalinolobus dwyeri* Large-eared Pied Bat	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.4, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.8, 11.10.9, 11.10.11, 11.10.13	Essential: 800.14	Mapped Essential Habitat includes all nominated RE within 5 km of potentially suitable shelter habitat (extensive areas of dissected sandstone with deep crevices and caves). No General Habitat is mapped.
Mammals	*Dasyurus hallucatus* Northern Quoll	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.4, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.8, 11.10.9, 11.10.11, 11.10.13	Essential Habitat: 332.88 General Habitat: 467.26	Mapped Essential Habitat includes all nominated RE within 1 km of shelter habitat (extensive areas of dissected sandstone with deep crevices and caves). Mapped General Habitat includes all remnant and regrowth vegetation of the nominated RE in a buffer 1 to 5 km of potentially suitable shelter habitat.
Mammals	*Nyctophilus corbeni* South-eastern Long-eared Bat	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.4, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.8, 11.10.9, 11.10.11, 11.10.13	General: 849.12	Mapped General Habitat includes all areas of remnant vegetation and regrowth that may be suitable for foraging or shelter.
Mammals	*Petauroides volans* Greater Glider	11.3.2, 11.3.19, 11.3.25, 11.9.2, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.11, 11.10.13	General: 376.88	This species requires eucalypt-dominated woodlands and open forests with large tree hollows as den sites. Mapped General Habitat includes all areas of remnant vegetation that may be suitable for shelter and foraging.

Class	Species name	Potentially Suitable REs	Mapped extent of Habitat (ha)	Habitat Mapping Rules/Notes
Mammals	*Phascolarctos cinereus* Koala	Essential: 11.3.2, 11.3.19, 11.3.25 General: 11.9.2, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.11, 11.10.13	Essential: 13.68 General: 414.87	Essential Habitat includes eucalypt-dominated riparian and floodplain REs. Mapped General Habitat includes all other remnant and regrowth of RE dominated by Myrtaceae species.
Reptiles	*Acanthophis antarcticus* Common Death Adder	11.9.4, 11.9.5, 11.10.1, 11.10.3, 11.10.8, 11.10.13	General: 175.52	This species is dependent on the presence of abundant shelter/ambush predation cover e.g. low shrubs, rocks, logs and dense leaf litter. It is considered to be potentially present in RE containing abundant cover. Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE.
Reptiles	*Delma torquata* Collared Delma	11.3.2, 11.3.19, 11.9.2, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.9, 11.10.11, 11.10.13	General: 832.01	Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE.
Reptiles	*Egernia rugosa* Yakka Skink	Essential: 11.3.2, 11.3.19, 11.9.2, 11.9.7, 11.10.1, 11.10.7, 11.10.9, 11.10.11 General: 11.9.5, 11.9.10, 11.10.3, 11.10.13	Essential: 742.69 General: 99.83	Mapped Essential Habitat is based on known records within the nominated RE and includes all remnant vegetation and regrowth of the nominated RE. Mapped General Habitat includes all remnant vegetation and regrowth of the nominated RE. This may include sub-optimal habitat.
Reptiles	*Elseya albagula* White-throated Snapping Turtle	11.3.25	Essential: 0.62	This turtle is an obligate aquatic species that nests on banks near habitat pools. Mapped Essential Habitat includes RE 11.3.25 where this includes permanent pools and adjacent banks of Hutton Creek.
Reptiles	*Furina dunmalli* Dunmall's Snake	11.3.2, 11.3.19, 11.9.2, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.9, 11.10.11, 11.10.13	General: 842.52	Mapped General Habitat includes all remnant vegetation and regrowth of the nominated RE.
Reptiles	*Rheodytes leukops* Fitzroy River Turtle	11.3.25	Essential: 0.62	This turtle is an obligate aquatic species that nests on banks near habitat pools. Mapped Essential Habitat includes RE 11.3.25 where this includes permanent pools and adjacent banks of Hutton Creek.
Reptiles	*Strophurus taenicauda* Golden-tailed Gecko	11.3.2, 11.3.19, 11.9.2, 11.9.5, 11.9.7, 11.9.10, 11.10.1, 11.10.3, 11.10.7, 11.10.9, 11.10.11, 11.10.13	General: 842.52	This species relies on shelter sites under defoliating bark of *Callitris*, *Acacia* and *Eucalyptus* species. Mapped General Habitat includes all areas of remnant and regrowth of the nominated REs.

The suitability of areas of vegetation as fauna habitat is determined by the presence and abundance of microhabitat features relevant to the needs of individual species or groups of species (e.g. terrestrial reptiles). In general, mature vegetation (remnant or regrowth) is more likely to support appropriate levels of these microhabitat features, while their presence in younger regrowth and clearings is less likely. This is particularly the case where clearing for agriculture or other purposes has involved the destruction of fallen timber and coarse woody debris, such that where young

regrowth is present it lacks necessary microhabitat for ground-dwelling fauna. Some areas of young regrowth may contain such habitat features (e.g. log piles used by reptiles). However, these areas constitute a small and unpredictable portion of the available suitable habitat. For the purposes of this report, Essential and/or General Habitat is assumed to be present only in remnant and mapped regrowth vegetation.

For two species of aquatic fauna, the Fitzroy River Turtle (*Rheodytes leukops*) and White-throated Snapping Turtle (*Elseya albagula*), RE-based predictive mapping has limited value. Both species are obligate aquatic species that depend on the presence of permanent water for shelter and foraging habitat. However, the White-throated Snapping Turtle, at least, is capable of travelling up- or downstream during seasonal flow periods, thus traversing stretches of watercourse normally dry for extended periods (Limpus *et al.* 2011). Additionally, both species lay eggs in terrestrial sites (sandy or loam stream banks) near permanent water i.e. riverine pools. Hence although the habitat at the Site for these turtles lies within the mapped extent of RE 11.3.25, the habitat parameters determining the presence of the species (permanent and temporary water for shelter, foraging and dispersal; suitable soils for nesting) are independent of the presence, condition and extent of woody vegetation attributable to this RE. The only suitable habitat for these turtle species within the Site is at the crossing point on Hutton Creek.

Predictive habitat maps for selected species are shown in Appendix F.

3.5.1.2. Habitat Quality Index Assessment

An index of habitat quality was calculated at each assessment site for thirteen (13) EPBC Act-listed fauna species present or potentially occurring at the Site. This assessment excluded White-throated Needletail (*Hirundapus caudacutus*), an EPBC Act listed species that is also likely to occur at the Site but which is not dependent on specific microhabitat features. Habitat quality scores were averaged within each of the twenty (20) AU and weighted by the proportion of each AU relative to the total vegetated area. Summation of area-weighted AU habitat quality scores provided a Habitat Quality Score for the vegetated part of the Site (849.12 ha). Scores for these thirteen species are shown in Table 9 (maximum possible score is 10).

Table 9: Summary of Habitat Quality Scores for EPBC Act listed threatened fauna species known from or potentially occurring at the Site.

Fauna Species	Final Habitat Quality Score for the Impact Area
Northern Quoll	3.93
Koala	4.83
Greater Glider	4.14
Large-eared Pied Bat	4.58
South-eastern Long-eared Bat	7.03
Red Goshawk	3.71
Squatter Pigeon (southern)	6.12
Black-breasted Button-quail	1.33
Collared Delma	5.09
Yakka Skink	5.32
Dunmall's Snake	4.90
White-throated Snapping Turtle	0.02
Fitzroy River Turtle	0.02

High scores, such as for South-eastern Long-eared Bat (7.0) and Squatter Pigeon (6.1), indicate that suitable habitat for food, shelter, breeding and dispersal of these species is widespread at the Site, with low levels of threats. Low scores may indicate higher levels of threats, a lack of habitat supporting some aspects of life-history, or limited extent of suitable habitat at the Site For the two aquatic species, the Fitzroy River Turtle and White-throated Snapping Turtle, low scores reflect their dependence on stream pools, which make up a low proportion of the Site area. Although AU (RE) not associated with riparian areas clearly failed to provide any suitable habitat, the riparian RE 11.3.25 included a section of Hutton Creek with a large permanent waterhole and regular extended flows. As discussed above (3.5.1.1) it should be noted that RE 11.3.25 often will not be correlated with the presence of essential aquatic habitat.

3.5.1.3. Analysis of potential Significant Impacts

The proposed development at the Site may potentially produce significant impacts upon threatened fauna species. Such potential impacts are assessed following the EPBC Act guidelines for Significant Impacts on Matters of National Environmental Significance (DoE 2013). This assessment is also consistent with the Queensland Environmental Offsets Policy (DEHP 2014). Table 10 shows the results of this assessment for threatened fauna species (EPBC and NC Act) identified as confirmed, likely or potentially present at the Site.

