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Santos GLNG Offset Plan and Acquittal Summary: EPBC Act Approval 2012/6615

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Abbreviations

Acronym	Description
ALA	Atlas of Living Australia
CSG	Coal Seam Gas
DAWE	Department of Agriculture, Water and the Environment
DES	Department of Environment and Science
DNRME	Department of Natural Resources, Mines and Energy
DoE	Department of the Environment
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GLNG	Gladstone Liquefied Natural Gas
GFD	Gas Field Development
GTP	Gas Transmission Pipeline
MNES	Matters of National Environmental Significance
OAMP	Offset Area Management Plan
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
TEC	Threatened Ecological Community
SEVT	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
VM Act	*Vegetation Management Act 1999*

1.0 Introduction

1.1 Background

The Santos Gladstone Liquefied Natural Gas (GLNG) Project involves the development of Coal Seam Gas (CSG) resources in the Surat and Bowen Basins in Queensland, to supply gas via a 430 kilometre (km) gas transmission pipeline (GTP) to the LNG Facility located on Curtis Island.

Throughout the development of the Santos GLNG Project and in accordance with Santos GLNG Project approvals, potentially impacted environmental values are systematically identified and assessed and in order of preference are avoided, minimised or mitigated. For a project the size and scale of the Santos GLNG Project, not all potential impacts to identified values can be avoided and/or mitigated, resulting in significant residual adverse impacts to environmental values. Santos are committed to providing environmental offsets to compensate for significant residual impacts on matters of national environmental significance (MNES).

The Santos GLNG Project requires environmental offsets for significant residual impacts on MNES under five separate approvals under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- EPBC 2008/4057 which relates to the LNG facility and associated onshore facilities.
- EPBC 2008/4058 which relates to the marine facilities for the LNG facility.
- EPBC 2008/4059 which relates to the CSG fields.
- EPBC 2008/4096 which relates to the GTP.
- EPBC 2012/6615 which relates to the expansion of the CSG fields (the Santos GLNG Gas Field Development Project [GFD Project]).

The GFD Project under EPBC 2012/6615 was originally approved in March 2016 and commenced in November 2016. History of the *Santos GLNG Offset Plan and Acquittal Summary: EPBC Act Approval 2012/6615* (Stage 4), including the *Mt Tabor Offset Area Management Plan* (OAMP; Appendix A) associated with Stage 4 is as follows:

- Revision 0:
  - Prepared in July 2021 to address offset requirements for the original Stage 4 footprint.
  - Approved by the Department of Agriculture, Water and the Environment (DAWE) on 23 September 2021.
- Revision 1:
  - Updated in August 2022 to reflect a minor variation in the Mt Tabor offset area due to inability to install fencing along the western boundary of the original offset area proposed in Revision 0. The OAMP was also updated based on a reduction in project impacts to allow for full acquittal of offset requirements for yakka skink on Mt Tabor within the new boundary.
  - Submitted to the Department of Climate Change, Energy, the Environment and Water (previously DAWE) for approval in August 2022 and revised and submitted for approval again in November 2022.

This document (revision 1) has been updated in accordance with the above.

1.2 Purpose

This document has been prepared to demonstrate how Santos will acquit MNES offset obligations associated with the GFD Project under EPBC 2012/6615. Under EPBC 2012/6615, Santos may carry out the action in project stages and deliver environmental offsets for residual significant impacts to MNES over time. This offset plan has been prepared for Stage 4 of the GFD Project, to address conditions 11-19 under EPBC 2012/6615 (see Section 2.0).

1.3 Scope

This document includes:

- offset conditions of EPBC 2012/6615 and where each condition is addressed in this document (Section 2.0)
- details of the methods for assessing significant residual impacts and a summary of the impacts addressed as part of this document for Stage 4 of the GFD Project (Section 3.0)
- a reconciliation of impacts and offsets for Stages 1-3 of the GFD Project (Section 4.0)
- summary of how the proposed offset areas meet the requirements under the EPBC Act Environmental Offsets Policy (Section 5.0)
- brief overview of the offset properties selected to acquit the MNES offset requirements of Stage 4 of the GFD Project, namely, Mt Tabor (Lot 6 CHS25) and Springwater (Lot 8 SP261936) (Section 6.0)
- demonstration of how each MNES offset requirement is acquit (Section 7.0)
- OAMPs for the Mt Tabor and Springwater offset areas (Appendix A and B, respectively).

2.0 Approval Conditions

Table 1 provides a summary of the conditions related to offsets under EPBC 2012/6615 for Stage 4 of the GFD Project and how they have been addressed within this document.

Table 1: EPBC Act Approval Conditions and how they are met

Condition number	Condition	How the conditions are met
EPBC Act approval 2012/6615		
11	The approval holder must ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy.	Offsets to compensate for significant residual impacts associated with Stage 4 of the GFD Project will be delivered in accordance with the principles of the EPBC Act Environmental Offsets Policy. Section 5.0 provides a summary of how the proposed offset areas meet the requirements for an offset under the EPBC Act Environmental Offset Policy with additional detail provided in Section 2.8 and 2.9 of the Mt Tabor (Appendix A) and Springwater (Appendix B) OAMP, respectively.
12	The approval holder may carry out the action in project stages. The approval holder must deliver environmental offsets for residual significant impacts to matters of national environmental significance for each project stage.	The action will be carried out in stages. This offset plan has been prepared to address offset requirements for residual significant impacts on MNES associated with Stage 4 of the GFD Project, as described in Section 3.0.
13	The approval holder must submit an Offset Management Plan for the Minister's written approval. The Offset Management Plan may be prepared and submitted to the Minister for written approval in stages. If the approval holder submits the Offset Management Plan in stages, each version of the Offset Management Plan must address the known and predicted impacts of the completed, current, and next proposed project phases.	This offset plan has been submitted for the Minister's written approval. This offset plan has been prepared to address offset requirements for residual significant impacts on MNES associated with Stage 4 of the GFD Project, as described in Section 3.0. A reconciliation of impacts for Stage 1-3 of the GFD Project is included in Section 4.0.
14	The Offset Management Plan must include: a. a method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities; b. results from pre-disturbance surveys and/or an alternative approved methodology (if used) for the project phase as required under conditions 4 and 5; c. details of the offset areas required to address predicted residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities for the project phase; d. a survey and description of the current condition (prior to any management activities) of each offset area proposed, including existing vegetation (the baseline condition). This must include a shapefile of each offset property boundary; e. information about how the offset areas provide connectivity with other relevant habitats and biodiversity corridors, including a map depicting the offset areas in relation to other habitats and biodiversity corridors; f. performance and completion criteria for evaluating the management of the offset area, and criteria for triggering remedial action (if necessary); g. a description of the management measures that will be implemented for the protection of EPBC threatened species, EPBC migratory species and EPBC communities, including a discussion of how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans; h. a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria; i. a description of potential risks to the successful implementation of the plan, and a description of the contingency measures that would be implemented to mitigate against these risks; j. a timeline for when actions identified in the Offset Management Plan will be implemented for each offset area; and k. the proposed legal mechanism for securing the offset.	The Mt Tabor and Springwater offset areas are proposed to be secured to acquit offset requirements for Stage 4 of the GFD Project. OAMPs for the Mt Tabor and Springwater offset areas have been developed in accordance with the requirements outlined in condition 14 (see Appendix A and B, respectively). A summary of how each requirement has been addressed is provided below and further detailed in each OAMP. a. The method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities is discussed in Section 3.2. b. Details of the relevant field assessments are provided in Section 3.2 and a summary of the residual significant impacts on MNES for Stage 4 of the GFD Project is provided in Section 3.2.3. c. A description of the proposed Mt Tabor and Springwater offset areas is provided in Section 6.0 and a summary of the offset area to be secured on each property to acquit the residual significant impacts for Stage 4 of the GFD Project is provided in Section 7.0. d. Details of the baseline field surveys and ecological condition are provided in Section 2.4 and 2.5 of the Mt Tabor OAMP (Appendix A) and Springwater OAMP (Appendix B). Shapefiles of the offset areas will be submitted with this offset plan. e. Details on the connectivity and the landscape context are provided in Section 2.2 of the Mt Tabor OAMP (Appendix A) and the Springwater OAMP (Appendix B). f. Performance criteria, trigger levels and remedial actions for management activities are discussed in Section 6.0 of the Mt Tabor OAMP (Appendix A) and Section 7.0 of the Springwater OAMP (Appendix B). g. Management measures implemented for the protection of MNES, including how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans are provided in Section 3.0 and 6.0 of the Mt Tabor OAMP (Appendix A) and Section 7.0 of the Springwater OAMP (Appendix B). h. The monitoring program to measure the effectiveness of the management measures and progress against the performance and completion criteria is detailed in Section 7.0 of the Mt Tabor OAMP (Appendix A) and Section 8.0 of the Springwater OAMP (Appendix B). i. Risks to the successful implementation of the OAMPs are outlined in Section 5.0 of the Mt Tabor OAMP (Appendix A) and Section 5.0 of the Springwater OAMP (Appendix B). j. The timing for implementation of the management and monitoring program is provided in Section 9.0 of the Mt Tabor OAMP (Appendix A) and Section 8.6 of the Springwater OAMP (Appendix B). k. Details on how each of the offset areas for Stage 4 of the GFD Project will be legally secured are provided in Section 2.7 of the Mt Tabor OAMP (Appendix A) and Section 2.8 of the Springwater OAMP (Appendix B).

Condition number	Condition	How the conditions are met
15	The currently approved Offset Management Plan must be implemented by the approval holder.	This offset plan complements previous offsets plans and proposals submitted for approval. Once approved, this offset plan will be implemented.
16	The approval holder must register and legally secure offsets for the first project phase identified in the Offset Management Plan within two years of commencement of the first project phase.	On 6 April 2018, the Springwater offset area was declared an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999* (VM Act) and legally secured through a voluntary declaration. The Santos GLNG Gas Fields Development Project Stage 1 Offset Plan was approved on 31 October 2016. See Section 2.7 of the Mt Tabor OAMP (Appendix A) and Section 2.8 of the Springwater OAMP (Appendix B) for further detail.
17	The approval holder must register and legally secure offsets for a project phase which are sufficient to acquit the residual significant impacts of that project phase.	On 6 April 2018, the Springwater offset area was declared an area of high nature conservation value under section 19F of the VM Act and legally secured through a voluntary declaration. See Section 2.7 of the Mt Tabor OAMP (Appendix A) and Section 2.8 of the Springwater OAMP (Appendix B) for further detail.
18	If the approval holder submits the Offset Management Plan in stages, the approval holder must prepare and submit an updated Offset Management Plan for each subsequent project phase, for written approval by the Minister. The updated Offset Management Plan must: a. include the information required for the Offset Management Plan at condition 14 for the next project phase; b. include a reconciliation of actual and predicted but yet to be actualised residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities against offsets secured for the commenced project phases and may be subtracted from the obligations required for the subsequent project phases. Any shortfall in secured offsets relative to the requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases must be added to the obligations required for the next project phase; and c. demonstrate how the offset builds on offsets already secured for previous project stages and will contribute to a larger strategic offset for cumulative project impacts.	The Mt Tabor and Springwater OAMPs (Appendix A and B, respectively) have been prepared to satisfy offset requirements for Stage 4 of the GFD Project. The Springwater OAMP has previously been approved by the Commonwealth Government as a suitable offset to compensate for impacts associated with Stages 1 to 3 of the GFD Project under EPBC 2012/6615 as follows: • Santos GLNG Gas Fields Development Project Stage 1 Offset Plan 2016 – 2021 (Document Number: 0007-650-PLA-0008), approved on 31 October 2016 and prepared to support gas field developments in Scotia Gas Field Petroleum Lease (PL) 176. • Santos GLNG Gas Fields Development Project Stage 2 Offset Plan (Document Number: 0030-650-EMP-0001 (Rev 2)), approved on 29 June 2018 and prepared to support gas field developments in Maisey Gas Field (PL 176). • Santos GLNG Gas Fields Development Stage 3 Offset Plan (Rev 1, 12 April 2021), approved on 17 May 2021 and prepared to support gas field developments in Scotia Gas Field (PL 176), and Arcadia Gas Field (PL 90, PL 234 and PL 421). The Stage 3 approved Springwater OAMP has been updated to address the Stage 4 offset requirements for Brigalow (*Acacia harpophylla* dominant and co-dominant) threatened ecological community (TEC), Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT) TEC and Black-breasted Button-quail habitat in accordance with the requirements under condition 18 of EPBC 2012/6615 (Appendix B). A reconciliation of impacts for Stage 1-3 of the GFD Project is included in Section 4.0.
19	The approval holder must not commence the project phase until the Offset Management Plan, updated for that project phase has been approved by the Minister in writing.	This offset plan and associated OAMPs are submitted for the approval of the Minister.

3.0 Significant Residual Impacts

3.1 Staging Plan

Environmental offsets for the Santos GFD Project will be acquit in stages. For each offset stage of the GFD Project an environmental offset plan will be developed to:

- Report on the methodology and results of the environmental assessments completed over the proposed disturbance area (e.g. desktop and field ecological assessment results).
- Identify actual significant residual impacts on MNES for each stage.
- Reconcile the offsets obligations, post disturbance, against the advanced offsets provided.

An indicative flow diagram demonstrating the staging process is provided in Figure 1.

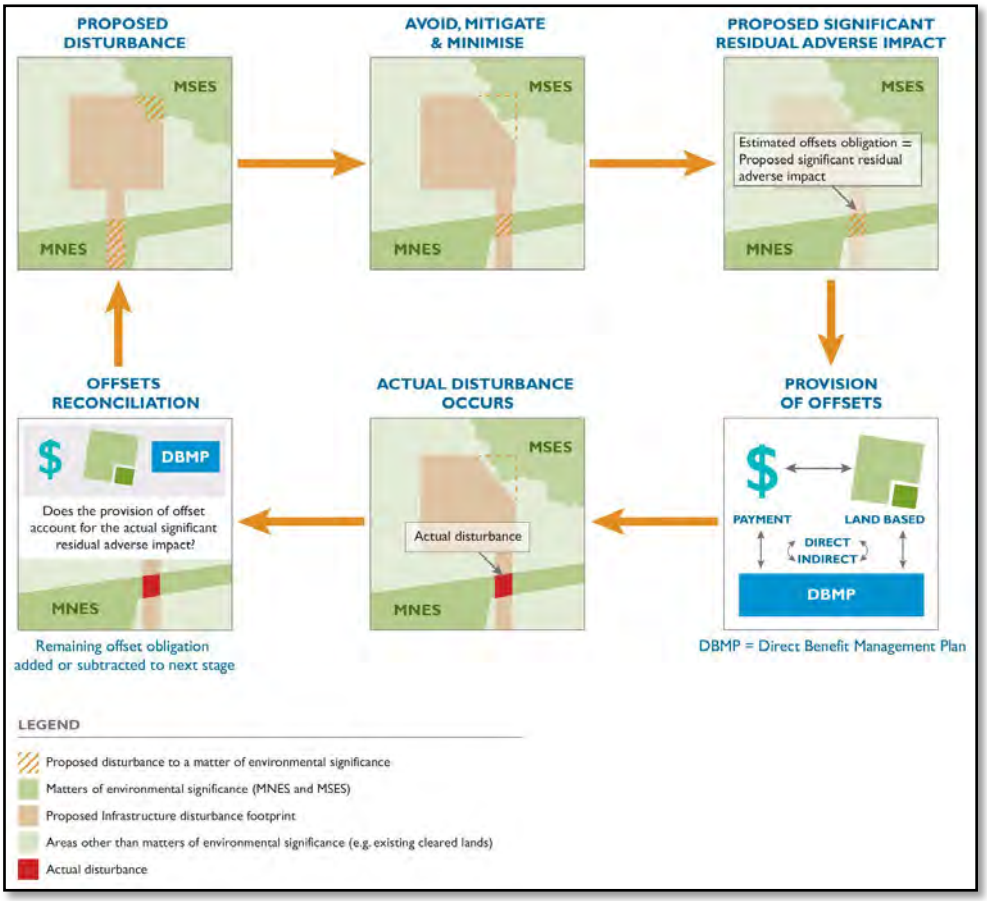

Figure 1: The Santos GLNG Staging Process

This offset plan has been prepared for Stage 4 of the GFD Project in accordance with condition 18 of EPBC 2012/6615.

3.2 Methods for Assessing Stage 4 Impacts

3.2.1 Stage 4 development area

The Stage 4 development area is located approximately 45 km east-northeast of Injune, south central Queensland and sits entirely within Subregion 24 (Carnarvon Ranges) of the Brigalow Belt Bioregion (Sattler and Williams, 1999). The northern section (Waddy Brae, Fairview, Moonah and Beilba State Forest) is within the Maranoa Regional Council area, while the remainder of the area is within the Banana Shire.

The development area has a long history as a pastoral settlement and continues to be used for cattle grazing in remnant and non-remnant patches, resulting in large areas of clearing, particularly in valleys and accessible areas of clay-loam soils on plateaus and hills. Thinning of woodland for grazing and harvesting is also apparent through much of the area, with extensive areas of remnant vegetation set aside for future harvesting. Much of the cleared areas have been infested with pasture grasses which have penetrated remnant vegetation. Recently, agricultural fields have been established on some plateau tops to grow stock feed (Boobook, 2021a).

Periodic disturbance by fire is apparent within and around much of the remnant and regrowth vegetation throughout the area, including evidence of severe fires resulting in loss of canopy integrity and penetration into patches of SEVT and Brigalow communities (Boobook, 2021a).

There has also been extensive development of CSG infrastructure comprising the Fairview gas field. Extensive networks of roads, tracks, fences and cleared areas throughout the area support pastoral, forestry and gas extraction industries (Boobook, 2021a).

3.2.2 Ecological surveys and assessments

An ecological assessment of the Stage 4 development area was undertaken by Boobook Ecological Consulting (Boobook) to provide baseline ecological data and to inform future offset obligations. The assessment included a desktop investigation followed by detailed field surveys in September 2020, October 2020, November 2020 and February 2021 to confirm the vegetation communities, flora/fauna species and habitat values present within the development area (Boobook, 2021a).

Formal survey sites were established by Boobook in a number of vegetation assessment units, based on identifiable vegetation characteristics. At each site quaternary vegetation structure and floristics, BioCondition and fauna habitat assessments were conducted. A description of the desktop and field survey assessments are summarised in the following sections.

In-field verification of desktop findings and additional findings of significance were undertaken in general accordancewith 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).
- Functional Thresholds for Assessing Regional Ecosystem Functionality (Santos, 2015).

3.2.2.1.1. Desktop assessment

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

- Queensland government remnant regional ecosystem (RE) and mature regrowth mapping (Department of Environment and Science [DES], 2020b; Department of Natural Resources, Mines and Energy [DNRME], 2020a).
- Essential Habitat mapping (DNRME, 2020b).
- EPBC Act Protected Matters Search Tool (Department of Agriculture, Water and the Environment [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, 2020e).
- Regulated vegetation and other Matters of State Conservation Significance (DES, 2020e; DNRME, 2020a, 2020b).
- Atlas of Living Australia (ALA) flora and fauna records within 10 km of the approximate centre of the Site (ALA, 2020).

3.2.2.2 Regional Ecosystem and Threatened Ecological Community Assessment

Desktop RE mapping was ground-truthed based on quaternary level of data collected across the disturbance area in accordance with Neldner *et al*. (2020). Vegetation community polygons were verified in accordance with Queensland RE description and biodiversity status as per the Regional Ecosystem Description Database (REDD) (DES, 2020a) and classified as remnant RE, vegetation consistent with RE (regrowth) or non-remnant vegetation (Santos, 2014). 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).

For each area of potential TEC, an assessment of vegetation survey data was made against the Commonwealth Government's TEC threshold criteria (e.g. Threatened Species Scientific Committee, 2013).

3.2.2.3 BioCondition assessment

BioCondition assessments were used to evaluate ecological functionality of each vegetation community. These assessments were completed at 48 sites, which were selected to include each mapped RE (remnant and regrowth status). BioCondition assessments were undertaken in accordance with the BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual (Eyre *et al*., 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). Where published benchmarks were not available, these site scores were derived by comparison of site attributes against regional benchmarks and median scores for remnant vegetation sites of the relevant RE, with low levels of disturbance, obtained from previous Boobook surveys (Boobook, 2021a).

3.2.2.4 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 confirmed, likely or potentially present within the development area. Identified habitat REs were classified as Essential or General Habitat using the definitions provided in the Santos FaunaHabitat model (Aurecon, 2014) as follows:

- Essential Habitat - is an area containing resources that are considered essential for the maintenance of populations ofthe 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 potentially 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.

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 (Boobook, 2021a).

Microhabitat assessments were conducted at representative sites within each ground-truthed assessment unit present within the development area. 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 area. 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.

3.2.2.5 Targeted flora survey

Targeted surveys for threatened flora species were informed by the desktop search results and local experience. Searches for threatened flora species under the EPBC Act and/or *Nature Conservation Act 1992* 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 (Boobook, 2021a).

3.2.3 Significant Residual Impact Assessment

The Commonwealth Minister for the Environment requires the approval holder to ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy and secure environmental offsets to compensate for residual impacts to MNES for each stage of the GFD Project.

The EPBC Act Environmental Offsets Policy states that environmental offsets are measures that compensate for the residual adverse impacts of an action on the environment and defines residual adverse impacts as those impacts that remain after avoidance and mitigation measures have been implemented. The EPBC Act Environmental Offsets Policy requires residual adverse impacts to be offset if the impact is considered to be 'significant' as defined by the 'Matters of National Environmental Significance – Significant Impact Guidelines Version 1.1' (Department of the Environment [DoE], 2013).

Based on the results of the desktop assessment and detailed field surveys described in Section 3.2.2, a likelihood of occurrence assessment for EPBC Act listed threatened species, migratory species and ecological communities was undertaken within the Stage 4 development area to determine the known or potential presence of MNES (Boobook 2021a).

Potential residual impacts were identified for EPBC Act listed threatened species and ecological communities, identified in annex 1 to the EPBC 2012/6615 approval, that were confirmed, likely or potentially present within the Stage 4 of the GFD Project development area. The extent of the residual impact for each MNES was determined by assessing a conservative 'best guess' scenario, i.e. assuming the maximum linear infrastructure corridor widths and larger well layouts on the most likely development layout, within the extent of predictive habitat mapping (defined by potentially suitable RE) within the Stage 4 development area. This generally results in a significant over-estimate of impacts, as it is rare the maximum potential disturbance widths are utilised during all construction. Table 2 summarises the conservative 'best guess' scenario of impacts to EPBC Act listed threatened species and ecological communities based on the predictive habitat mapping for each MNES within the Stage 4 GFD development area.

For EPBC Act listed migratory and marine fauna species a likelihood of occurrence assessment was also undertaken, followed by a significant residual impact assessment in accordance with the EPBC Act guidelines for Significant Impacts on Matters of National Environmental Significance (DoE, 2013) for species identified as confirmed, likely or potentially present within the Stage 4 GFD Project development area. The results of this assessment are presented in Table 3 and indicate that there would be no significant residual impacts to EPBC Act listed migratory and marine fauna species.

Following the results of the significant residual impact assessment described above, Santos propose to secure environmental offsets to compensate for the impacts to EPBC Act listed threatened species and ecological communities identified in Table 2.

Santos will ensure the impacts to MNES as a result of implementing Stage 4 of the action will be no greater than the impacts specified in Table 2 and for which offsets are specified in Table 6.

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Table 2: Proposed disturbance to EPBC Act listed threatened fauna and ecological communities within the Stage 4 development area

MNES	Status*	Distribution and known habitat use	Potentially suitable RE	Disturbance area (ha)
Threatened ecological communities				
Brigalow TEC (*Acacia harpophylla* dominant and co-dominant)	E	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. Regrowth patches of RE 11.9.5 were also mapped as TEC, except in some extensively disturbed patches where non-native plant cover exceeded 50%.	11.9.5	5.5
Semi-evergreen vine thickets TEC of the Brigalow Belt (North and South) and Nandewar Bioregions	E	All RE 11.9.4 was assigned to the SEVT TEC.	11.9.4	2.0
Threatened species				
Northern quoll (*Dasyurus hallucatus)*	E	**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. 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.	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	291.9
Collared delma (*Delma torquata)*	V	**Likely to be present.** Eucalypt woodland with potentially suitable shelter sites (e.g. small rocks, woody debris) is present within the Site. Mapped General Habitat includes all areas of remnant and regrowth of the nominated RE.	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	482.7
Dunmall's snake (*Furina dunmalli)*	V	**Likely to be present.** Potentially suitable foraging and shelter habitat is present and widespread in remnant and regrowth REs within the Site. Mapped General Habitat includes all remnant vegetation and regrowth of the nominated RE.	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	486.7

MNES	Status*	Distribution and known habitat use	Potentially suitable RE	Disturbance area (ha)
Yakka skink (*Egernia rugosa*) - Essential and General	V	**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. 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.	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	487.1
Large-eared pied bat (*Chalinolobus dwyeri)*	V	**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. Mapped Essential Habitat includes all nominated RE within 5 km of potentially suitable shelter habitat (i.e. extensive areas of dissected sandstone with deep crevices and caves).	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	367.9
Red goshawk (*Erythrotriorchis radiatus*)	V	**Potentially present.** Suitable breeding habitat (i.e. permanent water bodies and riparian habitat with tall trees) is absent within the Site, but potential foraging habitat (e.g. open areas near water, forests and woodlands) is present at the Site. 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.	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	491.1
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	**Confirmed present.** Suitable habitat (i.e. grassy woodland) is present within the Site. The species has been recorded from Fairview Gas Field. This species usually inhabits areas near a water source, and nests and forages in a wide range of grassy woodland and open forest types. General Habitat includes all areas of remnant and regrowth of the nominated RE.	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	486.1
Koala (*Phascolarctos cinereus*) – Essential and General	V	**Likely to be present.** Suitable habitat (i.e. *Eucalyptus*-dominated woodlands and open forests) is present and widespread within the Site, which is within the known range of the species. Essential Habitat includes eucalypt-dominated riparian and floodplain REs. Mapped General Habitat includes all other remnant and regrowth of RE dominated by Myrtaceae species.	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	346.1
Black-breasted button-quail (*Turnix melanogaster*)	V	**Potentially present.** Suitable habitat (i.e. SEVT) is present within the Site. This bird lives in drier rainforest types (including SEVT), brigalow shrubby open forest and littoral shrublands, where it forages in deep leaf litter. 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.	11.9.4, 11.10.8	2.3

MNES	Status*	Distribution and known habitat use	Potentially suitable RE	Disturbance area (ha)
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	**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. Mapped General Habitat includes all areas of remnant vegetation and regrowth that may be suitable for foraging or shelter.	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	491.1

* Status: E = Endangered and V = Vulnerable (DAWE, 2020a-d; DAWE, 2021a-h).

Table 3: Assessment of potential significant impacts upon EPBC Act listed migratory and/or marine fauna species potentially present within the development area

Species	Significant Impact Criteria (DoE 2013; Department of Environmental Heritage and Protection, 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.	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.	
Common sandpiper (*Actitis hypoleucos*)	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
Cattle egret (*Bubulcus ibis*)	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
Eastern great egret (*Ardea alba modesta*)								
Fork-tailed swift (*Apus pacificus*)	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.
White-throated needletail (*Hirundapus caudacutus*)								
White-bellied sea-eagle (*Haliaeetus leucogaster*)	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
Straw-necked ibis (*Threskiornis spinicollis)*	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
Brown goshawk (*Accipiter fasciatus)*								No
Fan-tailed cuckoo (*Cacomantis flabelliformis)*								No
Pallid cuckoo (*Cacomantis pallidus)*								No

Species	Significant Impact Criteria (DoE 2013; Department of Environmental Heritage and Protection, 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.	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.	
Shining bronze-cuckoo (*Chalcites lucidus)*								No
Black-eared cuckoo (*Chalcites osculans)*								No
Oriental cuckoo *(Cuculus optatus)*								No
Eastern koel (*Eudynamys orientalis)*								No
Channel-billed cuckoo (*Scythrops novaehollandiae)*								No
Forest kingfisher (*Todiramphus macleayii)*								No
Rainbow bee-eater (*Merops ornatus)*								No
Australian magpie-lark (*Grallina cyanoleuca)*								No
Satin flycatcher (*Myiagra cyanoleuca)*								No
Rufous fantail (*Rhipidura rufifrons)*								No
Black-faced cuckoo-shrike (*Coracina novaehollandiae)*								No
White-bellied cuckoo-shrike (*Coracina papuensis)*								No
Australasian pipit (*Anthus novaeseelandiae)*								No
Welcome swallow (*Hirundo neoxena)*								No

4.0 Impact and Offset Reconciliation for Stage 1-3

In accordance with condition 18 (b) of EPBC 2012/6615, a reconciliation of actual and predicted but yet to be actualised residual significant impacts to MNES against offsets secured for the commenced project stages must be undertaken. Secured offsets in excess of requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases will be subtracted from the obligations required for subsequent project phases. Any shortfall in secured offsets relative to the requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases will be added to the obligations required for the next project phase.

Table 4 provides a summary of the proposed significant residual impacts on MNES required to be offset for Stages 1, 2 and 3 of the GFD Project including the offset area secured on the Santos owned Springwater property to compensate for the proposed disturbance. The offset areas on Springwater have been approved in accordance with the following OAMPs under EPBC 2012/6615:

- Santos GLNG Gas Fields Development Project Stage 1 Offset Plan 2016 – 2021 (Document Number: 0007-650-PLA-0008), approved on 31 October 2016 and prepared to support gas field developments in Scotia Gas Field (PL 176).
- Santos GLNG Gas Fields Development Project Stage 2 Offset Plan (Document Number: 0030-650-EMP-0001 (Rev 2)), approved on 29 June 2018 and prepared to support gas field developments in Maisey Gas Field (PL 176).
- Santos GLNG Gas Fields Development Stage 3 Offset Plan (Rev 1, 12 April 2021), approved on 17 May 2021 and prepared to support gas field developments in Scotia Gas Field (PL 176), and Arcadia Gas Field on (PL 90, PL 234 and PL 421).

Activities comprising Stage 1 of the GFD Project will not incur any significant residual impacts to MNES and therefore have not been included in the table below. Activities comprising Stages 2 and 3 of the GFD Project are yet to be completed in full, so an assessment of actual impacts to date is yet to be finalised.

Table 4: Reconciliation of predicted significant residual impacts associated with Stage 1-3 of the GFD Project and offset area secured on the Springwater property

MNES	Status*	Area of suitable habitat within the Springwater offset area (ha)	Stage 2			Stage 3			Surplus remaining (after stage 1 – 3; ha)
			Predicted Stage 2 impacts (ha)	Impacts offset as part of Stage 2 (ha)	Offset area secured (ha)	Residual Stage 2 impacts reconciled and included in Stage 3 (ha)	Predicted Stage 3 impacts including reconciled Stage 2 (ha)	Offset area secured (ha)	
Threatened Ecological Communities									
Brigalow TEC (*Acacia harpophylla* dominant and co-dominant)	E	369.3	6.8	6.2	53.0	0.6	24.8	198.0	69.7
Semi-evergreen vine thicket TEC of the Brigalow Belt (North and South) and Nandewar Bioregions	E	57.5	-	-	-	-	-	-	44.5
Threatened Species									
Northern quoll (*Dasyurus hallucatus)*	E	837.3	-	-	-	-	-	251.0	137.0
Collared delma (*Delma torquata)*	V	768.4	55.9	49.0	284.0	6.9	48.3	339.5	87.6
Dunmall's snake (*Furina dunmalli)*	V	768.4	55.9	49.0	284.0	6.9	48.3	351.5	87.6
Yakka skink (*Egernia rugosa*)	V	768.4	54.8	48.2	279.0	6.6	48.0	350.5	87.6
Large-eared pied bat (*Chalinolobus dwyeri)*	V	837.3	-	-	-	-	-	251.0	137.0
Red goshawk (*Erythrotriorchis radiatus*)	V	837.3	-	-	-	-	31.0	288.0	137.0
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	429.6	-	-	-	-	10.8	75.0	42.6
Koala (*Phascolarctos cinereus*)	V	429.6	42.1	37.5	217.0	4.6	23.1	156.0	42.6
Black-breasted button-quail (*Turnix melanogaster*)	V	57.5	-	-	-	-	0.6	5.7	44.5
South-eastern long-eared Bat (*Nyctophilus corbeni*)	V	837.3	55.9	49.0	340.0	6.9	50.2	371.0	137.0

* Status: E = Endangered and V = Vulnerable (DAWE, 2020a-d; DAWE, 2021a-h).

5.0 EPBC Act Offset Framework

Offsets are proposed to be secured on the Mt Tabor and Springwater properties, as detailed in Section 6.0 below. Table 5 outlines how the proposed offset areas will be provided to compensate for significant residual impacts to MNES and meet the requirements of the EPBC Act Environmental Offsets Policy.

Table 5: Assessment against Principles of the Offset Policy

Principle	How the principle is met in this offset proposal
1. deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	The Mt Tabor and Springwater offset areas acquit MNES offset requirements under EPBC 2012/6615 as outlined in Table 6 of this offset plan. The offset areas will be managed and monitored to improve the quality of Brigalow TEC, SEVT TEC and viability of habitat for MNES fauna species. The Mt Tabor and Springwater OAMPs (Appendix A and Appendix B) include specific management objectives with interim performance targets and completion criteria. Management actions are outlined with accompanying adaptive management triggers and corrective actions in the event that monitoring identifies that interim performance targets are not attained or completion criteria are not attained and/or maintained. The offset areas will be managed and monitored from approval of the OAMP for a minimum of 20 years. It is anticipated that the completion criteria will be achieved within a 20 year period.
2. be built around direct offsets but may include other compensatory measures	MNES offset obligations under EPBC 2012/6615 will be acquit through the delivery of direct land-based offsets on the Mt Tabor and Springwater offset areas.
3. be in proportion to the level of statutory protection that applies to the protected matter	The threatened status of the impacted protected matters is considered in the offsets assessment guides in calculating the area of the offset to be provided.
4. be of a size and scale proportionate to the residual impacts on the protected matter	The size of the offset area to be secured for offset obligations has been calculated in accordance with the offsets assessment guides and is presented as part of the Mt Tabor and Springwater OAMPs (Appendix A and Appendix B).
5. effectively account for and manage the risks of the offset not succeeding	The Mt Tabor and Springwater OAMPs (Appendix A and Appendix B) have been developed in consideration of known and identified threats to the offset values to manage the risk of failing to achieve the completion criteria and overall environmental outcomes for the offset area. Threats to the offset Site are managed by through the implementation of the management measures, including: • Fire prevention and management • Weed and pest animal monitoring and control • Clearing protection • Management of grazing • Restricted access The relevant risks were identified based on a review of current literature (i.e. conservation advices, recovery plans, etc) and identification of potential site-specific risks based on the results of field surveys and discussions with the landholder. The results of the risk assessment, presented in the Mt Tabor and Springwater OAMPs (Appendix A and Appendix B), have informed the adaptive management process including the identification of threats to offset

Principle	How the principle is met in this offset proposal
	values, management objectives, performance criteria, management actions, monitoring programs, adaptive management triggers and corrective actions. If the offset cannot attain and maintain the completion criteria then additional offsets will be provided to compensate for the impact and the failed offset.
6. be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)	The environmental outcomes proposed to be achieved through the implementation of the Mt Tabor and Springwater OAMPs (Appendix A and Appendix B) are based on additional management and monitoring measures conducted as part of business as usual on the properties. For example under the *Biosecurity Act 2014* a person has a general biosecurity obligation to: take all reasonable and practical steps to prevent or minimise each biosecurity risk. The steps proposed in the OAMPs are above reasonable and practical steps required to control feral animals and weeds in central Queensland. Once the Voluntary Declaration has been secured over the offset area, environmental laws prevent other land uses inconsistent with the OAMP being approved over these parts of the properties.
7. be efficient, effective, timely, transparent, scientifically robust and reasonable	The Mt Tabor and Springwater offset areas have been identified to be suitable using an evidence based and scientifically robust approach, as detailed in the Mt Tabor and Springwater OAMPs (Appendix A and Appendix B). The environmental outcomes to be achieved through the OAMPs will be delivered progressively over 20 years. The offset area will be legally secured through a Voluntary Declaration under the VM Act, therefore any vegetation clearing contravention of the OAMPs is not permissible without specific Queensland government approval. The preparation and implementation of the OAMPs support the efficient, effective, timely, transparent and scientifically robust approach to providing offsets.
8. have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The OAMPs include a detailed monitoring program which will assess the effectiveness of the management actions undertaken and the progress of the offset area in achieving the environmental outcomes. The results of all management and monitoring programs will be included in annual reports to be prepared for each management year. An implementation schedule for monitoring and management is provided in the OAMPs which will be reviewed at least annually to ensure the timely implementation of the OAMPs.