Table 10: Assessment of potential significant impacts upon EPBC Act listed threatened fauna species potentially present at the Site.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Calyptorhynchus lathami* Glossy Black-Cockatoo	Possible: Potential loss of foraging habitat and nesting habitat (hollow-bearing trees) in up to 847.58 ha of open forest habitat.	Yes: loss of 847.58 ha of habitat likely to result in a significant impact on the species' AoO. No impact on EoO as the species is widespread beyond the Site.	No: the species can cross narrow linear disturbances to tree canopy cover.	Yes: Potential loss of foraging and nesting habitat (hollow-bearing trees) in up to 847.58 ha of open forest habitat.	None known	None known	Possible: potential impacts as described.	Yes: Potential decrease in foraging habitat and loss of potential nest sites.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Erythrotriorchis radiatus* Red Goshawk	Possible: species known to be very sensitive to disturbance. Potential loss of 849.12 ha of foraging habitat and including potential nesting habitat (tall trees in RE 11.3.25).	Possible. The species is known to be very sensitive to disturbance. However, the impact of potential loss of 849.12 ha of foraging habitat (AoO) is uncertain as linear clearing may enhance predation opportunities for this species (feeds on medium to large birds). No impact on EoO as large areas of suitable habitat occur nearby.	No: the species can cross narrow linear disturbances to tree canopy cover	Possible: species known to be very sensitive to disturbance. Impact of potential loss of 849.12 ha of foraging habitat uncertain as linear clearing may enhance predation opportunities for this species (feeds on medium to large birds). Possible disturbance of nesting habitat.	None known	None known	Possible: potential impacts as described but note that the species has very large home range and clearing and other impacts may not be critical if core nesting habitat not affected.	Yes: Potential decrease in foraging habitat and loss of potential nest site for this wide-ranging species.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Geophaps scripta scripta* Squatter Pigeon (southern)	Possible: potential loss of 837.14 ha of woodland foraging habitat but the species is known to forage in cleared pastoral landscapes. Potential loss of breeding habitat (lightly grassed sites, often on elevated positions).	Possible: potential loss of 837.14 ha of woodland foraging habitat (AoO) but the consequences are uncertain as this species is known to forage in cleared pastoral landscapes. No impact on EoO as the species is widespread beyond the Site (though approaching southern range limit).	No: the species can cross narrow linear disturbances to tree canopy cover	Possible: potential loss of 837.14 ha of woodland foraging habitat but the species is known to forage in cleared pastoral landscapes. Loss of foraging places may thus be only short-term. Potential loss of breeding habitat (lightly grassed sites, often on elevated positions).	None known	None known	Possible but uncertain as the species has demonstrated ability to adjust to partial clearing of woodland habitat.	Yes: Potential decrease in foraging habitat and disturbance to breeding habitat.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Hirundapus caudacutus* White-throated Needletail	No: species is an aerial feeding insectivore that forages over a wide range of intact and disturbed landscapes. It does not breed in Australia and only very rarely roosts during its summer presence.	No: proposed disturbance not materially relevant to the species.	No: proposed disturbance not materially relevant to the species.	No: no significant impact on foraging resources is anticipated, no other critical locations are relevant to the species in Australia	None known	None known	No: species is an aerial feeding insectivore that forages over a wide range of intact and disturbed landscapes. It does not breed in Australia and only very rarely roosts during its summer presence.	No.
Birds	*Ninox strenua* Powerful Owl	Yes: potential loss of 741.51 ha of nesting and foraging habitat.	Possible: potential loss of 741.51 ha of woodland foraging habitat (AoO) but the consequences are uncertain as this species has a large home range is known to forage in disturbed landscapes. No impact on EoO as the species has been recorded from nearby areas.	No: potential clearing will not fragment the habitat as suitable habitat is widespread adjacent to the development and the species is able to cross narrow linear disturbance of canopy cover.	Possible: potential loss of 741.51 ha of woodland foraging habitat but the species is known to forage in disturbed landscapes. Potential loss of breeding habitat (large tree hollows in tall open forest).	None known	None known	Possible: potential impacts as described but note that the species has large home range and clearing and other impacts may not be critical if core nesting habitat not affected.	Yes: Potential decrease in foraging habitat and disturbance to breeding habitat.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Turnix melanogaster* Black-breasted Button-quail	Possible: potential loss of 1.54 ha of habitat	Yes: AoO - this species is very sensitive to patch size thus clearing that reduces total patch size will impact on carrying capacity of remaining habitat patch. Potential impact on EoO from loss of a local population, as this species reaches its western limit in this region. However, larger areas of suitable habitat occur in adjacent areas outside the footprint of this development.	No: potential clearing will not fragment the habitat.	Yes: potential loss of 1.54 ha of essential foraging and breeding habitat.	None known	None known	Yes: species is very sensitive to patch size thus clearing that reduces total patch size will impact on carrying capacity of remaining habitat patch.	Yes: Loss of a small area of potential foraging and breeding habitat which may impact on viability of remaining habitat for the species.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Insects	*Jalmenus eubulus* Pale Imperial Hairstreak	Yes: potential loss of 29.47 ha of habitat	Yes: AoO - this species is dependent on mature *Acacia harpophylla* trees thus clearing that reduces total patch size will impact on carrying capacity of remaining habitat patch. No impact on EoO expected from reduction of a local population, as this species occurs in adjacent areas to at least Carnarvon Gorge.	No: potential clearing will not fragment the habitat as the species is able to cross (overfly) narrow linear canopy disturbances.	Possible: a reduction of 29.47 ha in breeding habitat (mature *Acacia harpophylla* community).	None known	None known	Possible: a reduction of 26.36 ha in breeding habitat (mature *Acacia harpophylla* community).	Yes: Loss of potential foraging and breeding habitat.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Mammals	*Dasyurus hallucatus* Northern Quoll	Possible: loss of 800.14 ha potential foraging habitat within 5 km of shelter habitat including 332.88 ha within 1 km of shelter habitat. Uncertainty exists as to how much of this habitat would be used by the species as it is contingent on proximity to denning habitat. No loss of denning or breeding habitat will occur.	Potential loss of 800.14 ha of foraging habitat (AoO) with likely long-term loss of availability of food resources. No impact on EoO as suitable habitat occurs in nearby areas.	No: the species can cross narrow linear disturbances to tree canopy cover	Potential loss of 800.14 ha habitat with likely long-term loss of availability of food resources (terrestrial vertebrates and invertebrates).	None known: The Cane Toad is a recognised threat, but it is already established within the Site	None known	Possible: potential loss of 631.49 ha of foraging habitat with likely long-term loss of availability of food resources. Uncertainty exists as to how much of this habitat would be used by the species as it is contingent on proximity to denning habitat.	Yes: Decrease in foraging habitat without impacting on ecologically critical breeding and shelter sites.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Mammals	*Chalinolobus dwyeri* Large-eared Pied Bat	Uncertain: potential loss of 800.14 ha foraging habitat within 5 km of roost habitat. No loss of critical roosting / breeding habitat (caves / deep rock clefts)	Potential loss of 800.14 ha of foraging habitat (AoO) but narrowly linear configuration of clearing may not significantly impact on availability of food resources (aerial insects). No impact on EoO as suitable habitat occurs in nearby areas.	No: the species can cross narrow linear disturbances to tree canopy cover	Potential loss of 800.14 ha of foraging habitat but narrowly linear configuration of clearing may not significantly impact on food resources. No loss of roosting or breeding habitat will occur	None known	None known	Uncertain: potential loss of some foraging habitat. No loss of critical roosting / breeding habitat (caves / deep rock clefts)	Yes: Decrease in foraging habitat without impacting on ecologically critical breeding and shelter sites

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Mammals	*Nyctophilus corbeni* South-eastern Long-eared Bat	Likely: potential loss of some foraging habitat. Likely loss of critical roosting / breeding habitat (tree hollows)	Potential loss of 849.12 ha of foraging habitat (AoO) but narrowly linear configuration of clearing may not significantly impact on availability of food resources (aerial insects). Loss of breeding and roosting habitat may be significant. No impact on EoO as suitable habitat occurs in nearby areas.	No; the species can cross narrow linear disturbances to tree canopy cover	Potential loss of 849.12 ha of foraging habitat but narrowly linear configuration of clearing may not significantly impact on food resources. Likely loss of roosting or breeding habitat (tree hollows) will occur	None known	None known	Likely: potential loss of foraging habitat. Likely loss of critical roosting / breeding habitat (tree hollows)	Yes: Decrease in foraging habitat and reduction in potential breeding and shelter sites.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Mammals	*Petauroides volans* Greater Glider	Likely: potential loss of 376.88 ha of foraging habitat. Likely loss of critical denning / breeding habitat (tree hollows)	Yes: Potential loss of 376.88 ha of foraging habitat (AoO) with long-term loss of food resources (foliage of various eucalypt species). Potential loss of many habitat trees (hollows). No impact on EoO as suitable habitat occurs in nearby areas and the species is widespread beyond the Site.	No; the species can cross narrow linear disturbances to tree canopy cover.	Yes: Potential loss of 376.88 ha of foraging habitat with long-term loss of food resources (foliage of various eucalypt species). Potential loss of many habitat trees (hollows).	None known	None known	Likely: potential loss of foraging habitat. Likely loss of critical denning / breeding habitat (tree hollows)	Yes: Decrease in foraging habitat and loss of potential breeding and shelter sites.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Mammals	*Phascolarctos cinereus* Koala	Likely: potential loss of 428.55 ha of foraging and shelter habitat, including 13.68 ha of preferred alluvial RE (Essential Habitat).	Yes: Potential loss of 428.55 ha of foraging and shelter habitat (AoO) with long-term loss of food resources (foliage of various eucalypt species). No impact on EoO as suitable habitat occurs in nearby areas and the species is widespread beyond the Site.	No: the species can cross narrow linear disturbances to tree canopy cover	Yes: Potential loss of 428.55 ha of foraging and shelter habitat with long-term loss of food resources (foliage of various eucalypt species).	None known	None known: chlamydia is present in Koala populations in southern inland Queensland and may already be present in animals at the Site.	Likely: potential loss of foraging and shelter habitat.	Yes: Decrease in foraging and shelter habitat.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Reptiles	*Acanthophis antarcticus* Common Death Adder	Yes: potential loss of 175.52 ha of foraging, shelter and breeding habitat associated with shrub cover, surface rock and woody debris in open and closed forests: loss is expected to be long-term. Note, however, that the species is unlikely to inhabit all available potential habitat as population densities appear to be low in habitat adjacent to the development area.	Yes: Potential loss of 175.52 ha of shelter, foraging and breeding habitat (AoO) with long-term loss of food resources (lizards, small mammals and birds). No impact on EoO as suitable habitat occurs in nearby areas and the species is widespread beyond the development area.	No: the species can cross narrow linear disturbances to soil surface and tree canopy cover.	Yes: potential loss of 175.52 ha of foraging, shelter and breeding habitat associated with shrub cover, surface rock and woody debris in open and closed forests: loss is expected to be long-term.	None known (Cane Toad is known threat to the species but is already established in the development area).	None known.	Potential: loss of 174.87 ha of foraging, shelter and breeding habitat associated with shrub cover, surface rock and woody debris in open and closed forests.	Yes: Reduction in total area of habitat, and potential loss of individuals in the development area.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Reptiles	*Delma torquata* Collared Delma	Yes: potential loss of 832.01 ha of foraging, shelter and breeding habitat associated with surface rock and woody debris in woodlands: loss is expected to be long-term.	Likely reduction in AoO from loss of 832.01 ha of potential foraging, shelter and breeding habitat. No impact on EoO as the species has a widespread, although patchy distribution in the region.	Uncertain: the species has a naturally fragmented distribution which may indicate it does not readily disperse across unsuitable habitat, but narrow linear strips may not be a barrier to movement.	Yes: potential loss of 832.01 ha of foraging, shelter and breeding habitat associated with surface rock and woody debris in woodlands: loss is expected to be long-term.	None known	None known	Possible: long-term loss of foraging, shelter and breeding habitat associated with surface rock and woody debris in woodlands.	Yes: Reduction in total area of habitat, and likely loss of individuals in the development area.
Reptiles	*Egernia rugosa* Yakka Skink	Yes: potential loss of 842.52 ha of woodland habitat is likely to involve extensive loss of large woody material (logs, fallen trees) that forms shelter habitat for the species.	Likely reduction in AoO from loss of 842.52 ha of potential foraging, shelter and breeding habitat. No impact on EoO as the species has a widespread, although patchy distribution in the region.	No: the species can cross narrow linear disturbances to tree canopy cover	Yes: potential loss of 842.52 ha of woodland habitat is likely to involve loss of large woody material (logs, fallen trees) that forms shelter habitat for colonies (family groups).	None known	None known	Yes: loss of essential shelter habitat	Yes: Loss of suitable habitat and shelter sites, likely loss of individuals within the development area.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Reptiles	*Elseya albagula* White-throated Snapping Turtle	Unlikely: potential loss of 0.62 ha of riparian RE 11.3.25 on Hutton Creek may involve disturbance or removal of nesting habitat on riverbanks. However, the area is very small.	No: AoO - potential loss of 0.62 ha of RE 11.3.25 at Hutton Creek may impact riparian nesting habitat but this area is very small. An impact on AoO is unlikely. No impact on EoO. The Site is near the SW limit of distribution and at the limit of all year flow in the Dawson River. However, the species is known to occur in permanent waterholes upstream on both Hutton Creek and the Dawson River.	No: any waterway barrier works done in conjunction with vegetation clearing must not result in permanent disruption to flows and fauna movement (*Fisheries Act* – QLD)	No: potential loss of 0.62 ha of riparian RE 11.3.25 may involve disturbance or removal of nesting habitat on riverbanks but this is a very steep and rocky area and more extensive potential nesting habitat is present elsewhere on Hutton Creek and adjacent Dawson River.	None known	None known	No: potential loss of a very small area of nesting habitat not considered likely to affect species' recovery.	No: Possible disturbance and loss of a very small area of potential breeding habitat is not considered to be a significant impact.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Reptiles	*Furina dunmalli* Dunmall's Snake	Yes: potential loss of 842.52 ha of woodland habitat is likely to reduce population.	Possible reduction in AoO from loss of 842.52 ha of potential foraging, shelter and breeding habitat. No impact on EoO as the species is widely distributed in the general area, though rarely encountered.	No: the species can cross narrow linear disturbances to tree canopy cover	Yes: potential loss of 842.52 ha of woodland and open forest habitat will involve loss of shelter and foraging habitat.	None known	None known	Possible: loss of some essential shelter habitat	Yes: Decrease in area of potential habitat; likely loss of individuals within development area.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Reptiles	*Rheodytes leukops* Fitzroy River Turtle	Unlikely: potential loss of 0.62 ha of riparian RE 11.3.25 on Hutton Creek may involve disturbance or removal of nesting habitat on riverbanks. However, the area is very small.	No: AoO - potential loss of 0.62 ha of RE 11.3.25 at Hutton Creek may impact riparian nesting habitat but this area is very small. An impact on AoO is unlikely. No impact on EoO. The Site is near the SW limit of distribution and at the limit of all year flow in the Dawson River but no change in EoO is anticipated.	No: any waterway barrier works done in conjunction with vegetation clearing must not result in permanent disruption to flows and fauna movement (*Fisheries Act* – QLD)	No: potential loss of 0.62 ha of riparian RE 11.3.25 may involve disturbance or removal of nesting habitat on riverbanks but this is a very steep and rocky area and more extensive potential nesting habitat is present elsewhere on Hutton Creek and adjacent Dawson River.	None known	None known	No: potential loss of a very small area of nesting habitat not considered likely to affect species' recovery.	No: Possible disturbance and loss of a very small area of potential breeding habitat is not considered to be a significant impact.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Reptiles	*Strophurus taenicauda* Golden-tailed Gecko	Yes: potential loss of 842.52 ha of woodland habitat is likely to reduce population.	Yes: likely reduction in AoO from loss 842.52 ha of potential foraging, shelter and breeding habitat. No impact on EoO as the species is widely distributed in the general area, though rarely encountered.	No: the species can cross narrow linear disturbances to tree canopy cover	Yes: potential loss of 842.52 ha of woodland and open forest habitat will involve loss of shelter, breeding and foraging habitat.	None known	None known	Possible: loss of habitat, but suitable habitat is abundant adjacent to the development and the species remains widespread.	Yes: Decrease in area of potential habitat; likely loss of individuals within development area.