6.0 Offset Approach

Santos will acquit the offset obligations for Stage 4 of the GFD Project under EPBC 2012/6615 on the Mt Tabor and Springwater offset areas. The following sections provide an overview of each offset option and Figure 2 spatially presents the location of the proposed offset areas in relation to the GFD Project.

6.1 Mt Tabor

Mt Tabor, also known as 'Goorathuntha', is a 71,200 ha property located approximately 120 km northeast of Augathella, south Central Queensland (Lot 6 CHS25). The property is owned by Goorathuntha Traditional Owners Ltd and is currently used for cattle grazing.

Mt Tabor is situated within Subregion 24 (Carnarvon Ranges) of the Brigalow Belt Bioregion (Sattler and Williams, 1999) and straddles the boundary between Murweh Shire Council and Maranoa Regional Council. The property is located in the north-eastern portion of the Warrego catchment of the Murray-Darling Basin (Boobook, 2021b). Numerous streamlines, a branched upper tributary catchment of Tickerabang Creek and several peripheral gullies are present on the Site, allowing temporary pools to occur in streams throughout the Site (Boobook, 2021b). Several farm dams are also present, although no permanent streams, springs or wetlands are known to occur (Boobook, 2021b).

Detailed field surveys of the Mt Tabor offset area were undertaken by Boobook in Lot 6 CHS25 between December and January 2021, to determine the potential biodiversity offset values and the suitability of the area as an offset for the Santos GLNG Project. Specifically, RE and TEC assessments/ground-truthing and mapping, BioCondition surveys, threatened fauna habitat assessment and mapping, targeted fauna surveys and incidental threatened flora surveys were conducted.

An OAMP for the Mt Tabor offset area is included in Appendix A and has been prepared to meet the requirements of conditions 11-19 of EPBC 2012/6615.

6.2 Springwater

Springwater is a 12,636 ha grazing property (Lot 8 SP261936) and is located within the local government area of Maranoa Regional Council, approximately 46 km east-northeast of Injune, Queensland. The offset management area is located in the northeast sections of the Springwater property. The SOA is bounded by the Hutton Creek in the west and the property boundary of Fairview Station in the north and the east.

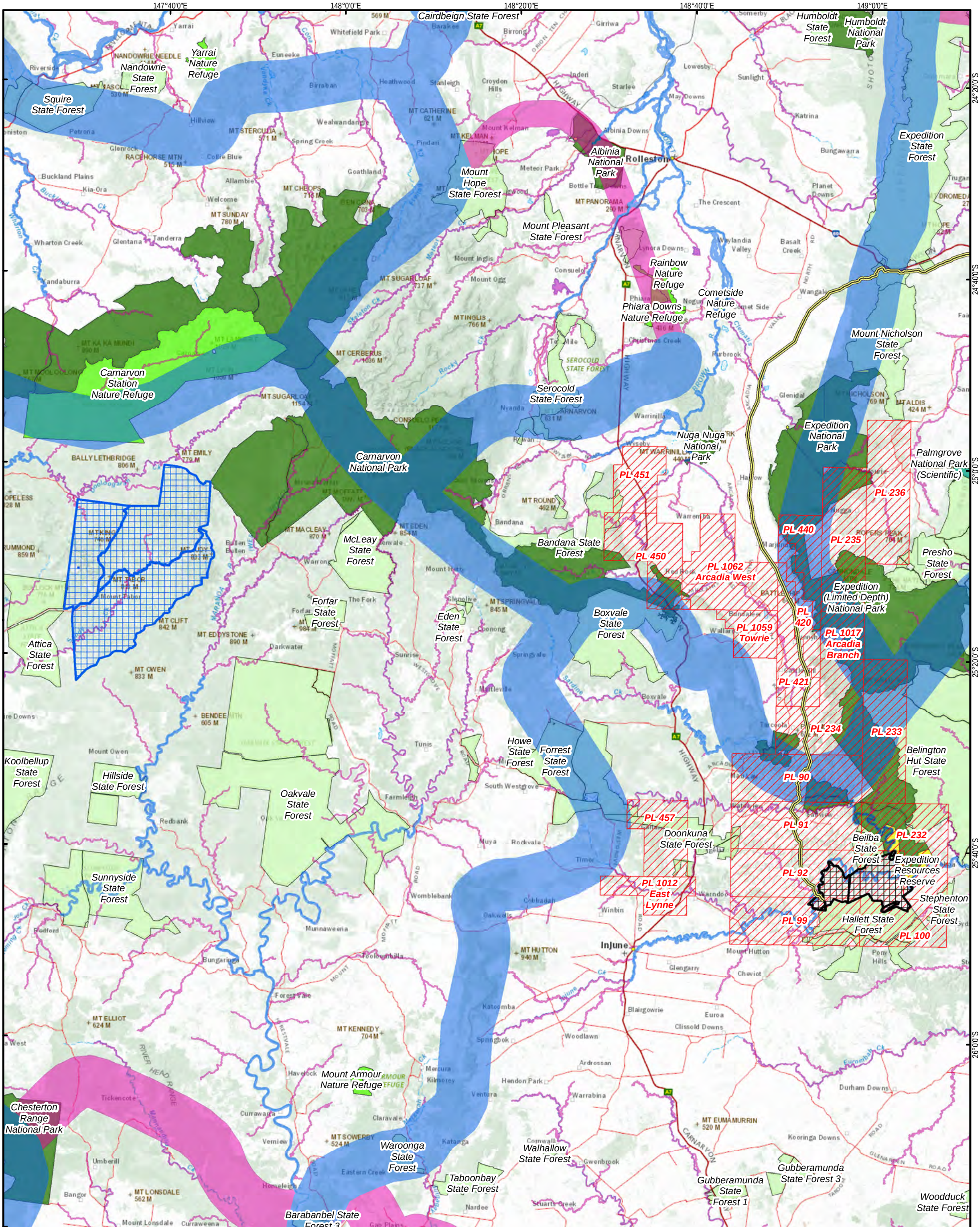
Springwater is located within subregion 24 (Carnarvon Ranges) of the Brigalow Belt South Bioregion (Sattler and Williams, 1999). Current land uses include cattle grazing, irrigated cropping, tree plantations and petroleum activities. The property is contiguous with large areas of remnant vegetation in the north on Beilba State Forest, 'Fairview' Holding and Expedition (Limited Depth) National Park, to the northeast on Expedition Resource Reserve, and to the south on Hallett State Forest. The Site is owned and managed by Santos.

Detailed field surveys of the Springwater offset area were initially undertaken by Boobook in 2015, to determine the potential biodiversity offset values and the suitability of the area as an offset for the Santos GLNG Project. Specifically, BioCondition surveys, threatened flora survey and mapping, targeted fauna surveys, canopy cover analysis and RE and vegetation community assessments/ground-truthing and mapping were conducted. An OAMP for the Springwater offset area was first approved by the Commonwealth Government on 31 October 2016 for Stage 1 of the GFD Project under EPBC 2012/6615 and has been subsequently updated and approved to address additional offset requirements associated with Stages 2 (approved 29 June 2018) and 3 (approved 17 May 2021) of the GFD Project. The current

Springwater OAMP has been updated to acquit offset requirements for Stage 4 of the GFD Project drawing down on surplus areas of suitable MNES habitat within the approved Springwater offset area (Appendix B).

Following approval of the Springwater OAMP for Stage 1 of the GFD Project, the offset area was legally secured through a Voluntary Declaration under the VM Act, thereby satisfying the legal security requirements under condition 16 of EPBC 2012/6615.

Ongoing management and monitoring of the offset area has been undertaken in accordance with commitments included in the approved versions of the OAMP to assess the progress of the offset area in achieving the required ecological outcomes.



SANTOS

Figure 2
Project context

- Mt Tabor - 6CHS25
- Springwater - 8SP261936
- GTP - petroleum pipeline (PPL 166)
- Santos Petroleum Lease

Protected areas
- National Park
- National Park (Scientific)
- State Forest
- Conservation Park
- Resources Reserve
- Nature Refuge

Statewide Corridors v1.4
- State
- Regional

Location diagram

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Petroleum leases
- Protected areas
- Statewide corridors

Date: 7/20/2021 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:650,000@A3

0 5 10 15 20 Kilometres

N

CO2 Australia

Path: P:\GIS\Data\Projects\Santos\910_210623_MtTabor\OFFSET_ACQUITTAL_Figure 2 - Project context.mxd

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7.0 Offset Acquittal

Table 6 presents a summary of the offset areas to be secured to acquit offset requirements for Stage 4 of the GFD Project under EPBC 2012/6615 on Mt Tabor and Springwater as well the area of surplus offset values remaining within each of the offset areas. For MNES where a surplus is noted, Santos proposes to draw down on these to acquit future offset requirements.

The results of the detailed field assessments including the ground-truthed RE mapping and fauna habitat associations were used to inform the suitability and location of the offset area on each of the properties and are discussed in detail as part of the OAMPs (See Appendix A and B).

The minimum offset area required to be secured for each MNES was determined in accordance with the EPBC Act offsets assessment guide. The offsets assessment guide spreadsheets and supporting justifications are presented as part of the Mt Tabor and Springwater OAMPs provided in Appendix A and B, respectively. A habitat quality score for each MNES for both the impact and offset area has been calculated to inform the offsets assessment guide.

The habitat quality of the impact area for each MNES required to be offset (Table 2) was calculated based on the outcomes of the detailed field surveys (Section 3.0) in accordance with the habitat quality scoring method described in Appendix C. This method has been developed based on a combination of assessment methods outlined in the Queensland Herbarium's BioCondition Manual and the Guide to Determining Terrestrial Habitat Quality (version 1.3; DES, 2020b) to be consistent with the requirements under the EPBC Act guideline for the offsets assessment guide. A detailed summary of the impact area habitat quality score calculations is provided in Appendix D.

A baseline habitat quality score for each MNES offset value, determined based on the results of the detailed field assessments, was used to inform the offsets assessment guide and will be used as a measure to assess the success of the OAMPs through the interim performance targets and completion criteria. A detailed summary of the field assessments, baseline habitat quality scores for each MNES and interim performance targets and completion criteria are provided in each of the OAMPs (see Appendix A and B).

Santos

Table 6: Offset acquittal for Stage 4 of the GFD under EPBC 2012/6615

MNES	Status under EPBC Act*	Impact area (ha)	Mt Tabor offset area			Springwater offset area			Total % acquittal
			Offset area to be secured under OAG (ha)	% acquittal	Surplus area available (ha)	Offset area to be secured under OAG (ha)	% acquittal	Surplus area available (ha)	
Listed threatened ecological communities									
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	5.5	-	-	-	65.6	105.70%	4.1	105.70%
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	2.0	-	-	-	26	102.41%	18.5	102.41%
Listed threatened species									
Northern quoll (*Dasyurus hallucatus*)	E	291.9	4,473.0	160.95%	856.4	-	-	137	160.95%
Collared delma (*Delma torquata*)	V	482.7	4,473.0	101.76%	856.4	-	-	87.6	101.76%
Dunmall's snake (*Furina dunmalli*)	V	486.7	4,473.0	100.92%	856.4	-	-	87.6	100.92%
Yakka skink (*Egernia rugosa*)	V	487.1	4,437.8	100.04%	-	-	-	87.6	100.04%
Large-eared pied bat (*Chalinolobus dwyeri*)	V	367.9	4,473.0	133.51%	856.4	-	-	137.0	133.51%
Red goshawk (*Erythrotriorchis radiatus*)	V	491.1	4,473.0	116.68%	856.4	-	-	137.0	116.68%
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	486.1	4,473.0	101.04%	856.4	-	-	42.6	101.04%
Koala (*Phascolarctos cinereus*)	V	346.1	4,473.0	141.92%	856.4	-	-	42.6	141.92%
Black-breasted button-quail (*Turnix melanogaster*)	V	2.3	-	-	-	19	102.05%	18.5	102.05%
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	491.1	4,473.0	100.02%	856.4	-	-	137.0	100.02%

* Status: E = Endangered and V = Vulnerable (DAWE, 2020a-d; DAWE, 2021a-h).

8.0 References

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APPENDIX A

Mt Tabor Offset Area Management Plan

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Mt Tabor Offset Area Management Plan

Document Number: 0007-650-EMP-0020

Date	Rev	Reason For Issue	Reviewed	Endorsed	Approved
21 July 2021	0	For DAWE submission	MB	MB	JC/ED
22 August 2022	1	Updated based on reduced impacts and revised property boundary	MB	MB	JC/ED

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Appendix E – Overall Fuel Hazard Assessment Guide
Appendix F – Habitat Quality Method

Abbreviations

Acronym	Description
BPA	Biodiversity Planning Assessment
CSG	Coal Seam Gas
DAF	Department of Agriculture and Fisheries (Qld)
DAWE	Department of Agriculture, Water and the Environment; formerly Department of the Environment and Energy (DEE)
DES	Department of Environment and Science; formerly Department of Environment and Heritage Protection (DEHP)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GFD	Gas Field Development
GLNG	Gladstone Liquefied Natural Gas
GTP	Gas Transmission Pipeline
MNES	Matters of National Environmental Significance
OAMP	Offset Area Management Plan
PMAV	Property Map of Assessable Vegetation
RE	Regional Ecosystem
REDD	Reginal Ecosystem Description Database
spp	species
TEC	Threatened Ecological Community
VM Act	*Vegetation Management Act 1999* (Qld)

Executive summary

This offset area management plan (OAMP) has been prepared to address the offsets requirements for matters of national environmental significance (MNES) associated with Stage 4 of the Gas Fields Development Project (GFD Project) in accordance with EPBC 2012/6615. Original approval for the OAMP (revision 0) was received from the Department of Agriculture, Water and the Environment (DAWE; now the Department of Climate Change, Energy, the Environment and Water) in September 2021. It has since been updated (this document; revision 1) to reflect minor variation from the originally proposed offset area and reduced GFD Project impacts.

Santos will secure a 5,329.4 hectare (ha) offset area on the Mt Tabor property (Lot 6 CHS25), comprising 4,473.0 ha of habitat to acquit MNES offset requirements for Stage 4 of the GFD Project under EPBC 2012/6615 and 856.4 ha of surplus offset values to be used by Santos to acquit future offset requirements (Table ES1).

Desktop and field surveys of the Mt Tabor property were completed from December 2020 to January 2021 to confirm the presence of offset values and suitability to satisfy the GFD Project's offset obligations as follows:

- Preliminary desktop assessment of biodiversity offset values (Boobook, 2021a)
- Detailed field assessment to confirm presence of environmental values within the offset area including:
  - Ground-truthing of vegetation mapping
  - BioCondition assessments in accordance with the BioCondition methodology (Eyre *et al*., 2015)
  - Targeted fauna surveys
  - Incidental flora surveys

The outcome of this OAMP will partially acquit the Stage 4 offset obligations for the GFD Project under EPBC 2012/6615 in accordance with the EPBC Act Environmental Offsets Policy. The Mt Tabor offset area will be managed and monitored, based on an adaptive management framework, to achieve the interim performance targets and completion criteria presented in Table ES2.

The key management actions to be implemented include:

- restricting access to the offset area
- maintenance and upgrades of existing access tracks, fencing and firebreaks
- fire management through strategic grazing and fuel hazard reduction burns
- weed management
- pest animal management.

Ongoing monitoring events will be undertaken to assess the effectiveness of the management actions and progress of the offset area in achieving the interim performance targets and completion criteria, including:

- biannual offset area inspections
- biomass monitoring
- fuel load monitoring
- weed monitoring

- pest animal monitoring
- rapid monitoring events
- habitat quality assessments
- photo monitoring.

Annual reports will be prepared to detail progress of the offset area in achieving the interim performance targets and completion criteria for each management year including the results of management and monitoring activities completed.

Within 12 months following approval of this OAMP, Santos will apply to have the offset area protected via a Voluntary Declaration under section 19E and 19F of the *Vegetation Management Act 1999* (Qld), including surplus areas identified in Table ES1. The Voluntary Declaration will remain in place for the life of EPBC 2012/6615.

Table ES1: Summary of Santos GLNG Project MNES offset requirements acquit on the Mt Tabor offset area

MNES	Status under EPBC Act*	Impact area (ha)	Mt Tabor offset area		
			Offset area to be secured under OAG (ha)	% acquittal	Surplus area available (ha)
Listed threatened ecological communities (TEC)					
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	5.5	-	-	-
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	2.0	-	-	-
Listed threatened species					
Northern quoll (*Dasyurus hallucatus*)	E	291.9	4,473.0	160.95%	856.4
Collared delma (*Delma torquata*)	V	482.7	4,473.0	101.76%	856.4
Dunmall's snake (*Furina dunmalli*)	V	486.7	4,473.0	100.92%	856.4
Yakka skink (*Egernia rugosa*)	V	487.1	4,437.8	100.04%	-
Large-eared pied bat (*Chalinolobus dwyeri*)	V	367.9	4,473.0	133.51%	856.4
Red goshawk (*Erythrotriorchis radiatus*)	V	491.1	4,473.0	116.68%	856.4
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	486.1	4,473.0	101.04%	856.4
Koala (*Phascolarctos cinereus*)	V	346.1	4,473.0	141.92%	856.4
Black-breasted button-quail (*Turnix melanogaster*)	V	2.3	-	-	-
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	491.1	4,473.0	100.02%	856.4

*Status: E = Endangered and V = Vulnerable (DAWE, 2020a-d; DAWE, 2021a-h).

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Table ES2: Interim performance targets and completion criteria

MNES	Baseline	Interim performance targets (year 5, 10 and 15)	Completion criteria (year 20)
Northern quoll (*Dasyurus hallucatus)*	7	No decrease in overall habitat quality score from previous monitoring event	8
Collared delma (*Delma torquata)*	7	No decrease in overall habitat quality score from previous monitoring event	8
Dunmall's snake (*Furina dunmalli)*	7	No decrease in overall habitat quality score from previous monitoring event	8
Yakka skink (*Egernia rugosa*)	7	No decrease in overall habitat quality score from previous monitoring event	8
Large-eared pied bat (*Chalinolobus dwyeri)*	8	No decrease in overall habitat quality score from previous monitoring event	9
Red goshawk (*Erythrotriorchis radiatus*)	8	No decrease in overall habitat quality score from previous monitoring event	9
Squatter pigeon (southern) (*Geophaps scripta scripta*)	8	No decrease in overall habitat quality score from previous monitoring event	9
Koala (*Phascolarctos cinereus*)	8	No decrease in overall habitat quality score from previous monitoring event	9
South-eastern long-eared bat (*Nyctophilus corbeni*)	8	No decrease in overall habitat quality score from previous monitoring event	9

1.0 Introduction

The Santos Gladstone Liquefied Natural Gas (GLNG) Project involves the development of Coal Seam Gas (CSG) resources in the Surat and Bowen Basins in Queensland, to supply gas via a 430 kilometre (km) gas transmission pipeline (GTP) to the liquified natural gas (LNG) facility located on Curtis Island. Throughout the development of the Santos GLNG Project and in accordance with Santos GLNG Project approvals, potentially impacted environmental values are systematically identified and assessed and in order of preference are avoided, minimised or mitigated.

The Santos GLNG Project is required to provide environmental offsets for significant residual impacts on matters of national environmental significance (MNES) in accordance with approvals granted under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth; EPBC Act).

This offset area management plan (OAMP) has been prepared to address the acquittal of the MNES significant residual impacts for Stage 4 of the Gas Fields Development Project (GFD Project) under the GLNG Project approval EPBC 2012/6615, outlined in Table 1, on the Mt Tabor offset area (Figure 1).

Table 1: Impacted MNES required to be offset for Stage 4 of the GFD Project under EPBC 2012/6615

MNES	Status*	Impact area (ha)
Listed threatened ecological communities (TEC)		
Brigalow TEC (*Acacia harpophylla* dominant and co-dominant)	E	5.5
Semi-evergreen vine thickets TEC of the Brigalow Belt (North and South) and Nandewar Bioregions	E	2.0
Listed threatened species		
Northern quoll (*Dasyurus hallucatus)*	E	291.9
Collared delma (*Delma torquata)*	V	482.7
Dunmall's snake (*Furina dunmalli)*	V	486.7
Yakka skink (*Egernia rugosa*)	V	487.1
Large-eared pied bat (*Chalinolobus dwyeri)*	V	367.9
Red goshawk (*Erythrotriorchis radiatus*)	V	491.1
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	486.1
Koala (*Phascolarctos cinereus*)	V	346.1
Black-breasted button-quail (*Turnix melanogaster*)	V	2.3
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	491.1

*Status: E = Endangered and V = Vulnerable (Department of Agriculture, Water and the Environment [DAWE], 2020a-d; DAWE, 2021a-h).

1.1 Background

The GFD Project under EPBC 2012/6615 was originally approved in March 2016 and commenced in November 2016. Preparation for Stage 4 of the GFD Project began in late 2020. History of this OAMP associated with Stage 4 is as follows:

- Revision 0:
  - Prepared in July 2021 to address offset requirements for the original Stage 4 footprint.
  - Approved by DAWE on 23 September 2021.
- Revision 1:
  - Updated in August 2022 to reflect a minor variation in the Mt Tabor offset area due to inability to install fencing along the western boundary of the original offset area proposed in Revision 0. The OAMP was also updated based on a reduction in project impacts to allow for full acquittal of offset requirements for yakka skink on Mt Tabor within the new boundary.
  - Submitted to the Department of Climate Change, Energy, the Environment and Water (previously DAWE) for approval in August 2022.

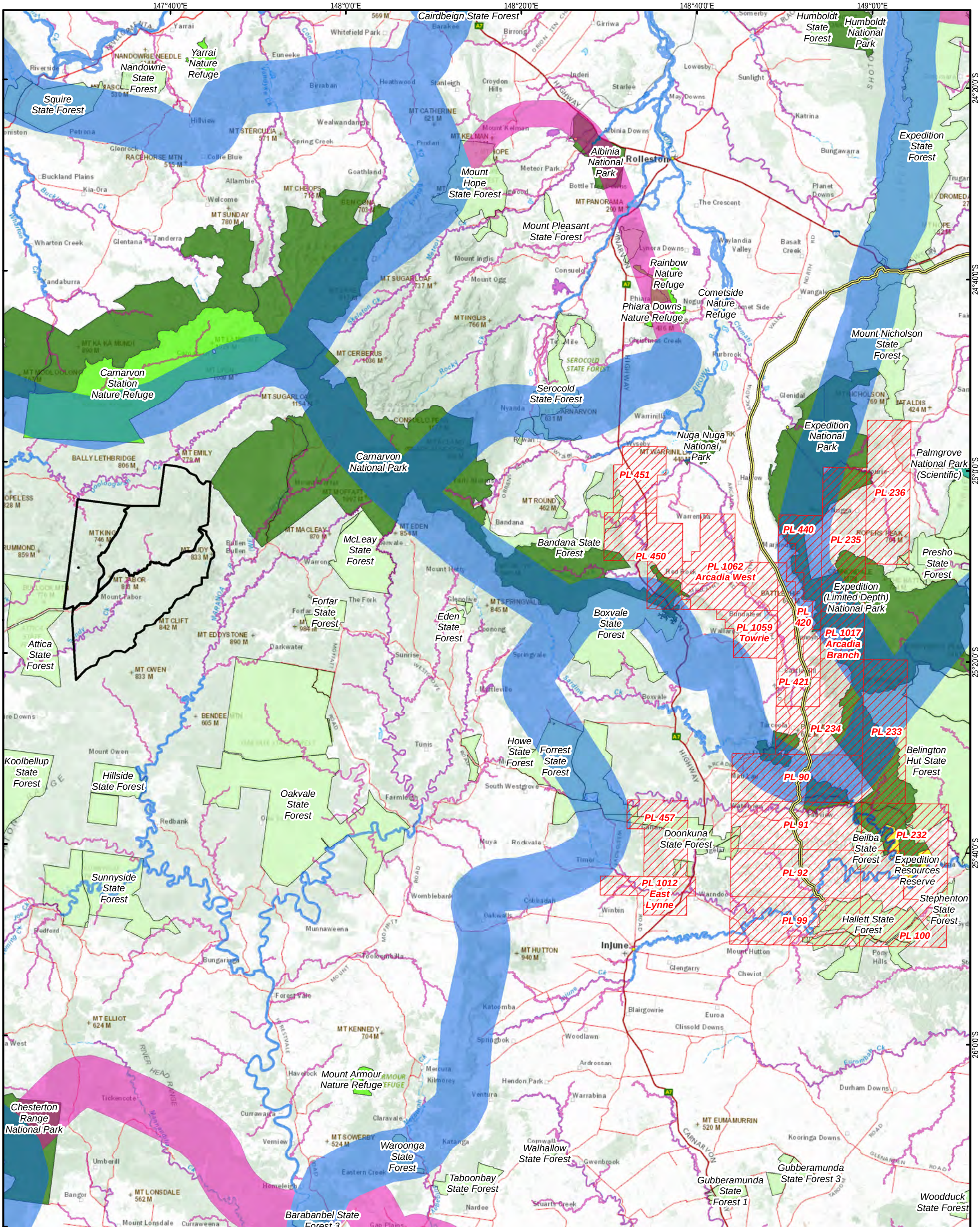
1.2 Purpose

This OAMP provides a detailed management and monitoring framework for the Mt Tabor offset area in accordance with the requirements of EPBC 2012/6615 as presented in Table 2 below.

Table 2: Approval conditions satisfied through this OAMP

Condition number	Condition	How the conditions are met
EPBC Act approval 2012/6615		
11	The approval holder must ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy.	Offsets to compensate for significant residual impacts associated with Stage 4 of the GFD Project will be delivered in accordance with the principles of the EPBC Act Environmental Offsets Policy. An offset area will be secured on Mt Tabor to acquit offset obligations for the MNES matters outlined in Table 1. The Mt Tabor offset area has been identified to comply with the requirements for an offset under the EPBC Act Environmental Offsets Policy as detailed in Section 2.8 of this OAMP.
12	The approval holder may carry out the action in project stages. The approval holder must deliver environmental offsets for residual significant impacts to matters of national environmental significance for each project stage.	The action will be carried out in stages. An offset plan has been prepared to address offset requirements for residual significant impacts on MNES associated with Stage 4 of the GFD Project.
13	The approval holder must submit an Offset Management Plan for the Minister's written approval. The Offset Management Plan may be prepared and submitted to the Minister for written approval in stages. If the approval holder submits the Offset Management Plan in stages, each version of the Offset Management Plan must address the known and predicted impacts of the completed, current, and next proposed project phases.	An offset plan has been prepared to address offset requirements for residual significant impacts on MNES associated with Stage 4 of the GFD Project. This OAMP for the Mt Tabor offset area is submitted as part of the offset plan to address Stage 4 of the GFD Project. A reconciliation of impacts for Stage 1-3 of the GFD Project is included in the offset plan.
14	The Offset Management Plan must include: a. a method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities; b. results from pre-disturbance surveys and/or an alternative approved methodology (if used) for the project phase as required under conditions 4 and 5; c. details of the offset areas required to address predicted residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities for the project phase; d. a survey and description of the current condition (prior to any management activities) of each offset area proposed, including existing vegetation (the baseline condition). This must include a shapefile of each offset property boundary; e. information about how the offset areas provide connectivity with other relevant habitats and biodiversity corridors, including a map depicting the offset areas in relation to other habitats and biodiversity corridors; f. performance and completion criteria for evaluating the management of the offset area, and criteria for triggering remedial action (if necessary); g. a description of the management measures that will be implemented for the protection of EPBC threatened species, EPBC migratory species and EPBC communities, including a discussion of how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans; h. a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria; i. a description of potential risks to the successful implementation of the plan, and a description of the contingency measures that would be implemented to mitigate against these risks; j. a timeline for when actions identified in the Offset Management Plan will be implemented for each offset area; and k. the proposed legal mechanism for securing the offset.	The Mt Tabor offset area is proposed to be secured to partially acquit offset requirements for Stage 4 of the GFD Project. An OAMP for the Mt Tabor offset area has been developed in accordance with the requirements outlined in condition 14. A summary of how each requirement has been addressed is provided below. a. The method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities is discussed in the offset plan, submitted in conjunction with this OAMP. b. Details of the relevant field assessments within the Stage 4 GFD Project development area are provided in the offset plan, submitted in conjunction with this OAMP. c. A summary of the significant residual impacts associated with Stage 4 of the GFD Project is provided in Table 1 of this OAMP and the offset plan. A summary of the offset area required to acquit the Stage 4 offset requirements is provided in the offset plan, with a summary of the proposed offset area on Mt Tabor and how it partially acquits the Stage 4 offset requirements provided in Section 2.6 of this OAMP. In accordance with the EPBC Act Environmental Offsets Policy the proposed offset areas required to be secured for each MNES were determined using the offsets assessment guide as described in Section 2.6. The offsets assessment guide spreadsheets and supporting justifications are provided in Appendix A. d. A summary of the ecological field surveys undertaken on the Mt Tabor offset area is described in Section 2.4. Details of the baseline ecological condition are provided in Section 2.5 and Appendix B of this OAMP. e. Details on the connectivity and the landscape context are provided in Section 2.2. f. Individual completion criteria have been developed for each MNES as part of the environmental outcomes to be achieved for the Mt Tabor offset area (Section 4.0). In addition, specific management objectives and performance criteria have been developed which will provide the basis for achieving the MNES completion criteria. The complete adaptive management process for this OAMP is encapsulated in Table 10 and includes management actions, monitoring events, adaptive management triggers and corrective actions that have been assigned to each management objective and performance criteria. g. Management measures to be implemented as part of this OAMP have been developed to address key threats known or with the potential to occur within the Mt Tabor offset area identified as part of detailed field surveys and take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans. A summary of the known and potential threats is detailed in Section 3.0 and proposed management measures are detailed in Section 6.0. h. The monitoring program to measure the effectiveness of the management measures and progress against the performance and completion criteria is detailed in Section 7.0. i. Risks to the successful implementation of this plan are included in the risk assessment presented in Appendix D. j. The timing for implementation of the management and monitoring program are provided in Section 9.0. k. Details on how the Mt Tabor offset area for Stage 4 of the GFD Project will be legally secured are provided in Section 2.7 of this OAMP.

Condition number	Condition	How the conditions are met
15	The currently approved Offset Management Plan must be implemented by the approval holder.	Once approved, this OAMP will be implemented.
16	The approval holder must register and legally secure offsets for the first project phase identified in the Offset Management Plan within two years of commencement of the first project phase.	Details on how the Mt Tabor offset area for Stage 4 of the GFD Project will be legally secured are provided in Section 2.7.
17	The approval holder must register and legally secure offsets for a project phase which are sufficient to acquit the residual significant impacts of that project phase.	Details on how the Mt Tabor offset area for Stage 4 of the GFD Project will be legally secured are provided in Section 2.7.
18	If the approval holder submits the Offset Management Plan in stages, the approval holder must prepare and submit an updated Offset Management Plan for each subsequent project phase, for written approval by the Minister. The updated Offset Management Plan must: a. include the information required for the Offset Management Plan at condition 14 for the next project phase; b. include a reconciliation of actual and predicted but yet to be actualised residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities against offsets secured for the commenced project phases and may be subtracted from the obligations required for the subsequent project phases. Any shortfall in secured offsets relative to the requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases must be added to the obligations required for the next project phase; and c. demonstrate how the offset builds on offsets already secured for previous project stages and will contribute to a larger strategic offset for cumulative project impacts.	An updated version of this OAMP will be submitted for any subsequent stages of the GFD project.
19	The approval holder must not commence the project phase until the Offset Management Plan, updated for that project phase has been approved by the Minister in writing.	This OAMP is submitted for the approval of the Minister.



SANTOS

Location diagram

Figure 1
Project context

- Mt Tabor - 6CHS25
- GTP - petroleum pipeline (PPL 166)
- Santos Petroleum Lease

Protected areas
- National Park
- National Park (Scientific)
- State Forest
- Conservation Park
- Resources Reserve
- Nature Refuge

Statewide Corridors v1.4
- State
- Regional

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CO2 Australia

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Petroleum leases
- Protected areas
- Statewide corridors

Date: 7/20/2021 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:650,000@A3

Path: P:\GIS\Data\Projects\Santos\910_210623_MtTabor\Figure 1 - Project context.mxd

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2.0 Mt Tabor property

2.1 Property overview

'Mt Tabor', also known as 'Goorathuntha' is a 71,200 ha property located approximately 120 km north-east of Augathella, in south central Queensland (Figure 2). The property is owned by Goorathuntha Traditional Owners Ltd and is currently used for cattle grazing.

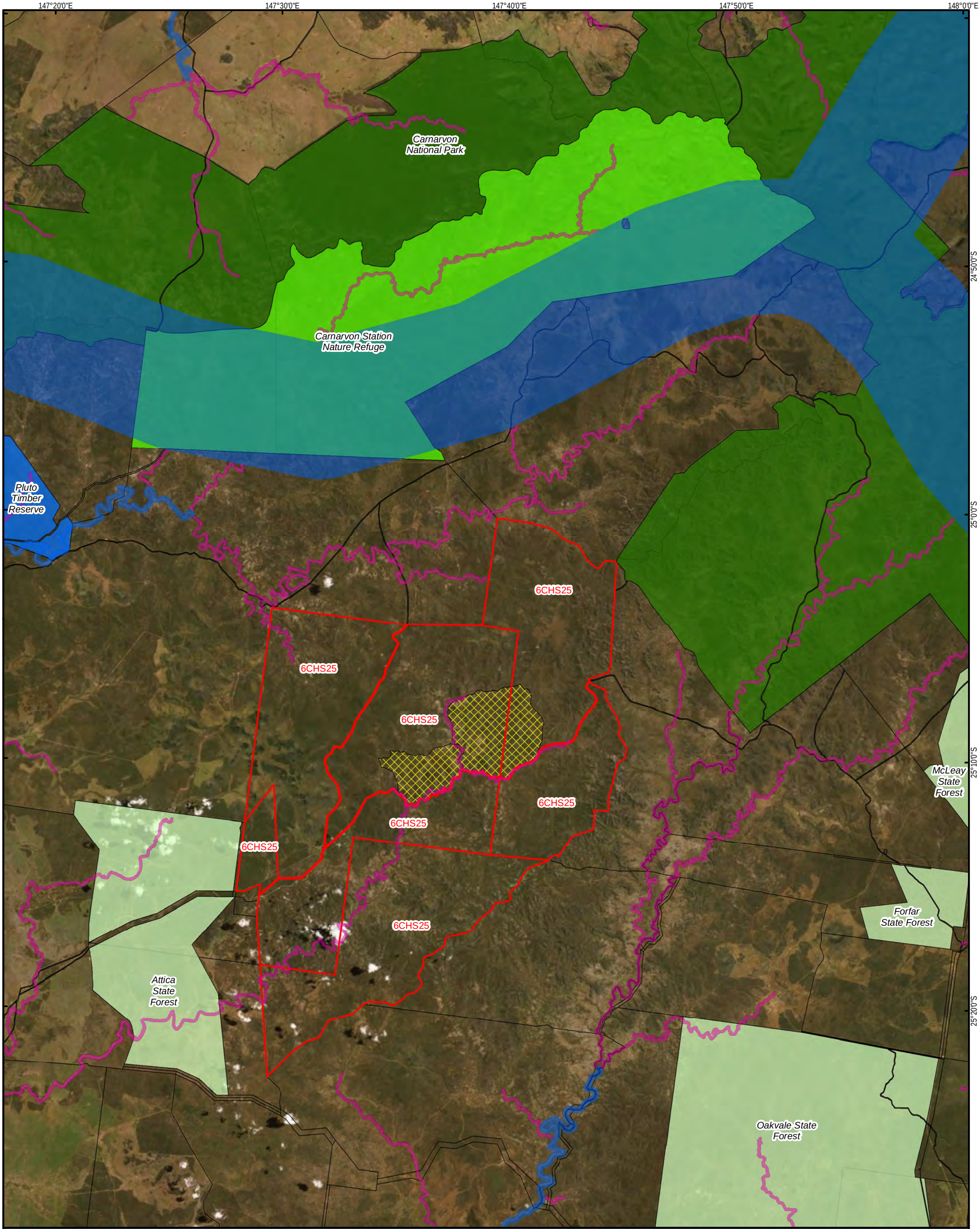
Mt Tabor is situated within Subregion 24 (Carnarvon Ranges) of the Brigalow Belt Bioregion (Sattler and Williams, 1999) and straddles the boundary between Murweh Shire Council and Maranoa Regional Council. Access to the property is via Mt Tabor Road from Augathella, or Killarney and Mt Tabor Roads from Morven.

The property is located in the north-eastern portion of the Warrego catchment of the Murray-Darling basin. Numerous watercourses, a branched upper tributary catchment of Tickerabang Creek, and several peripheral gullies are present on the site, allowing temporary pools to occur throughout the site. Several farm dams are also present, although no permanent streams, springs or wetlands are known to occur on the site.

Table 3 summarises Mt Tabor landholder and property details.

Table 3: Mt Tabor landholder and property details

Landholder and Property Details	
Registered Owner/s on Title:	Goorathuntha Traditional Owners Ltd
Postal Address:	PO BOX 187, Charleville QLD 4470
Lot on plan(s):	Lot 6 CHS25
Address:	13499 Mount Tabor Rd, Mount Moffatt, QLD
Tenure:	Leasehold
Area:	71,200 ha
Primary Local Government Area:	Maranoa Regional Council
Permits	
Coal Exploration Permit:	EPC 27222 Diversified Asset Holdings Pty Ltd



SANTOS

Location diagram

Figure 2
Property overview

- Mt Tabor - 6CHS25
- DCDB
- Mt Tabor offset area

Protected areas
- National Park
- State Forest
- Timber Reserve
- Nature Refuge

Statewide Corridors v1.4
- State
- Regional

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Protected areas
- Statewide corridors

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CO2 Australia

Date: 6/10/2022 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:250,000@A3

Path: P:\GISData\Projects\Santos\919_220609_Updated_Mt_Tabor\Figure 2 - Property overview.mxd

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2.2 Connectivity

The Mt Tabor property is part of a vast area of remnant vegetation covering the Carnarvon and Chesterton Ranges. This is an area considered of national significance on account of the extent of remnant vegetation, one which includes the headwaters of all major rivers of inland central Queensland (Boobook, 2021a). The Attica State Forest is located adjacent to the south-west boundary of the property and the Mount Moffatt section of Carnarvon National Park adjoins the north-east corner of the property (Figure 1).

Conservation corridors mapped as part of the Queensland Government's Biodiversity Planning Assessments (BPA) assess the biodiversity significance of land in a bioregion. The mapping of state and regional corridors within the Brigalow Belt Bioregion has focussed on those corridors that link adjacent bioregions or connect wildlife refugia (Department of Environment and Science [DES], 2021). Regional riparian corridors mapped as part of the BPA extend through the offset area with mapped state conservation corridors located within proximity to the property corresponding with nearby Carnarvon National Park (Figure 1).

2.3 Climate

The Mt Tabor property is characterised by a hotter wet season (typically November to March) and a cooler dry season (typically April to October) (Figure 3). Temperature records from the Injune weather station (#43015), approximately 117 km south-east of Mt Tabor, show mean monthly maximum temperatures range from 20.3°C (July) to 33.8°C (January) and mean monthly minimum temperatures range from 3.2°C (July) to 19.8°C (January) (BOM, 2021a). Rainfall records from the Derbyshire Downs weather station (#044223), located approximately 23 km south-west of Mt Tabor, show the mean monthly rainfall for the period 2003-2021 ranges from 15.3 mm (May) to 102.6 mm (December) (BOM, 2021b).

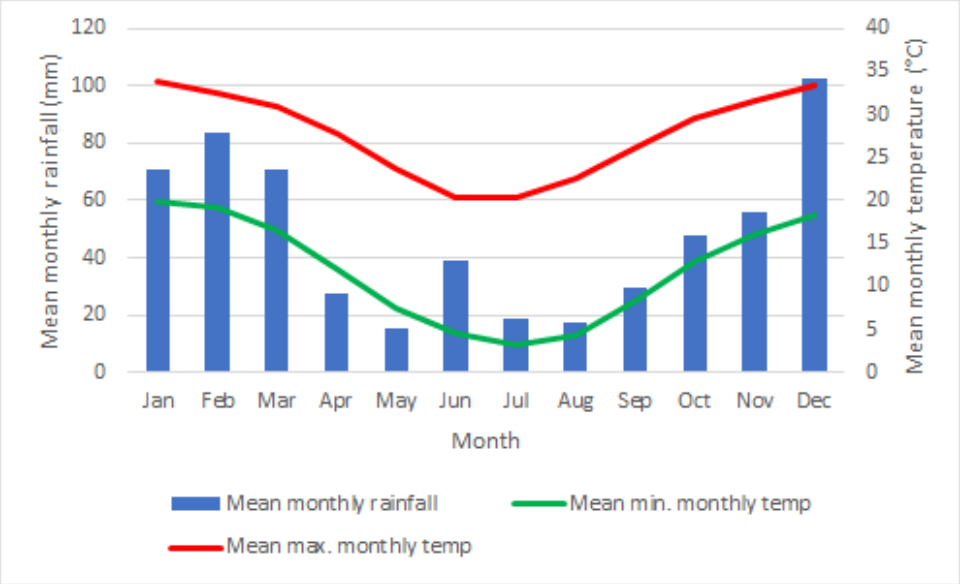


Figure 3: Mean monthly temperature and rainfall records

Mean monthly temperature records taken from Injune Post Office weather station 1967-2021. ID: 43015, with rainfall records taken from Derbyshire Downs weather station 2003-2021. ID: 044223 (BOM, 2021a, b).

2.4 On-ground property assessments

Within the Mt Tabor property, Santos has identified a 5,329.4 ha area for environmental offsets (herein referred to as the offset area). A combination of desktop and detailed on-ground assessments of the offset area have been undertaken within the offset area and broader property to confirm the suitability of the area to satisfy the project's offset obligations. The key desktop and field surveys of the offset area completed to date are summarised below:

- Preliminary desktop assessment of biodiversity offset values (Boobook, 2021a)
- Detailed field assessment undertaken by Boobook from December 2020 to January 2021 to ground-truth vegetation and confirm presence of environmental values (Boobook, 2021a)
- BioCondition assessments within the Mt Tabor offset area in accordance with the BioCondition methodology (Eyre *et al*., 2015). The condition of each site was compared to the benchmark data provided for each RE. Photo monitoring sites were established at all BioCondition assessment sites
- Targeted fauna surveys using the following methods to assess the presence of fauna for the endangered and vulnerable species also listed below within the Mt Tabor offset area:
    - Northern quoll
    - Large-eared pied bat
    - South-eastern long-eared bat
    - Koala
    - Red goshawk
    - Squatter pigeon (southern)
    - Collared delma
    - Dunmall's snake
    - Yakka skink
- Survey methods:
    - Camera traps
    - Harp trapping
    - Ultrasonic bat call detection
    - Active daytime habitat searching
    - Driven and on foot spotlighting searches
    - Active koala searches and scat analysis.
- Incidental searches for threatened flora species listed under the EPBC Act and/or *Nature Conservation Act 1992* (Qld) were carried out at vegetation assessment sites and during meanders in targeted habitat types.

2.5 Ground-truthed vegetation and habitat mapping

Based on the results of detailed ecological field assessments, ground-truthed vegetation within the offset area has been classified as remnant vegetation. Remnant woody dominated vegetation is defined as vegetation that has not been cleared or that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy (Neldner et al., 2020).

The results of detailed field assessments were subsequently used to confirm the suitability of the mapped ground-truthed regional ecosystems (RE) on the offset to support habitat for the project's MNES

offset requirements. Known habitat requirements for each conservation significant species were assessed against on-ground microhabitat observations within each vegetation type of the offset area. These assessments, combined with ecologist knowledge, was used to develop RE-based predictive habitat mapping for EPBC Act-listed threatened fauna species confirmed likely or potentially present in the offset area (Boobook, 2021a).

2.5.1 Vegetation description

Table 4 provides a summary of the ground-truthed RE mapped on the Mt Tabor offset area.

The offset area is located within a vast area of remnant vegetation dominated by Myrtaceae species, particularly on hills, slopes, shelves and plateaus (Boobook, 2021a). *Eucalyptus decorticans* covers a significant proportion of the property, although *E. crebra, E. melanophloia, E. fibrosa subsp. fibrosa* and *Corymbia* spp. are dominant in some sections (Boobook, 2021a).

Lysicarpus angustifolius, Allocasuarina inophloa and *Allocasuarina luehmannii* are characteristic of areas on and around rocky plateaus (Boobook, 2021a). However, *E. macrocarpa* was also noted in shallow soils on the sandstone plateau, around the basalt hills, and in gravely areas below scarps (Boobook, 2021a). *E. conica* and *E. melanophloia* dominate the broad valley areas with varying amounts of *E. melanophloia,* while *E. chloroclada* is dominant along streams (Boobook, 2021a). Stands of *E. grisea* and *E. major* are present along the floor and lower slopes of narrow gorges, as well as the areas below scarps (Boobook, 2021a). On gentler lower slopes, with areas of deep sand, a community of *Angophora leiocarpa* and *Callitris glaucophylla* is supported (Boobook, 2021a). Areas of basalt, although limited, are vegetated with grassy woodland dominated by *E. orgadophila* and/or *E. melanophloia* and abundant, tall *Macrozamia moorei* in some areas (Boobook, 2021a).

Table 4: Ground-truthed RE mapped within the Mt Tabor offset area (Boobook, 2021a)

RE	Description	Mt Tabor offset area (ha)
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	62.3
11.3.39	*Eucalyptus melanophloia* +/- *E. chloroclada* open woodland on undulating plains and valleys with sandy soils.	879.1
11.10.4	*Eucalyptus decorticans, Lysicarpus angustifolius* +/- *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp. woodland on coarse-grained sedimentary rocks	2,131.9
11.10.6	*Angophora leiocarpa*, *Callitris glaucophylla* open woodland on coarse-grained sedimentary rocks. Broad valleys.	891.6
11.10.7	*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks	47.8
11.10.11	*Eucalyptus populnea, E. melanophloia* +/- *Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	47.2
11.10.13	*Eucalyptus* spp. and/or *Corymbia* spp. open forest on scarps and sandstone tablelands.	1,269.4
	Total	**5,329.4**

* Includes 856.4 ha of surplus RE 11.10.6.

2.5.2 Habitat description

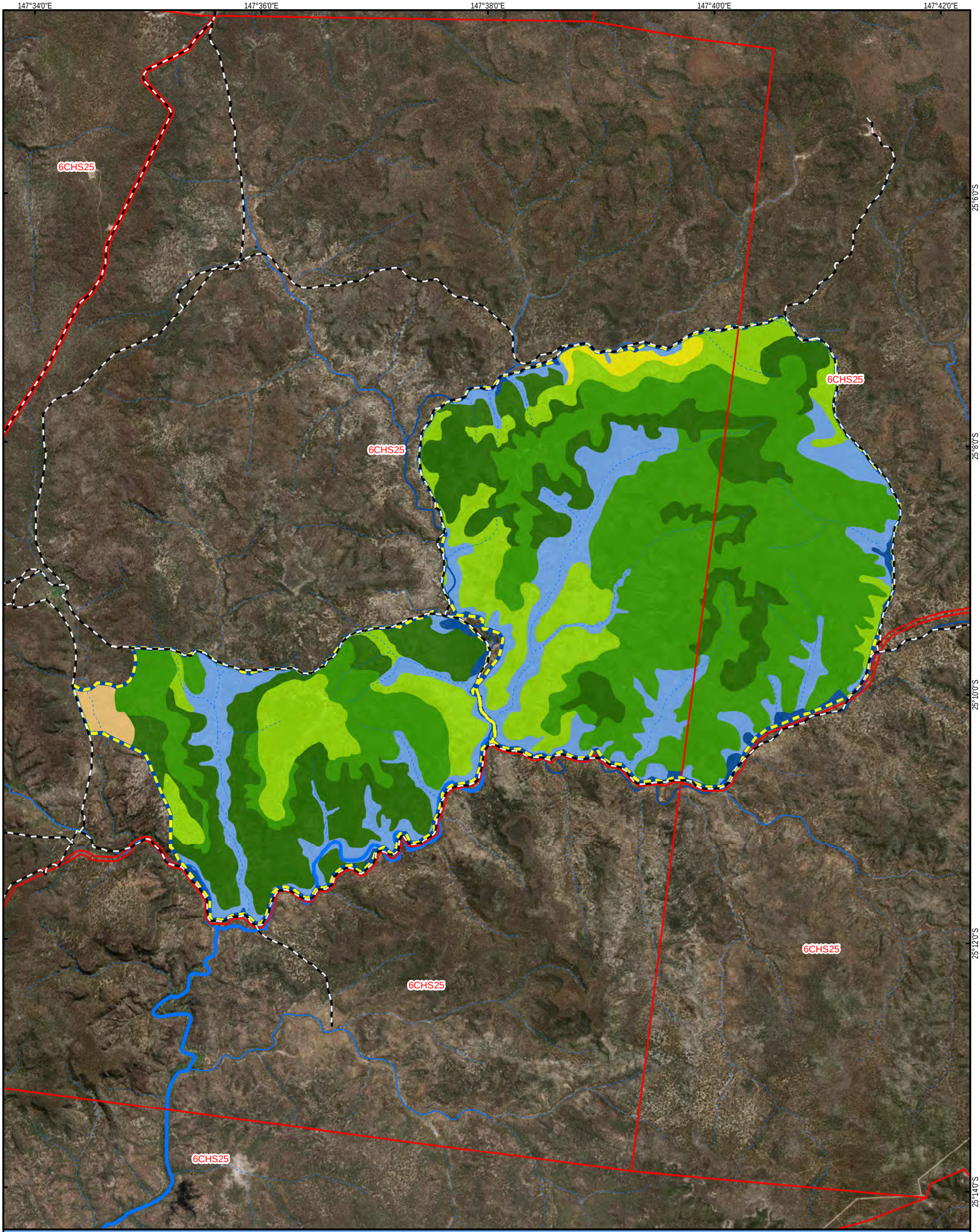
Following the results of detailed field assessments, known habitat requirements for targeted fauna species were assessed against on-ground microhabitat observations within each habitat type to categorise the quality of habitat present into essential or general habitat (Boobook, 2021a). The habitat definitions, 'essential' and 'general', used by Boobook were provided in the Santos Fauna Habitat model (Aurecon, 2014) and are defined as follows:

- Essential habitat is defined as an area containing essential resources for the maintenance of species populations (e.g. habitat for breeding, roosting, foraging and shelter), for either migratory or non-migratory species, from known records and/or expert advice.
- General habitat is defined as 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 habitat'. It may be defined from known records and expert knowledge of habitat relationships, despite the absence of records. Areas classified as 'general' may include areas of sub optimal habitat.

Table 5 provides a summary of the extent of predicted suitable habitat mapped on the Mt Tabor offset area for the project's MNES offset requirements based on the results of detailed field assessments (Boobook, 2021a). An additional description of the offset area for each MNES is provided in Section 3.0.

Table 5: Extent of predicted suitable habitat mapped for MNES associated with disturbance under EPBC 2012/6615 on Mt Tabor (Boobook, 2021a)

Species	Suitable REs	Habitat Mapping Rules	Essential Habitat (ha)	General Habitat (ha)
Large-eared pied bat	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*Essential habitat* includes all areas of remnant and regrowth vegetation of the nominated RE within 5 km of potentially suitable shelter habitat (extensive areas of dissected sandstone with deep crevices and caves).	5,329.4	-
Northern quoll	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*Essential habitat* includes all nominated RE within 1 km of potentially suitable shelter habitat (extensive areas of dissected sandstone with deep crevices and caves). *General Habitat* includes all remnant and regrowth vegetation of the nominated RE within 1 to 5 km of potential shelter habitat.	4,512.4	49.0
South-eastern long-eared bat	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*General habitat* includes all areas of remnant and regrowth vegetation that may be suitable for foraging or shelter.	-	5,329.4
Koala	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*Essential habitat* includes all remnant and regrowth vegetation of RE dominated by Myrtaceae species.	5,329.4	-
Red goshawk	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*General habitat* includes all areas of remnant and regrowth vegetation of the nominated RE. This species requires tall trees close to permanent water for nest sites but may forage at a distance from this habitat.	-	5,329.4
Squatter pigeon (southern)	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*General habitat* includes all areas of remnant and regrowth vegetation of the nominated RE.	-	5,329.4
Collared delma	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*General habitat* includes all areas of remnant and regrowth vegetation of the nominated RE.	-	5,329.4
Yakka skink	Essential Habitat: 11.3.2, 11.3.39, 11.10.7, 11.10.11 General Habitat: 11.10.4, 11.10.13	*Essential habitat* is based on known records within the nominated RE and includes all remnant and regrowth vegetation of the nominated RE. *General habitat* includes all remnant and regrowth vegetation of the nominated RE. This may include sub-optimal habitat.	1,036.4	3,401.3
Dunmall's snake	11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.13	*General habitat* includes all remnant and regrowth vegetation of the nominated RE.	-	5,329.4



SANTOS

Location diagram

Figure 4
Ground-truthed vegetation

- Mt Tabor - 6CHS25
- Mt Tabor offset area
- Access tracks

Watercourses

- Drainage contour
- Minor drainage line
- Creekline
- Major watercourse

Ground-truthed REs

- 11.3.2
- 11.3.39
- 11.10.4
- 11.10.6
- 11.10.7
- 11.10.11
- 11.10.13

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Watercourses

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Kilometres

N

CO2 Australia

Date: 6/10/2022 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:50,000@A3

Path: P:\GIS\Data\Projects\Santos\919_220609_Updated_Mt_Tabor\Figure 4 - GTRE.mxd

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2.6 Offset area

The Mt Tabor offset area is 5,329.4 ha, comprising 4,473.0 ha of habitat to acquit MNES offset requirements for Stage 4 of the GFD Project under EPBC 2012/6615 and 856.4 ha of surplus offset area (all RE 11.10.6) to be drawn down on by Santos to acquit future offset requirements.

Table 6 provides a summary of the Mt Tabor offset area including the offset area to be secured under EPBC 2012/6615 and the area of surplus habitat. Figure 4 spatially presents the Mt Tabor offset area and the ground-truthed vegetation communities.

Santos is committed to providing the required area of suitable habitat to acquit MNES offset requirements for Stage 4 of the GFD Project in accordance with the EPBC Act Environmental offsets Policy and offsets assessment guide; however, the final boundary of the Mt Tabor offset area is subject to change following consultation with Traditional Owners and in consideration of cultural heritage values present on site.

Table 6: Summary of the Mt Tabor offset area and acquittal

MNES	Status under EPBC Act*	Impact area (ha)	Mt Tabor offset area		
			Offset area to be secured under OAG (ha)	% acquittal	Surplus area available (ha)
Listed threatened ecological communities					
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	5.5	-	-	-
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	2.0	-	-	-
Listed threatened species					
Northern quoll (*Dasyurus hallucatus*)	E	291.9	4,473.0	160.95%	856.4
Collared delma (*Delma torquata*)	V	482.7	4,473.0	101.76%	856.4
Dunmall's snake (*Furina dunmalli*)	V	486.7	4,473.0	100.92%	856.4
Yakka skink (*Egernia rugosa*)	V	487.1	4,437.8	100.04%	-
Large-eared pied bat (*Chalinolobus dwyeri*)	V	367.9	4,473.0	133.51%	856.4
Red goshawk (*Erythrotriorchis radiatus*)	V	491.1	4,473.0	116.68%	856.4
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	486.1	4,473.0	101.04%	856.4
Koala (*Phascolarctos cinereus*)	V	346.1	4,473.0	141.92%	856.4
Black-breasted button-quail (*Turnix melanogaster*)	V	2.3	-	-	-
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	491.1	4,473.0	100.02%	856.4

*Status: E = Endangered and V = Vulnerable (DAWE, 2020a-d; DAWE, 2021a-h).

2.7 Offset protection

The Mt Tabor offset area will be protected via a Voluntary Declaration under section 19E and 19F of the Queensland *Vegetation Management Act 1999* (the VM Act) and will be declared as an area of high nature conservation value. Santos will apply for the offset area to be secured under a Voluntary Declaration within 12 months following the approval of this OAMP. The Voluntary Declaration will be registered on the property title and will be binding on current and future landowners.

A Voluntary Declaration under the VM Act is an authorised legally binding mechanism and is considered appropriate to legally secure MNES values and protect the area from vegetation clearing. The offset area will be mapped as a Category A area on the Property Map of Assessable Vegetation (PMAV). A Category A area on a PMAV is described as an "Area subject to compliance notices, offsets and voluntary declarations".

The Voluntary Declaration will remain in place for the life of EPBC 2012/6615. The Voluntary Declaration may only be removed in accordance with the provisions of the VM Act or if the chief executive the Queensland Department of Natural Resources, Mines and Energy considers it necessary.

Offset area coordinates for the proposed declared area for the Voluntary Declaration are given in Appendix C.

2.8 EPBC Act environmental offsets policy

Table 7 outlines how the Stage 4 GFD Project offset obligations acquit on the Mt Tabor offset area meet the requirements of the EPBC Act Environmental Offsets Policy.

Table 7: Assessment against Principles of the Offset Policy

Principle	How the principle is met in this offset proposal
1. deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	The Mt Tabor offset area partially acquits MNES offset requirements for Stage 4 of the GFD Project under EPBC 2012/6615 as outlined in Table 6. The remaining will be acquitted elsewhere. The Mt Tabor offset area will be managed and monitored to improve the quality and viability of habitat for threatened fauna species. This OAMP sets out specific management objectives with interim performance targets and completion criteria. Management actions are outlined with accompanying adaptive management triggers and corrective actions in the event that monitoring identifies that interim performance targets are not attained, or completion criteria are not attained and/or maintained. The offset area will be managed and monitored from approval of the OAMP for a minimum of 20 years. It is anticipated that the completion criteria will be achieved within a 20-year period.
2. be built around direct offsets but may include other compensatory measures	MNES offset obligations for Stage 4 of the GFD Project under EPBC 2012/6615 will be acquit through the delivery of direct land-based offsets on the Mt Tabor offset area and additional land based offset areas to be secured by Santos.
3. be in proportion to the level of statutory protection that applies to the protected matter	The threatened status of the impacted protected matters is considered in the offsets assessment guide in calculating the area of the offset to be provided.

Principle	How the principle is met in this offset proposal
4. be of a size and scale proportionate to the residual impacts on the protected matter	The size of the offset area to be secured for offset obligations has been calculated in accordance with the offsets assessment guide (Appendix A).
5. effectively account for and manage the risks of the offset not succeeding	This OAMP has been developed in consideration of known and identified threats to the offset values to manage the risk of failing to the achieve the completion criteria and overall environmental outcomes for the offset area. Threats to the offset site are managed through the implementation of the management measures discussed in Section 6.0, including: • Fire prevention and management • Weed and pest animal monitoring and control • Clearing protection • Management of grazing • Restricted access The relevant risks were identified based on a review of current literature (i.e. conservation advices, recovery plans etc) and identification of potential site-specific risks based on the results of field surveys and discussions with the landholder. The results of the risk assessment, presented in Appendix D, have informed the adaptive management process including the identification of threats to offset values, management objectives, performance criteria, management actions, monitoring programs, adaptive management triggers and corrective actions. If the offset cannot attain and maintain the completion criteria then additional offsets will be provided to compensate for the impact and the failed offset (see Section 5.2.4).
6. be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)	The environmental outcomes proposed to be achieved through the implementation of this OAMP are based on additional management and monitoring measures conducted as part of business as usual on the Mt Tabor property. For example, under the *Biosecurity Act 2014* (Qld) a person has a general biosecurity obligation to take all reasonable and practical steps to prevent or minimise each biosecurity risk. The steps proposed in this OAMP are above reasonable and practical steps required to control feral animals and weeds in central Queensland. Once the Voluntary Declaration has been secured over the offset area, environmental laws prevent other land uses inconsistent with this OAMP being approved over this part of the property.
7. be efficient, effective, timely, transparent, scientifically robust and reasonable	The Mt Tabor offset area has been identified to be suitable using an evidence based and scientifically robust approach. The environmental outcomes to be achieved through this OAMP will be delivered progressively over 20 years. The offset area will be legally secured through a Voluntary Declaration under the VM Act, therefore any vegetation clearing contravention of this OAMP is not permissible without specific Queensland government approval. The preparation and implementation of this OAMP supports the efficient, effective, timely, transparent and scientifically robust approach to providing offsets.

Principle	How the principle is met in this offset proposal
8. have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	This OAMP includes a detailed monitoring program which will assess the effectiveness of the management actions undertaken and the progress of the offset area in achieving the environmental outcomes. The results of all management and monitoring programs will be included in annual reports (Section 8.0). An implementation schedule for monitoring and management is provided in Section 9.0 which will be reviewed at least annually to ensure the timely implementation of this OAMP.

3.0 Offset values

The following sections provide a description of the offset area and potential threats that will be managed as part of this OAMP for each MNES offset value. Figure 5 illustrates the location of suitable habitat for MNES within the Mt Tabor offset area.

3.1 Northern quoll

3.1.1 Offset area

Habitat for the northern quoll within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 160.95% of the offset requirement for this species.

This species is dependent on the presence of suitable shelter habitat in the form of caves and deep crevices in extensive rock formations (commonly sandstone) and forages in associated woodland and forest habitat (DAWE, 2020a). The offset area is characterised by rugged topography from remnant eroded sandstone, bounded by scarps and cliffs with numerous narrow gorges, with the above REs found across the offset area (Boobook, 2021a). Primarily essential habitat for the species, defined by all of the mentioned REs within 1 km of potentially suitable shelter habitat, covers a majority of the offset area (Boobook, 2021a). A small area of general habitat, defined as >1km from potentially suitable shelter habitat, is also present (Boobook, 2021a). The offset area is located within the species historical range, with recent records for the species from the nearby Carnarvon Range (Boobook, 2021a).

3.1.2 Threats

The following key threats to northern quoll were identified and will be addressed through the implementation of this OAMP (DAWE, 2020a; Boobook, 2021a):

- Poisoning through ingestion of cane toads (*Rhinella marina*)
- Loss of ground cover as a consequence of unsuitable fire, resulting in risk of increased predation and/or reduced food
- Loss of ground cover as a consequence of livestock grazing
- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
- Predation by feral predators (e.g., cats, foxes, wild dogs)
- Poisoning through 1080 baiting.

3.2 Collared delma

3.2.1 Offset area

Habitat for the collared delma within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 101.76% of the offset requirement for this species.

The collared delma is known to occur in REs on land zones 3, 9 and 10 (DAWE, 2020b), with all REs in the offset area comprising of these land zones (Boobook, 2021a). The species occupies a range of eucalypt woodlands and open forests; and requires rocks, timber bark and other large woody debris for shelter (Wilson, 2015; DAWE, 2020b). General habitat for the collared delma was identified through the entirety of the offset area, including eucalypt woodland supporting potentially suitable shelter sites (e.g. small rocks, woody debris). There are scattered occurrences of this species from inland southern Queensland, with the closest record being from Carnarvon Station around 40 km north-northeast (Boobook, 2021a).

3.2.2 Threats

The following known and potential threats to the collared delma will be addressed through the implementation of this OAMP (DAWE, 2020b; Boobook, 2021a):

- Alteration of ground cover as a consequence of unsuitable fire regime
- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Predation by feral predators (e.g., cats, foxes, wild dogs)
- Removal of foraging and shelter habitat (e.g., rocks, coarse woody debris, ground litter)
- Change in ground layer composition as a consequence of livestock grazing and feral horse browsing
- Alteration of habitat suitability through the presence and extent of non-native, invasive weeds.

3.3 Dunmall's snake

3.3.1 Offset area

Habitat for Dunmall's snake within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 100.92% of the offset requirement for this species.

The Dunmall's snake occurs in a variety of habitats including forests and woodlands (including those dominated by brigalow, bull-oak and other *Acacia, Eucalyptus* and *Callitris* species) on clay loam, cracking clay soils and sandstone derived soil (DAWE, 2020c). Rare observations have been made on the edge of dry vine scrub and in hard ironstone country (DAWE, 2020c). The offset area is comprised of eucalypt and *Callitris*-dominated REs providing suitable general habitat for the species (Boobook, 2021a).

3.3.2 Threats

The following known and potential threats to Dunmall's snake will addressed through the implementation of this OAMP (DAWE, 2020c; Boobook, 2021a):

- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Predation by feral predators (e.g., cats, foxes, pigs)
- Change in ground layer composition as a consequence of livestock grazing and feral horse browsing
- Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
- Alteration of ground cover as a consequence of unsuitable fire regime.

3.4 Large-eared pied bat

3.4.1 Offset area

Habitat for the large-eared pied bat within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 133.51% of the offset requirement for this species.

This species requires a combination of sandstone cliffs/escarpments to provide roosting habitat that is adjacent to fertile woodlands, preferably box gum or river/rainforest corridors for foraging (TSSC, 2012). The offset is characterised by eroded sandstone plateaus, bounded by scraps and cliffs and is within the known range of the species (Boobook, 2021a). The large-eared pied bat is known to occur from nearby Mount Moffatt within Carnarvon National Park (Boobook, 2021a). Essential habitat was identified throughout the entirety of the offset area defined as all areas of remnant vegetation within 5 km of potentially suitable shelter habitat (extensive areas of dissected sandstone with deep crevices and caves) (Boobook, 2021a).

3.4.2 Threats

The following known and potential threats to the large-eared pied bat will be addressed through the implementation of this OAMP (DAWE, 2021c; Boobook, 2021a):

- Potential of reduced foraging opportunities and flying invertebrate productivity as a consequence of unsuitable fire regime
- Predation by feral predators (e.g., foxes)
- Loss of sandstone roosting/maternity sites, whether through occupation by pest animal species (e.g., goats) or impacts to structural integrity from uncontrolled wildfire.

3.5 Red goshawk

3.5.1 Offset area

Habitat for the red goshawk within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 116.68% of the offset requirement for this species.

Breeding habitat is intact tall forest associated with major drainage lines; however, the species may often forage much further away from these areas (DAWE, 2021d). The offset area is considered to comprise of suitable foraging habitat for the species with open areas near water, forests and woodlands of the mentioned REs likely supporting a diversity of prey (Boobook, 2021a).

3.5.2 Threats

The following known and potential threats to the red goshawk will be addressed through the implementation of this OAMP (DAWE, 2021d; Boobook, 2021a):

- Loss of suitable foraging habitat through land clearing and effects associated with fragmentation of large contiguous patches of forest and woodland, particularly large trees in alluvial valleys
- Potential of reduced prey (e.g., medium sized birds) as a consequence of unsuitable fire regime
- Potential of reduced prey as a consequence of impacts such as grazing, reducing productivity.

3.6 Squatter pigeon (southern)

3.6.1 Offset area

Habitat for the squatter pigeon within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 101.04% of the offset requirement for this species.

The squatter pigeon (southern) favours open-forests to sparse, open-woodlands and scrub that are mostly dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species and are close to water bodies or watercourses (DAWE, 2021e). Although there are no known permanent streams, springs or wetlands within the offset, it does encompass numerous watercourses and farm dams (Boobook, 2021a). The above REs, which are distributed across the offset area, are dominated by *Eucalyptus, Corymbia, Acacia* and *Callitris* species. As such, general habitat for the squatter pigeon (southern) was identified across the entirety of the offset. This species was observed across the offset area during Boobook's assessment, with 11 locations recorded (Figure 5).

3.6.2 Threats

The following key threats to the squatter pigeon (southern) will be addressed through the implementation of this OAMP (TSSC, 2015a; Boobook, 2021a):

- Change in ground layer composition as a consequence of grazing and ecosystem engineering actions by rabbits (e.g. burrowing, soil turnover)
- Change in ground layer composition and trampling ground nests as a consequence of livestock grazing and feral horse browsing, especially in grassy, alluvial areas
- Change in ground layer composition, including thickening of understorey structure, as a consequence of unsuitable fire regime
- Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Predation by feral predators (e.g., cats, foxes).

3.7 Yakka skink

3.7.1 Offset area

Habitat for the yakka skink within the Mt Tabor offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,437.8 ha which acquits 100.04% of the offset requirement for this species.

The yakka skink is known to occur in open dry sclerophyll forest, woodland and scrub and a within a wide variety of vegetation types within land zones 3, 4, 5, 7, 9 and 10 (DAWE, 2020d). The species is commonly found under partly buried rocks, logs, root cavities or in abandoned animal burrows (DAWE, 2020d). Suitable habitat for the species was identified across the offset area comprising of eucalypt-dominant woodlands with occasional shelter sites (e.g. large logs) (Boobook, 2021a).