3.5.2. Migratory and Marine Fauna

PMST search results (DAWE 2020a) indicated 11 EPBC Act-listed migratory fauna species and 16 marine species that could potentially occur within the Site. A likelihood of occurrence assessment for EPBC Act-listed migratory and marine fauna is presented in Table 11.

Table 11: Assessment of likelihood of occurrence for EPBC Act-listed migratory and marine fauna at the Site.

Key to status: CE/CR = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened; SL = Special Least Concern; C = Least Concern; M = Migratory; Ma = Marine.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
Birds	*Actitis hypoleucos* Common Sandpiper	M, Ma	SL	Spring-summer migrant to Australia usually found in coastal environments (muddy, sandy or rocky stream banks, mangrove margins) but may occur on any inland freshwater or saline wetland during passage, including artificial habitats (Pizzey and Knight 2010). Much less commonly reported in the inland (ALA 2020).	**Potentially present.** Limited suitable habitat (rocky stream margins) is present within the Site.
	Apus pacificus Fork-tailed Swift	M, Ma	SL	Summer visitor to Australia in small to very large flocks that travel with weather fronts, occurring Australia-wide (Pizzey and Knight 2010, ALA 2020). It feeds aerially over all natural and artificial environments.	**Likely to be present.** The Site is within the known range of the species and it may forage aerially over all habitat types.
	Bubulcus ibis Cattle Egret (listed as *Ardea ibis*)	Ma	C	Widely distributed in northern and eastern Australia, also SW Australia. Inhabits a wide range of dryland and wetland habitats and notably associates with livestock (Pizzey and Knight 2010). Nests colonially in flooded or swamp forests. Records exist for the Arcadia Valley and upper Dawson River areas (ALA 2020).	**Potentially present.** Suitable habitat (pasture) is present within the Site.
	Ardea alba modesta Eastern Great Egret (listed as great Egret *A. alba*)	Ma	C	Widely distributed in northern and eastern Australia including the interior (Pizzey and Knight 2010). Forages in a range of wetland types, including riverine environments and farm dams. Nests colonially in riverine or swamp woodlands. There are numerous records within the upper Dawson catchment (ALA 2020).	**Potentially present.** Limited stream pool habitat is present within the Site.
	Calidris acuminata Sharp-tailed Sandpiper	M, Ma	SL	A widespread spring-summer migrant to Australia, utilizing both inland and coastal wetlands such as tidal mudflats, saltmarshes and saline and freshwater inland swamps (Pizzey and Knight 2010). There are numerous records in inland southern Queensland (ALA 2020).	**Unlikely to be present.** No suitable palustrine wetland habitat exists within the Site.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
	Calidris ferruginea Curlew Sandpiper	CE, M, Ma	CR	A migratory species usually encountered on coastal and near-coastal saline and freshwater tidal and palustrine wetlands (DAWE 2020b). Passage migrants are occasionally present on inland wetlands, and the species is sparsely recorded across inland Queensland (ALA 2020).	**Unlikely to be present.** No suitable palustrine wetland habitat exists within the Site.
	Calidris melanotos Pectoral Sandpiper	M, Ma	SL	Spring-summer migrant preferring freshwater wetlands, both inland and sub-coastally (Pizzey and Knight 2010). Much less common than the related Sharp-tailed Sandpiper in Australia, there are few records in inland southern Queensland (ALA 2020).	**Unlikely to be present.** No suitable palustrine wetland habitat exists within the Site.
	Chalcites osculans Black-eared Cuckoo (Listed as *Chrysococcyx osculans*)	Ma	C	Breeding migrant to inland Australia, inhabiting dry woodlands and shrublands (Pizzey and Knight 2010). The species is common in southern inland Queensland and there are several records in the upper Dawson catchment (ALA 2020).	**Likely to be present.** Suitable habitat is widespread within the Site.
	Cuculus optatus Oriental Cuckoo	M	SL	Migrant to coastal and near-inland northern and eastern Australia, inhabiting denser forest types but may occur in other habitats on passage (Pizzey and Knight 2010). There are scattered inland southern Queensland records including the upper Dawson catchment (ALA 2020).	**Potentially present.** Suitable habitat is widespread within the Site.
	Gallinago hardwickii Latham's Snipe	M, Ma	SL	Spring-summer migrant, preferring wet pastures, boggy margins of vegetated wetlands and similar habitat at a range of elevations (Pizzey and Knight 2010). It occurs throughout eastern Australia including southern inland Queensland including one record from Belington Hut SF (ALA 2020).	**Unlikely to be present.** No suitable palustrine wetland habitat exists within the Site.
	Haliaeetus leucogaster White-bellied Sea-Eagle	Ma	C	Occurs around the entire Australian coast but also penetrates far inland on larger rivers (Pizzey and Knight 2010). Feeds on a variety of vertebrates and will take carrion. There are numerous records of the species in the Dawson catchment (ALA 2020).	**Potentially present.** Suitable riverine habitat is very limited within the Site; however, the species is regularly recorded in the Dawson River catchment.
	Hirundapus caudacutus White-throated Needletail	M, Ma, V	V	Summer visitor in small to very large flocks that travel with weather fronts, occurring mainly in eastern Australia (Pizzey and Knight (2010, ALA 2020). It feeds aerially over all natural and artificial environments.	**Likely to be present.** The Site is within the known range of the species and it may forage aerially over all habitat types.