3.7.2 Threats

The following key threats to the yakka skink will be addressed through the implementation of this OAMP (DAWE, 2020d; Boobook, 2021a):

- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Predation by feral predators (e.g., cats, foxes, pigs)
- Removal of foraging and shelter habitat (e.g., rocks, coarse woody debris, ground litter)
- Destruction of potential shelter habitat associated with rabbit warren ripping
- Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
- Alteration of ground cover as a consequence of unsuitable fire regime.

3.8 South-eastern long-eared bat

3.8.1 Offset area

Habitat on the Mt Tabor offset area for south-eastern long-eared bat comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 100.02% of the offset requirement for this species.

The species is known to occur in a variety of dry forest habitats including those dominated by river red gum, open woodland, mallee, brigalow and other arid and semi-arid habitats, although the preferred habitat is mallee and *Callitris* woodlands (Pennay *et al*., 2011), and habitats that have a distinct canopy with a dense, cluttered understorey (Turbill and Ellis, 2006). The species roosts in tree hollows or under bark (NSW NPWS, 2003). Surveys suggest the species requires large tracts of forest to occur (Turbill *et al*., 2008).

The entirety of the offset area was identified as suitable general habitat for foraging and roosting. One observation of this species was made during assessment, close to the south-west border (Figure 5; Boobook, 2021a).

3.8.2 Threats

The following key threats to the south-eastern long-eared bat will be addressed through the implementation of this OAMP (TSSC, 2015b; Boobook, 2021a):

- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Alteration of the structure of suitable habitat (e.g. mix of shrubby and open structure habitat) including loss of hollow-bearing trees as a consequence of unsuitable fire regime
- Impacts on understorey habitat as a consequence of livestock grazing, impacting habitat for understorey invertebrate prey
- Competition for hollows from native fauna species (e.g., parrots and cockatoos) and non-native fauna species (e.g., European honeybees, common myna), especially where hollows are limited.

3.9 Koala

3.9.1 Offset area

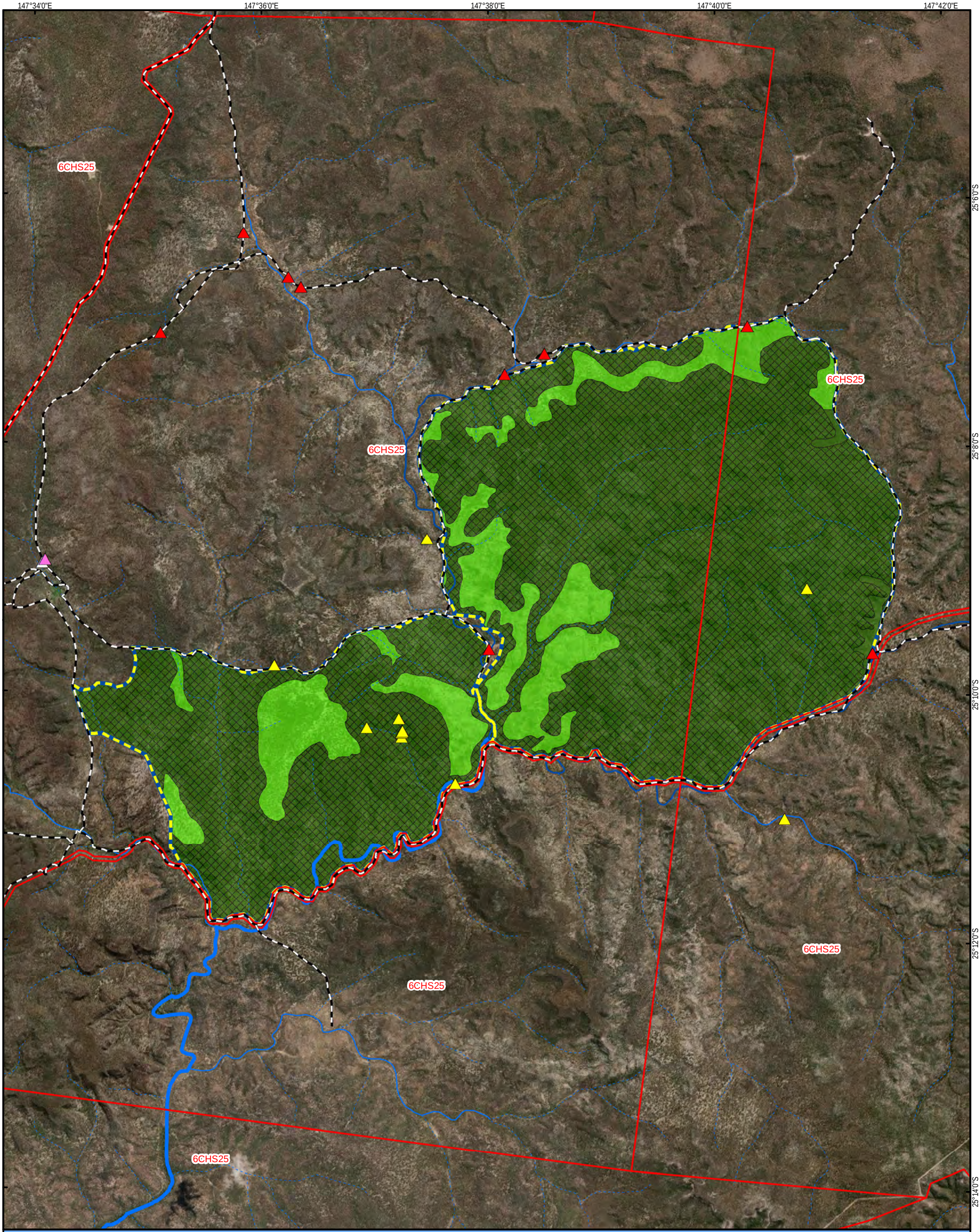
Habitat for the koala within the offset area comprises areas of RE 11.3.2, 11.3.39, 11.10.4, 11.10.6, 11.10.7, 11.10.11 and 11.10.13. The offset area being secured is 4,473.0 ha which acquits 141.92% of the offset requirement for this species.

Koala habitat can be broadly defined as any forest or woodland containing known koala food trees, which are naturally abundant on fertile clay soils (DAWE, 2021f). Koalas predominantly feed on *Eucalyptus* spp.; however, they are also known to consume other Myrtaceae species (DAWE, 2021f). Suitable habitat (eucalypt-dominated woodlands and open forests) was identified across the offset area with potential food trees, including *Eucalyptus populnea, E. chloroclada, E. major, E. grisea, E. microcarpa, E. melanophloia, E. fibrosa* and *E. crebra,* present (Boobook, 2021a). Several koala observations were made during assessment in the southern section of the site, including scratch marks on trees, with the largest cluster around the centre of the southern border (Figure 5; Boobook, 2021a).

3.9.2 Threats

The following key threats to the koala will be addressed through the implementation of this OAMP (DAWE, 2021f; Boobook, 2021a):

- Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat
- Mortality due to vehicle collision
- Predation by feral predators, particularly wild or domesticated dogs
- Alteration of the structure of suitable habitat, including loss of primary feed trees, as well as direct mortality as a consequence of unsuitable fire regime
- Evidence for the presence of disease within the population (i.e., *Chlamydia pecorum*).



SANTOS

Location diagram

Figure 5
MNES offset areas

- Mt Tabor - 6CHS25
- Mt Tabor offset area
- Access tracks

Watercourses
- Drainage contour
- Minor drainage line
- Creekline
- Major watercourse

Threatened species records
- Koala
- Greater glider
- Squatter pigeon
- Large-eared pied bat

MNES offset areas
- Offset area for all MNES (exc. yakka skink)
- Yakka Skink offset area
- Surplus offset area

0 0.5 1 1.5 2
Kilometres

N

CO2 Australia

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Watercourses

Date: 8/9/2022 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:50,000@A3

Path: P:\GIS\Data\Projects\Santos\919_220609_Updated_Mt_Tabor\Figure 5 - MNES offset areas.mxd

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4.0 Environmental outcomes to be achieved

The outcome of this OAMP will partially acquit the Stage 4 offset obligations for the GFD Project under EPBC 2012/6615 in accordance with the EPBC Act *Environmental Offsets Policy*.

The specific environmental outcomes to be achieved for the offset on Mt Tabor are defined as interim performance targets and completion criteria, detailed in Table 8, based on the proposed habitat quality score to be achieved for each MNES in the offsets assessment guides (Appendix A).

Table 8: Interim performance targets and completion criteria for the Mt Tabor offset area

MNES	Baseline	Interim performance targets (year 5, 10 and 15)	Completion criteria (year 20)
Northern quoll (*Dasyurus hallucatus)*	7	No decrease in overall habitat quality score from previous monitoring event	8
Collared delma (*Delma torquata)*	7	No decrease in overall habitat quality score from previous monitoring event	8
Dunmall's snake (*Furina dunmalli)*	7	No decrease in overall habitat quality score from previous monitoring event	8
Yakka skink (*Egernia rugosa*)	7	No decrease in overall habitat quality score from previous monitoring event	8
Large-eared pied bat (*Chalinolobus dwyeri)*	8	No decrease in overall habitat quality score from previous monitoring event	9
Red goshawk (*Erythrotriorchis radiatus*)	8	No decrease in overall habitat quality score from previous monitoring event	9
Squatter pigeon (southern) (*Geophaps scripta scripta*)	8	No decrease in overall habitat quality score from previous monitoring event	9
Koala (*Phascolarctos cinereus*)	8	No decrease in overall habitat quality score from previous monitoring event	9
South-eastern long-eared bat (*Nyctophilus corbeni*)	8	No decrease in overall habitat quality score from previous monitoring event	9

5.0 Adaptive management

5.1 Adaptive management

This OAMP is based on an adaptive management approach which involves 'flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood' (National Research Council, 2004).

Adaptive management includes two key phases:

- establishment of the key components of a management framework including engaging stakeholders, developing clear and measurable objectives and performance criteria, identification and selection of potential management actions and the development of monitoring protocols which enable the evaluation of progress towards achieving objectives, and which will effectively contribute to the adaptive management decision making process.
- an iterative learning phase which involves utilisation of the management framework to learn about the natural resource system and iteratively adapt management strategies and approaches based on what is learned (Williams, 2011).

The management of natural systems involves uncertainty which can affect the success of the management measures in achieving the objectives and performance criteria. Williams (2011) and Williams and Brown (2016) identify four kinds of uncertainty, outlined as follows, with how they have been addressed through the development of this OAMP:

- environmental variation
  - caused by external factors that act upon natural systems, but which are not influenced by the resource conditions and dynamics, for example variation in rainfall or temperature
  - largely outside of the control of the manager (Williams, 2011)
  - influence is considered in the analysis of the effectiveness of the adaptive management approach, the analysis of the ability to achieve and maintain performance criteria and when considering the need for corrective actions.
- partial observability
  - includes potential uncertainty arising from variation in the collection of data during monitoring events, and from being unable to completely observe the natural system in its entirety (Williams and Brown, 2016)
  - addressed in this OAMP through the development of a monitoring program based on scientifically tested and repeatable methods.
- partial controllability
  - relates to the difference between the intended effect of the management measures to be implemented through this OAMP and the actual effect of their implementation on the ground (Williams and Brown, 2016)
  - address through adherence to an adaptive management approach including regular monitoring of conformance with performance criteria, assessment of adaptive management triggers, the implementation of corrective actions, review and amendments to the OAMP, and reporting to ensure that management measures are being effectively implemented on the ground.

- structural and process uncertainty
  - concerns a lack of knowledge or understanding regarding biological and ecological processes and relationships, and differing views regarding how natural systems respond to management (Williams and Brown, 2016)
  - addressed through the adaptive management approach. Following the results of ongoing management, monitoring and reporting, the OAMP will be reviewed and updated as required to incorporate learnings, updated conservation advice and best practice management techniques.

5.2 OAMP adaptive management framework

5.2.1 Risk assessment

The adaptive management process for this OAMP is supported by a risk assessment through which the known and potential risks for each offset value have been evaluated. The relevant risks were identified based on a review of current literature (i.e. conservation advices, recovery plans etc) and identification of potential site-specific risks. As presented in Appendix D, the risk assessment included an assessment of the likelihood and consequence for each identified risk, both with and without the implementation of control strategies. The results of the risk assessment have informed the adaptive management process including the identification of threats to offset values, management objectives, performance criteria, management actions, monitoring programs, adaptive management triggers and corrective actions.

Implementation of the adaptive management process aims to reduce the risk of the identified threats occurring to ensure that the overall outcome sought by this OAMP are achieved.

5.2.2 Adaptive management process

The adaptive management process for this OAMP includes the following key components:

- **identified threats to offset values** – known and potential threats to the offset values have been identified as part of the risk assessment process
- **relevant offset values** – MNES or other offset matter for which the identified threat is relevant have been indicated
- **management objectives** – management objectives have been developed to address each identified threat to the offset values, and to ensure that the interim performance targets and completion criteria are attained
- **performance criteria** – assessable criteria have been defined to measure adherence to the management objectives
- **management actio**n – specific management actions have been identified to ensure that the performance criteria and management objectives are satisfied, and which will ultimately result in attainment of the interim performance targets and completion criteria
- **monitoring** – a combination of qualitative and quantitative methodologies has been included to assess whether management actions are meeting the performance criteria and management objectives, and ultimately, whether the OAMP is supporting the delivery of the interim performance targets and completion criteria

- **adaptive management trigger** – measurable events or parameters have been identified which, when triggered, indicate that a performance criterion has not been satisfied, instigating the implementation of contingency plans and corrective actions
- **corrective actions** – a two-step process has been established to identify the likely cause of the non-compliance with the performance criteria and allow for identification of suitable corrective actions. Corrective actions include the implementation of a feasible, appropriate and effective action to address the identified issue and ensure the performance criteria is satisfied.

Figure 6 illustrates the ongoing adaptive management cycle of implementation, learning and review, with the aim of achieving the interim performance targets and completion criteria. Through the implementation of this adaptive management process, it is anticipated that the interim performance targets and completion criteria will be attained and maintained for the life of the approval.

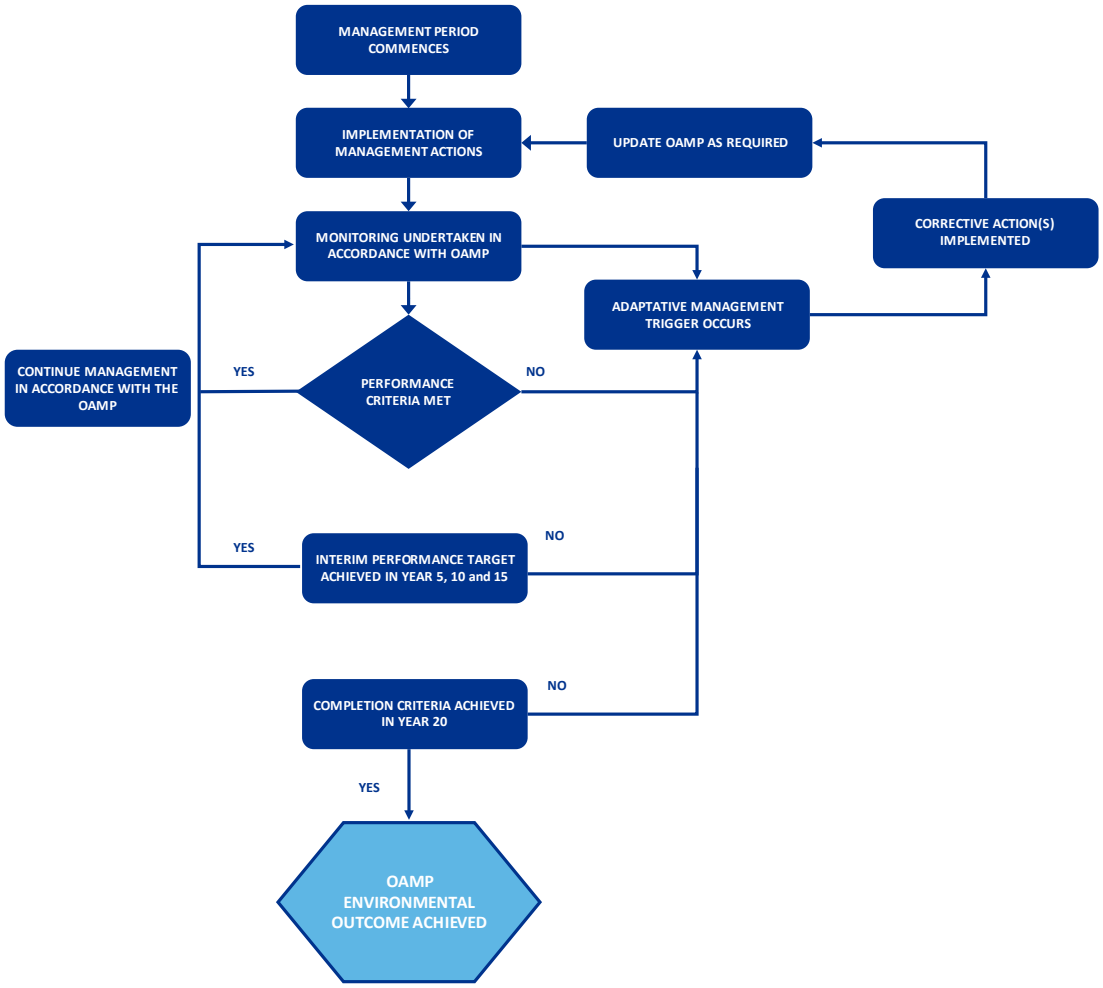


Figure 6: Process for implementation of the OAMP

5.2.3 Timing for implementation of the OAMP

The offset area will be managed and monitored until the interim performance targets and completion criteria are achieved. It is anticipated that through the adaptive management approach, interim performance targets and completion criteria will be achieved within the proposed 20-year management period. However, if the interim performance targets and/or completion criteria for offset values have not been achieved within the anticipated timeframes, management and monitoring will continue beyond the 20-year management period in accordance with this OAMP until the completion criteria have been achieved. Once attained, completion criteria will be maintained for at least the life of the EPBC Act approval relevant to this OAMP.

5.2.4 Risk of offset failure

Based on the adaptive approach to management and the proposed management and monitoring program, it is considered that the management objectives, interim performance targets and completion criteria will be successfully achieved.

In the unlikely event that the interim performance targets are not achieved for one or more offset values by year 5, 10 or 15 for those offset values, Santos will obtain advice from suitably qualified people/groups with the aim of identifying appropriate additional management interventions.

It should be noted that unavoidable temporary perturbations such as severe drought, or insect/fungal pest invasion that may cause a temporary decrease in metrics such as canopy or shrub cover from which the community still may recover within the next 5-year period should not preclude assessment of a satisfactory increase in ecological condition by the completion date.

If it is considered that the completion criteria cannot be achieved, Santos will update this OAMP proposing alternative offset areas in order to acquit the required offset requirements. The revised OAMP will be submitted to the Commonwealth Government.

6.0 Management program

6.1 Management objectives

A summary of the management objectives and performance criteria for the offset area is presented in Table 9, and the complete adaptive management process for this OAMP is encapsulated in Table 10. Management actions, monitoring events, adaptive management triggers and corrective actions have been assigned to each management objective and performance criteria.

Table 9: Summary of the management objectives and performance criteria

Management objectives	Performance criteria
Achieve the completion criteria including habitat quality improvements for offset values and remnant status for those regrowth vegetation communities.	Increase the habitat quality scores for each offset value at each habitat quality assessment site based on the results of baseline and subsequent monitoring events so as to achieve the scores in the completion criteria.
Maintain the extent of offset value habitat within the offset area	No unapproved and/or intentional clearing of habitat within the offset area, with the exception of clearing that is required for fencing, access, firebreaks and public safety as outlined in Table 11.
Ensure that the livestock grazing restrictions outlined in Section 6.2.4.1 for fire management and weed control assist in the enhancement of ground cover attributes for offset values and does not result in the degradation of habitat.	Increase the richness and average % cover of native perennial grasses at each habitat quality assessment site based on the results of baseline and subsequent monitoring events.
	Biomass levels of 2,500 kg/ha are retained at each of the monitoring sites at the end of the dry season.
	Livestock are only observed to be grazing in the offset area during strategic grazing event/s.
Minimise predation risk by wild dogs to threatened fauna species.	Reduction in Catling* Index for wild dogs from year 1 and subsequent monitoring events.
Minimise predation risk by feral cats to threatened fauna species.	Reduction in Catling* Index for feral cats from year 1 and subsequent monitoring events.
Minimise predation risk by foxes to threatened fauna species.	Reduction in Catling* Index for foxes from year 1 and subsequent monitoring events.
Minimise degradation of offset value habitat by feral horses.	Reduction in Catling* Index for feral horses from year 1 and subsequent monitoring events.
Minimise degradation of offset value habitat by rabbits.	Maintain rabbit impact category as ‘acceptable’.
Minimise degradation of offset value habitat by feral pigs.	Reduction in mean feral pig abundance score from year 1 and subsequent monitoring events.

Management objectives	Performance criteria
Minimise risk of poisoning by ingestion of cane toads by the northern quoll.	Manage to reduce relative abundance of cane toads to the greatest extent possible.
Manage invasive weed species to reduce degradation of offset value habitat.	A decrease in species richness and relative abundance of weed species at 80% of monitoring sites from year 1 and subsequent monitoring events. No new weed species are identified at any monitoring site (based on year 1 and subsequent monitoring data).
Reduce the risk of adverse impacts to offset value habitat by inappropriate fire regimes or unplanned fire.	No unplanned fire within the offset area. Increase in habitat quality scores as a result of implementation of any fire management measures.
Achieve the interim performance targets and completion criteria for each offset value within 5, 10 and 20 years, respectively.	The interim performance targets are achieved for all offset values by year 5, 10 or 15. The completion criteria are achieved for all offset values by year 20.

* Catling index provides a measure of relative abundance of wild dogs, foxes, horse and feral cats within the offset area. The Catling index will be measured as the percentage of camera nights in which the pest species was observed as part of fauna camera monitoring for the species, as outlined in Section 6.2.6.

Table 10: Management objectives, performance criteria, adaptive management triggers and corrective actions.

Identified threats to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective actions	Corrective actions
Degradation of habitat	Achieve the completion criteria including habitat quality improvements for offset values and remnant status for those regrowth vegetation communities.	Increase the habitat quality scores for each offset value at each habitat quality assessment site based on the results of baseline and subsequent monitoring events so as to achieve the scores in the completion criteria. Achieve structural and floristic components for a vegetation community to be reclassified as remnant.	Implementation of the management actions and adaptive management framework as outlined in this OAMP.	Monitoring of offset value habitat quality scores and condition of habitat will be undertaken in accordance with Section 7.0 including: Offset area inspections (Section 7.1) Rapid monitoring events (Section 7.6.1) Habitat quality assessments to determine habitat quality scores (Section 7.6.2). Targeted fauna surveys (Section 7.6.4) The results of monitoring events will be compared against the interim performance targets and completion criteria to determine the progress of the offset area and recorded as part of reporting (Section 8.0).	Interim performance targets are not achieved for one or more offset values by year 5, 10 or 15. Completion criteria are not achieved for one or more offset values by year 20.	Step 1: Investigate cause of trigger • Investigate reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. • Re-evaluate the suitability of the relevant management measures in the OAMP. • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s • The appropriate corrective actions will be implemented and may include: o Third party review of the OAMP to provide input on the effectiveness of the management actions. o Increasing the frequency and intensity of pest animal and weed control measures, or revising the type of measures to be implemented. o Modifying the strategic grazing regime to better support enhancement of offset values. o For offset values that have not achieved interim performance targets by year 5, 10 or 15 for those offset values, Santos will obtain advice from suitably qualified people/groups with the aim of identifying appropriate additional management interventions. o If it is considered that the completion criteria cannot be achieved, Santos will update this OAMP proposing alternative offset areas in order to acquit the required offset requirements in accordance with the offsets assessment guide. The revised OAMP will be submitted to the Commonwealth Government.
Habitat loss through vegetation clearing	Maintain the extent of offset value habitat within the offset area.	No unapproved and/or intentional clearing of habitat within the offset area, with the exception of clearing that is required for fencing, access, firebreaks and public safety as outlined in Table 11.	Protection of the offset area via a Voluntary Declaration under section 19E and 19F of the VMA, as described in Section 2.7.	Reporting to the Commonwealth Government consistent with EPBC approval.	Any activities in contravention of the Voluntary Declaration and this OAMP.	Step 1: Investigate cause of trigger • Investigate reasons why unapproved clearing occurred e.g. unauthorised access • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s • The appropriate corrective actions will be implemented and may include: o Addition fencing, signage and/or security for the offset area o Restoration of the impacted area.
			Comply with the restrictions outlined in Table 11. Construction and maintenance of access tracks, fencing and	Compliance with restrictions for vegetation clearing associated with maintenance and establishment of access tracks, fencing and firebreaks will also be	Clearing for access, fencing, firebreaks or public safety is not undertaken in accordance with the restrictions outlined in Section 6.2.	Step 1: Investigate cause of trigger • If restrictions for clearing associated with fencing, access, firebreaks or public safety are not adhered to, Santos will ensure that all clearing activities cease immediately.

Identified threats to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective actions	Corrective actions
			firebreaks will be undertaken in accordance with Sections 6.2.2, 6.2.3 and 6.2.4. In the event that vegetation clearing is required for fencing, access, firebreaks or public safety, all activities will be planned, recorded and monitored.	assessed as part of offset area inspections (Section 7.1).		• Investigate the reason for unapproved or unintentional clearing. • Following clearing, the area is to be assessed by a suitably qualified ecologist/expert to determine the total clearing extent of offset value habitat. • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s • The appropriate corrective actions will be implemented and may include: o Reviewing and modifying protocols for the establishment of fences, access tracks, and firebreaks. o Prior to the establishment of fences, access tracks, and firebreaks, the area to be cleared will be clearly marked out with flagging tape and checked prior to clearing. o Rehabilitation of the impacted area.
Degradation of habitat by livestock overgrazing.	Ensure that the livestock grazing restrictions outlined in Section 6.2.4.1 for fire management and weed control assist in the enhancement of ground cover attributes for offset values and does not result in the degradation of habitat.	Increase the richness and average % cover of native perennial grasses at each habitat quality assessment site based on the results of baseline and subsequent monitoring events.	Implementation of strategic grazing to reduce fuel loads and control exotic pasture grasses and promote the establishment of native perennial grass species in accordance with Section 6.2.4.1.	Rapid monitoring events and habitat quality assessments will be undertaken in accordance with Section 7.6.1 and 7.6.2. These will include assessment of % cover of native perennial grasses.	Decrease in the richness and average % cover of native perennial grasses at one or more habitat quality assessment sites based on the results of baseline and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate the reason for the decrease in richness and average % cover of native perennial grasses • Identify appropriate corrective actions. Step 2: Implementation of Corrective Action/s • The appropriate corrective actions will be implemented and may include: o Modifying the strategic grazing regime including modifying the frequency, intensity and/or duration of grazing events. o Constructing additional fencing should the current fencing be considered insufficient to manage livestock in accordance with the grazing regime. o Installing additional watering points for livestock to manage livestock in accordance with the grazing regime.
		Biomass levels of 2,500 kg/ha are retained at each of the monitoring sites at the end of the dry season.	Implementation of a strategic grazing regime to protect and maintain environmental values in accordance with Section 6.2.4.1.	Biomass monitoring will be undertaken in accordance with Section 7.2.	Biomass monitoring results indicate less than 2,500 kg/ha of biomass is present at any of the monitoring sites at the end of the dry season.	Step 1: Investigate cause of trigger • Investigate the reason for biomass being less than 2,500 kg/ha. • Re-evaluate the strategic grazing regime to assess the suitability of grazing to ensure no less than an average of 2,500 kg/ha of biomass is retained at the end of the dry season. • Identify appropriate corrective actions. Step 2: Implementation of Corrective Action/s • The appropriate corrective actions will be implemented and may include:

Identified threats to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective actions	Corrective actions
						o Removal of stock or spelling grazing from the area of the offset in which less than 2,500 kg/ha of biomass was identified. o Review adherence to livestock grazing restrictions in Section 6.2.4.1 o Where relevant, amending livestock management practices in the OAMP, including amending stocking rates, and/or duration and/or frequency of strategic grazing events.
		Livestock are only observed to be grazing in the offset area during strategic grazing event/s.	Existing fencing is always maintained as outlined in Section 6.2.3.	Offset area inspections to be undertaken at least annually (Section 7.1) and will include monitoring to assess the: • condition of fencing to identify any necessary maintenance requirements. • presence of livestock within the offset area.	Livestock are observed within the offset area when not permitted within that area. Damaged fencing is observed.	Step 1: Investigate cause of trigger • If livestock are identified in the offset area, remove stock immediately. • Inspect and evaluate fencing and identify the cause of livestock within the offset area. • Identify appropriate corrective actions. Step 2: Implementation of Corrective Action/s • The appropriate corrective actions will be implemented and may include: o Repairing fencing where required to ensure its condition is satisfactory to exclude livestock. o Constructing additional fencing should the current fencing be considered insufficient to exclude livestock.
Predation by wild dogs	Minimise predation risk by wild dogs to threatened fauna species.	Reduction in Catling* Index for wild dogs from year 1 and subsequent monitoring events.	Implement control actions for wild dogs in accordance with Section 6.2.6.	Undertake monitoring for wild dogs in accordance with Section 7.5.	An increase in Catling* Index for wild dogs from year 1 and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate potential sources or reasons that may have attributed to an increase in the: o Catling* index for wild dogs, feral cats and/or foxes o relative abundance of feral pigs and horses. o Review adherence to pest management control measures as outlined in Section 6.2.6 o Identify appropriate corrective actions. Step 2: Implementation of corrective action/s o The appropriate corrective actions will be implemented and may include: o Increasing the frequency and intensity of pest animal control. o Revising methods of pest animal control in accordance with Queensland Department of Agriculture and Fisheries (DAF) guidelines, and coordinate with neighbouring land owners to ensure a consistent approach. o Updating pest animal control methods in the OAMP and targeted pest animal control programs.
Predation by feral cats.	Minimise predation risk by feral cats to threatened fauna species.	Reduction in Catling* Index for feral cats from year 1 and subsequent monitoring events.	Implement control actions for feral cats in accordance with Section 6.2.6.	Undertake monitoring for feral cats in accordance with Section 7.5.	An increase in Catling* Index for feral cats from year 1 and subsequent monitoring events.	
Predation by foxes.	Minimise predation risk by foxes to threatened fauna species.	Reduction in Catling* Index for foxes from year 1 and subsequent monitoring events.	Implement control actions for foxes in accordance with Section 6.2.6.	Undertake monitoring for foxes in accordance with Section 7.5.	An increase in Catling* Index for foxes from year 1 and subsequent monitoring events.	
Degradation of habitat by feral horses	Minimise degradation of offset value habitat by feral horses.	Reduction in the observed presence of feral horse on the property.	Implement control actions for feral horses in accordance with Section 6.2.6.	Undertake monitoring for feral horses in accordance with Section 7.5.	An increase in Catling* Index for feral horses from year 1 and subsequent monitoring events.	
Degradation of habitat by rabbits.	Minimise degradation of offset value habitat by rabbits.	Maintain rabbit impact category as 'acceptable'.	Implement control actions for rabbits in accordance with Section 6.2.6.	Undertake monitoring for rabbits in accordance with Section 7.5.	Rabbit impact category measured as 'monitor closely', or 'unacceptable'.	
Degradation of habitat by feral pigs.	Minimise degradation of offset value habitat by feral pigs.	Reduction in mean feral pig abundance score from	Implement control actions for feral pigs in	Undertake monitoring for feral pigs in accordance with Section 7.5.	An increase in mean feral pig abundance score from	

Identified threats to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective actions	Corrective actions
		year 1 and subsequent monitoring events.	accordance with Section 6.2.6.		year 1 and subsequent monitoring events.	
Lethal ingestion of cane toads	Minimise risk of lethal ingestion of cane toads by the northern quoll.	Manage to reduce relative abundance of cane toads to the greatest extent possible.	Implement control actions for cane toads in accordance with Section 6.2.6.	Undertake monitoring for cane toads in accordance with Section 7.5.	A significant increase in the relative abundance of cane toads in the offset area from year 1 abundance is observed in the first five years of monitoring.	
Invasion of habitat by weed species, including exotic grasses.	Manage invasive weed species to reduce degradation of offset value habitat.	A decrease in species richness and relative abundance of weed species at 80% of monitoring sites from year 1 and subsequent monitoring events. No new weed species are identified at any monitoring site (based on year 1 and subsequent monitoring data).	Implement weed control actions in accordance with Section 6.2.5. Adhere to weed hygiene restrictions in accordance with Section 6.2.1.	Undertake weed monitoring in accordance with Section 7.4.	An increase in species richness and relative abundance of weed species at more than 20% of monitoring sites from year 1 and subsequent monitoring events. A new weed species is identified at one or more monitoring sites.	Step 1: Investigate cause of trigger • Investigate potential sources or reasons that may have attributed to an increase in species richness and/or relative abundance of weeds. • Investigate potential sources or reasons for the occurrence of the new weed species. • Review adherence to weed management control measures as outlined in Section 6.2.5 • Review adherence to weed hygiene restrictions as outlined in Section 6.2.1 • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s • The appropriate corrective actions will be implemented and may include: o Amending weed hygiene restrictions. o Providing additional educational awareness training for all staff and contractors to ensure weed hygiene restrictions are adhered to. o Revising weed control methods in accordance with the *Biosecurity Act 2014* (Qld). o Increasing the frequency and intensity of weed control. o Updating weed control methods in the OAMP and targeted weed control programs.
Inappropriate fire regimes	Reduce the risk of adverse impacts to offset value habitat by inappropriate fire regimes or unplanned fire.	No unplanned fire within the offset area Increase in habitat quality scores as a result of implementation of any fire management measures.	All fire management measures to be implemented in accordance with the program outlined in Section 6.2.4.	Habitat quality assessments to determine habitat quality scores will be undertaken in accordance with Section 7.6.2. Rapid monitoring events will be undertaken to assess the general condition of vegetation in accordance with Section 7.6.1.	As a result of fire management measures, or an unplanned fire, there is a decrease in the habitat quality score for any offset value from baseline and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate reasons why the fire management measures have resulted in a decrease in habitat quality scores. • Review adherence to the fire management measures as outlined in Section 6.2.4 • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s • The appropriate corrective actions will be implemented and may include: o Increasing the frequency of biomass monitoring. o Increasing the frequency of weed control measures.

Identified threats to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective actions	Corrective actions
						o Amending the strategic grazing regime. o Reviewing effectiveness of firebreaks, and establishment of additional fire breaks. o Review timing and intensity of fuel hazard reduction burns in accordance with the Regional Ecosystem Description Database (REDD) fire management guidelines and conservation advice for the particular offset value.
Offset fails to achieve the interim performance targets and completion criteria within the anticipated 5, 10, 15 and 20 year timeframes, respectively.	Achieve the interim performance targets and completion criteria for each offset value within 5, 10, 15 and 20 years, respectively.	The interim performance targets are achieved for all offset values by year 5, 10 or 15. The completion criteria are achieved for all offset values by year 20.	All management actions outlined in Section 6.0 will be implemented to ensure that the interim performance targets and completion criteria are achieved.	Monitoring of the offset area will be undertaken in accordance with Section 7.0 including: • Offset area inspections (Section 7.1). • Offset value assessments (Section 7.6) The results of monitoring events will be compared against the interim performance targets and completion criteria to determine the progress of offset area and recorded as part of reporting (Section 8.0).	Interim performance targets are not achieved for one or more offset values by year 5, 10 or 15. Completion criteria are not achieved for one or more offset values by year 20.	Step 1: Investigate cause of trigger • Investigate reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. • Re-evaluate the suitability of the relevant management measures in the OAMP. • Identify appropriate corrective actions. Step 2: Implementation of corrective action (s) • The appropriate corrective actions will be implemented and may include: o Third party review of the OAMP to provide input on the effectiveness of the management actions. o Increasing the frequency and intensity of pest animal and weed control measures, or revising the type of measures to be implemented. o Modifying the strategic grazing regime, or fire management measures, to better support enhancement of offset values.