Class	Scientific & Common Name	EPBC Act Status	NC Act Status	Distribution and Known Habitat Use	Likelihood of Occurrence
	Merops ornatus Rainbow Bee-eater	Ma	C	A widespread and abundant species that is a breeding migrant in this region. It arrives from the north in September, returning in April (Pizzey and Knight 2010). It feeds on bees and other invertebrates, aerially, sallying from a perch, or on the ground. It is a summer breeder in the region but requires open areas of loamy soil for nesting tunnels.	**Confirmed present** This species was observed on several occasions during the field surveys. The site includes many suitable areas for nest sites.
	Motacilla flava Yellow Wagtail	M, Ma	SL	Summer migrant in small numbers to mostly coastal northern Australia but birds often sighted in southern Australia: it prefers open grassed areas such as wetland margins, short pasture and parks (Pizzey and Knight 2010). There are no existing records for southern inland Queensland (ALA 2020).	**Unlikely to be present.** Preferred wetland and wet, short grassland habitat is very limited within the Site and there are no records for inland southern Queensland.
	Myiagra cyanoleuca Satin Flycatcher	M, Ma	SL	A passage migrant in southern Queensland, with birds recorded in a variety of woodland types as well as parks and gardens, but breeding in south-east Australia in more closed forest types (Pizzey and Knight 2010). There are scattered records in the Carnarvon and Expedition Ranges (ALA 2020).	**Potentially present.** Suitable habitat is present within the Site.
	Rhipidura rufifrons Rufous Fantail	M, Ma	SL	A breeding migrant in southern Queensland, with birds recorded in a variety of woodland types as well as parks and gardens. Breeding occurs in more closed forest types (Pizzey and Knight 2010). There are scattered records in the Carnarvon and Expedition Ranges (ALA 2020): these inland birds are likely to be passage migrants.	**Potentially present.** Suitable habitat is present within the Site.
	Rostratula australis Australian Painted Snipe	E, Ma	E	Recorded over much of Australia other than the driest interior, but most frequently recorded within the Murray-Darling Basin (ALA 2020). Forages at shallow edges and adjacent vegetated margins of freshwater wetlands (DAWE 2020b) and is able to use both artificial and natural ephemeral and permanent wetlands (Marchant and Higgins 1993).	**Unlikely to be present.** Suitable habitat (permanent and ephemeral shallow palustrine wetlands) is not present within the Site.

Although eleven species of EPBC Act listed migratory and/or marine fauna were predicted to be potentially present within the Site, only one of these species, the Rainbow Bee-eater (*Merops ornatus*), was detected during the surveys.

However, an additional thirteen species of listed Marine birds (DEH 2000) were observed during field surveys within the Site, these being:

- Straw-necked Ibis (*Threskiornis spinicollis*)

- Brown Goshawk (*Accipiter fasciatus*);
- Fan-tailed Cuckoo (*Cacomantis flabelliformis*);
- Shining Bronze-cuckoo (*Chalcites lucidus*), (listed as *Chrysococcyx lucidus*);
- Pallid Cuckoo (*Cacomantis pallidus*), (listed as *Cuculus pallidus*);
- Eastern Koel (*Eudynamys orientalis*), (listed as Common Koel, *Eudynamys scolopacea*);
- Channel-billed Cuckoo (*Scythrops novaehollandiae*);
- Forest Kingfisher (*Todiramphus macleayii*);
- Australian Magpie Lark (*Grallina cyanoleuca*);
- Black-faced Cuckoo-shrike (*Coracina novaehollandiae*);
- White-bellied Cuckoo-shrike (*Coracina papuensis*)
- Australasian Pipit (*Anthus novaeseelandiae*) (listed as Richard's Pipit); and,
- Welcome Swallow (*Hirundo neoxena*).

3.5.2.1. Analysis of potential Significant Impacts

The proposed development at the Site may potentially produce significant impacts upon migratory and/or marine fauna listed under the EPBC Act. Such potential impacts are assessed following the EPBC Act guidelines for Significant Impacts on Matters of National Environmental Significance (DoE 2013). This assessment is also consistent with the Queensland Environmental Offsets Policy (DEHP 2014). Table 12 shows the results of this assessment for twenty-four species of migratory/marine fauna (EPBC Act) identified as confirmed, likely or potentially present at the Site.

Table 12: Assessment of potential significant impacts upon EPBC Act listed Migratory and/or Marine fauna species potentially present at the Site.

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Actitis hypoleucos* Common Sandpiper	No: There is limited suitable habitat (stream margins) at the Site and the development will not disturb this habitat	No: No loss of potential habitat will occur.	No: Disturbance within the Site is unlikely to permanently impact on movement of the species, hence no isolation or fragmentation of populations is predicted.	No: Very limited potential habitat within the Site will not be disturbed by the development.	None known	None known	No: Very limited potential habitat within the Site will not be disturbed by the development.	No
Birds	*Bubulcus ibis* Cattle Egret	No: There is limited suitable habitat (riverine pools and wetlands) at the Site and the development will not disturb this habitat	No: No loss of potential habitat will occur.	No: Disturbance within the Site is unlikely to permanently impact on movement of these species, hence no isolation or fragmentation of populations is predicted.	No: Very limited potential habitat within the Site will not be disturbed by the development.	None known	None known	No: Very limited potential habitat within the Site will not be disturbed by the development.	No
Birds	*Ardea alba modesta* Eastern Great Egret								

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Apus pacificus* Fork-tailed Swift	No: These species are aerial feeding insectivores that forage over a wide range of intact and disturbed landscapes. The species do not breed in Australia and only very rarely roost during their summer presence.	No: the proposed disturbance is not materially relevant to these species.	No: the proposed disturbance is not materially relevant to these species.	No: no significant impact on foraging resources is anticipated, no other critical locations are relevant to these species in Australia	None known	No: These species are aerial feeding insectivores that forage over a wide range of intact and disturbed landscapes. The species do not breed in Australia and only very rarely roost during their summer presence.	No: the proposed disturbance is not materially relevant to these species.	No: the proposed disturbance is not materially relevant to these species.
Birds	*Hirundapus caudacutus* White-throated Needletail								
Birds	*Hieraaetus leucogaster* White-bellied Sea-Eagle	No: Limited suitable habitat (riverine pools for foraging and riparian trees for roosting and nesting) at the Site and the development will not disturb this habitat	No: No loss of potential habitat will occur.	No: Disturbance within the Site is unlikely to permanently impact on movement of the species, hence no isolation or fragmentation of populations is predicted.	No: Very limited potential habitat within the Site will not be disturbed by the development.	None known	None known	No: Very limited potential habitat within the Site will not be disturbed by the development.	No

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	**Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.**	**Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.**	**Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).**	**Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.**	**Introduce disease that may cause the population to decline.**	**Interfere with the recovery of the species.**	
Birds	*Threskiornis spinicollis* Straw-necked Ibis	No: These bird species are common and widely distributed in eastern Australia and the development is not expected to impact on their distributions.	No: The scale of the development will not significantly reduce AoO or EoO for these species.	No: the scale of the development will not isolate or fragment populations of these mobile species.	No: The scale of the development will not significantly reduce critical habitat for these widespread and mobile species. Three species are non-breeding visitors/passage migrants within the development area.	None known	None known	No: These species are common and widespread mobile fauna, not currently under threat. Species recovery criterion is not relevant to this group of species.	No
Birds	*Accipiter fasciatus* Brown Goshawk								No
Birds	*Cacomantis flabelliformis* Fan-tailed Cuckoo								No
Birds	*Cacomantis pallidus* Pallid Cuckoo								
Birds	*Chalcites lucidus* Shining Bronze-cuckoo								No
Birds	*Chalcites osculans* Black-eared Cuckoo								No
Birds	*Cuculus optatus* Oriental Cuckoo								No
Birds	*Eudynamys orientalis* Eastern Koel								No
Birds	*Scythrops novaehollandiae* Channel-billed Cuckoo								No
Birds	*Todiramphus macleayii* Forest Kingfisher								No
Birds	*Merops ornatus* Rainbow Bee-eater								No

Class	Species	Significant Impact Criteria (DoE 2013; DEHP 2014)							Significant Residual Impact
		Lead to a long-term decrease in the size of a population (including declines due to loss or modification of habitat).	Reduce the Area of Occupancy (AoO), or the Extent of Occurrence (EoO) of the species.	Fragment an existing population into two or more populations; or, result in genetically distinct populations forming.	Adversely affect habitat critical to the survival of a species (including disruption to breeding, feeding, nesting, migration or resting sites).	Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.	Introduce disease that may cause the population to decline.	Interfere with the recovery of the species.	
Birds	*Grallina cyanoleuca* Australian Magpie Lark								No
Birds	*Myiagra cyanoleuca* Satin Flycatcher								No
Birds	*Rhipidura rufifrons* Rufous Fantail								No
Birds	*Coracina novaehollandiae* Black-faced Cuckoo-shrike								No
Birds	*Coracina papuensis* White-bellied Cuckoo-shrike								No
Birds	*Anthus novaeseelandiae* Australasian Pipit								No
Birds	*Hirundo neoxena* Welcome Swallow								No

3.6. Wetlands, Watercourses and Springs

3.6.1. Wetlands

State mapping (DES 2020f) shows the potential presence of wetlands based on the presence of remnant RE that may comprise 1-50% wetlands, these being RE 11.3.2 and 11.3.25. No lacustrine or riverine wetlands are mapped within the Site.

The Site crosses Hutton Creek approximately 2.4 km upstream of the confluence with the Dawson River. At this point the stream has incised an abrupt gorge around 25 m deep with sandstone boulders and bedrock outcropping along the banks and in the stream. A narrow corridor of riparian woodland (RE 11.3.25) covers the steep banks of this gorge with patches of dense Weeping Bottlebrush (*Melaleuca viminalis*) along and overhanging the stream. An extended, deep pool is present at the crossing point on Hutton Creek with gentle flow and rocky riffles above and below this point at the time of field survey. This appears to be a spring-fed pool with permanent water. Similarly large stream pools occur above and below this site and these contribute to perennial flow in the Dawson River below the confluence with Hutton Creek.

These pools on Hutton Creek and the upper Dawson River serve as refuges for several fish species, at least three turtle species, Water Rat and Platypus. A large adult White-throated Snapping Turtle (Critically Endangered: EPBC Act) was observed feeding in the pool at the Hutton Creek crossing point. It seems likely that these pools are important for aquatic fauna that may use them as foraging habitat but also as refuges from which to forage or travel in interconnecting shallow riffles. Such refuge pools may be critical habitat during periods of low flow, when inter-pool riffles may be dry.

3.6.2. Watercourses

Hutton Creek is mapped as a stream order 6 watercourse (DES 2020f) and is by far the most significant watercourse within the Site. Although this is mapped as a non-perennial stream, the long, deep, clear pools around the crossing point on Hutton Creek and strong flow over intervening riffles suggest extended flows from lower Hutton Creek to the Dawson confluence. The stream bed and banks in this section are characterized by outcropping sandstone bedrock. More generally the banks of Hutton Creek support a distinct riparian vegetation community (RE 11.3.25). Elsewhere the Site crosses several minor drainage features of stream order 1 or 2. None of these minor streamlines carried water at the time of survey and none but Hutton Creek showed evidence of extended flows.

3.6.3. Springs

No mapped springs occur within the Site. Springs were detected during the field survey within or immediately adjoining the footprint at Yebna in close proximity to an existing mapped spring (DES 2020e, 2020f). Several other mapped springs occur near the crossing point on Hutton Creek, in minor tributary gullies (DES 2020e, 2020f). It is likely that the deep clear pools, and continuous flow of lower Hutton Creek, are fed by additional springs in the rocky stream bed. These springs are associated with the outcropping Precipice Sandstone bedrock along the Hutton Creek gorge. Locations of springs detected during this survey are shown in Appendix A.

4. Conclusions

The desktop assessment and field survey identified the following potential ecological values and/or constraints within the Site:

- Approximately 8.33 ha of Brigalow (*Acacia harpophylla* dominant and dominant) TEC.
- Approximately 0.76 ha of Poplar Box Grassy Woodland on Alluvial Plains TEC.
- Approximately 0.99 ha of SEVT TEC.
- Presence of three Endangered (biodiversity status) RE, these being:
    - RE 11.9.4: 0.99 ha of remnant;
    - RE 11.9.5: 4.28 ha of remnant and 6.17 ha of regrowth; and
    - RE 11.9.10: 25.20 ha of remnant.
- Presence of four Of Concern (biodiversity status) RE, these being:

- RE 11.3.2: 0.76 ha of remnant and 7.44 ha of regrowth;
- RE 11.3.25: 5.06 ha of remnant;
- RE 11.9.7: 3.02 ha of remnant; and
- RE 11.10.8: 0.56 ha of remnant.

- Presence of two NC Act listed threatened flora species, namely *Melaleuca irbyana* and *Sannantha brachypoda.*
- Confirmed presence of two EPBC and NC Act listed threatened fauna species, namely White-throated Snapping Turtle (*Elseya albagula*) and Squatter Pigeon (*Geophaps scripta scripta*).
- Potential presence of the following EPBC and/or NC Act listed threatened fauna species:
  - *Acanthophis antarcticus* (Common Death Adder);
  - *Calyptorhynchus lathami* (Glossy Black-Cockatoo);
  - *Chalinolobus dwyeri* (Large-eared Pied Bat);
  - *Dasyurus hallucatus* (Northern Quoll);
  - *Delma torquata* (Collared Delma);
  - *Egernia rugosa* (Yakka Skink);
  - *Elseya albagula* (White-throated Snapping Turtle);
  - *Erythrotriorchis radiatus* (Red Goshawk);
  - *Furina dunmalli* (Dunmall's Snake);
  - *Geophaps scripta scripta* (Squatter Pigeon (southern));
  - *Hirundapus caudacutus* (White-throated Needletail);
  - *Jalmenus eubulus* (Pale Imperial Hairstreak);
  - *Ninox strenua* (Powerful Owl);
  - *Nyctophilus corbeni* (South-eastern Long-eared Bat, Corben's Long-eared Bat);
  - *Petauroides volans* (Greater Glider);
  - *Phascolarctos cinereus* (Koala);
  - *Rheodytes leukops* (Fitzroy River Turtle);
  - *Strophurus taenicauda* (Golden-tailed Gecko); and,
  - *Turnix melanogaster* (Black-breasted Button-quail);
- Potential or confirmed presence of 24 species of Migratory and/or Marine bird species, as listed under the EPBC Act.
- Presence of springs at Yebna and Hutton Creek and significant waterholes associated with Hutton Creek.

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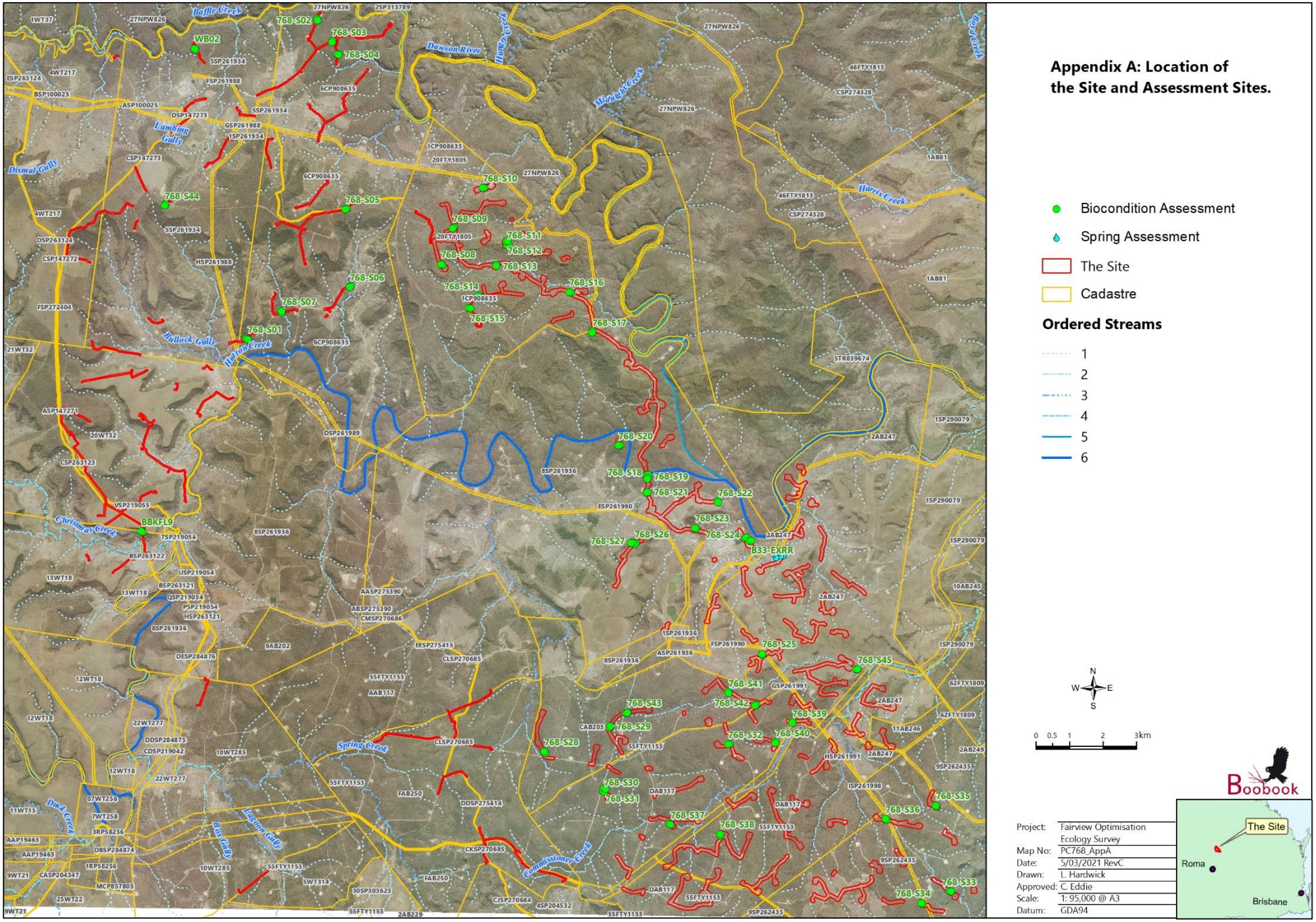
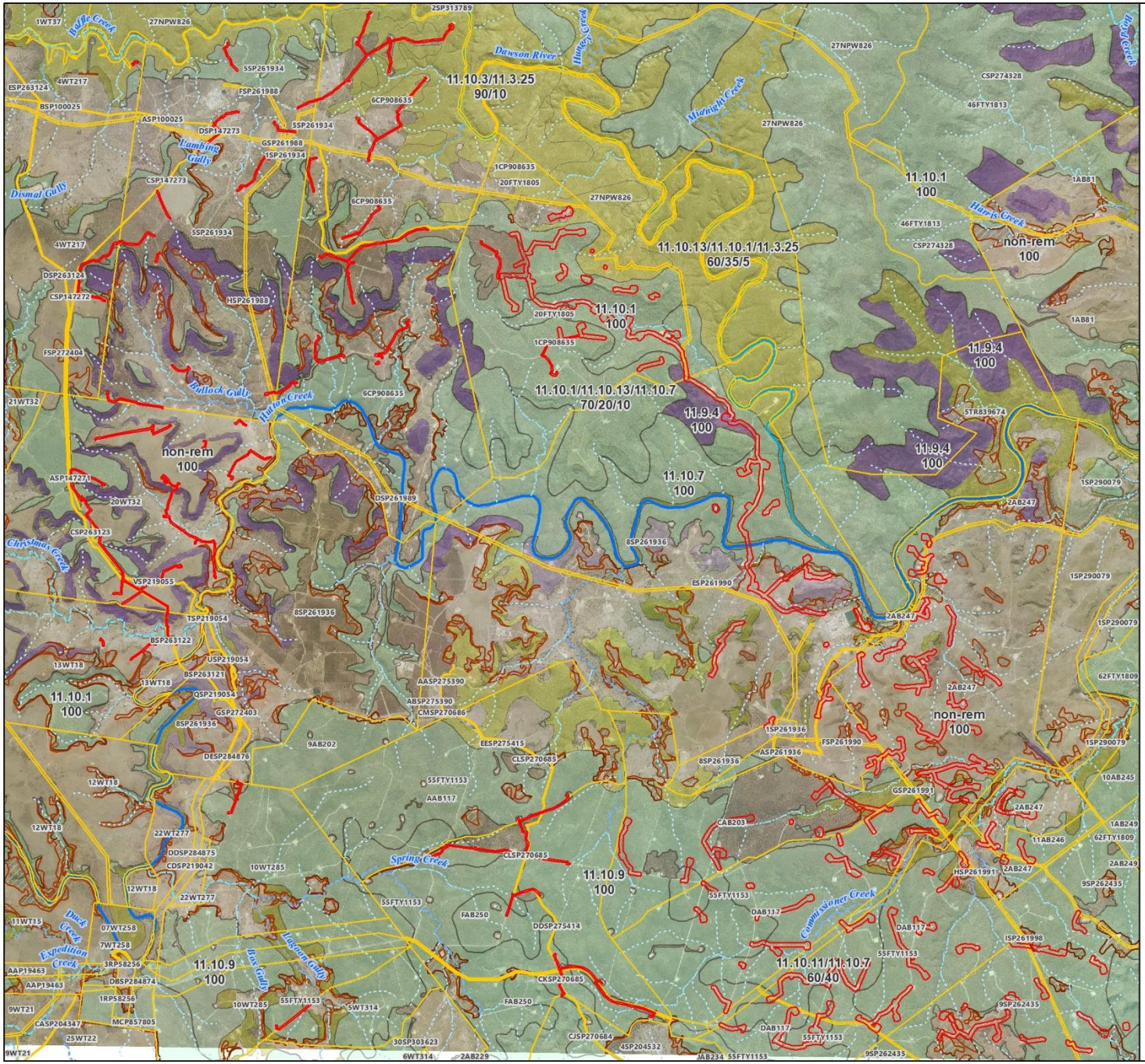
Appendix A. Location of the Site and assessment sites.