6.2 Management actions

6.2.1 General restrictions

Table 11 details the restrictions to be implemented for the offset area to ensure the completion criteria and management objectives are met.

Table 11: Offset area restrictions

Restrictions	Details
Weed hygiene	• Weed hygiene measures will be implemented to prevent the movement of weed material into the offset area. • All persons entering the offset area will be required to ensure vehicles and equipment are weed free. • All contractors entering the offset area must hold a current weed hygiene certificate or equivalent for all vehicles and equipment. • Evidence is to be provided on request to the landowner and Santos environmental advisors that vehicles, slashers or any machinery implementing management actions are clean prior to entry to minimise potential weed spread.
Vehicles	• Vehicle movement will be limited to designated access tracks in the offset area and access will be restricted to authorised personnel only. • Vehicles will travel to track conditions to minimise the risk of vehicle strike to fauna.
Vegetation clearing	• Clearing will be excluded from the offset area through demarcation and protection by means of Voluntary Declaration under the VM Act. Clearing for timber gathering and development will also be excluded. • Clearing of native vegetation will not be permitted within the offset area as part of any management and monitoring activities associated with this OAMP, except for clearing that is required for: o maintenance of access tracks and/or fire breaks o fence construction and maintenance and o ensuring public safety or as directed by emergency management response personnel in the event of unplanned fire or other emergency or associated procedure. • If vegetation clearing is required for fencing, access, firebreaks or public safety, all activities will be appropriately planned, recorded and monitored. • Machinery will not be allowed on site after heavy or prolonged rainfall events until after the site has dried to allow for safe movement of traffic.
Unauthorised access or use	• Access into the offset area will be restricted to authorised personnel only. • Signs will be installed in prominent locations (i.e. at access points into the offset area) which recognise that the areas are protected for conservation purposes. The signs will advise that access into the offset area is restricted to authorised personnel only • The property will be suitably fenced to restrict access by unauthorised persons. • At no time can persons access the site without first approaching the Land Advisor of the Mt Tabor property and informing them of their intent. • When entering and leaving the property, the Land Advisor must be advised.

Restrictions	Details
	• Contractors will only be permitted to access the property following the direct engagement by Santos.

6.2.2 Access tracks

Existing access tracks will be utilised to facilitate necessary management, maintenance and monitoring activities as part of this OAMP. If existing access tracks become impassable (through erosion or vegetation regrowth), maintenance activities of these tracks (e.g. grading) will be prioritised over alternative track alignments. Gully crossings are likely to be subject to periodic, ongoing maintenance because of erosion following rain events.

Existing and new access tracks will be no wider than 5 m and vegetation disturbance will be minimised.

6.2.3 Fencing

Fencing will be installed to assist with management of livestock control for weed and fuel load management. Following approval of this OAMP the final location for fencing will be scouted with the Traditional Owners as part of on-ground cultural heritage surveys and will be provided to the Commonwealth Government following completion.

Fencing will comprise of a 4 wire fence consisting of 3 strand 1.57HT barb with a plain high tensile wire at the top, wood and/or steel posts at 7m spacing, a strainer post every 100m and 1 gate located every kilometre. This type of fencing is also considered appropriate to facilitate the fauna movement across the property. Importantly, the movement of the species being offset will not be impeded by the proposed fencing design.

Any vegetation disturbance associated with new fence construction will be minimised in accordance with Table 11.

Regular inspections of all fencing will be undertaken in accordance with Section 7.1, and repairs to the fences will be made as required.

6.2.4 Fire management

The Mt Tabor property has previously been subject to severe fire, particularly within the last two years (Boobook, 2021a). A planned and co-ordinated fire management strategy will be implemented to

- improve habitat quality through:
  - controlling weeds, biomass levels and fuel loads
  - supporting development of structural components of habitat for offset values (e.g. recruitment of native plants, establishment of fire sensitive native herbs and groundcover, important microhabitat including fallen logs and leaf litter, and increased understorey)
  - promoting germination and recruitment of eucalypt species and other species characteristic of the specific RE.

Unplanned fire risk will be managed through:

- establishment and regular maintenance of firebreaks (Figure 7)
- monitoring and managing fuel loads primarily through the implementation of a controlled grazing regime (Section 6.2.4.1)

- fuel hazard reduction burns (if required; Section 6.2.4.2).

Firebreaks will be established and maintained around the boundary of the offset area, with green firebreaks established where the offset area joins native vegetation. Firebreaks will be maintained at least annually to remove overhanging trees or fallen debris and dense vegetation. Firebreak maintenance will be undertaken to a width of up to 10 metres.

6.2.4.1 Strategic grazing

The current and historic land use of the Mt Tabor property includes cattle grazing supported by tracks, fencing and dams, with limited clearing around this infrastructure. Strategic grazing within the offset area will be used to manage fuel loads and control exotic weeds and pasture grasses. As increasing grazing intensity is correlated with an increase in weedy cover (Franks, 2002), and a decrease in native grass species richness, grazing will be permitted in the offset area on a managed and limited basis to control weeds and reduce fuel loads.

Best practice management for strategic livestock grazing within the Mt Tabor offset area will be undertaken as follows:

- livestock will only be permitted in the offset area to reduce fuel loads, avoid weed seed set and reduce weed cover
- within the offset area a minimum of 2,500 kg/ha of biomass will be retained at the end of the dry season.

To minimise erosion and subsequent impacts on water quality, strategic grazing will be excluded where rainfall causes inundated or waterlogged soils. The location and extent of grazing exclusion areas will be reviewed annually based on the results of management and monitoring events.

The suitability of conditions for undertaking a grazing event will be informed by biomass monitoring events as described in Section 7.2.

6.2.4.2 Fuel hazard reduction burns

The aim of fuel hazard reduction burns is to manage excess fuel loads, to initiate regeneration of eucalypt communities and to create habitat with a mosaic of different fire frequencies and times since fire.

Fire management, through fuel hazard reductions burns will be guided by conservation advice documentation (e.g. for MNES) and the Regional Ecosystem Description Database (REDD; Queensland Herbarium, 2021), which provides recommendations for fire management for each of the component RE (Table 12), guidelines published in Fire and Biodiversity Monitoring Manual published by South East Queensland Fire and Biodiversity Consortium (2002), local regional fire plans, regional fire authorities and local knowledge of fire behaviour.

Hazard reduction burns will be considered if fuel hazard ratings within the offset area are unable to be maintained below extreme in accordance with the Overall Fuel Hazard Assessment Guide (Hines et al., 2010; Appendix E) through the implementation of strategic grazing and weed control. However, the location and timing for fuel hazard reduction burns will be informed by the results of biomass monitoring (Section 7.2) and fuel load monitoring (Section 7.3) in conjunction with the results of habitat quality assessments and considering the REDD fire management guidelines for the vegetation community and MNES conservation advices.

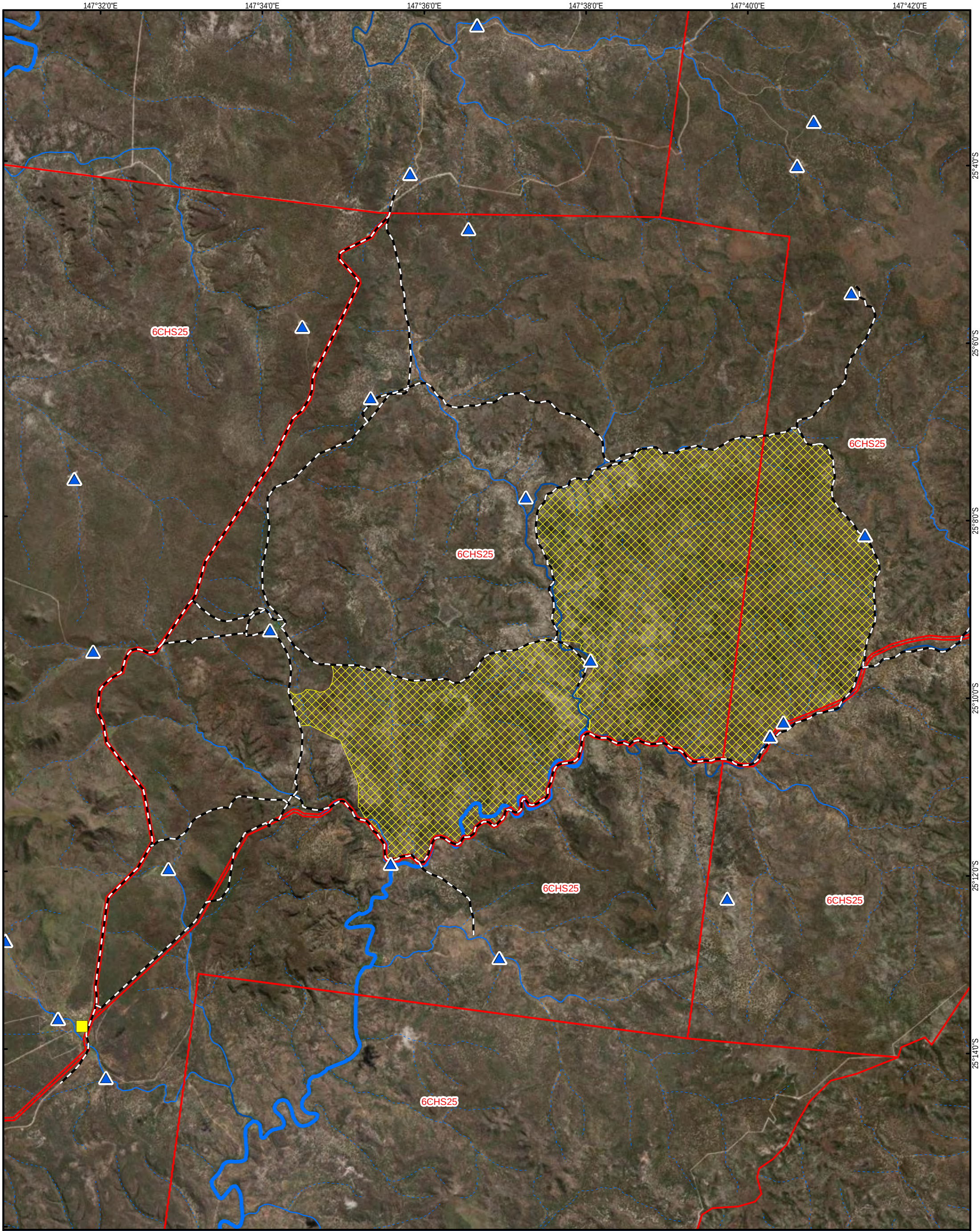
In general, fire management will be undertaken in a mosaic pattern at the appropriate time of year when there is:

- high soil and fuel moisture levels, ideally following minimum of 40 mm of rainfall
- low ambient temperature and wind speed
- high atmospheric humidity
- the risk of long-term impacts/high intensity fire is low, and/or
- when plants approach a more active growing phase.

Table 12: Fire management guidelines for each component RE (REDD; Queensland Herbarium, 2021)

RE	Fire Management Guidelines
11.3.2	• Conduct a low to moderate burn every 6-10 years. • Timing for burning should be late wet to early dry season when there is good soil moisture, early storm season or after good spring rains. • Burn less than 30% of the area in any year. • Burn under conditions of good soil moisture and when plants are actively growing. Sometimes a small amount of wind may move the fire front quickly so that burn intensity is not too severe to destroy habitat trees. • Management of this vegetation type will be based on maintaining vegetation composition, structural diversity, fauna habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfire by: o maintaining a fire mosaic o control invasive shrubs o low to moderate intensity burns with good soil moisture to minimise loss of hollow trees o avoiding riparian communities where appropriate.
11.3.39	• Conduct a low to moderate burn every 6-10 years. • Timing for burning should be late wet to early dry season when there is good soil moisture, early storm season or after good spring rains. • Burn less than 30% in any year. • Burn under conditions of good soil moisture and when plants are actively growing. Sometimes a small amount of wind may move the fire front quickly so that burn intensity is not too severe to destroy habitat trees. • Management of this vegetation type will be based on maintaining vegetation composition, structural diversity, fauna habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfire by: o maintaining a fire mosaic o control invasive shrubs o low to moderate intensity burns with good soil moisture are necessary to minimise loss of hollow trees. o avoid riparian communities where appropriate.
11.10.4	• Maintain fire management of surrounding country.

RE	Fire Management Guidelines
	• Burn surrounding country only under conditions of good soil moisture and when plants are actively growing. • This RE is likely to be difficult to burn owing to a lack of ground fuel that normally occurs in this RE.
11.10.6	• Conduct a low to moderate burn every 6-10 years. • Timing for burning should be late wet to early dry season when there is good soil moisture, early storm season or after good spring rains. • Burn less than 10-30% in any year to achieve a mosaic. • Burn under conditions of good soil moisture and when plants are actively growing. • Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent.
11.10.7	• Conduct a moderate to high burn every 6-10 years. • Timing for burning should be during late wet to early dry season when there is good soil moisture, early storm season or after good spring rains. • Burn less than 10-30% of the area in any year. • Burn surrounding vegetation under conditions of good soil moisture and when plants are actively growing throughout the year so that fires will be very limited in extent. • Best protection from fire is through the creation of a multi-aged mosaic in surrounding vegetation and perimeter burning.
11.10.11	• Conduct a moderate burn every 3-5 years. • Timing for burning should be during late wet to early dry season when there is good soil moisture, early storm season or after good spring rains. • Burn less than 30% in any year. • Burn under conditions of good soil moisture and when plants are actively growing.
11.10.13	• Manage surrounding country. • Burn surrounding country only under conditions of good soil moisture and when plants are actively growing. • Will be difficult to burn owing to a lack of ground fuel that normally occurs in this RE.



SANTOS

Location diagram

Figure 7
Infrastructure

Mt Tabor - 6CHS25
Mt Tabor offset area
Mt Tabor homestead

Watercourses
Drainage contour
Minor drainage line
Creekline
Major watercourse

Infrastructure
Access tracks
Watering point

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Watercourses

0 0.5 1 1.5 2
Kilometres

N

CO2 Australia

Date: 6/10/2022 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:70,000@A3

Path: P:\GISData\Projects\Santos\919_220609_Updated_Mt_Tabor\Figure 7 - Infrastructure.mxd

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6.2.5 Weed management

Weed management in the offset area will aim to minimise the introduction, establishment and spread of restricted and prohibited pest plants under the *Biosecurity Act 2014* (Qld) and other invasive species that present a threat to vegetation communities and species habitat in the offset area. Weed management will focus on reducing the extent of the existing weeds as well as minimising the risk of introduction of additional weed species to the offset area.

Historically several different invasive grasses and broadleaf weeds have been recorded within the offset area. As such, weeds will be managed using biological, chemical and/or mechanical control in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets for the relevant weed species, as necessary.

6.2.6 Pest animal management

Pest animals present or have the potential to occur on or within the immediate vicinity of the Mt Tabor property, pose the following threats:

- Predation of native fauna by foxes, feral cats and wild dogs
- Erosion and degradation of habitat and competition by rabbits, pigs and feral horses.
- Risk of lethal ingestion of cane toads by the northern quoll.

Pest animal control activities will be undertaken to minimise the introduction of pest animals and control existing pest animal populations in accordance with the *Biosecurity Act*. Table 13 provides examples of approved species-specific pest animal control measures recommended by the Queensland and Commonwealth governments. Results of pest animal assessments will be reviewed following each reporting event to inform the need for, location and timing of species-specific control measures in subsequent years.

Table 13: Examples of species-specific control methods for pest animal species

Species	Status under Biosecurity Act 2014	Example control method	Reference
Wild dog (*Canis familiaris*)	Category 3,4,6	• Exclusion fencing • Trapping (e.g. foot hold traps) • Baiting • Shooting	(DAF, 2020a)
Fox (*Vulpes vulpes*)	Category 3,4,5,6	• Exclusion fencing • Trapping • Shooting • Poisoning	(DAF, 2020b)
Feral cat (*Felis catus*)	Category 3,4,6	• Exclusion fencing • Night shooting • Poisoning • Trapping	(DAF, 2020c)

Species	Status under Biosecurity Act 2014	Example control method	Reference
Pig (*Sus scrofa*)	Category 3,4,6	• Exclusion fencing • Trapping • Shooting • Poisoning	(DAF, 2020d)
Rabbits (*Oryctolagus cuniculus*)	Category 3, 4, 5, 6	• Manual control (i.e. harbour destruction) • Mechanical control (i.e. warren ripping) • Trapping • Exclusion fencing • Biological control • Poison baiting • Fumigation • Shooting	(DAF, 2021)
Cane toad (*Rhinella marina*)	-	Currently there are no effective broad scale control methods (e.g. baiting). Should cane toads be identified to be present within the northern quoll offset management area and the relative abundance has been observed to be increasing from the monitoring event undertaken in year 1 of management, potential sources or reasons that may have attributed to the increase will be investigated. Appropriate control strategies relevant to the offset management area and the reason for the increase in the relative abundance of cane toads will be identified and implemented.	(DAF, 2020e)
Feral horse (*Equus caballus*)	-	• Relocation through mustering or trapping	(DAF, 2016)

7.0 Monitoring

The results of the monitoring program outlined in the following sections will be used to inform operational management decisions, including adaptive implementation of this OAMP to ensure the performance criteria and management objectives, and ultimately interim performance targets and completion criteria are met.

The monitoring results will also be used to assess adherence to performance criteria, and to determine when corrective actions are required to be implemented. The results will also be compared to those from previous monitoring events to assess change over time and to inform the ongoing implementation of the OAMP.

7.1 Offset area inspections

The aim of offset area inspections is to enable a general assessment of the offset area to identify any potential issues that may require remedial action to be undertaken. Inspections will be undertaken twice per year for the duration of the management period to assess the following:

- condition of fencing, gates and signs
- condition of access tracks
- condition of firebreaks
- compliance with restrictions for vegetation clearing associated with maintenance and establishment of access tracks, fencing and firebreaks
- incidence of erosion within offset area, particularly around permanent and semi-permanent water bodies or areas subject to inundation or waterlogging
- damage/degradation resulting from pest animal activity within the offset area
- signs of land degradation and over-grazing
- presence of weed/invasive species
- exclusion of livestock
- incidental fauna observations and any additional risks to offset values (i.e. evidence of vehicle strike).

7.2 Biomass monitoring

Biomass monitoring for fire management will be undertaken twice a year, at the end of the wet season and end of the dry season, to:

- determine the risk of fire to the offset site and
- inform fire management strategies to control fuel loads.

Biomass is at its greatest at the end of the wet season (April) with fire risk greatest towards the end of the dry season (October). Biomass will be monitored within the offset areas using appropriate photo standards which will be used to determine dry matter yields and subsequently fuel loads. Biomass monitoring will be undertaken at the same permanent weed monitoring sites established as part of the year 1 monitoring.

Fuel loads will be managed through strategic grazing events (see Section 6.2.4.1) if the biomass assessment at the end of the wet season shows that biomass is greater than 2,500 kg/ha within the offset area.

The stocking rate of these strategic grazing events will be determined through a feed budgeting assessment (see Section 7.2.1) undertaken prior to a grazing event in the offset area. A feed budgeting assessment is a recognised method of determining the stocking rate based on the amount of feed available and the amount of feed desired at the end of the grazing event (i.e. >2,500 kg/ha).

7.2.1 Feed budgeting assessment

The process for undertaking a feed budget assessment will include the following sequence of activities:

- determine the current amount of feed present (kg/ha) using appropriate photo standards available on the Future Beef website[1].
- determine the amount of feed desired (kg/ha) at the end of the grazing event.
- calculate the total useable feed (kg/ha) by subtracting the feed desired from the feed present.
- determine utilisation (i.e. the proportion of useable feed that livestock can use).
- determine the feed available for the grazing animal (kg/ha) by multiplying the total useable feed by the utilisation rate.
- calculate the safe stocking rate by:
    - determining the feed consumption per day (kg/day)
    - determining the number of days feed is required (days)
    - calculating the feed requirement per head (kg/hd) by multiplying the feed consumption per day by the number of days
    - calculating the stocking rate (ha/hd) by dividing the feed requirement per head by feed available
    - calculate the number of stock (head) by dividing the area of the paddock by the stocking rate.

The amount of feed available prior to the grazing event will be estimated using the appropriate photo standards available on the Future Beef website. The “Dry Season Feed Budget” worksheet will then be used to calculate the required stocking rate for the grazing event.

At the completion of the grazing event, photo standards will be used to assess ground cover and ecosystem biomass. Should the grazing event be required to be extended (e.g. as a result of additional rainfall and resultant grass growth and potential weed flowering), the feed budget assessment will be recalculated using the “Dry Season Feed Budget” worksheet.

[1] See https://futurebeef.com.au/knowledge-centre/pastures-forage-crops/pasture-photo-standards/

7.3 Fuel load monitoring

Fuel load monitoring will be undertaken in accordance with the Overall Fuel Hazard Assessment Guide (Hines et al., 2010; Appendix E). Fuel load assessment monitoring will include a baseline survey in year 1 (post wet season; April), with ongoing fuel load assessment monitoring conducted every year at the same time and location as biomass monitoring post wet season. Monitoring will focus on assessing the key structural layers of the fine fuels that burn in bushfires, specifically bark, elevated fuels, near-surface fuels and surface fuels. This will allow for a rapid assessment of each fuel layer, which in in turn is given a hazard rating and are then combined to provide an overall fuel hazard rating of low, moderate, high, very high or extreme.

The fuel hazard rating will be monitored to compare any changes from previous assessments. In conjunction with results of habitat quality assessments, the results of the fuel load assessments will be used to determine if fuel hazard reduction burns are required within the offset area. Weed management and strategic grazing within the offset area will also be undertaken to maintain fuel hazard rating below extreme.

7.4 Weed monitoring

Weed monitoring sites will be randomly stratified, fixed monitoring sites representative of offset values and incorporating natural variability such as aspect (e.g. a mix of north-, east-, south- and west-facing monitoring sites), community type – (e.g. woodland, riparian). There will also be fixed monitoring sites at strategic trafficable areas (e.g. entry gates, creek crossings, stock watering points) to monitor potential introduction and/or irruptions of prohibited and restricted weed species.

The offset area will be monitored for weeds every two years (post wet season) to determine the species richness and abundance, for the duration of the management period. The results of this monitoring will inform the methods for weed treatment and control (see Section 6.2.5).

Non-native plant cover is also assessed as part of the habitat quality assessments detailed in Section 7.6.2, and the presence of weed species will also be recorded as part of the general offset area inspections (see Section 7.1), where noted.

7.5 Pest animal monitoring

The offset area will be monitored for evidence of pest animals every two years (post wet season), including a baseline survey in year 1 of the distribution and abundance of pest animals.

Based on the results of year 1 surveys, pest animal monitoring sites will be established in year 1. Monitoring of pest animals will target areas of known impacts/movements (e.g. along topographic features, including creeks, pads, paths, ridge-tops and roads) to not only maximise the success of encountering pest animals, but target monitoring in environments that are more regularly impacted (e.g. drainage lines, moist gullies and around swamps and lagoons favoured by feral pigs; Hone, 1995). The location of pest animal monitoring sites will be assessed prior to each monitoring event.

Pest animal monitoring will also be undertaken in association with and immediately prior to the pest animal control activities (Section 6.2.6). Initial monitoring results will determine the degree of effort required to control the pest population and post control monitoring will determine the degree of success of control operations.

Monitoring of pest animals will involve the deployment of motion sensing infra-red cameras as well as other techniques such as sand plots as appropriate to determine pest animal species present in the offset area and indicative population numbers.

Methods for determining the presence and relative abundance for foxes, feral cats, rabbits and feral pigs are presented in Table 14. Evidence of pest animals, including feral horses, will be documented during the offset area inspections (see Section 7.1)

Table 14: Pest animal monitoring methodology

Pest animal	Methodology to be implemented
Fox, wild dog, feral cat, horse	To assess the relative abundance of foxes and feral cats within the offset area, camera monitoring will be undertaken as follows to provide a measure of the Catling index for each species. The Catling index will be measured as the percentage of camera nights in which the pest species was observed. An increase or decrease in the Catling index value between subsequent monitoring events will represent an increase or a decrease in the relative abundance of pest species and a measure of the success of pest animal control. • fauna monitoring cameras will be placed in the offset area • cameras will be placed along tracks and left in place for a minimum of three consecutive nights • an analysis of the camera footage will be undertaken to determine the percentage of camera nights with animal captures for each species observed. This percentage represents the Catling index (Mitchell and Balogh, 2007b, c).
Feral pig	An assessment of the presence or absence of feral pig signs as a measure of the relative abundance of feral pigs within the offset area in accordance with Mitchell and Balogh (2007a) and Hone (1988), will be undertaken as follows: • nominate randomly stratified sites across the offset area in environments that are more regularly impacted (e.g. drainage lines, moist gullies, around swamps etc) • calculate an abundance score for each transect as the percentage of 'present' feral pig signs • calculate the mean abundance score (and variance) across all transects in the offset area. The average frequency of occurrence across the offset area will be used as an index of abundance and compared between subsequent monitoring events to assess the effectiveness of feral pig control. Furthermore, changes to scores for individual sites/transects can point to areas to target control activities. [a] Feral pig signs can include rooting, wallows, dung, footprints, travel pads, plant damage and tree rubs, as well as the physical presence of feral pigs.
Rabbit	An assessment of rabbit impact in accordance with Cooke *et al.* (2014) will be undertaken as follows. Randomly stratified, permanent monitoring points, a 2-ha patch of habitat is traversed over 15-20 minutes assessing: • Rabbit abundance – a measure of the presence and number of rabbit warrens and the abundance of any faecal pellets (including 'buck-heaps' or latrines) – measured on a scale of 0 – 5 • Seedling abundance – a measure of the presence and abundance of native vegetation seedlings encountered during the 15-20-minute traverse – measured on a scale of 0 – 5 • Rabbit damage – a measure of seedlings (< 0.5 m height) with evidence of rabbit damage, identified as 45° 'secateurs-like' cuts through smaller stems, defoliation and gnawing of bark – measured on a scale of 0 – 5.

Pest animal	Methodology to be implemented
	From this assessment, a 'corrected regeneration score' is calculated from the seedling abundance and rabbit damage score. This measure corrects for seedling regeneration as a function of observed rabbit damage and is subsequently used to calculate overall rabbit impact with the rabbit abundance score (refer to Cooke *et al.* (2014)). Overall rabbit impact is assigned as one of three categories – 'acceptable', 'monitor closely' or 'unacceptable', as determined from a combination of the score for rabbit abundance and the corrected regeneration score.
Cane toad	An assessment of the relative abundance of cane toads within the offset area will be undertaken as follows based on survey methods outlined in OEHDPC (2013): • nominate three randomly stratified, permanent 200 m x 200 m sites across the Mt Tabor offset area, near areas of standing perennial freshwater water bodies • at each site, randomly select the start location of two 200 m transects (100 m apart) to run in an east-west direction and record the start locations via GPS. • traversing in an east-west direction, survey for the presence or absence of any cane toads or signs of 1 m either side of the transects in every 20 m section. • calculate an abundance score for transects at each site as the percentage of 'present' cane toads from the 20 sections along the two 200 m transects. • calculate the mean abundance score (and variance) across all transects in the offset site. If the variance exceeds 20% of the mean, more sites/transects are required. Targeted searches for cane toads will be during warmer months (September to March) after dark when the species is most active, on a suitably warm and wet night. However, targeted searches of water bodies will also be undertaken during day light when tadpoles are most active, and eggs can be easily identified.

7.6 Offset value assessments

7.6.1 Rapid monitoring event

Rapid monitoring events will be carried out each year monitoring events are not completed for habitat quality assessments (Section 7.6.2) and targeted fauna survey (Section 7.6.4)

These will be aligned with the offset area inspections (see Section 7.1) and carried out by suitably qualified ecologists during spring and early summer (October to January) to coincide with the optimal time of year for fauna in the Brigalow Belt Bioregion (Eyre *et al*., 2018).

During each rapid monitoring field assessment, the following will be conducted:

- Incidental fauna surveys including early morning and late evening bird surveys and other MNES species will be conducted throughout the day by the ecologists.
- Photos will be taken at designated and fixed photo monitoring points as outlined in Section 7.6.3. The locations of the fixed photo monitoring points are shown in Figure 8.

7.6.2 Habitat quality assessment

A detailed baseline assessment of habitat quality was completed between December 2020 and January 2021, including establishment of BioCondition sites in all major vegetation communities.

Vegetation condition and habitat quality for each MNES will be assessed generally in accordance with the *Guide to Determining Terrestrial Habitat Quality* (version 1.3; DES, 2020) and the methods outlined in Appendix F. In order to be consistent with the requirements under the EPBC Act guideline for the offsets assessment guide the species habitat index component of the habitat quality score will be calculated based on the results of the targeted fauna surveys detailed in Section 7.6.4.

Fixed transects were established and assessed as part of the baseline in 2020, with additional transects proposed to be established as part of the year one habitat quality assessments to meet the minimum requirement for sites in accordance with the Guide to Determining Terrestrial Habitat Quality (version 1.3 (see Figure 8). BioCondition assessments will be undertaken at each of the transects in year one and then every two years for the first six years, and then every three years thereafter. As part of year one monitoring activities, monitoring points will be marked with a capped stake and a GPS location will be recorded.

The results of habitat quality assessments for subsequent years will include summary data from previous reporting years, presented to allow trend analysis of each of the measured attributes and assess progress towards achieving the interim performance targets and completion criteria.

7.6.3 Photo monitoring

Photo monitoring is a qualitative analysis technique that provides the opportunity for visual time series analysis of changes in vegetation composition, structure and integrity. In areas where active management is being undertaken, photo monitoring offers a simple and effective visual means by which to capture the response of the vegetation to management actions. Photo monitoring will be conducted at all habitat quality assessment sites presented in Figure 8, based on best practice photo monitoring techniques, see Appendix 4 of BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. (Eyre *et al*., 2015).

Photo monitoring will be undertaken as part of habitat quality assessments (Section 7.6.2) and rapid monitoring events (Section 7.6.1).

7.6.4 Targeted fauna surveys

Targeted fauna surveys will be conducted to assess the distribution and richness of the fauna offset values within the offset area. The targeted fauna survey methods focus on the MNES species that are unlikely to be detected effectively during the rapid assessment surveys due to cryptic behaviour or localised habitat requirements. Targeted surveys will be undertaken generally in accordance with recommended surveys guidelines from the Queensland and Commonwealth governments and/or other reputable published guidelines. Table 15 provides a summary of the proposed methodology, search effort and timing for targeted surveys. It is important to note that the proposed survey methodology will be reviewed prior to each survey event and if considered necessary will be modified to ensure they are based on the ecology, habitat requirements and behavioural aspects of the species of interest.

Targeted fauna surveys will be carried out in conjunction with habitat quality assessments in year 1 and then every two years for the first six years, and then every three years thereafter.

Table 15: Fauna Species Survey Methods

Technique	Regime	Target and method
Elliot B (box trap) or cage trap	Four per site over four consecutive nights, checked early morning, reopened late afternoon.	Baited with a mixture of oats, peanut butter, vegetable oil and sardines. Placed within suitable micro-habitat for northern quoll.
Funnel trap	Six at each of five trap sites over four consecutive nights, checked early morning and afternoon.	Placed in pairs either side along a 30m drift-fence. Targeting Dunmall's snake and collared delma.
Anabat	Three units overnight for four consecutive nights	Left overnight on site near entrances to possible roost sites for large-eared pied bat, if considered present, and/or along flyways and near waterbodies.
Harp trap	Two per night for four consecutive nights, locations chosen based on presence of suitable flyways	Targeting south-eastern long-eared bat, which is not identifiable by ultrasonic calls, and the large-eared pied bat.
Camera trap	10 over at least 14 consecutive nights	Focused on stations baited with a mixture of oats, peanut butter, vegetable oil and sardines. Targeting northern quoll and possibly yakka skink. (Meek *et al.*, 2014).
Spotlighting	On foot	Targeting koala and Dunmall's snake.
Spotlighting	Rocky areas.	Targeting northern quoll and collared delma.
Spotlighting	By vehicle along tracks.	Targeting Dunmall's snake and koala.
Scat search	Conducted in habitat considered suitable for target species.	Targeting koala and northern quoll. The Spot Assessment Technique (SAT), or a variation, were used to survey for koalas within suitable habitat within the site.
Bird survey	At waterbodies.	Targeting squatter pigeon (southern).
Bird survey	Meander along watercourses during the day.	Targeting nest sites for red goshawk. Includes diurnal koala search.
Track traverse	By vehicle and on foot.	Targeting squatter pigeon (southern).
Diurnal herpetofauna search	Late morning/early afternoon.	Conducted by two searchers, duration is determined by site-specific habitat quality and presence of suitable micro-habitat. Targeting collared delma, Dunmall's snake and yakka skink.

147°34'0"E 147°36'0"E 147°38'0"E 147°40'0"E 147°42'0"E

25°6'0"S 25°8'0"S 25°10'0"S 25°12'0"S 25°14'0"S

6CHS25 MTB10 MTB09 MTB08 MTB23 MTB05 MTB12 MTB06 MTB11 MTB13 MTB14 MTB07 MTB22 MTB38 MTB15 MTB21 MTB37 MTB41 MTB32 MTB16 MTB26 MTB42 MTB34 MTB04 6CHS25 MTB17 6CHS25 MTB25 MTB30 MTB20 MTB36 MTB03 MTB43 MTB44 MTB29 MTB24 MTB40 MTB02 MTB35 MTB31 MTB18 MTB19 MTB27 MTB45 MTB33 MTB39 MTB01 MTB28 MTB40 6CHS25 6CHS25 6CHS25

SANTOS

Location diagram

Figure 8
Monitoring sites

Mt Tabor - 6CHS25
Mt Tabor offset area
Access tracks

BioCondition sites
Outside offset (existing)
Within offset (existing)
Within offset (new)

Ground-truthed REs
11.3.2
11.3.39
11.10.4
11.10.6
11.10.7
11.10.11
11.10.13

0 0.5 1 1.5 2
Kilometres

N

CO2 Australia

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data

Date: 6/10/2022 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:50,000@A3

Path: P:\GISData\Projects\Santos\919_220609_Updated_Mt_Tabor\Figure 8 - Monitoring sites.mxd

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8.0 Reporting

8.1 Reporting

A report detailing the progress of the offset area in achieving the interim performance targets and completion criteria will be prepared for each management year by the suitably qualified ecologist responsible for conducting the monitoring. The report will contain, at a minimum:

- a description of the monitoring conducted, when it was conducted, and by whom
- a discussion of the weather in the lead up to and during the monitoring
- results of monitoring events conducted
- an overview of the management actions implemented since the last report
- a description of the performance criteria not met, any triggers that have been exceeded and the corrective actions that were implemented
- an indication of any risks or potential threats that have become apparent to the management area since the development of this management plan, and activities to be undertaken to manage these threats and/or risks
- progress towards achieving the interim performance targets and completion criteria.