Appendix A: Location of the Site and Assessment Sites.
Biocondition Assessment
Spring Assessment
The Site
Cadastre
Ordered Streams
1
2
3
4
5
6
N
W
E
S
0 0.5 1 2 3km
Boobook
Project: Fairview Optimisation Ecology Survey
Map No: PC768_AppA
Date: 5/03/2021 RevC
Drawn: L. Hardwick
Approved: C. Eddie
Scale: 1: 95,000 @ A3
Datum: GDA94
The Site
Roma
Brisbane

Appendix B. State Government mapped Regional Ecosystems (RE) and mature regrowth within the Site.



Appendix B: State Government mapped Regional Ecosystems and Mature Regrowth within the Site.

The Site

Cadastre

Remnant Regional Ecosystems (Biodiversity Status)

- Endangered, Dominant
- Endangered, Sub-dominant
- Of Concern, Dominant
- Of Concern, Sub-dominant
- No concern At Present

Mature Regrowth (Biodiversity Status)

- Endangered, Dominant
- Endangered, Sub-dominant
- Of Concern, Dominant
- No concern At Present

Ordered Streams

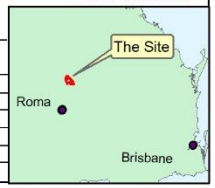
- 1
- 2
- 3
- 4
- 5
- 6

N
W E
S

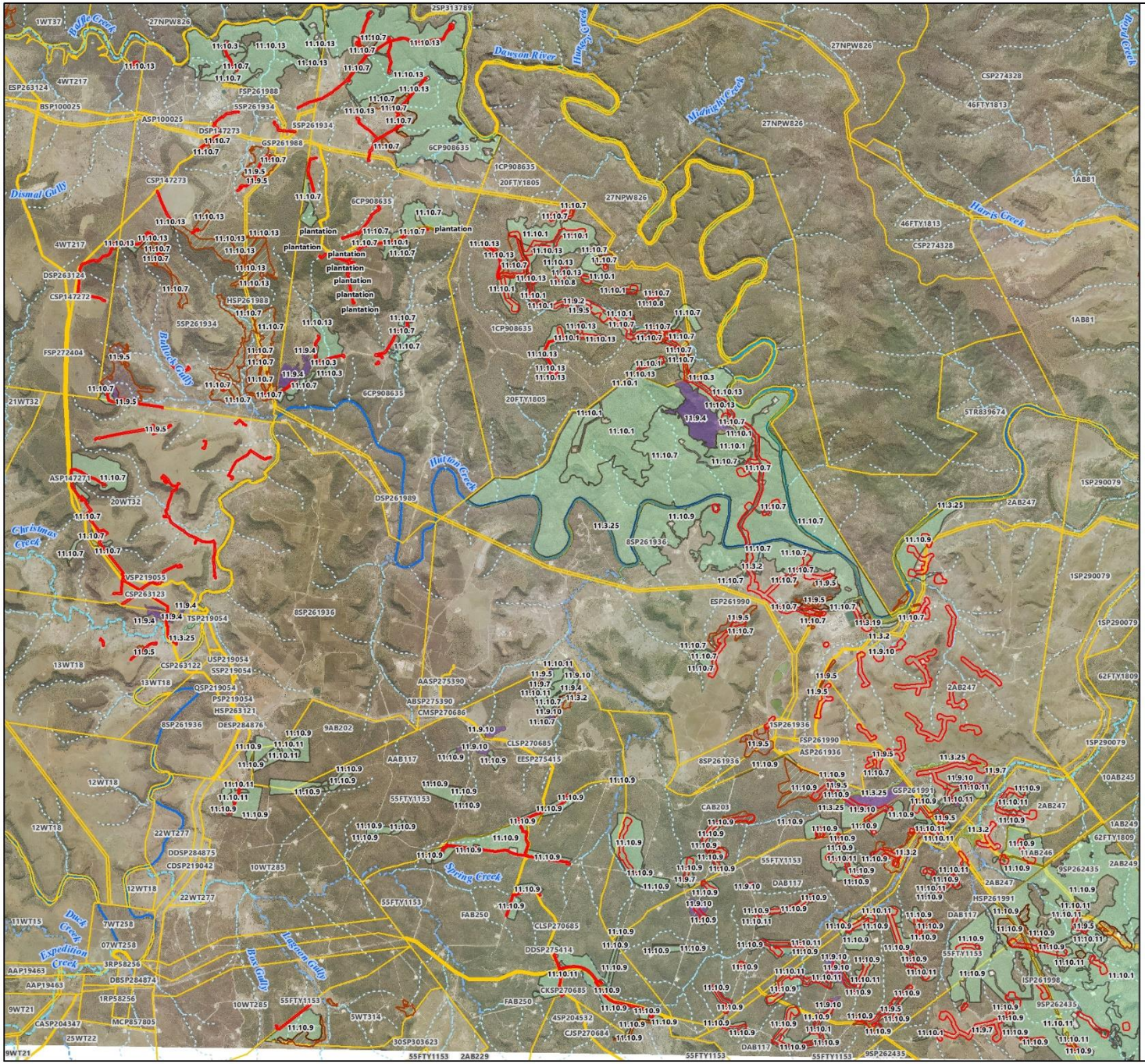
0 0.5 1 2 3km

Boobook

Project:	Fairview Optimisation Ecology Survey
Map No:	PC768_AppB
Date:	5/03/2021 RevC
Drawn:	L. Hardwick
Approved:	C. Eddie
Scale:	1: 95,000 @ A3
Datum:	GDA94



Appendix C. Ground-truthed remnant and regrowth RE.



Appendix C: Ground-truthed Remnant and Regrowth Regional Ecosystem.

The Site

Cadastre

Ground-truthed Regional Ecosystem (Biodiversity Status)

Endangered, Dominant

No concern At Present

Of Concern, Dominant

Ground-truthed Regrowth (Biodiversity Status)

Regrowth, Endangered

Regrowth, Of Concern

Regrowth, No Concern at Present

Ordered Streams

1

2

3

4

5

6

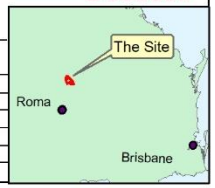
N

W E

S

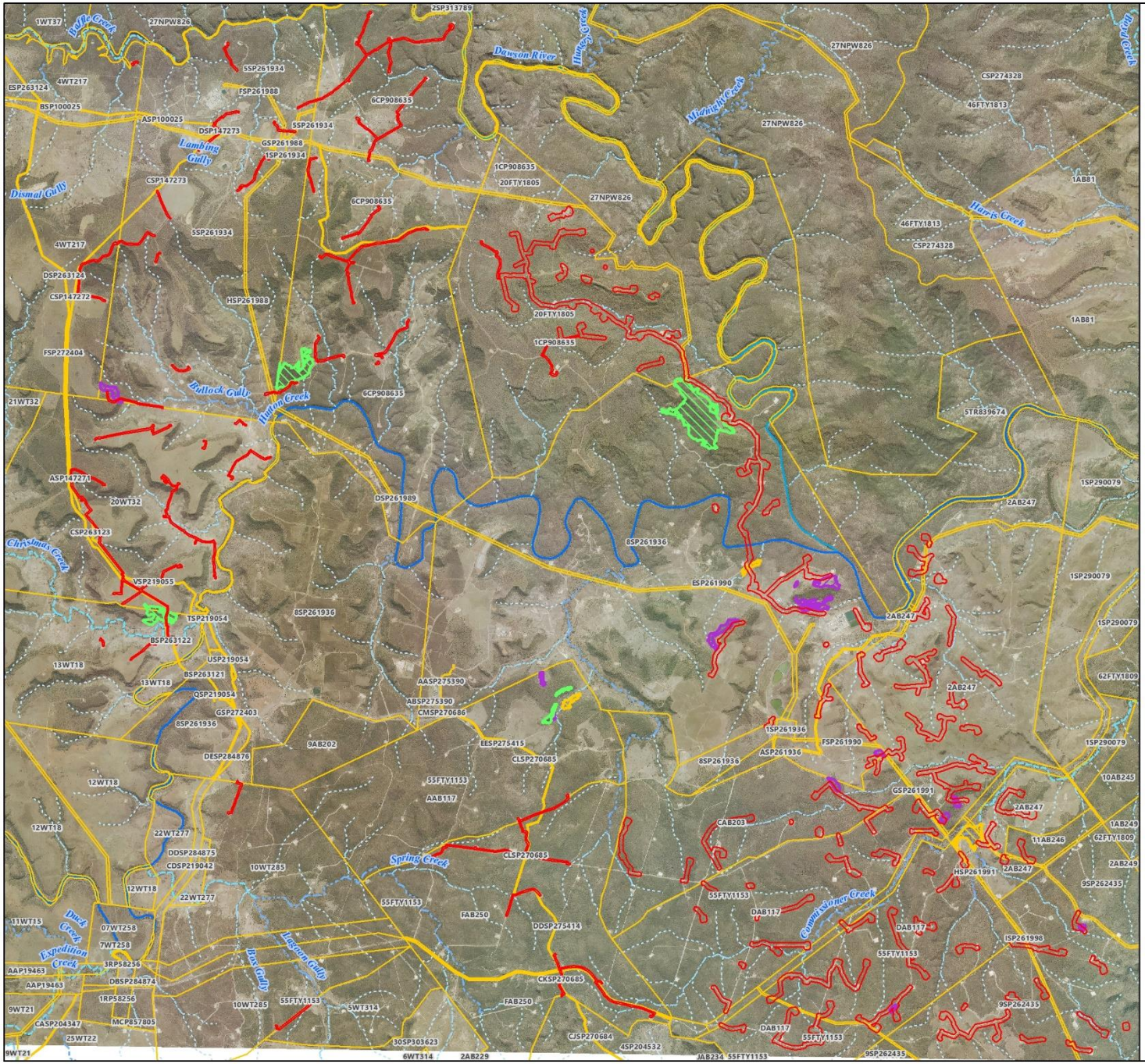
0 0.5 1 2 3km

Boobook



Project:	Fairview Optimisation Ecology Survey
Map No:	PC768_AppC
Date:	5/03/2021 RevC
Drawn:	L. Hardwick
Approved:	C. Eddie
Scale:	1: 95,000 @ A3
Datum:	GDA94

Appendix D. Ground-truthed extent of TEC.



Appendix D: Ground-truthed Extent of Threatened Ecological Communities.

The Site

Cadastre

Threatened Ecological Community

Brigalow

Semi-evergreen Vine Thicket

Other, Poplar Box on Alluvium

Ordered Streams

1

2

3

4

5

6

N

W E

S

0 0.5 1 2 3km

Boobook

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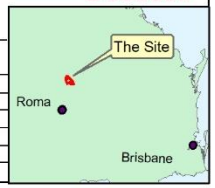

Appendix E. Locations of threatened flora and fauna recorded within the Site.

Appendix E: Locations of threatened flora and fauna recorded within the Site.

The

Cadastre

Notable Fauna

Squatter Pigeon (southern subspecies) *(Geophaps scripta scripta)*

White-throated Snapping Turtle *(Elseya albagula)*

Notable Flora

Swamp Tea-tree *(Melaleuca irbyana)*

Swamp Tea-tree *(Melaleuca irbyana)*

A Myrtle-bush *(Sannantha brachypoda)*

Ordered Streams

1
2
3
4
5
6

N W E S

0 0.5 1 2 3km

Boobook

Project:	Fairview Optimisation Ecology Survey
Map No:	PC768_AppE
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Approved:	C. Eddie
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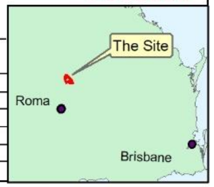
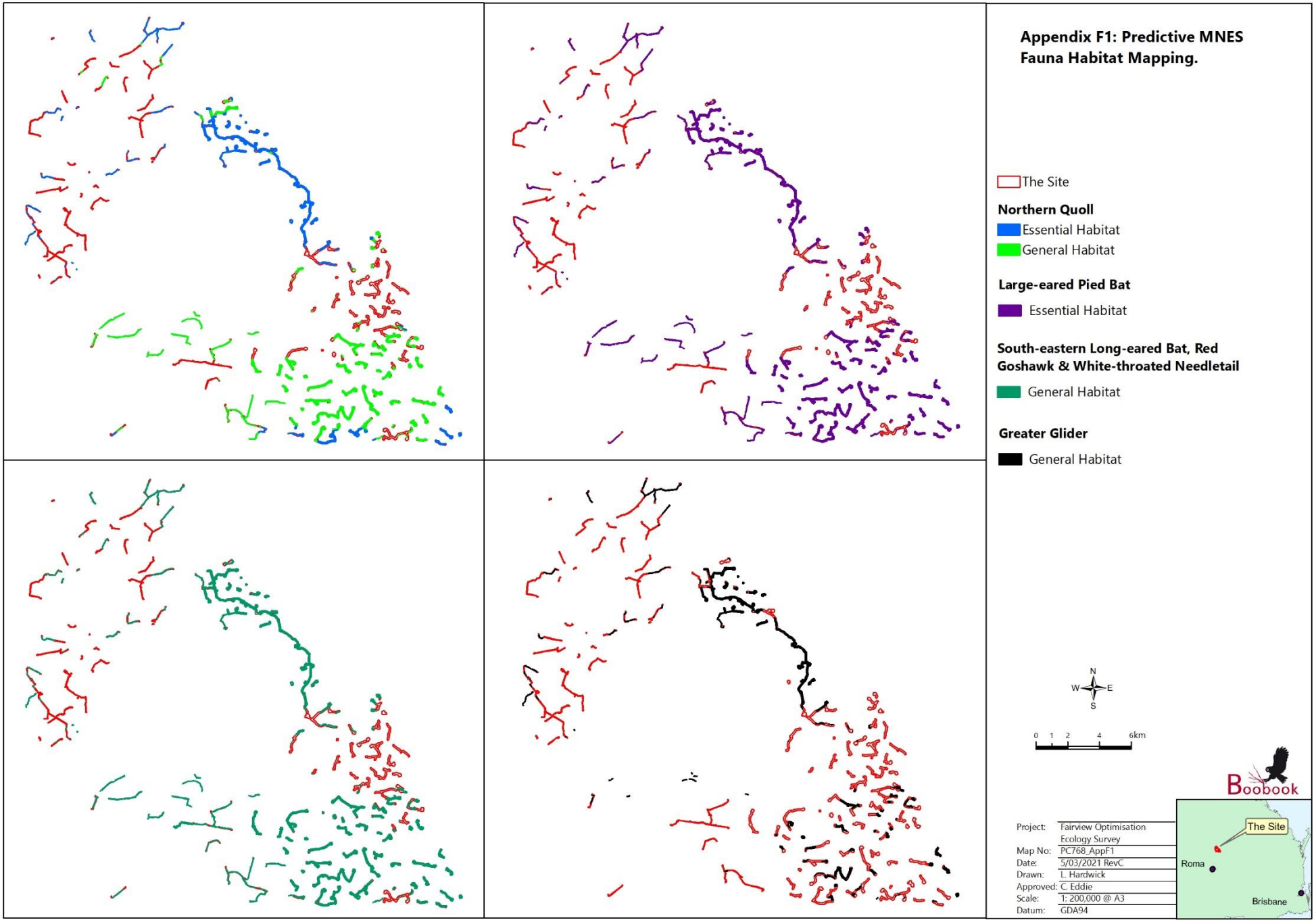
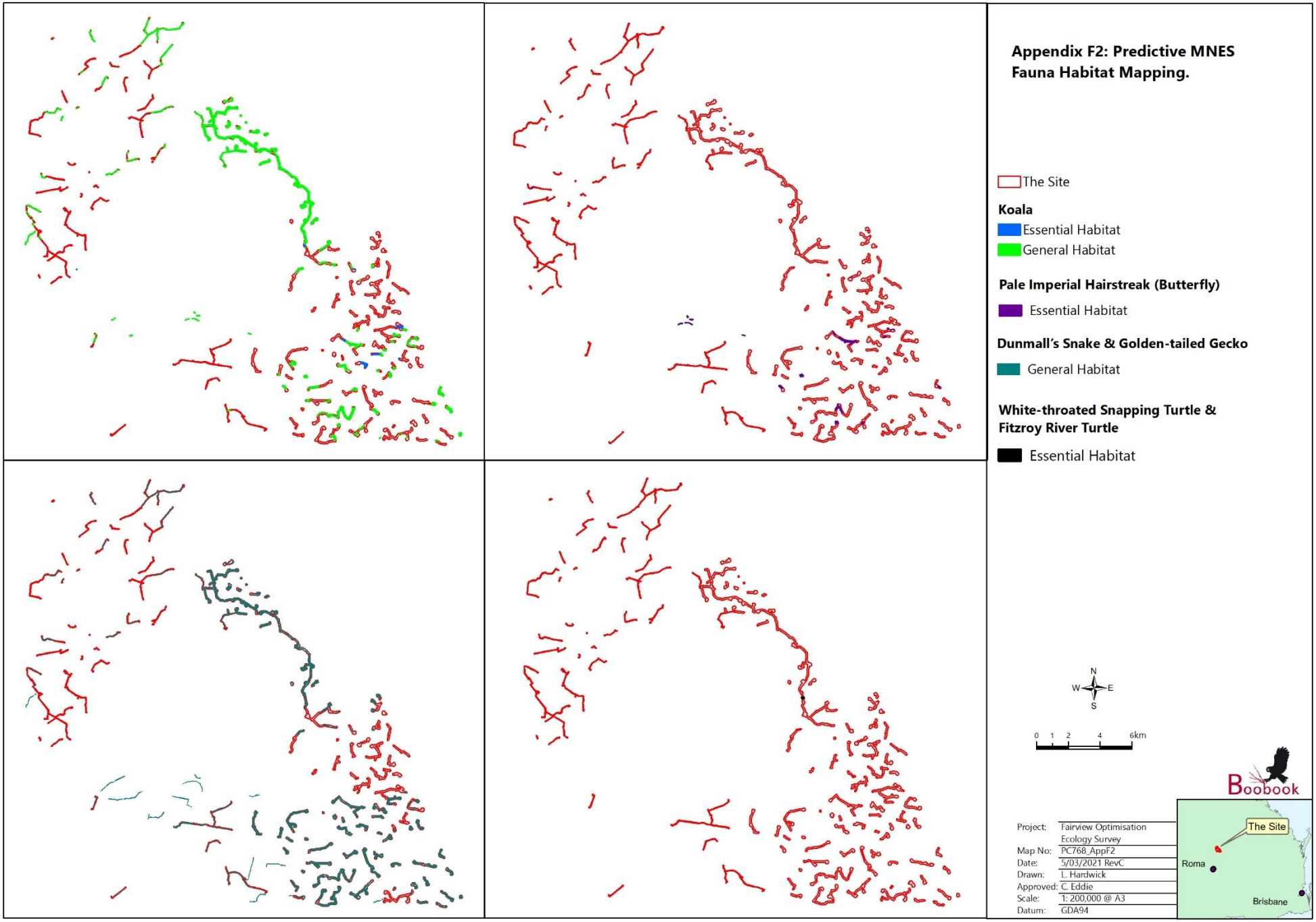
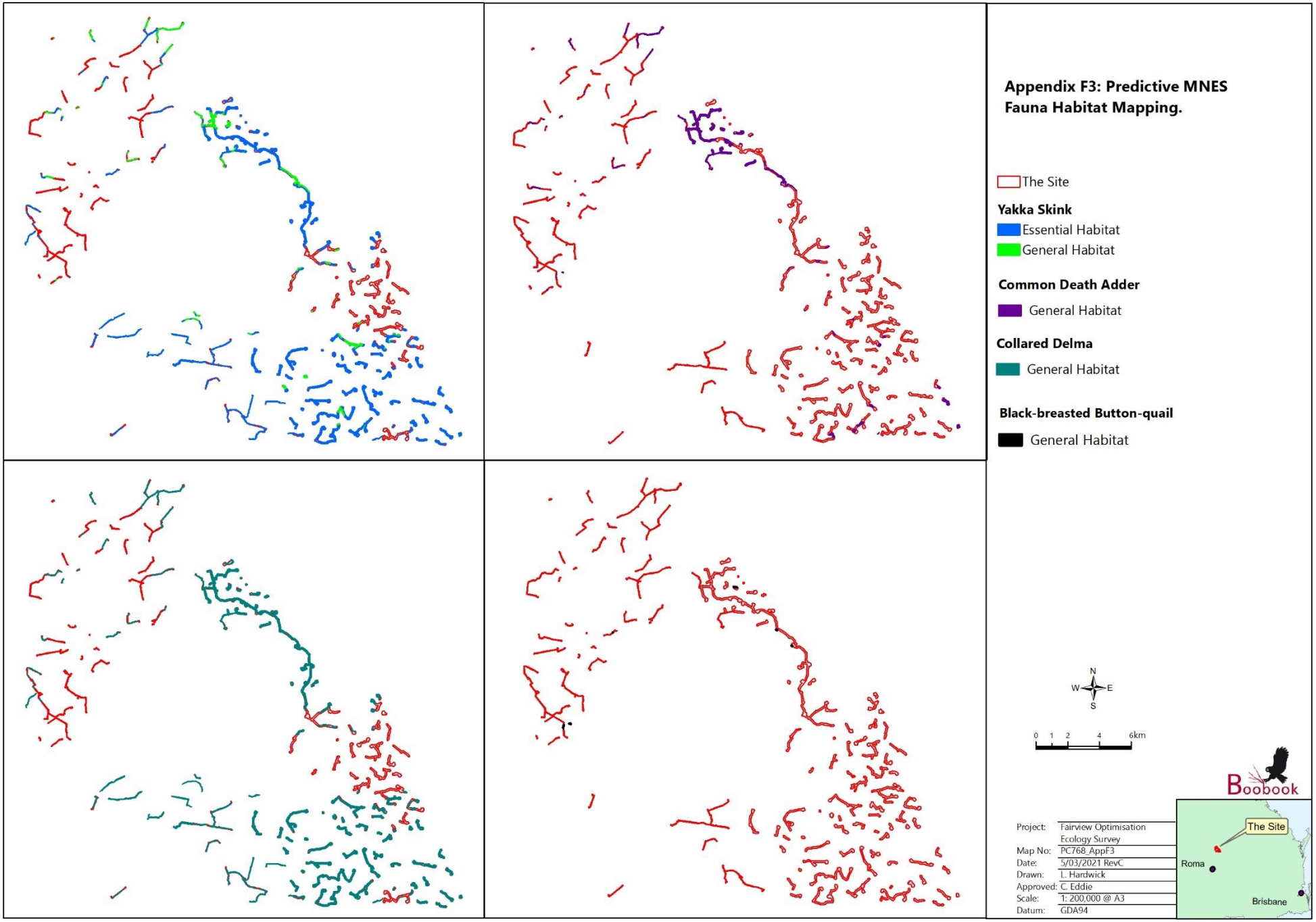
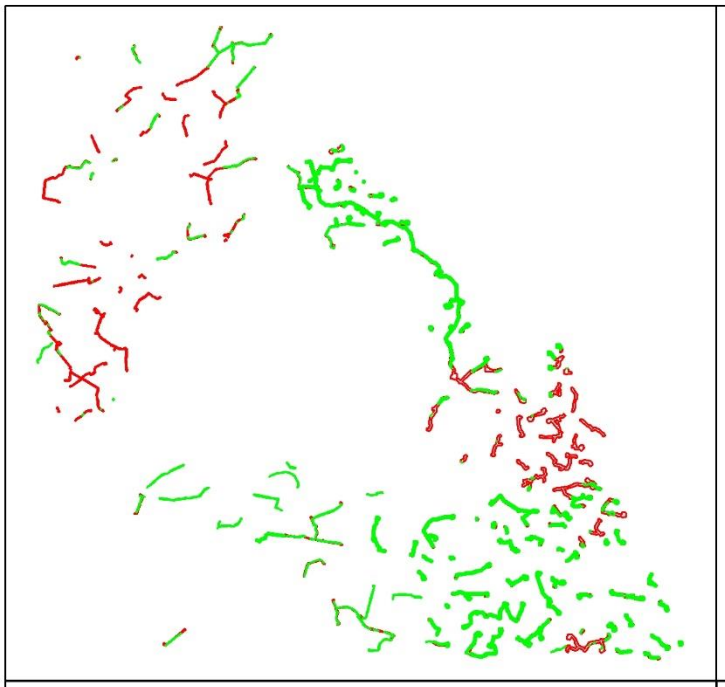