8.2 Update of OAMP

The OAMP will be reviewed, audited and updated every 5 years. In addition, the OAMP will be updated in accordance with the principles of adaptive management, if required, to incorporate any changes identified through management activities, site visits and monitoring activities. This may include the revision of current management actions, identification of additional activities (including monitoring activities) and responses to adaptive management triggers, other environmental threats to the offset area, information obtained through research programs.

9.0 Implementation schedule

Table 16 and Table 17 summarise the implementation schedule for the management, monitoring and reporting activities presented in this OAMP. Santos will be wholly responsible for the implementation of this OAMP and reporting on the performance of the offset area in meeting the offset obligations under EPBC Approval 2012/6615 and Section 4.0 of this OAMP.

Table 16: Implementation of management actions

Activity		Management years ✓ Activity required ▪ Activity to be carried out as required																				Timing	Related monitoring
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
General restrictions (Section 6.2.1)	Access, vehicles, vegetation clearing, weed hygiene	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	At all times	General offset inspections (Section 7.1)
Access tracks (Section 6.2.2)	Maintenance/new tracks	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required	
Fencing (Section 6.2.3	Construction of additional fencing to support livestock exclusion and strategic grazing	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required	
	Maintenance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		
Fire management (Section 6.2.4)	Fuel hazard reduction burns	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required	Biomass monitoring (Section 7.2)
Grazing (Section 6.2.4.1)	Strategic grazing	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required based on the results of biomass monitoring, and informed by weed monitoring	Biomass monitoring (Section 7.2) Weed monitoring (Section 7.4)
Weed management (Section 6.2.5)	Invasive grasses and broadleaf weeds	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	Control activities in addition to strategic grazing to be undertaken as required	Weed monitoring (Section 7.4)
Pest animal management (Section 6.2.6)	Wild dog, feral cat, fox, pig, rabbit, cane toad and feral horse	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	Control activities to be undertaken as required	Pest animal monitoring (Section 7.5)
Reporting (Section 8.0)	Annual reporting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Annual reports to be prepared each year.	Reporting (Section 8.0)
	Update OAMP					▪					▪					▪					▪	The OAMP will be reviewed, audited and updated every 5 years.	

Table 17: Implementation of monitoring events

Survey or monitoring objective	Monitoring activity	Management years ✓ Activity required ▪ Activity to be carried out as required																				Timing	Survey/monitoring guidelines	Reliability
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Offset area inspections (Section 7.1)	Twice yearly inspections of to enable a general assessment of the offset area and identify any potential issues that may require remedial action. See Section 7.1 for the criteria to be assessed as part of each inspection.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Inspections will be undertaken at least twice a year. Usually at the end of the wet season and the end of the dry season, with one of the inspections occurring prior to the submission of the annual report.	See Section 7.1 for a list of potential issues to be inspected.	General assessment of the offset management areas to identify any potential issues that may require remedial action to be undertaken.
Biomass monitoring (Section 7.2)	Biomass monitoring for fire management and to inform strategic grazing regime.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Twice every year at the end of the wet season (April) and towards the end of the dry season (October).	Assessment against Future Beef photo standards (Section 7.2)	Methodology developed by the Queensland Government.
Fuel load monitoring (Section 7.3)	Assessment of the fuel hazard rating within the offset area to inform fire management strategies.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Annually at the end of the wet season (April).	Overall Fuel Hazard Assessment Guide (Hines *et al.* 2010; Appendix E)	Method developed by the Victorian Government.
Weed monitoring (Section 7.4)	Ongoing weed surveys to assess the effectiveness of weed control.	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		Every two years post wet season.	NSW Guidelines for Monitoring weed Control and recovery of native vegetation (Auld 2009). Photo monitoring of selected sites to assess visual changes in weed species and infestations over time. The use of precision unmanned aerial vehicles (drone) technology, aerial imagery and/or remote sensing.	Assessment will be undertaken generally in accordance with published, reputable guidelines.
Pest animal monitoring (Section 7.5)	Ongoing pest animal surveys to assess the effectiveness of pest animal control.	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		Every two years post wet season.	Monitoring method outlined in Section 7.5.	Assessment undertaken generally in accordance with published monitoring techniques developed by the NSW Government.

Survey or monitoring objective	Monitoring activity	Management years ✓ Activity required ▪ Activity to be carried out as required																				Timing	Survey/monitoring guidelines	Reliability
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Offset value assessments	Rapid monitoring events		✓		✓		✓	✓		✓	✓		✓	✓		✓	✓		✓	✓		Each year monitoring events are not completed for habitat quality assessments (Section 7.6.2), targeted fauna survey (Section 7.6.4).	See Section 7.6.1	
	Assessment of vegetation condition and habitat quality	✓		✓		✓			✓			✓			✓			✓			✓	Year one, and then every two years for the first six years, and then every three years thereafter.	Guide to Determining Terrestrial Habitat Quality version 1.3 and the methods outlined in Appendix F.	Assessment undertaken in accordance with method developed by the Queensland Government and aligns with the EPBC Act *Environmental Offsets Policy* measure of 'habitat quality' and is intended to provide a consistent framework for environmental offsets in Queensland.
	Photo monitoring	✓		✓		✓			✓			✓			✓			✓			✓		Photos at each photo monitoring point will be taken in a north, east, south and westerly direction. A record of the photographs will be maintained, including GPS co-ordinates, date and time of each photograph and the direction in which the photograph was taken.	Based on best practice photo monitoring techniques, see Appendix 4 of BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. (Eyre *et al.,* 2015).
	Targeted fauna surveys	✓		✓		✓			✓			✓			✓			✓			✓		See methods outlined in Section 7.6.4.	Techniques for fauna surveys are based on recommended survey guidelines published by the Queensland and Commonwealth governments.

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APPENDIX A

Offsets Assessment Guides for the Mt Tabor offset area

Table A1 summarises the offsets assessment guide inputs for each MNES to be offset on Mt Tabor. The inputs included in the offsets assessment guides are based on the following justifications.

Quality of impact area

The habitat quality of the impact area for each MNES was assessed based on the outcomes of detailed field surveys undertaken between September 2020 and February 2021 (Boobook, 2021b). Assessments of the impact area included:

- Regional Ecosystem (RE) and Threatened Ecological Community (TEC) assessment
- BioCondition assessments in accordance with *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual* (Eyre et al, 2015).
- Threatened species habitat assessment and mapping, including assessment of essential and general habitat using definitions provided in the Santos Fauna Habitat model (Aurecon 2014)

Habitat quality scoring was undertaken generally in accordance with the method described in Appendix C of the acquittal summary (Santos, 2021). This method has been developed based on a combination of assessment methods outlined in the Queensland Herbarium's BioCondition Manual and the *Guide to Determining Terrestrial Habitat Quality* (version 1.3; DES, 2020) to be consistent with the requirements under the EPBC Act guideline for the offsets assessment guide.

Quality of offset area

A baseline habitat quality score for each MNES offset value was determined generally in accordance with the *Guide to Determining Terrestrial Habitat Quality* (version 1.3; DES, 2020) based on the results of the detailed field assessments of the Mt Tabor offset area (see Section 2.4). The baseline habitat quality method is described in Appendix F, with scores derived from that method detailed in Appendix B of this OAMP. The offset area on Mt Tabor is based on ground-truthed vegetation mapping undertaken on Mt Tabor, matching to known or potential habitat associations for each MNES.

Future quality without offset management

Based on a business as usual scenario without offset management, habitat quality scores on Mt Tabor are not expected to change.

Future quality with offset management

The Mt Tabor offset area will be secured and managed to improve the quality of vegetation communities and habitat for MNES. The Mt Tabor OAMP will be implemented and includes specific management actions aimed at reducing the scope and severity of species-specific threats to each MNES, the impact of threatening processes and improving the quality of MNES habitat within the offset area (see Section 6.2). This includes:

- Pest animal control
- Livestock management
- Weed control
- Fire management
- Access restrictions.

Confidence in result – future quality

The OAMP has been developed in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for the species, and negotiations with the landholder. The OAMP details specific management outcomes aimed at improving the quality of MNES habitat. Ongoing monitoring of the offset area will also be undertaken to regularly assess the progress of the offset and ensure the offset area management plans achieves its required outcomes. The OAMP will support an efficient, effective, timely, transparent, scientifically robust and reasonable approach to managing and monitoring the offset area.

Risk of loss without offset

Risk of loss without offset is 0%.

Risk of loss with offset

The offset area will be secured through declaration as an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999*, therefore the risk of loss is 0%.

Confidence in result – risk of loss

The legally binding mechanism will be registered on the land title and bind all current and future land owners to ensure that the offset is protected.

Time over which loss is averted (years)

The offset area will be protected by a legally binding mechanism which will remain in effect as required by the applicable Commonwealth legislative requirements, therefore, the time over which loss is averted is considered to be the maximum allowable time of 20 years.

Time until ecological benefit (years)

The implementation of site-specific land management actions through the development and application of an OAMP is expected to increase the quality of the offset area by improving vegetation condition and reducing potential threats to MNES. An ecological benefit is expected to be realised in 20 years.

Table A1: Summary of offsets assessment guide inputs for each MNES

Inputs		South-eastern long-eared bat	Collared delma	Yakka skink	Northern quoll	Large-eared pied bat	Red goshawk	Dunmall's snake	Squatter pigeon (southern)	Koala
Impact	Area (ha)	491.1	482.7	487.1	291.9	367.9	491.1	486.7	486.1	346.1
	Quality	7	7	7	6	7	6	7	7	7
Offset start hectares (ha)		4,473.0	4,473.0	4,437.8	4,473.0	4,473.0	4,473.0	4,473.0	4,473.0	4,473.0
Offset quality	Start quality	8	7	7	7	8	8	7	8	8
	Future quality without offset	8	7	7	7	8	8	7	8	8
	Future quality with offset	9	8	8	8	9	9	8	9	9
	Confidence in result (%)	80	80	80	80	80	80	80	80	80
Risk of loss	Without offset	0	0	0	0	0	0	0	0	0
	With offset	0	0	0	0	0	0	0	0	0
	Confidence in result (%)	90	90	90	90	90	90	90	90	90
Risk related time horizon/time over which loss is averted (max. 20 years)		20	20	20	20	20	20	20	20	20
Time until ecological benefit		20	20	20	20	20	20	20	20	20

APPENDIX B

Baseline habitat quality score for the Mt Tabor offset area

Table B1: Baseline habitat quality score for Mt Tabor offset area (sites MTB01 to MTB24)

Site ID				MTB01	MTB02	MTB03	MTB04	MTB05	MTB06	MTB07	MTB08	MTB09	MTB10	MTB11	MTB12	MTB13	MTB14	MTB15	MTB16	MTB17	MTB18	MTB19	MTB20	MTB21	MTB22	MTB23	MTB24
RE				11.3.39	11.3.2	11.10.6	11.10.4	11.10.6	11.3.2	11.3.39	11.10.4	11.10.4	11.10.11	11.10.6	11.10.11	11.10.7	11.10.13	11.3.2	11.10.13	11.3.39	11.3.39	11.10.13	11.10.13	11.10.7	11.10.6	11.10.7	11.10.11
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*
Site condition	Total number of large trees	15	19%	15	15	15	15	10	15	15	5	5	10	10	10	15	15	10	5	15	15	5	5	15	15	15	15
	Canopy height	5	6%	5	5	3	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	2.5	1.5	5	4	4	5
	Recruitment of canopy sp.	5	6%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	5	5	5	5	5
	Canopy cover	5	6%	4	5	2	3.5	3.5	5	4	4	4	5	5	4	2.5	5	5	2	2.5	3.5	2.5	2.5	2.5	5	5	4
	Shrub canopy cover	5	6%	0	0	0	5	5	3	0	3	3	3	3	5	3	3	3	5	5	3	5	5	5	5	3	3
	Woody debris length	5	6%	3	2	5	2	5	2	3	2	5	5	5	5	5	5	2	5	0	0	2	2	2	3	0	2
	Native sp. richness	20	25%	10	15	10	17.5	12.5	17.5	15	17.5	20	15	20	17.5	15	20	15	12.5	12.5	15	15	10	17.5	17.5	20	15
	Non-native plant cover	10	13%	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	5	10	10	10	10	10	10	10
	Native perennial grass cover	5	6%	1	5	3	5	5	3	5	1	3	1	5	5	3	1	1	3	5	3	3	5	1	5	1	5
	Litter cover	5	6%	3	5	3	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5
	Total/80	**80**	**100%**	**51**	**67**	**56**	**73**	**66**	**70.5**	**67**	**57.5**	**64**	**64**	**73**	**71.5**	**68.5**	**72**	**61**	**57.5**	**60**	**64.5**	**50**	**51**	**68**	**74.5**	**68**	**69**
Northern quoll																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
	Total/45	45	100%	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9
Species habitat index	Quality as foraging habitat	5	17%	4	4	3	4	4	4	3	4	3	3	3	3	4	5	4	4	4	4	4	3	3	4	3	4
	Quality as shelter, breeding habitat	5	17%	3	3	3	3	3	3	3	3	3	3	3	4	2	4	3	3	3	3	2	2	3	3	3	3
	Quality as mobility habitat	5	17%	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	13.3	13.3	12.7	13.3	13.3	13.3	12.7	13.3	12.7	12.7	12.7	13.3	12.7	15.3	13.3	13.3	13.3	13.3	12.7	12.0	12.7	13.3	12.7	13.3
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9
	Species habitat index	20	40%	13.3	13.3	12.7	13.3	13.3	13.3	12.7	13.3	12.7	12.7	12.7	13.3	12.7	15.3	13.3	13.3	13.3	13.3	12.7	12.0	12.7	13.3	12.7	13.3

Santos

Site ID				MTB01	MTB02	MTB03	MTB04	MTB05	MTB06	MTB07	MTB08	MTB09	MTB10	MTB11	MTB12	MTB13	MTB14	MTB15	MTB16	MTB17	MTB18	MTB19	MTB20	MTB21	MTB22	MTB23	MTB24
RE				11.3.39	11.3.2	11.10.6	11.10.4	11.10.6	11.3.2	11.3.39	11.10.4	11.10.4	11.10.11	11.10.6	11.10.11	11.10.7	11.10.13	11.3.2	11.10.13	11.3.39	11.3.39	11.10.13	11.10.13	11.10.7	11.10.6	11.10.7	11.10.11
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*
	Total /10	145	100%	6.8	7.4	6.9	7.7	7.4	7.6	7.3	7.1	7.2	7.2	7.5	7.6	7.4	8.0	7.2	7.1	7.2	7.3	6.7	6.6	7.3	7.7	7.3	7.5
	Total /10 (rounded)			**7**	**7**	**7**	**8**	**7**	**8**	**7**	**7**	**7**	**7**	**8**	**8**	**7**	**8**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**8**	**7**	**8**
Koala																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	Total/45	45	100%	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7
Species habitat index	Quality as foraging habitat	5	17%	4	4	4	5	4	4	4	4	4	4	4	4	5	3	4	4	4	4	4	3	4	4	3	4
	Quality as shelter, breeding habitat	5	17%	4	4	4	5	4	4	4	4	4	4	4	4	5	4	4	3	4	3	4	3	4	4	4	4
	Quality as mobility habitat	5	17%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	4	5
	Role of the site population in regards to the overall species population	5	50%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Total/20	20	100%	16.0	16.0	16.0	17.3	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	17.3	15.3	16.0	15.3	16.0	15.3	16.0	14.7	16.7	16.7	15.3	16.7
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7
	Species habitat index	20	40%	16.0	16.0	16.0	17.3	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	17.3	15.3	16.0	15.3	16.0	15.3	16.0	14.7	16.7	16.7	15.3	16.7
	Total /10	145	100%	7.7	8.3	7.9	8.8	8.3	8.4	8.3	7.9	8.2	8.2	8.5	8.5	8.6	8.3	8.1	7.8	8.0	8.1	7.7	7.4	8.5	8.7	8.2	8.5
	Total /10 (rounded)			**8**	**8**	**8**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**9**	**8**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**7**	**8**	**9**	**8**	**9**
Large-eared pied bat																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Total/45	45	100%	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
Species habitat index	Quality as foraging habitat	5	17%	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Quality as shelter, breeding habitat	5	17%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Quality as mobility habitat	5	17%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	14.0	14.0	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7

Santos

Site ID				MTB01	MTB02	MTB03	MTB04	MTB05	MTB06	MTB07	MTB08	MTB09	MTB10	MTB11	MTB12	MTB13	MTB14	MTB15	MTB16	MTB17	MTB18	MTB19	MTB20	MTB21	MTB22	MTB23	MTB24
RE				11.3.39	11.3.2	11.10.6	11.10.4	11.10.6	11.3.2	11.3.39	11.10.4	11.10.4	11.10.11	11.10.6	11.10.11	11.10.7	11.10.13	11.3.2	11.10.13	11.3.39	11.3.39	11.10.13	11.10.13	11.10.7	11.10.6	11.10.7	11.10.11
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
	Species habitat index	20	40%	14.0	14.0	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	Total /10	145	100%	7.4	8.0	7.7	8.4	8.1	8.3	8.1	7.8	8.0	8.0	8.4	8.3	8.2	8.3	7.9	7.8	7.9	8.1	7.5	7.5	8.2	8.4	8.2	8.2
	Total /10 (rounded)			**7**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**
South-eastern long-eared bat																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	Total/45	45	100%	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8
Species habitat index	Quality as foraging habitat	5	17%	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Quality as shelter, breeding habitat	5	17%	5	3	4	4	4	3	4	4	2	4	3	4	4	4	3	3	2	2	1	1	3	3	1	4
	Quality as mobility habitat	5	17%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5	5	4	5
	Role of the site population in regards to the overall species population	5	50%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Total/20	20	100%	16.7	15.3	16.7	16.7	16.7	16.0	16.7	16.7	15.3	16.7	16.0	16.7	16.7	16.7	16.0	16.0	15.3	15.3	14.0	14.0	16.0	16.0	14.0	16.7
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8
	Species habitat index	20	40%	16.7	15.3	16.7	16.7	16.7	16.0	16.7	16.7	15.3	16.7	16.0	16.7	16.7	16.7	16.0	16.0	15.3	15.3	14.0	14.0	16.0	16.0	14.0	16.7
	Total /10	145	100%	8.1	8.4	8.3	8.9	8.7	8.7	8.7	8.3	8.3	8.6	8.8	8.9	8.8	8.9	8.3	8.2	8.2	8.3	7.5	7.6	8.6	8.8	8.2	8.8
	Total /10 (rounded)			**8**	**8**	**8**	**9**	**9**	**9**	**9**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**9**	**9**	**8**	**9**
Red goshawk																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Total/45	45	100%	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6

Santos

Site ID				MTB01	MTB02	MTB03	MTB04	MTB05	MTB06	MTB07	MTB08	MTB09	MTB10	MTB11	MTB12	MTB13	MTB14	MTB15	MTB16	MTB17	MTB18	MTB19	MTB20	MTB21	MTB22	MTB23	MTB24
RE				11.3.39	11.3.2	11.10.6	11.10.4	11.10.6	11.3.2	11.3.39	11.10.4	11.10.4	11.10.11	11.10.6	11.10.11	11.10.7	11.10.13	11.3.2	11.10.13	11.3.39	11.3.39	11.10.13	11.10.13	11.10.7	11.10.6	11.10.7	11.10.11
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*
Species habitat index	Quality as foraging habitat	5	17%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Quality as shelter, breeding habitat	5	17%	3	3	1	3	3	3	3	3	3	3	3	3	3	2	2	1	2	3	3	1	3	4	2	2
	Quality as mobility habitat	5	17%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	13.3	13.3	12.0	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	12.7	12.7	12.0	12.7	13.3	13.3	12.0	13.3	14.0	12.7	12.7
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6
	Species habitat index	20	40%	13.3	13.3	12.0	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	12.7	12.7	12.0	12.7	13.3	13.3	12.0	13.3	14.0	12.7	12.7
	Total /10	145	100%	7.0	7.6	6.9	7.8	7.6	7.8	7.6	7.3	7.5	7.5	7.8	7.8	7.7	7.7	7.3	7.0	7.2	7.5	7.0	6.8	7.7	8.0	7.5	7.6
	Total /10 (rounded)			**7**	**8**	**7**	**8**	**8**	**8**	**8**	**7**	**8**	**8**	**8**	**8**	**8**	**8**	**7**	**7**	**7**	**8**	**7**	**7**	**8**	**8**	**8**	**8**
Squatter pigeon (southern)																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	Total/45	45	100%	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3
Species habitat index	Quality as foraging habitat	5	17%	4	5	4	4	4	5	4	4	5	3	4	3	4	3	4	4	4	4	4	3	4	4	4	4
	Quality as shelter, breeding habitat	5	17%	5	5	5	4	5	5	5	5	5	4	4	5	4	5	4	4	4	4	4	4	4	4	4	4
	Quality as mobility habitat	5	17%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Role of the site population in regards to the overall species population	5	50%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Total/20	20	100%	17.3	18.0	17.3	16.7	17.3	18.0	17.3	17.3	18.0	16.0	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.0	16.7	16.7	16.7	16.7
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3
	Species habitat index	20	40%	17.3	18.0	17.3	16.7	17.3	18.0	17.3	17.3	18.0	16.0	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.0	16.7	16.7	16.7	16.7
	Total /10	145	100%	7.9	8.7	8.1	8.6	8.5	8.8	8.5	8.2	8.6	8.2	8.6	8.6	8.5	8.6	8.2	8.0	8.1	8.3	7.8	7.7	8.4	8.7	8.4	8.5

Santos

Site ID				MTB01	MTB02	MTB03	MTB04	MTB05	MTB06	MTB07	MTB08	MTB09	MTB10	MTB11	MTB12	MTB13	MTB14	MTB15	MTB16	MTB17	MTB18	MTB19	MTB20	MTB21	MTB22	MTB23	MTB24
RE				11.3.39	11.3.2	11.10.6	11.10.4	11.10.6	11.3.2	11.3.39	11.10.4	11.10.4	11.10.11	11.10.6	11.10.11	11.10.7	11.10.13	11.3.2	11.10.13	11.3.39	11.3.39	11.10.13	11.10.13	11.10.7	11.10.6	11.10.7	11.10.11
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*
	Total /10 (rounded)			**8**	**9**	**8**	**9**	**8**	**9**	**9**	**8**	**9**	**8**	**9**	**9**	**8**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**9**	**8**	**8**
Collared delma																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Total/45	45	100%	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9
Species habitat index	Quality as foraging habitat	5	17%	4	4	3	4	4	4	4	4	3	3	4	4	3	4	3	3	4	4	4	3	3	4	4	3
	Quality as shelter, breeding habitat	5	17%	4	4	4	4	4	4	4	4	3	4	3	3	3	5	3	3	2	3	3	3	3	4	2	3
	Quality as mobility habitat	5	17%	4	4	3	4	4	4	4	4	4	4	4	4	4	5	4	4	3	4	4	3	4	5	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	14.0	14.0	12.7	14.0	14.0	14.0	14.0	14.0	12.7	13.3	13.3	13.3	12.7	15.3	12.7	12.7	12.0	13.3	13.3	12.0	12.7	14.7	12.7	12.7
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9
	Species habitat index	20	40%	14.0	14.0	12.7	14.0	14.0	14.0	14.0	14.0	12.7	13.3	13.3	13.3	12.7	15.3	12.7	12.7	12.0	13.3	13.3	12.0	12.7	14.7	12.7	12.7
	Total /10	145	100%	7.2	7.8	7.1	8.0	7.7	7.9	7.8	7.4	7.4	7.5	7.9	7.8	7.6	8.2	7.3	7.1	7.1	7.5	7.0	6.8	7.5	8.2	7.5	7.6
	Total /10 (rounded)			**7**	**8**	**7**	**8**	**8**	**8**	**8**	**7**	**7**	**8**	**8**	**8**	**8**	**8**	**7**	**7**	**7**	**8**	**7**	**7**	**8**	**8**	**8**	**8**
Yakka skink																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
	Total/45	45	100%	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6
Species habitat index	Quality as foraging habitat	5	17%	3	4	3	3	3	4	3	3	3	3	4	4	3	3	3	3	3	3	4	3	3	4	3	3
	Quality as shelter, breeding habitat	5	17%	4	3	3	3	3	3	2	2	3	3	3	3	3	3	2	2	1	3	3	1	2	2	2	2
	Quality as mobility habitat	5	17%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	4	4	3	4	4	4	4

Santos

Site ID				MTB01	MTB02	MTB03	MTB04	MTB05	MTB06	MTB07	MTB08	MTB09	MTB10	MTB11	MTB12	MTB13	MTB14	MTB15	MTB16	MTB17	MTB18	MTB19	MTB20	MTB21	MTB22	MTB23	MTB24
RE				11.3.39	11.3.2	11.10.6	11.10.4	11.10.6	11.3.2	11.3.39	11.10.4	11.10.4	11.10.11	11.10.6	11.10.11	11.10.7	11.10.13	11.3.2	11.10.13	11.3.39	11.3.39	11.10.13	11.10.13	11.10.7	11.10.6	11.10.7	11.10.11
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	13.3	13.3	12.7	12.7	12.7	13.3	12.0	12.0	12.7	12.7	13.3	13.3	12.7	12.7	11.3	11.3	10.7	12.7	13.3	10.7	12.0	12.7	12.0	12.0
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6
	Species habitat index	20	40%	13.3	13.3	12.7	12.7	12.7	13.3	12.0	12.0	12.7	12.7	13.3	13.3	12.7	12.7	11.3	11.3	10.7	12.7	13.3	10.7	12.0	12.7	12.0	12.0
	Total /10	145	100%	6.6	7.2	6.7	7.3	7.0	7.4	7.0	6.6	7.0	7.0	7.4	7.4	7.1	7.3	6.6	6.5	6.4	7.0	6.6	6.1	7.0	7.4	7.0	7.0
	Total /10 (rounded)			**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**7**	**7**	**6**	**7**	**7**	**7**	**7**
Dunmall's snake																											
Site context	Patch size	10	25%	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Connectivity	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Context	5	13%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Absence of threats	25	50%	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Total/45	45	100%	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9
Species habitat index	Quality as foraging habitat	5	17%	4	3	3	4	4	4	4	4	3	3	3	4	4	3	3	3	4	4	4	3	3	4	3	3
	Quality as shelter, breeding habitat	5	17%	5	3	3	4	3	4	3	3	3	4	3	4	3	3	3	3	2	3	3	1	2	3	2	2
	Quality as mobility habitat	5	17%	5	4	4	5	5	5	5	5	4	4	4	4	5	4	4	4	3	4	4	4	4	4	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	15.3	12.7	12.7	14.7	14.0	14.7	14.0	14.0	12.7	13.3	12.7	14.0	14.0	12.7	12.7	12.7	12.0	13.3	13.3	11.3	12.0	13.3	12.0	12.0
Habitat quality score	Site condition	80	30%	51	67	56	73	66	70.5	67	57.5	64	64	73	71.5	68.5	72	61	57.5	60	64.5	50	51	68	74.5	68	69
	Site context	45	30%	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9
	Species habitat index	20	40%	15.3	12.7	12.7	14.7	14.0	14.7	14.0	14.0	12.7	13.3	12.7	14.0	14.0	12.7	12.7	12.7	12.0	13.3	13.3	11.3	12.0	13.3	12.0	12.0
	Total /10	145	100%	7.4	7.5	7.1	8.1	7.7	8.0	7.8	7.4	7.4	7.5	7.7	7.9	7.8	7.7	7.3	7.1	7.1	7.5	7.0	6.6	7.4	7.9	7.4	7.4
	Total /10 (rounded)			**7**	**8**	**7**	**8**	**8**	**8**	**8**	**7**	**7**	**8**	**8**	**8**	**8**	**8**	**7**	**7**	**7**	**8**	**7**	**7**	**7**	**8**	**7**	**7**

*rem = remnant vegetation.

Table B2: Scoring for known or potential threats to threatened fauna species on Mt Tabor contributing to habitat quality score

Species	Potential or known threats to species occurring on Mt Tabor to be addressed in OAMP	Scope	Severity	Score	Contributing to habitat quality score*
Northern quoll (*Dasyurus hallucatus*)	Poisoning through ingestion of cane toads (Rhinella marina)	1	2	2	Yes
	Loss of ground cover as a consequence of unsuitable fire, resulting in risk of increased predation and/or reduced food	4	4	16	Yes
	Loss of ground cover as a consequence of livestock grazing	5	4	20	Yes
	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Alteration of habitat suitability through the presence and extent of non-native, invasive weeds	5	5	25	-
	Predation by feral predators (e.g., cats, foxes, wild dogs)	5	5	25	-
	Poisoning through 1080 baiting	5	5	25	-
	Total/25 (contributing to habitat quality score)			**13**	
Koala (*Phascolarctos cinereus*)	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Mortality due to vehicle collision	5	5	25	-
	Predation by feral predators, particularly wild or domesticated dogs	5	4	20	Yes
	Alteration of the structure of suitable habitat, including loss of primary feed trees, as well as direct mortality as a consequence of unsuitable fire regime	4	4	16	Yes
	Evidence for the presence of disease within the population (i.e., Chlamydia pecorum)				-
	Total/25 (contributing to habitat quality score)			**18**	
Large-eared pied bat (*Chalinolobus dwyeri*)	Potential of reduced foraging opportunities and flying invertebrate productivity as a consequence of unsuitable fire regime	4	5	20	Yes
	Predation by feral predators (e.g., foxes)	5	5	25	-
	Loss of sandstone roosting/maternity sites, whether through occupation by pest animal species (e.g., goats) or impacts to structural integrity from uncontrolled wildfire	5	5	25	-
	Total/25 (contributing to habitat quality score)			**20**	
South-eastern long-eared bat (*Nyctophilus corbeni*)	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Alteration of the structure of suitable habitat (e.g. mix of shrubby and open structure habitat) including loss of hollow-bearing trees as a consequence of unsuitable fire regime	4	5	20	Yes
	Impacts on understorey habitat as a consequence of livestock grazing, impacting habitat for understorey invertebrate prey	5	5	25	Yes
	Competition for hollows from native fauna species (e.g., parrots and cockatoos) and non-native fauna species (e.g., European honeybees, common myna), especially where hollows are limited	5	5	25	-
	Total/25 (contributing to habitat quality score)			**23**	
Red goshawk (*Erythrotriorchis radiatus*)	Loss of suitable foraging habitat through land clearing and effects associated with fragmentation of large contiguous patches of forest and woodland, particularly large trees in alluvial valleys	4	4	16	Yes
	Potential of reduced prey (e.g., medium sized birds) as a consequence of unsuitable fire regime	4	4	16	Yes
	Potential of reduced prey as a consequence of impacts such as grazing, reducing productivity	3	5	15	Yes
	Total/25 (contributing to habitat quality score)			**16**	
Squatter pigeon (southern) (*Geophaps scripta scripta*)	Change in ground layer composition as a consequence of grazing and ecosystem engineering actions by rabbits (e.g. burrowing, soil turnover)	5	5	25	-
	Change in ground layer composition and trampling ground nests as a consequence of livestock grazing and feral horse browsing, especially in grassy, alluvial areas	3	5	15	Yes
	Change in ground layer composition, including thickening of understorey structure, as a consequence of unsuitable fire regime	4	5	20	Yes
	Alteration of habitat suitability through the presence and extent of non-native, invasive weeds	5	5	25	-
	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Predation by feral predators (e.g., cats, foxes)	5	5	25	-
	Total/25 (contributing to habitat quality score)			**18**	
Collared delma (*Delma torquata*)	Alteration of ground cover as a consequence of unsuitable fire regime	4	4	16	Yes
	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Predation by feral predators (e.g., cats, foxes, wild dogs)	5	5	25	-

Species	Potential or known threats to species occurring on Mt Tabor to be addressed in OAMP	Scope	Severity	Score	Contributing to habitat quality score*
	Removal of foraging and shelter habitat (e.g., rocks, coarse woody debris, ground litter)	5	5	25	-
	Change in ground layer composition as a consequence of livestock grazing and feral horse browsing	5	5	25	-
	Alteration of habitat suitability through the presence and extent of non-native, invasive weeds	5	5	25	-
	Total/25 (contributing to habitat quality score)			**16**	
Yakka skink (*Egernia rugosa*)	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Predation by feral predators (e.g., cats, foxes, pigs)	5	5	25	-
	Removal of foraging and shelter habitat (e.g., rocks, coarse woody debris, ground litter)	5	5	25	-
	Destruction of potential shelter habitat associated with rabbit warren ripping	5	5	25	-
	Alteration of habitat suitability through the presence and extent of non-native, invasive weeds	5	5	25	-
	Alteration of ground cover as a consequence of unsuitable fire regime	3	3	9	Yes
	Total/25 (contributing to habitat quality score)			**9**	
Dunmall's snake (*Furina dunmalli*)	Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat	5	5	25	-
	Predation by feral predators (e.g., cats, foxes, pigs)	5	5	25	-
	Change in ground layer composition as a consequence of livestock grazing and feral horse browsing	5	5	25	-
	Alteration of habitat suitability through the presence and extent of non-native, invasive weeds	5	5	25	-
	Alteration of ground cover as a consequence of unsuitable fire regime	4	4	16	Yes
	Total/25 (contributing to habitat quality score)			**16**	

*Based on Habitat Quality scoring method described in Appendix F.

Table B3: Habitat quality scores for REs contributing to the offset area for each MNES

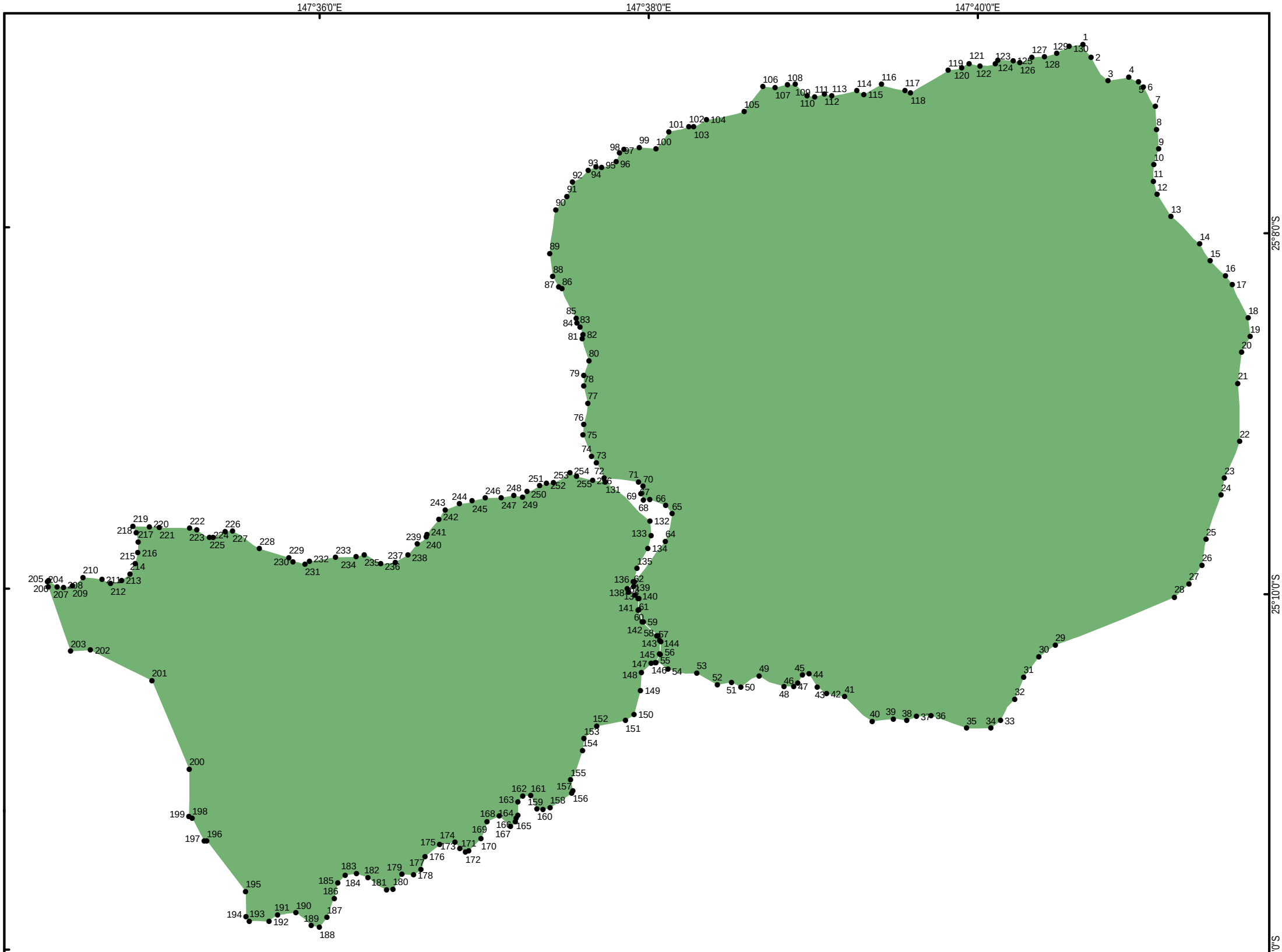
RE	Area (ha)	Average habitat quality score /10								
		Red goshawk	Squatter pigeon (southern)	Large-eared pied bat	Northern quoll	South-eastern long-eared bat	Koala	Collared delma	Yakka skink	Dunmall's snake
11.3.2	62.3	7.7	8.7	8.0	7.3	8.3	8.0	7.7	7.0	7.7
11.3.39	879.1	7.5	8.3	7.8	7.0	8.3	8.0	7.5	6.8	7.5
11.10.4	2,131.9	7.7	8.7	8.0	7.3	8.3	8.3	7.3	7.0	7.3
11.10.6	891.6	7.8	8.5	8.0	7.5	8.8	8.5	7.8	7.0	7.8
11.10.7	47.8	8.0	8.0	8.0	7.0	8.7	8.3	8.0	7.0	7.3
11.10.11	47.2	8.0	8.3	8.0	7.7	9.0	8.3	8.0	7.0	7.7
11.10.13	1,269.4	7.3	8.3	8.0	7.3	8.3	7.8	7.3	6.5	7.7

Table B4: Final area-weighted habitat quality score contribution for each MNES per RE

RE	Area (ha)	Contribution to final habitat quality score /10								
		Red goshawk	Squatter pigeon (southern)	Large-eared pied bat	Northern quoll	South-eastern long-eared bat	Koala	Collared delma	Yakka skink	Dunmall's snake
11.3.2	62.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
11.3.39	879.1	1.2	1.4	1.3	1.2	1.4	1.3	1.2	1.3	1.2
11.10.4	2,131.9	3.1	3.5	3.2	2.9	3.3	3.3	2.9	3.4	2.9
11.10.6	891.6	1.3	1.4	1.3	1.3	1.5	1.4	1.3	-	1.3
11.10.7	47.8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
11.10.11	47.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
11.10.13	1,269.4	1.7	2.0	1.9	1.7	2.0	1.8	1.7	1.9	1.7
Final habitat quality score		**8**	**8**	**8**	**7**	**8**	**8**	**7**	**7**	**7**

APPENDIX C

Mt Tabor offset area boundary coordinates (GDA94)



Coordinate	Easting	Northing	Coordinate	Easting	Northing	Coordinate	Easting	Northing	Coordinate	Easting	Northing	Coordinate	Easting
1	568287	7222035	46	565376	7215509	91	563015	7220481	136	563692	7216544	181	561174
2	568369	7221903	47	565331	7215476	92	563074	7220628	137	563634	7216472	182	560983
3	568541	7221663	48	565232	7215474	93	563231	7220749	138	563644	7216436	183	560865
4	568753	7221700	49	564976	7215581	94	563314	7220785	139	563710	7216408	184	560753
5	568852	7221652	50	564791	7215467	95	563369	7220778	140	563741	7216371	185	560677
6	568902	7221601	51	564696	7215519	96	563517	7220839	141	563741	7216253	186	560642
7	569024	7221403	52	564549	7215491	97	563554	7220925	142	563786	7216130	187	560563
8	569036	7221166	53	564341	7215611	98	563598	7220960	143	563934	7215990	188	560490
9	569057	7220967	54	564048	7215651	99	563754	7220981	144	563964	7215939	189	560405
10	569010	7220807	55	563927	7215716	100	563926	7220967	145	563959	7215802	190	560249
11	569006	7220634	56	563969	7215801	101	564054	7221141	146	563918	7215715	191	560063
12	569045	7220502	57	563976	7215934	102	564261	7221195	147	563876	7215708	192	559974
13	569186	7220276	58	563945	7215995	103	564311	7221193	148	563778	7215618	193	559771
14	569476	7219995	59	563797	7216135	104	564441	7221266	149	563768	7215434	194	559740
15	569587	7219822	60	563750	7216258	105	564823	7221346	150	563700	7215187	195	559734
16	569742	7219670	61	563751	7216369	106	565015	7221602	151	563614	7215124	196	559339
17	569810	7219585	62	563697	7216497	107	565141	7221593	152	563319	7215069	197	559311
18	569973	7219241	63	563704	7216547	108	565268	7221623	153	563191	7214943	198	559190
19	569993	7219051	64	564022	7216959	109	565346	7221625	154	563175	7214821	199	559156
20	569904	7218891	65	564090	7217238	110	565469	7221508	155	563054	7214517	200	559160
21	569866	7218570	66	564025	7217322	111	565544	7221500	156	563077	7214407	201	558778
22	569888	7217980	67	563862	7217384	112	565646	7221528	157	563066	7214380	202	558151
23	569730	7217602	68	563795	7217382	113	565722	7221507	158	562844	7214235	203	557949
24	569696	7217430	69	563770	7217443	114	565978	7221562	159	562770	7214216	204	557719
25	569542	7216978	70	563794	7217518	115	566047	7221524	160	562712	7214223	205	557711
26	569500	7216713	71	563746	7217564	116	566228	7221627	161	562645	7214359	206	557722
27	569366	7216522	72	563397	7217602	117	566469	7221563	162	562566	7214355	207	557808
28	569219	7216388	73	563318	7217760	118	566526	7221540	163	562517	7214293	208	557873
29	568003	7215899	74	563266	7217828	119	566911	7221770	164	562515	7214157	209	557967
30	567835	7215776	75	563179	7218047	120	567046	7221796	165	562496	7214126	210	558071
31	567681	7215568	76	563187	7218152	121	567123	7221841	166	562490	7214088	211	558267
32	567589	7215342	77	563228	7218367	122	567233	7221813	167	562440	7214043	212	558353
33	567443	7215126	78	563188	7218544	123	567392	7221841	168	562325	7214149	213	558470
34	567346	7215050	79	563186	7218653	124	567418	7221874	169	562199	7214092	214	558552
35	567096	7215048	80	563239	7218802	125	567572	7221870	170	562137	7213920	215	558607
36	566736	7215175	81	563172	7219028	126	567642	7221852	171	562011	7213795	216	558633
37	566586	7215168	82	563179	7219070	127	567764	7221902	172	561978	7213782	217	558638
38	566485	7215124	83	563149	7219150	128	567891	7221909	173	561921	7213819	218	558617
39	566349	7215141	84	563118	7219187	129	568017	7221941	174	561871	7213881	219	558581
40	566134	7215117	85	563112	7219235	130	568145	7222017	175	561716	7213855	220	558749
41	565851	7215370	86	562965	7219537	131	563407	7217564	176	561567	7213734	221	558854
42	565669	7215401	87	562931	7219558	132	563864	7217165	177	561524	7213601	222	559163
43	565573	7215467	88	562872	7219663	133	563875	7217017	178	561447	7213546	223	559235
44	565487	7215603	89	562841	7219898	134	563840	7216885	179	561332	7213555	224	559364
45	565418	7215590	90	562900	7220345	135	563732	7216680	180	561239	7213401	225	559404

GDA94 Zone 55 projection

SANTOS

Figure C1
Offset area coordinates

- Offset area co-ordinates
- Mt Tabor offset area

Location diagram

0 0.5 1 1.5 2
Kilometres

N

CO2 Australia

Date: 6/10/2022 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:45,000@A3

Path: P:\GISData\Projects\Santos\919_220609_Updated_Mt_Tabor\Figure C1 - Offset area co-ordinates.mxd

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APPENDIX D

Risk Assessment

Risk Assessment Summary

The following risk assessment assess the potential risk of failing to achieve the management objectives, interim performance targets and completion criteria for the offset area as outlined in this OAMP.

For each risk identified, the potential consequence of the risk (rated from 1 (no impact) to 6 (irreversible impact; Table D1) was assessed against the likelihood of that risk occurring (Table D2) to determine a risk rating. The risk rating was evaluated by using the matrix in Table D2.

The consequence and likelihood of each risk was first considered without the management measures in place to provide an initial risk rating. The consequence and likelihood of each risk occurring was then reassessed following the implementation of the management measures to provide a residual risk rating.

Table D3 provides the risk register which was used to document the findings of the risk assessment process.

Table D1: Consequence rating relative to offset value

	Consequence
I	No impact to MNES Value
II	Small-scale impact to MNES
III	Moderate-scale impact to MNES
IV	Large-scale impact to MNES
V	Extensive population or community scale impact to MNES
VI	Irreversible impact to MNES.

Santos

Table D2: Likelihood classification and risk matrix

Santos Risk Matrix

Santos

Consequence						
Safety	**Negligible Harm** + No bodily damage or minimal harm or impairment (hours to days)	**Minor Harm** + Short term impairment (days to weeks)	**Moderate Harm** + Temporary disablement or medium term impairment (weeks to months)	**Severe Harm** + Long term/life altering disablement or impairment	**Single Fatality OR Critical Life Threatening Injuries**	**Multiple Fatalities**
Environment	+ No impact to Environmental Value (EV).	+ Small-scale impact to EV(s) of conservation significance + Potential surface or groundwater impact.	+ Moderate-scale impact to EV(s) of conservation significance + Localised surface or groundwater impact.	+ Large-scale impact to EV(s) of conservation significance + Moderate-scale surface water impact; + Localised impact to groundwater with potential or known beneficial use.	+ Extensive population or community scale impact to EV(s) of conservation significance + Extensive impact to other EV(s).	+ Irreversible impact to EV(s).
Community & Reputation	+ No actual or potential community criticism + Details remain within Santos sites and/or offices	+ Minor level local community criticism (< week) + No reputation impact	+ Local community criticism (> week) or one-day community protest + Local company reputation impacted	+ State-level community criticism or protest over multiple days/locations + State-based company reputation impacted + Very short-term share price impact (< week)	+ National community criticism or large scale protest + Company reputation and approvals impacted + Shareholder intervention or short-term share price impact (< month)	+ Sustained national community criticism or widespread protest + Industry reputation and approvals impacted + Changes at executive/board level or long-term share price impact (> month)
Financial (A$)	< $30k	$30k to $300k	$300k to $3m	$3m to $30m	$30m to $300m	> $300m
Workforce	+ Will require some staff attention over several days. + No actual or potential impact to culture	+ Will require several days local management time. + Minor impact to employee engagement and limited staff turnover	+ Will require head office staff and take several weeks of site management time. + Moderate impact to employee engagement and staff turnover above industry average with some key roles	+ Will require several weeks of senior management time + Impact to employee engagement (< 6 months), moderate turnover of key roles and no succession	+ Will require several months of senior management time + Impact to employee engagement (< 18 months), high staff turnover and attraction issues	+ Will require more than a year of senior management involvement and operations severely disrupted + Impact to employee engagement (> 18 months), significant key role turnover and attraction issues
Compliance	+ Non-conformance with legislation, instruments (e.g. tenure licence) or contract + No regulatory or punitive action	+ Minor breach of legislation, instruments or contract + Notification/report to; request for information by; and/or administrative/ warning notice from the regulator + LOCI Tier 3 or non-hydrocarbon releases notifiable to the regulator	+ Limited number of minor breaches of legislation, instruments or contract + Statutory notice from the regulator + LOCI Tier 2 or non-hydrocarbon releases immediately reportable to the regulator	+ Systemic minor breaches (or one moderate breach) of legislation, instruments or contract + Company charged with an offence with minor penalty/fine + LOCI Tier 1 or cumulative regulator notification of non-hydrocarbon releases	+ Systemic moderate breaches (OR single material breach) of legislation, instruments or contract + Company charged with an offence with moderate penalty/fine	+ Material breaches of legislation, instruments or contract + Company or officers charged with an offence with material penalty/fine, or loss of tenure/operatorship

Likelihood		I	II	III	IV	V	VI
ALMOST CERTAIN (< 4 monthly) Occurs in almost all circumstances OR could occur *within days to weeks*	f	Low	Medium	High	Very High	Very High	Very High
LIKELY (4 monthly - 1 yearly) Occurs in most circumstances OR could occur *within weeks to months*	e	Low	Medium	High	High	Very High	Very High
OCCASIONAL (1 - 3 yearly) Has occurred before in Santos OR could occur *within months to years*	d	Low	Low	Medium	High	High	Very High
POSSIBLE (3 - 10 yearly) Has occurred before in the industry OR could occur *within the next few years*	c	Very Low	Low	Low	Medium	High	Very High
UNLIKELY (10 - 30 yearly) Has occurred elsewhere OR could occur *within decades*	b	Very Low	Very Low	Low	Low	Medium	High
REMOTE (30 - 100 yearly) Requires exceptional circumstances and is unlikely even in the long term OR only occurs as a *"one in 100 year event"*	a	Very Low	Very Low	Very Low	Low	Medium	Medium

Table D3: Risk assessment

Management objective	Risk description	Initial risk rating			Control strategies	Residual risk rating		
		Likelihood	Consequence	Overall risk rating		Likelihood	Consequence	Overall risk rating
Maintain the extent of offset value habitat within the offset area.	Habitat or vegetation loss through land clearing.	D	V	H	• Protection of the offset area via a Voluntary Declaration under section 19E and 19F of the VMA, as described in Section 2.7. • Comply with the restrictions outlined in Table 11. • Construction and maintenance of access tracks, fencing and firebreaks will be undertaken in accordance with Sections 6.2.2, 6.2.3 and 6.2.4 • Restoration of impacted areas subject to any unauthorised clearing.	B	V	M
Ensure that the livestock grazing restrictions for fire management and weed control assist in the enhancement of ground cover attributes for offset values and does not result in the degradation of habitat.	Degradation of offset value habitat quality as a result of livestock grazing	D	III	H	• Implementation of strategic grazing to reduce fuel loads and control exotic pasture grasses and promote the establishment of native perennial grass species in accordance with Section 6.2.4.1 • Annual biomass monitoring to inform strategic grazing regimes. • Rapid monitoring events and habitat quality assessments will be undertaken in accordance with Section 7.6.1 and 7.6.2 including an assessment of % cover of native perennial grasses	B	III	L
Minimise predation risk by wild dogs to threatened fauna species.	Predation of threatened fauna by wild dogs.	D	III	M	• Regular monitoring for pest animals will be undertaken in accordance with the methods detailed in Section 7.5 and pest animal control will be implemented following the results of monitoring in accordance with Section 6.2.6	C	III	L
Minimise predation risk by foxes to threatened fauna species.	Predation of threatened fauna by foxes.	D	III	M		C	III	L
Minimise predation risk by feral cats to threatened fauna species.	Predation of threatened fauna by cats.	D	III	M		C	III	L
Minimise degradation of offset value habitat by feral pigs.	Degradation of habitat by feral pigs.	D	III	M		C	III	L
Minimise competition and degradation of offset value habitat by rabbits.	Increased competition and degradation of habitat by rabbits.	D	III			C	III	L
Minimise degradation of offset value habitat by feral horses.	Degradation of habitat by feral horses.	D	III	M		C	III	L
Manage populations of cane toad	Lethal ingestion by native fauna	D	III			C	III	L
Manage invasive weed species to reduce degradation of offset value habitat.	Invasion of habitat by weed species, including exotic grasses.	D	III	M	• Regular weed monitoring will be undertaken in accordance with Section 7.4. • Based on the results of monitoring events, weeds will be managed using biological, chemical and/or mechanical control in accordance with the control	C	III	L

Management objective	Risk description	Initial risk rating			Control strategies	Residual risk rating		
		Likelihood	Consequence	Overall risk rating		Likelihood	Consequence	Overall risk rating
					measures outlined in the Biosecurity Queensland Fact Sheets, for the relevant weed species (see Section 6.2.5)			
Reduce the risk of adverse impacts to offset value habitat by inappropriate fire regimes or unplanned fire.	Decrease in the habitat quality score for any offset value from baseline and subsequent monitoring events as a result of fire management measures, or an unplanned fire.	D	IV	H	• Fuel loads within the offset area will be managed through strategic livestock grazing and fuel hazard reduction burns as outlined in Section 6.2.4 • Firebreaks will be established and maintained around the boundary of the offset area, with green firebreaks established where the offset area joins native vegetation. Firebreaks will be maintained at least annually in mid / late autumn and, or early spring to remove overhanging trees or fallen debris and dense vegetation	B	IV	L
Achieve the interim performance targets and completion criteria for each offset value within 5, 10, 15 and 20 years, respectively.	Interim performance targets are not achieved for offset values by year 5, 10 or 15. Completion criteria are not achieved for offset values by year 20.	E	III	H	• Implementation of this OAMP, including the management actions and monitoring program outlined in Section 6.0 and Section 7.0. • Monitoring of the offset area will be undertaken in accordance with Section 7.0 including: o Offset area inspections (Section 7.1). o Offset value assessments (Section 7.6) • The results of monitoring events will be compared against the interim performance targets and completion criteria to determine the progress of offset area and recorded as part of reporting (Section 8.0). • Implementation of the adaptive management process outlined in Section 5.0 • Obtain advice with the aim of identifying appropriate additional management interventions if interim performance targets are not achieved for one or more offset values by year 5,10 or 15. • If it is considered that the completion criteria cannot be achieved, Santos will update this OAMP proposing alternative offset areas in order to acquit the required offset requirements in accordance with the offsets assessment guide. The revised OAMP will be submitted to the Commonwealth Government.	B	III	L

APPENDIX E

Overall Fuel Hazard Assessment Guide

Department of Sustainability and Environment

Overall fuel hazard assessment guide

4th edition July 2010

Fire and adaptive management

report no. 82

State Government Victoria

Overall fuel hazard assessment guide

4th edition July 2010

Fire and adaptive management, report no. 82

By Francis Hines, Kevin G Tolhurst, Andrew AG Wilson and Gregory J McCarthy

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Cover image: Elaine – Atchison Rd Fire, Victoria, January 2008. Bark Hazard – Extreme, Elevated Fuel Hazard – Moderate, Near-surface Fuel Hazard – Low, Surface Fuel Hazard – Very High. Overall Fuel Hazard – Extreme. Fire burning under FFDI 17 – High.

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1. About this guide

1.1 Purpose

The main purpose of this guide is to allow people to:

- make a rapid, visual assessment of fuel arrangement, and
- gain an understanding of how this will affect the chances of controlling a bushfire.

1.2 Audience

This guide has been principally designed to provide information on fuel arrangement to be used by:

- firefighters to assess the difficulty of controlling a bushfire.

Information on fuel arrangement may also be used by:

- asset owners and managers to assess potential bushfire risks to assets
- land and fire managers to provide a measurable objective and trigger for fuel management in fire management plans
- personnel to identify which key attributes and fuel layers are contributing the most to the hazard
- personnel to plan and conduct planned burns
- personnel to assess the effectiveness of planned burning or mechanical hazard reduction
- fire behaviour analysts to produce fire-spread predictions and community warnings.

Those who use the guide for these other purposes need to be mindful of its limitations and how the results are applied and interpreted.

1.3 What fuel is assessed

This guide is for assessing fine fuels that burn in bushfires. Fine fuels are the fuels that burn in the continuous flaming zone at the fire's edge. They contribute the most to the fire's rate of spread and flame height. Typically, they are dead plant material, such as leaves, grass, bark and twigs thinner than 6mm thick, and live plant material thinner than 3mm thick. Once ignited, these fine fuels generally burn out within two minutes.

This guide focuses on assessing the key structural layers of the fine fuel complex, in particular those of bark, elevated, near-surface and surface fuels.

1.4 How the fuel is assessed

Each fuel layer is assessed simply and visually. Assessing the fuel takes only a few minutes and is based on the premise that the eye is better able to integrate local variations in fuel than systematic measurement. Each fuel layer is assessed in turn and given a hazard rating. Particular emphasis is placed on how the fuel is arranged within each of these layers. The hazard ratings are then combined to produce an Overall Fuel Hazard Rating that ranges from Low to Extreme.

1.5 Why fuel arrangement is more important than fuel load

The image below highlights the effect that changing the arrangement of the fuel can have on fire behaviour. Both fires were ignited at the same time in the same way. Both fires are burning in the same fuel load, approximately two broadsheets of newspaper over a 20cm diameter area. The fuel on the right was laid flat and has little vertical orientation. The fuel on the left was crumpled up, which gave it more vertical orientation and exposed more of the surface to the air. As a result, the fire on the left shows significantly greater flame height and the fuel is consumed much faster.

The simple difference in the arrangement of the fuel significantly affects the resulting fire behaviour. The effect would not be discerned if the fuel assessment was based purely on fuel load. An assessment of fuel hazard takes into account the fuel arrangement. It gives a better indication of potential fire behaviour and suppression difficulty.

1.6 Suppression difficulty is not just about fire behaviour

This guide has been mainly developed to allow people to assess the impact of fuel arrangement on suppression difficulty. An assessment of suppression difficulty (how hard it is to control a bushfire) is not based solely on the anticipated fire behaviour. Many other factors affect the chances of a firefighting operation succeeding, including resources, fire size and terrain.

In order to consider the impact of fuels, the other factors need to be treated as if they are constant. The factors that have been held constant are referred to as the Reference Extended First Attack Conditions. Further detail on these conditions is contained in Appendix 1.

1.7 Basis of the Overall Fuel Hazard classification

A comprehensive explanation of this guide is contained in DSE's *Overall fuel hazard assessment guide: a rationale report – fire and adaptive management report no. 83* (in prep.).

This assessment guide updates and builds on work previously published by Wilson (1992a, 1992b, 1993), McCarthy *et al*. (1998a, 1998b, 1998c, 1999, 2001), the Department of Environment and Heritage (2006) and Gould *et al*. (2007a, 2007b).

Classifying Overall Fuel Hazard is complex, with few available measurements. Therefore, we have relied on the perceptions of experienced fire personnel (e.g. fire behaviour specialists, fire managers and firefighters). The collective experience of these personnel is vast, with a broad geographic base across Australia.

1.8 Need for continual learning and development

Although our knowledge about fuels has many gaps, this guide is based on the best available information and experience. The authors acknowledge that this guide will need to change and improve as more information is obtained.

Observers of firefighting operations can improve future editions of this guide by carefully recording what they see. Observations, comments and feedback can be emailed to fire.monitoring@dse.vic.gov.au.

2. How to use the guide

This guide has been kept concise and should not be considered as a standalone document. To produce reliable and consistent results requires extra knowledge which may be gained through local hands-on training in fuel assessment.

2.1 Application

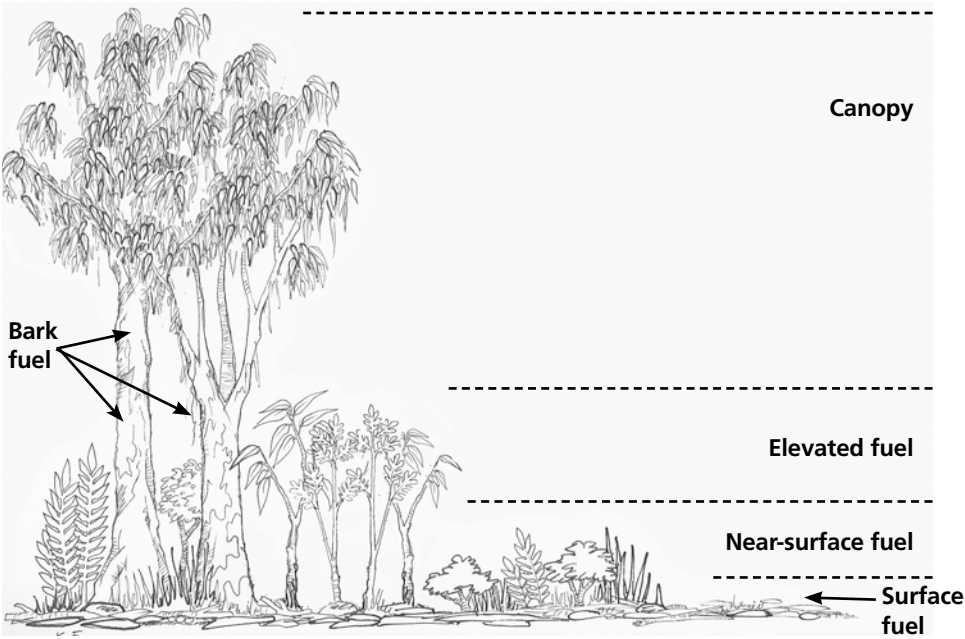
This guide is a tool for rapidly assessing fuel arrangement and its effect on the chances of controlling a bushfire. It may also be used for a range of other fire management purposes, as shown in the table below. Users of this guide should understand the underlying assumptions and limitations before applying it, particularly if applying it for purposes other than the assessment of suppression difficulty.

Application	Methodology
Assess suppression difficulty	Assess the fuels in which the fire may occur or is actually occurring.
Assess fuels for predicting potential risk to assets	Assess the fuels immediately adjacent to the asset as part of an assessment of possible radiant heat loads and defendable space. Assess the fuels further away from the asset; paying particular attention to areas that may generate spotting, such as ridges. Assessments should be focused, particularly in the direction of likely fire attack.
Assess the need for, or success of, fuel management activities	Assess the average fuels across the nominated area by sampling within major vegetation types, slopes and aspects.
Plan and conduct planned burns	Assess the variability in fuels across the nominated area by sampling within major vegetation types, slopes and aspects. Pay particular attention to areas where the burn may escape, such as the tops of gullies, ridge tops and areas adjacent to planned burn boundaries.
Assess fuels for predicting fire behaviour	Assess the fuel values needed as inputs for the appropriate fire behaviour model.

2.2 Fuel layers

Fuel in forests, woodlands and shrublands can be divided into four layers, each based on its position in the vegetation profile (Fig 2.1). This guide focuses on assessing the key structural layers of the fine fuel complex, those of bark, elevated, near-surface and surface fuels.

Figure 2.1 Fuel layers and bark



Use the following descriptions to determine how to separate vegetation into fuel layers.

Layer	Description	Contribution to suppression difficulty
Canopy	• Crowns of the tallest layer of trees. • Under some conditions canopy fuels can play a significant role in fire behaviour and suppression difficulty. Currently, however, these fuels are not assessed as part of Overall Fuel Hazard.	
Bark fuel	• Bark on tree trunks and branches, from ground level to canopy.	Spotting
Elevated fuel	• Fuels are mainly upright in orientation. • Generally most of the plant material is closer to the top of this fuel layer. • Sometimes contains suspended leaves, bark or twigs. • Fuels that have a clear gap between them and the surface fuels. • Can be highly variable in ground coverage. • Low-intensity fire (flame height of less than 0.5m) may pass beneath this layer without consuming much, if any, of it.	Influences the flame height and rate of spread of a fire.
Near-surface fuel	• Live and dead fuels, effectively in touch with the ground, but not lying on it. • Fuel has a mixture of vertical and horizontal orientation. • Bulk of the fuels are closer to the ground than to the top of this layer, or are distributed fairly evenly from the ground up. • Sometimes contains suspended leaves, bark or twigs. • Coverage may range from continuous to having gaps many times the size of the fuel patch. • Low-intensity fire (flame height of less than 0.5m) will consume most or all of this fuel. • Fuel in this layer will always burn when the surface fuel layer burns.	Influences the rate of spread and flame height of a fire.
Surface fuel (litter)	• Leaves, twigs, bark and other fine fuel lying on the ground. • Predominantly horizontal in orientation.	Influences the rate of spread of a fire.

This guide is for assessing fine fuels only. Coarse fuels including logs are not considered. See Section 1.3 for further details.

The descriptions of the fuel layers exclude references to species' names or common vegetation forms, such as shrubs. During a plant's life it may transition back and forth between different layers. For example, juvenile bracken fern can be classified as near-surface fuel before becoming elevated fuel as it matures. Once it dies and collapses it may become near-surface fuel again.

2.3 Assessment based on key attributes of fuel hazard

A fuel hazard rating of Low, Moderate, High, Very High or Extreme is assigned to each fuel layer by assessing it against the key attributes listed below.

Key attribute	
Horizontal continuity of the layer	Determines how readily a piece of burning fuel may ignite the fuel beside it. Identifies which of surface, near-surface or elevated fuels will determine the average flame height.
Vertical continuity of the layer	Determines how readily a piece of burning fuel may ignite the fuel above it.
Amount of dead material in the layer	Determines how much dead material is present to burn and thus help with igniting the live (green) fuels.
Thickness of the fuel pieces	Determines whether the fuel pieces will burn in the flaming front of the fire.
Total weight of fine fuel	Determines the weight of fine fuel contributing to the flaming front of the fire.

The descriptions in the hazard assessment tables do not cover all possible combinations of the key attributes. Users will need to exercise judgement and make an assessment using all key attributes when actual conditions fit between the descriptions.

2.4 Using the descriptions and photographs

This is **not** a photographic guide for assessing fuels. The **descriptions** for each of the key attributes should be used as the basis for determining the fuel hazard rating. Photographs cannot adequately show all of the key attributes that are important in determining fuel hazard. The photographs are provided to illustrate **some** of the key attributes for each fuel hazard rating. They do not represent all possible variations of that particular hazard rating.

2.5 Area of assessment

Within an area of interest fuels are assessed in small patches or plots. The size and number of plots depends on the reason for assessing the fuels. Some applications (such as for input into fire behaviour models) may require a more rigorous and systematic approach to sampling. Other applications (such as assessing fuel hazard during firefighting operations) will necessitate a more rapid informal approach. For whatever purpose the guide is being used it is recommended that the following principles be applied:

- Any assessment of fuels should try to assess the variability in fuels across an area by assessing the fuels at multiple plots.
- The size and number of plots should reflect the level of reliability required of the results.
- For surface, near-surface and elevated fuel layers the result of assessing the plot should reflect the average state of that fuel layer.
- For bark hazard the result of assessing the plot should be based on the trees with the highest rating.
- Always record with the result the name and the version of the guide used.

2.6 Tips for assessing fuel hazard

The process of assessing fuel hazard using this guide is largely subjective. Implementing the following techniques will help to improve accuracy and reliability:

- Identify and agree on examples of the highest rating of fuel hazard for each layer that occur locally. These examples should be used as benchmarks.
- Conduct assessments in pairs of observers and regularly change assessment pairs.
- Assessors should be no more than one hazard rating apart when assessing each layer (e.g. Low or Medium, not Low or High).
- Use different assessors to re-assess completed work and provide feedback.

2.7 Vesta fire behaviour predictions

In dry eucalypt forest with a litter and shrub understorey the *Field guide – fuel assessment and fire behaviour prediction in dry eucalypt forest* (Gould *et al.* 2007b) provides a systematic method for assessing fuel and predicting fire behaviour (rate of spread, flame height, and spotting). The Project Vesta fuel hazard scoring system is similar to the Victorian system developed by Wilson (1992a, 1992b, 1993) and revised by McCarthy *et al*. (1999). The scale that underlies the Vesta fuel hazard scores is directly related to fire behaviour. These scores, along with height measurements of various fuel layers, are needed as inputs into the fire behaviour prediction tables in Gould *et al*. (2007b). Section 9.3 contains a table for translating the fuel hazard rating for each fuel layer into Vesta fuel hazard scores.

2.8 Effect on fire behaviour

Each table for assessing fuel hazard contains information on the effect that the fuel arrangement is likely to have on fire behaviour. This effect is for weather conditions equivalent to a Forest Fire Danger Index (FFDI) of 25 (McArthur 1973). An FFDI of 25 can be achieved in many ways. For the purposes of this guide the specific conditions required to achieve this are:

Temperature: 33°C	Relative Humidity: 25%	Wind Speed: 20km/h
Drought Factor: 10	Slope: 0°	

If weather conditions vary from those listed above the effect on fire behaviour will also vary.

2.9 Fuel assessment data sheet

Appendix 2 contains a sample field data sheet that can be used when assessing fuels.

3. Bark fine fuel

3.1 Identification

Bark fuel is the bark on tree trunks and branches. Bark lying on or near the ground or draped over understorey plants is considered to be surface, near-surface or elevated fuel.

3.2 Identifying bark types

The key attributes for assessing the effect of bark on suppression difficulty are shown below:

Key attribute	Determines	How it is assessed
Ease of ignition	• How readily the bark will ignite. • Whether the fire will burn up the trunk and into the branches of the tree.	Thickness, size and shape of bark pieces.
How bark is attached	• How likely the bark is to break off the tree.	How easily the bark breaks off the tree.
Quantity of combustible bark	• Volume of potential embers that a fire may generate.	Relative quantity of combustible bark.
Size-to-weight ratio of the bark pieces	• How far the wind is likely to carry bark pieces once they break off the tree.	Thickness, size and shape of bark pieces.
Burn out time	• Length of time a piece of bark will stay ignited once it breaks off the tree.	Thickness, size and shape of bark pieces.

Descriptions of trees have been separated into three broad bark types using three of these key attributes – ease of ignition, burn out time and size-to-weight ratio:

1. Fine fibrous barks, including stringybarks
2. Ribbon or candle barks
3. Other bark types, including smooth, platy, papery and coarsely fibrous. The reason for describing these types in some detail is to help observers distinguish them from the above two types.