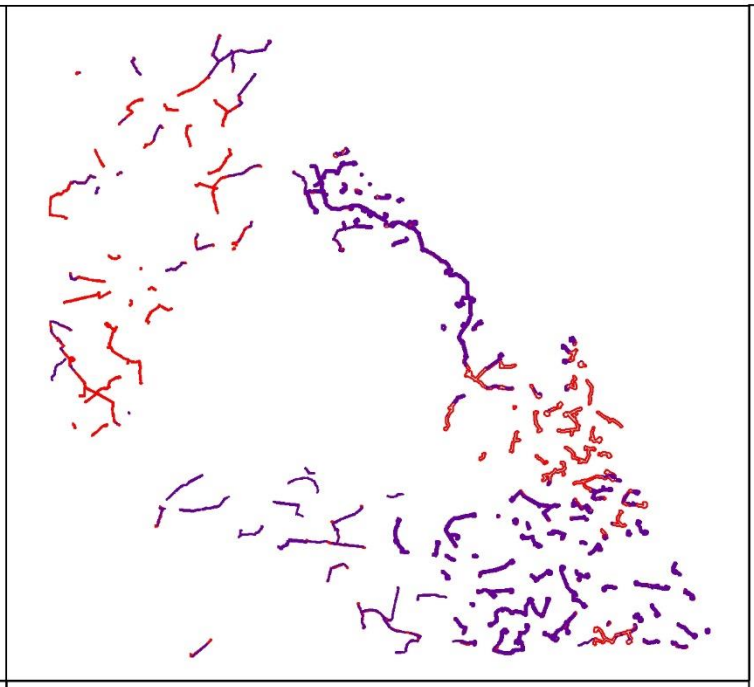
Appendix F. Predictive threatened fauna habitat mapping within the Site.

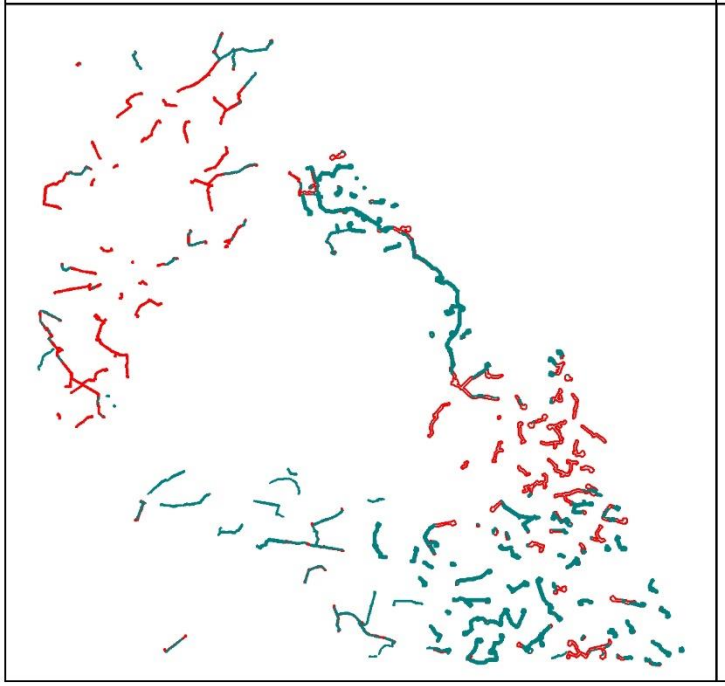

Appendix F1: Predictive MNES Fauna Habitat Mapping.
The Site
Northern Quoll
Essential Habitat
General Habitat
Large-eared Pied Bat
Essential Habitat
South-eastern Long-eared Bat, Red Goshawk & White-throated Needletail
General Habitat
Greater Glider
General Habitat
N
W
E
S
0 1 2 4 6km
Boobook
Project: Fairview Optimisation Ecology Survey
Map No: PC768_AppF1
Date: 5/03/2021 RevC
Drawn: L. Hardwick
Approved: C. Eddie
Scale: 1: 200,000 @ A3
Datum: GDA94
The Site
Roma
Brisbane


Appendix F2: Predictive MNES Fauna Habitat Mapping.
The Site
Koala
Essential Habitat
General Habitat
Pale Imperial Hairstreak (Butterfly)
Essential Habitat
Dunmall's Snake & Golden-tailed Gecko
General Habitat
White-throated Snapping Turtle & Fitzroy River Turtle
Essential Habitat
N
W
E
S
0 1 2 4 6km
Boobook
Project: Fairview Optimisation Ecology Survey
Map No: PC768_AppF2
Date: 5/03/2021 RevC
Drawn: L. Hardwick
Approved: C. Eddie
Scale: 1: 200,000 @ A3
Datum: GDA94
The Site
Roma
Brisbane


Appendix F3: Predictive MNES Fauna Habitat Mapping.
The Site
Yakka Skink
Essential Habitat
General Habitat
Common Death Adder
General Habitat
Collared Delma
General Habitat
Black-breasted Button-quail
General Habitat
N
W
E
S
0 1 2 4 6km
Boobook
Project: Fairview Optimisation Ecology Survey
Map No: PC768_AppF3
Date: 5/03/2021 RevC
Drawn: L. Hardwick
Approved: C. Eddie
Scale: 1: 200,000 @ A3
Datum: GDA94
The Site
Roma
Brisbane







Appendix F4: Predictive MNES Fauna Habitat Mapping.

The Site

Glossy Black-cockatoo

General Habitat

Squatter Pigeon (southern)

General Habitat

Powerful Owl

General Habitat

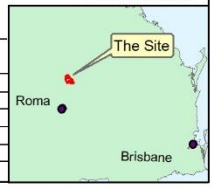
N

W E

S

0 1 2 4 6km

Boobook



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Map No:	PC768_AppF4
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Drawn:	L. Hardwick
Approved:	C. Eddie
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