3.3 Identifying Stringybark and other fine fibrous bark types

		Examples
Contribution to suppression difficulty	• Bark types that can produce massive quantities of embers and short distance spotting.	
Physical description	• Bark is fine fibrous material with easily visible fibres less than 1mm thick covering the whole trunk. • Bark fibres resemble the fine fibres that are twisted together to form natural string. • Old bark is retained on the trunk of the tree for decades, forming a relatively spongy fibrous mass with deep vertical fissures. • Outer bark may weather to a greyish colour, while underlying bark retains its original colour. • Bark may form large strands when peeled off. • Fine, hairlike pieces also break off from the tree when it is rubbed.	
Ease of ignition	• Bark is very flammable (can be easily lit with a match when dry). • Fires will readily climb the tree and branches.	
How bark is attached	• Young or new bark is held tightly to the trunk. • As bark ages it becomes less tightly held. • Old, long-unburnt bark is held very loosely.	
Quantity of combustible bark	• Bark on old, long-unburnt stringybarks can be more than 10cm in depth. During fires it can produce massive quantities of embers.	
Size-to-weight ratio	Burning pieces of bark tend to be either: • Very fine lightweight fibres that will be carried for less than 100m. • Small lightweight wads (about the size of a thumb) that will be carried for less than 300m. • Very large wads (bigger than a fist) that fall close to the tree.	
Burn out time	• Very fine fibres of bark that will burn out within one minute. • Small wads of bark that will burn out within 2–3 minutes. • Very large wads of bark that will burn for up to 10 minutes.	
Hazard accumulation	• Bark hazard can reach Extreme. • Bark hazard increases over time as the thickness and looseness of the old bark increases. • Repeated low intensity fires (<0.5m flame height) may produce a 'black sock' effect on the base of the trunk, but this may have limited effect in reducing the overall quantity of bark and the hazard.	

Table 3.1 Assessing the hazard of fine fibrous bark types including stringybarks

Only use this table if at least 10% of the trees in a forest have fine fibrous bark. To achieve a given hazard rating a best fit of both key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes		Hazard rating	Effect on fire behaviour (at FFDI 25)[1]
How bark is attached	**Quantity of combustible bark**		
This hazard rating cannot occur when only this bark type is present.		Low	
Bark tightly held. Requires substantial effort to break off bark by hand.	Very little combustible bark. Entire trunk almost completely black or charred.	Moderate	Spotting generally does not hinder fire control. Fires will not climb these trees.
Bark is mostly tightly held with a few pieces loosely attached.	Limited amount of combustible bark. 50–90% of trunk charred. Most of the bark is charred, especially on the lower part of the trunk.	High	Infrequent spotting. Fires will climb some of these trees.
Many pieces of bark loosely held. Deep fissures present in bark.	Large amounts of combustible bark. 10–50% of trunk charred. Upper parts of the tree may not be charred at all.	Very High	Substantial spotting. Fires will climb most of these trees.
Outer bark on trees is weakly attached. Light hand pressure will break off large wads of bark. Deep fissures present in bark.	Huge amounts of combustible bark. <10% of trunk charred. Minimal evidence of charring.	Extreme	Quantity of spotting generated makes fire control very difficult or impossible. Fires will climb virtually all these trees.

Assess bark hazard over a plot 20m in radius. Assessing multiple plots will give better results. Trunk is defined as being the part of the tree between the ground and the branches.

See Section 9.3 for application of bark hazard ratings for the Vesta fire behaviour tables.

1 FFDI 25 is a Forest Fire Danger Index of 25 (McArthur 1973). Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 3.2 Examples of Stringybarks and other fine fibrous bark hazard

Low	This hazard rating cannot occur when only this bark type is present.		
Moderate			
High			
Very High			
Extreme			

The photos above show some of the variation possible within each bark hazard rating.

3

3.4 Identifying ribbon or candle bark types

		Example
Effect on suppression difficulty	• Bark types that can produce substantial quantities of spotting at distances greater than 2km. Will also produce short distance spotting.	
Physical description	• Trees characterised by the annual shedding of old bark layers, exposing the smooth new bark underneath. • Bark is shed in the form of long strips or ribbons of bark. • Long strips of bark curl tightly inwards to form a candle-like shape (see image lower right). • Bark strips 50cm or more in length fall off and often drape around the trunk and over branches and surrounding shrubs. • Strips of bark are usually less than 2mm thick. • Bark is shed at various times of the year so that the trunk may have a mottled appearance.	
Ease of ignition	• Bark is moderately flammable (can be lit with a cigarette lighter when dry). • Fires will climb up ribbons of bark.	
How bark is attached	• Bark strips may drape over, or be weakly attached to, the trunk and branches.	
Quantity of combustible bark	• Large quantities of bark can be retained in upper trunk and head of the tree.	
Size-to-weight ratio	• Bark pieces are relatively light for their large size. • Easily transported by strong updrafts – may travel up to 30km downwind.	
Burn out time	• Bark can burn and smoulder within the curled up ribbons for longer than 10 minutes.	
Hazard accumulation	• Bark hazard never exceeds Very High. • Bark hazard tends to increase over the long term as ribbons accumulate on the tree. • A low intensity fire (flame height of less than 0.5m) may not reduce the hazard in this bark type.	

Note: Loose ribbon or candle-like bark that is retained on the trunk near ground level is not included in the assessment of ribbon or candle bark types. It is usually:

- firmly attached to the trunk of the tree
- consumed in place by a surface fire.

This bark is considered in 'Other bark types' and can also be considered as near-surface fuel.

Smooth-bark trees also shed bark as slabs or flakes. These bark types are considered in 'Other bark types'.

Table 3.3 Assessing the hazard of ribbon or candle bark types

If more than 10% of the trees in a forest are fine fibrous bark trees use Table 3.1 (Assessing the hazard of fine fibrous bark types) to determine the bark hazard for a site.

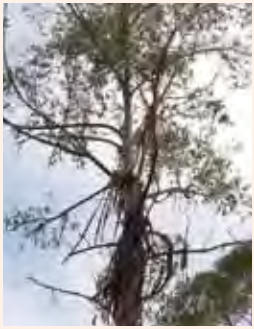
Key attribute Amount of combustible bark	Hazard rating	Effect on fire behaviour (at FFDI 25)[2]
This hazard rating cannot occur when only this bark type is present.	Low	
No long ribbons of bark present. Trunk and branches of trees almost entirely smooth.	Moderate	Spotting generally does not hinder fire control. Fires will not climb these trees.
Long ribbons of bark present on upper trunk (>4m above ground) and in head of trees. Lower trunk mainly smooth.	High	Infrequent spotting. Fires will climb some of these trees.
Long ribbons of bark in the head and upper trunk with: • ribbons hanging down to ground level or, • flammable bark covers trunk.	Very High	Substantial spotting. Fires will climb most of these trees.
This hazard rating cannot occur when only this bark type is present.	Extreme	

Assess bark hazard over a plot 20m in radius. Assessing multiple plots will give better results. Trunk is defined as the part of the tree between the ground and the branches.

See Section 9.3 for application of bark hazard ratings for the Vesta fire behaviour tables.

2 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 3.4 Examples of ribbon or candle bark hazard

Low	This hazard rating cannot occur when only this bark type is present.		
Moderate			
High			
Very High			
Extreme	This hazard rating cannot occur when only this bark type is present.		

3.5 Identifying other bark types

This bark type includes all other bark types not included in the previous two types. As a result, many different tree species are grouped together. This grouping is based on the ease of ignition, burn out time and size-to-weight ratio of the bark, rather than on botanical values. These other bark types can produce limited quantities of short distance spotting.

This bark type group has been divided into several subgroups. These subgroups are described in some detail to help observers distinguish them from the other two main bark types.

3.5.1 Ironbarks and Platy barks

Physical description	• Trees characterised by layers of old, coarse bark retained on the trunk and branches. • Bark becomes rough, compacted and furrowed with age • Bark feels very abrasive when rubbed by hand. • Bark pieces tend to be more than 2mm thick when they break off. • There may be little or no evidence of charring on the bark following planned burns.	**Example**
Hazard accumulation	• Bark hazard never exceeds Moderate.	

3.5.2 Coarsely fibrous barks

Physical description	• Trees characterised by short strand fibrous bark. • Layers of old dead bark are retained on the trunk and branches. • Unlike stringybark trees, the bark on these trees forms only short strands or chunks when peeled off. • Evidence of charring on the bark may last for up to 10 years.	**Example**
Hazard accumulation	• Bark hazard never exceeds High. • Bark hazard increases over the long term as the thickness and looseness of the old bark increases.	

3.5.3 Papery barks

Physical description	• Shrubs and trees growing from 2m to 30m tall, often with flaky shedding bark. • Old bark is retained on the trunk and branches and builds up into a thick spongy mass. • Bark layers tend to split allowing sheets of bark to become loose and eventually peel off. • Evidence of charring on the bark may last for up to 10 years.	**Example**
Hazard accumulation	• Bark hazard never exceeds High. • Bark hazard increases over the long term as the thickness and looseness of the old bark increases.	

3.5.4 Slab bark, smooth bark and small flakes

Physical description	• Trees characterised by the annual shedding of old bark layers, exposing the smooth living bark underneath. • Bark shed is often seasonal and often annual. • Species where the old bark tends to peel into large slabs (<50cm in length) or small flakes when shed. • Most of the bark falls off the tree soon after it is shed. • Some small amounts of bark may be retained on the stem or branches for several months before falling off, leading to a mottled effect. • The mottled effect leads to discontinuous bark fuel up the tree.	**Example**
Hazard accumulation	• Bark hazard never exceeds Moderate. • Bark hazard tends to be seasonal.	

Table 3.5 Assessing the hazard of other bark types

If more than 10% of the trees in a forest are fine fibrous bark trees use Table 3.1 (Assessing the hazard of fine fibrous bark types) to determine the bark hazard for a site. To achieve a given hazard rating a best fit of both key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes		Hazard rating	Effect on fire behaviour (at FFDI 25)[3]
How bark is attached	**Quantity of combustible bark**		
No trees present. or Trunk and branches of tree entirely smooth or free from loose bark.		Low	No bark present that could contribute to fire behaviour.
Bark rubs off by hand with firm pressure.	Limited amount of combustible bark.	Moderate	Spotting generally does not hinder fire control. Fires will climb some of these trees.
Light hand pressure will break bark off.	Large amounts of combustible bark.	High	Infrequent spotting. Fires will climb most of these trees.
This hazard rating cannot occur when only this bark type is present.		Very High	
This hazard rating cannot occur when only this bark type is present.		Extreme	

Assess bark hazard over a plot 20m in radius. Assessing multiple plots will give better results. Trunk is defined as the part of the tree between the ground and the branches.

See Section 9.3 for application of bark hazard ratings for the Vesta fire behaviour tables.

3 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

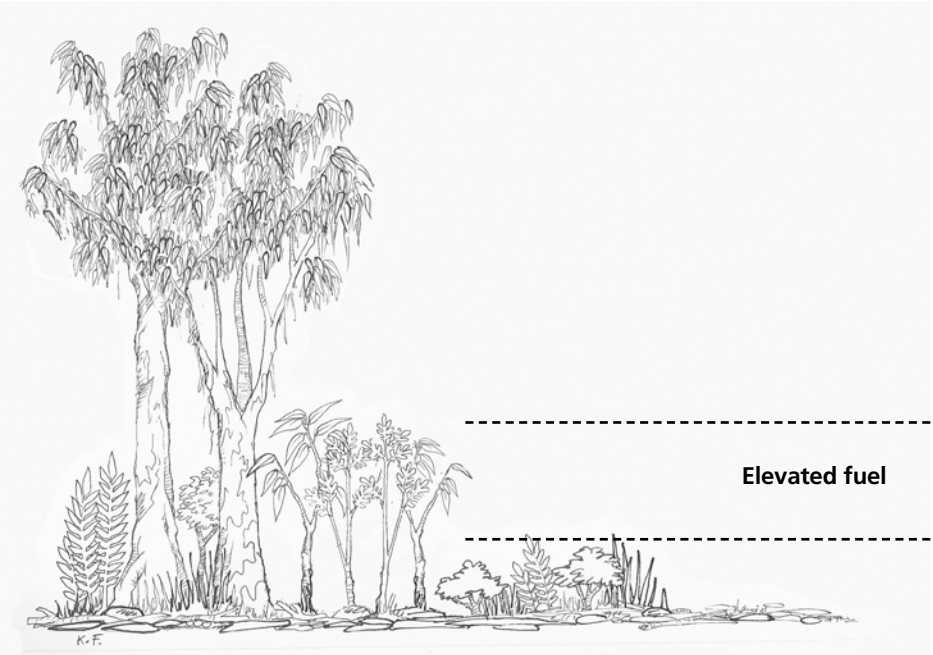
Table 3.6 Examples of other bark types

Low	No trees present. or Trunk and branches of tree entirely smooth or free from loose bark.		
Moderate			
High			
Very High	Does not occur when this is the only bark type present on a site.		
Extreme	Does not occur when this is the only bark type present on a site.		

4. Elevated fine fuel

4.1 Identification

- Fuels are mainly upright in orientation
- Generally most of the plant material is closer to the top of this layer
- Sometimes contains suspended leaves, bark or twigs
- Fuels that have a clear gap between them and the surface fuels
- Elevated fuel can be highly variable in ground coverage
- A low intensity fire (flame height of less than 0.5m) may pass beneath this layer without consuming much, if any, of it.



4.2 Assessment

The elevated fuel hazard is highest when the:

- foliage, twigs and other fuel particles are very fine (maximum thickness 1–2mm)
- proportion of dead material is high
- fuels are arranged with a high level of density and/or horizontal and vertical continuity that promotes the spread of flames
- live foliage has low fuel moisture content.

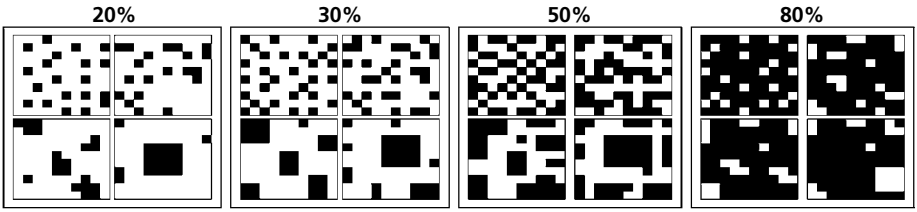
Table 4.1 Assessing elevated fine fuel hazard

To achieve a given hazard rating a best fit of all key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes					Fuel hazard rating	Effect on fire behaviour (at FFDI 25)[4]
Plant Cover	**% dead**	**Vertical continuity**	**Vegetation density**	**Thickness of fuel pieces**		
<20% or low flammability species	<20%		Easy to walk in any direction without needing to choose a path between shrubs.		Low	Little or no effect.
20–30%	<20%	Most of the fine fuel is at the top of the layer.	Easy to choose a path through but brush against vegetation occasionally.		Moderate	Does not sustain flames readily.
30–50%	<20%	Most of the fine fuel is at the top of the layer.	Moderately easy to choose a path through, but brush against vegetation most of the time.		High	Causes some patchy increases in the flame height and/or rate of spread of a fire.
50–80%	20–30%	Continuous fine fuel from the bottom to the top of the layer.	Need to carefully select path through.	Mostly less than 1–2mm thick.	Very High	Elevated fuels mostly dictate flame height and rate of spread of a fire.
>70%	>30%	Continuous fine fuel from the bottom to the top of the layer.	Very difficult to select a path through. Need to push through vegetation.	Large amounts of fuel <2mm thick.	Extreme	Elevated fuels almost entirely determine the flame height and rate of spread of a fire.

Assessing plant cover

For the purpose of this guide, plant cover is defined as the amount of ground blocked out by that fuel layer if viewed while looking straight down from above. Each plant is considered opaque – any ground within the perimeter of the plant cannot be seen. The following visual guide can be used to assist in assessing plant cover. Each quarter of any one square has the same percent cover.



4 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 4.2 Examples of elevated fine fuel hazard

Low	Elevated fuel absent or virtually absent	
Moderate		
High		
Very High		
Extreme		

Assess elevated hazard over a plot 10m in radius. Assessing multiple plots will give better results.

See Section 9.3 for application of elevated fuel hazard ratings for the Vesta fire behaviour tables. For the Vesta fire behaviour tables the elevated fuel height (m) should be the average of 10 measurements taken along a 300m walk-through. Measure the typical height from ground level.

5. Near-surface fine fuel

5.1 Identification

- Live and dead fuels effectively in touch with the ground but not lying on it
- Fuel has a mixture of vertical and horizontal orientation
- Either the bulk of the fuels is closer to the ground than the top of this layer, or is distributed fairly evenly from the ground up
- Sometimes contains suspended leaves, bark or twigs
- Coverage may range from continuous to having gaps many times the size of the fuel patch
- A low intensity fire (flame height of less than 0.5m) will consume most or all of this fuel
- Fuel in this layer will always burn when the surface fuel layer burns.

5.2 Assessment

The near-surface fuel hazard is highest when the:

- foliage, twigs and other fine fuel particles are very fine (maximum thickness 1–2mm)
- proportion of dead material is high
- fuels are arranged with a high level of density and /or horizontal and vertical continuity, that promotes the spread of flames
- live foliage has low fuel-moisture content.

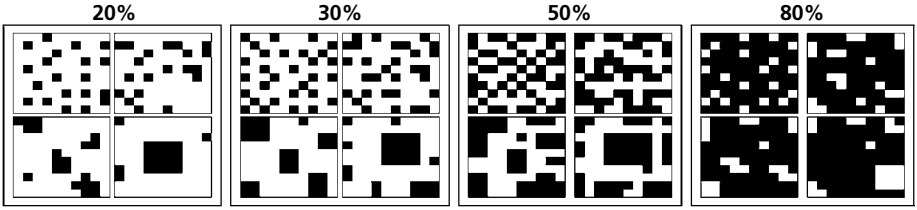
Table 5.1 Assessing near-surface fine fuel hazard

To achieve a given hazard rating a best fit of all key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes			Fuel hazard rating	Effect on fire behaviour (at FFDI 25)[5]
Plant cover	% dead	Horizontal connectivity		
<10%	<10%	Near-surface fuel is absent or virtually absent.	Low	Little or no effect.
10–20%	<20%	Gaps many times the size of fuel patches.	Moderate	Occasionally increases flame height.
20–40%	>20%	Gaps between fuel patches are greater than the size of fuel patches. Starting to obscure logs and rocks.	High	Contributes to surface fire spread and causes patchy increase to flame height.
40–60%	>30%	Fuel patches are equal to or larger than the gaps between the fuel patches.	Very High	Contributes significantly to fire spread and flame height. A fire will spread readily in this layer without having to consume the surface layer.
>60%	>50%	Very small gaps between fuel patches. Logs and rocks obscured.	Extreme	Contributes significantly to fire spread and flame height. A fire will spread readily in this layer without having to consume the surface layer.

Assessing plant cover

For the purpose of this guide, plant cover is defined as the amount of ground blocked out by that fuel layer if viewed while looking straight down from above. Each plant is considered opaque – any ground within the perimeter of the plant cannot be seen. The following visual guide can be used to assist in assessing plant cover. Each quarter of any one square has the same percent cover.



5 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 5.2 Examples of near-surface fine fuel hazard

Low	Near-surface fuel is absent or virtually absent	
Moderate		
High		
Very High		
Extreme		

Assess near-surface hazard over a plot 10m in radius. Assessing multiple plots will give better results.

See Section 9.3 for application of near-surface fuel hazard ratings for the Vesta fire behaviour tables. For the Vesta fire behaviour tables the near-surface fuel height (cm) should be the average of 10 measurements taken over a 300m walk through. Measure the typical height from ground level.

6. Surface fine fuel

6.1 Identification

- Leaves, twigs, bark and other fine fuel lying on the ground
- Predominantly horizontal in orientation
- Usually contributes the most to fuel load or quantity
- Includes the partly decomposed fuel (duff) on the soil surface.

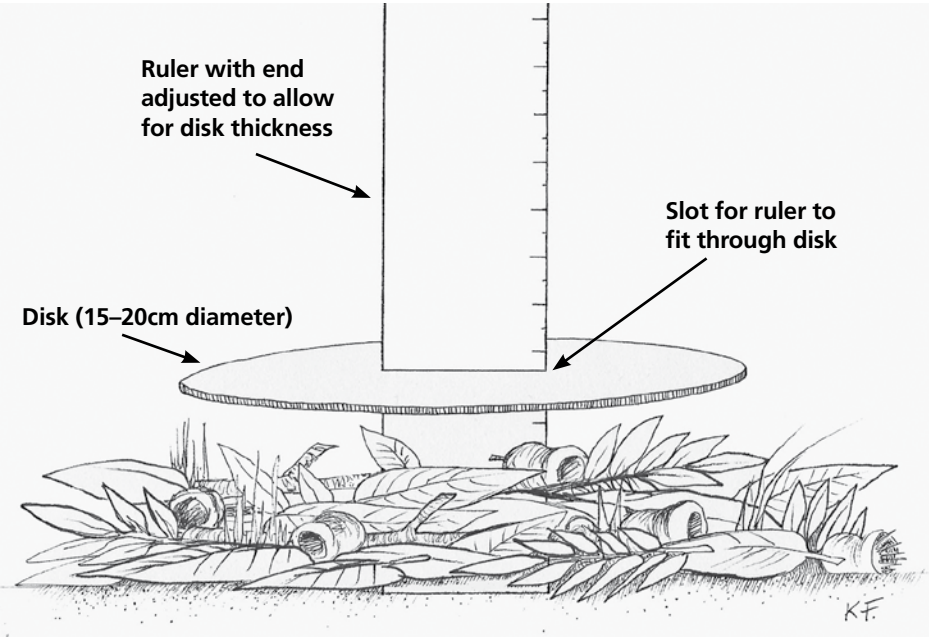
6.2 Assessment

The surface fine fuel hazard is highest when the:

- litter pieces are well connected
- surface litter cover is high, with minimal interruption from rocks, logs or patches of bare soil
- surface litter has substantial depth (greater than 30mm).

6.3 Measurement

Surface litter-bed depth should be measured using a simple depth gauge, as pictured below. This follows the methodology described in McCarthy (2004) and McCarthy *et al*. (1999).



Litter depth should be measured in areas where near-surface fuels do not obscure the litter. Fuel depth is measured using a 15cm circular disk with a ruler through a slot in its centre. To use this gauge, a small gap is made in the litter bed down to mineral soil, then the end of the ruler is placed resting on the mineral soil surface. The disk is pushed down with light pressure until its whole perimeter is in contact with the fuel. Light pressure can be described as 'enough pressure to hold a tennis ball under water'. The ruler is read off level with the top of the disk. Note that the end of the ruler needs to be adjusted to match the thickness of the disk.

Five measurements of litter bed depth should be made at each site. The average of these measurements is one of the attributes that can be used to determine the surface fine fuel hazard.

Table 6.1 Assessing surface fine fuel hazard

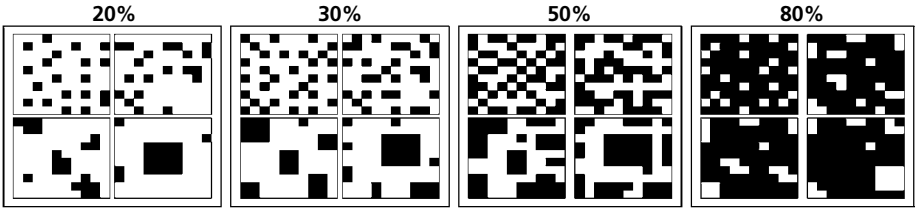
To achieve a given hazard rating a best fit of all key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes			Fuel hazard rating	Effect on fire behaviour (at FFDI 25)[6]
Horizontal connectivity	**Surface litter cover**	**Litter-bed depth**		
Litter poorly interconnected. Large areas of bare soil or rock. More soil than litter. Soil surface readily visible through litter bed.	<60%	Very thin litter layer <10mm	Low	Surface fires will not spread.
Litter well connected. Some areas of bare soil or rock. Soil surface occasionally visible through litter bed.	60–80%	Thin litter layer 10–25mm	Moderate	Litter connected well enough to allow fire spread to overcome bare patches.
Litter well connected. Little bare soil.	80–90%	Established litter with layers of leaves ranging from freshly fallen to decomposing. 20–30mm	High	Surface fires spread easily with a continuous fire edge.
Litter completely connected.	>90%	Thick litter layer 25–45mm	Very High	Surface fires spread easily. Increasing flame depth and residence time.
Litter completely connected.	>95%	Very thick layer of litter >35mm	Extreme	Surface fires spread easily. Increasing flame depth and residence time.

Assess surface hazard over a plot 10m in radius. Assessing multiple plots will give better results. For each plot litter bed depth should be an average of five measurements (McCarthy 2004) or more.

See Section 9.3 for application of surface fuel hazard ratings for the Vesta fire behaviour tables.

The following visual guide can be used to assist in assessing surface litter cover. Each quarter of any one square has the same percent cover.



6 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 6.2 Examples of surface fine fuel hazard

Low		
Moderate		
High		
Very High		
Extreme		

7. Determining the combined surface and near-surface fine fuel hazard rating

Assessments of surface and near-surface fuels must be combined together before an Overall Fuel Hazard rating can be determined. The near-surface fuel rating is used to adjust the surface fine fuel hazard rating, according to Table 7.1.

To determine the effect of near-surface fine fuel hazard:

1. Select the **surface fuel hazard rating** from column 1
2. Select the **near-surface fuel hazard rating** from column 2
3. Select the resulting **combined rating** value 3
4. Use this value to determine the Overall Fuel Hazard rating using the Table 8.1.

Table 7.1 Determining the combined surface and near-surface fine fuel hazard rating

1 Surface fine fuel hazard rating	2 Near-surface fine fuel hazard rating				
	Low	Moderate	High	Very High	Extreme
	3 Combined surface and near-surface fine fuel hazard rating				
Low	L	L	M	H	VH
Moderate	M	M	H	VH	E
High	H	VH	VH	VH	E
Very High	VH	VH	E	E	E
Extreme	E	E	E	E	E

8. Determining Overall Fuel Hazard

Overall Fuel Hazard = (sum of the influences of) Bark Hazard + Elevated Fine Fuel Hazard + Combined Surface and Near-surface Fine Fuel Hazard.

The following table is used to combine the assessed levels of Bark, Elevated and Combined Surface and Near-surface Fuel Hazard to give an Overall Fuel Hazard rating.

To determine the Overall Fuel Hazard rating:

1. Select the row that corresponds to the **Bark Hazard** ❶
2. Select the row that corresponds to the **Elevated Fine Fuel Hazard** ❷
3. Select the column that corresponds to the assessed level of **Combined Surface and Near-surface Fine Fuel Hazard** ❸
4. Identify where these two intersect and this will provide you with the corresponding Overall Fuel Hazard rating.

Table 8.1 Determining the Overall Fuel Hazard rating

❶ Bark Hazard	❷ Elevated Fine Fuel Hazard	❸ Combined Surface and Near-surface Fine Fuel Hazard *				
		L	M	H	VH	E
Low or Moderate	L	L	M	M	H	H
	M	L	M	M	H	H
	H	L	M	H	VH	VH
	VH	VH	VH	VH	VH	VH
	E	E	E	E	E	E
High	L	L	M	H	H	H
	M	L	M	H	H	H
	H	L	H	H	VH	VH
	VH	VH	VH	VH	VH	E
	E	E	E	E	E	E
Very High or Extreme	L	L	VH	VH	VH	E
	M	M	VH	VH	E	E
	H	M	VH	E	E	E
	VH	E	E	E	E	E
	E	E	E	E	E	E

* Combined Surface and Near-surface Fine Fuel Hazard is a measure of the Surface Fine Fuel Hazard adjusted to account for the level of near-surface fine fuel (see Table 7.1).

9. Interpreting and applying Overall Fuel Hazard

9.1 Chances of extended first attack success

The chances of extended first attack being successful[1] for a fire ignited in these fuels under the reference extended first attack conditions (Appendix 1) is approximately as follows:

Table 9.1 Chances of extended first attack success

GFDI[2]	FFDI[3]	Overall Fuel Hazard rating[4]				
		Low	Moderate	High	Very High	Extreme
0–2	0–5					
3–7	6–11					
8–20	12–24					
20–49	25–49					
50–74	50–74					
75–99	75–99					
100+	100+					

Chance of extended first attack success is greater than 95% (almost always succeeds)

Chance of extended first attack success is between 95% and 50% (succeeds most of the time)

Chance of extended first attack success is between 49% and 10% (fails most of the time)

Chance of extended first attack success is less than 10% (almost always fails)

Notes:

1. Extended first attack is deemed successful when a fire is controlled by 0800hrs the day after ignition and at less than 400 hectares.
2. GFDI is the Grass Fire Danger Index at the time of ignition and is assumed to be the highest GFDI expected before 0800hrs the next day.
3. FFDI is the Forest Fire Danger Index at the time of ignition and is assumed to be the highest FFDI expected before 0800hrs the next day.
4. Chance of success is for a fire ignited in fuels with this Overall Fuel Hazard rating.
5. Predicted outcomes will differ if the conditions vary from those listed in the reference extended first attack conditions.
6. Predicted outcomes based on expert opinion and informed by work carried out by Wilson (1992b, 1993), McCarthy *et al*. (1998a, 2001) and Plucinski *et al*. (2007).

9.2 Indicative fuel loads (t/ha)

In the absence of local data obtained by sampling fuel loads destructively the following table of indicative fuel load data from Project Vesta and Victorian studies may be useful. These tonnes per hectare figures may be applied to the Forest Fire Danger Meter Mark V (McArthur 1973) for predicting forward rate of spread and flame height for forest fires.

Table 9.2 Indicative fuel loads (t/ha)

Fuel	Fuel hazard rating				
	Low	Moderate	High	Very High	Extreme
Bark	0	1	2	5	7
Elevated	0–1	1–2	2–3	3–5	5–8
Near-surface	1–2	2–3	3–4	4–6	6–8
Surface	2–4	4–10	8–14	12–20	16–20+

9.3 Determining Vesta fuel hazard scores

The following table translates fuel hazard ratings for each fuel layer into Project Vesta fuel hazard scores. These scores can be used with the fire behaviour prediction tables in publications such as Gould *et al*. (2007b).

To determine the Vesta fuel hazard score:

1. Select the row that corresponds to the fuel hazard rating for required fuel layer ❶
2. Select the Vesta fuel hazard score column that corresponds to the same layer ❷
3. Identify where these two intersect and this will provide you with the corresponding Vesta fuel hazard score.

Table 9.3 Determining Vesta fuel hazard scores

	Vesta fuel hazard score ❷			
Fuel hazard rating ❶	**Surface**	**Near-surface**	**Elevated**	**Bark**
Low	1	1	1	0
Moderate	2	2	2	1
High	3	3	3	2
Very High	3.5	3.5	3.5	3
Extreme	4	4	4	4

Notes:

- Surface and near-surface hazard score and near-surface height (cm) is required for fire spread prediction.
- Rate of spread and elevated fuel height (m) is required for flame height prediction.
- Rate of spread, surface and bark fuel hazard scores are required for prediction of spotting distance.

Acknowledgements

This Fuel Hazard Assessment Guide updates and continues to develop work previously conducted by a number of authors. Andrew Wilson laid the foundations for this guide, with the conceptual framework presented in Research Report No. 31; and the visual guides for assessing the influence of bark and elevated fuels on suppression difficulty in the *Eucalypt Bark Hazard Guide and Elevated Fuel Guide* (Reports 32 and 35, respectively). Greg McCarthy (2004) detailed a method for rapidly assessing surface fine fuels in Research Report No. 44.

These three techniques were brought together in the first three editions of the *Overall Fuel Hazard Guide* (McCarthy, Tolhurst and Chatto, 1998b, 1998c, 1999). A subsequent unpublished edition of the guide, produced by Kevin Tolhurst (2005), provided greater detail on the assessment of near-surface fuels. In 2006, Mike Wouters adapted the guide for South Australian conditions, and incorporated the preliminary results from Project Vesta (CSIRO and Department of Conservation and Environment, Western Australia). Further information and results from the final Project Vesta report (Gould *et al.* 2007a) have also been incorporated.

Thanks to Lachie McCaw (Department of Environment and Conservation, Western Australia), Mike Wouters (Department of Environment and Heritage, South Australia), Jim Gould and Miguel Cruz (CSIRO) for their advice and comments during the production of this guide. Thanks must also go to the many other people across Australia who have provided comments and feedback during the production of the guide.

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Appendix 1. Reference extended first attack conditions

This guide assesses the impact of fuels in suppressing a fire during extended first attack, using local resources. Several factors affect the success of an extended first attack. Therefore, to consider the impact of fuels alone, the other factors must be treated as if they were constant. Table A1 below adapted from Wilson (1993) summarises reference extended first attack conditions for four fuel types.

Table A1. Revised reference extended first attack conditions

Fuel type	Forest fuels	Grass fuels	Mallee and scrub fuels	Heath fuels
Examples of typical resources (on scene within the designated arrival time)	Small dozer (D4) 1 to 2 small 4WD tankers (400l) 6 firefighters	5 x 4WD heavy tankers (4000l) each with 5 firefighters	Small dozer (D4) or tractor with scrub roller 1 to 2 small 4WD tankers (400l) 6 firefighters	Small dozer (D4) 1 to 2 small 4WD tankers (400l) 6 firefighters
Extended attack resources	Potential additional resources deployed to the fire during extended first attack may include heavy tankers, large plant (dozers, graders or tractors) and fire bombing aircraft.			
Arrival time	Within 60 minutes of detection			
Suppression workload	A single fire			
Topography and terrain	Burning on level ground with good access			
Fuel availability[1]	MDF is 10 or AFF is 1.0	100% grass curing	MDF is 10 or AFF is 1.0	
Wind speed[2]	20km/h	30km/h		20km/h
Fire danger rating system[3]	McArthur FFDI	McArthur GFDI	McArthur FFDI	

Notes:

1. MDF (McArthur Drought Factor) is calculated using the Forest Fire Danger Meter (McArthur 1973) and is a measure of the short-term availability of forest fuels. AFF (Available Fuel Factor) is used in Western Australia to define the proportion of litter fuel available for burning (Sneeuwjagt & Peet 1998).
2. Wind speed is measured at 10m height in the open above ground level.
3. FFDI is the McArthur Forest Fire Danger Index, GFDI is the McArthur Grass Fire Danger Index.

The rationale for the reference first attack conditions is documented in DSE's *Overall fuel hazard assessment guide: a rationale report – fire and adaptive management report no. 83* (in prep).

Appendix 2. Sample fuel assessment field work form v3

Date Assessed:	Assessors:
Sampling Location:	Veg Type:

Plot Information			
Plot No.			
Zone:			
Easting (GDA94 MGA UTM):			
Northing (GDA94 MGA UTM):			

Canopy height (Assess over a 20m radius)			
Average Height to Top of Canopy:	m	m	m
Average Height to Base of Canopy:	m	m	m

Bark fuel (Assess over a 20m radius)															
Stringybark Fuel Hazard:	NP	M	H	VH	E	NP	M	H	VH	E	NP	M	H	VH	E
Ribbon Bark Fuel Hazard:	NP	M	H	VH		NP	M	H	VH		NP	M	H	VH	
Other Bark Fuel Hazard:	L	M	H			L	M	H			L	M	H		

Select the Bark Hazard rating from above that will be used to determine Overall Fuel Hazard. (Only use the Stringybark hazard rating if more than 10% of the trees are Stringybark **AND** it has the highest rating. Otherwise use the bark with next highest rating.)

Bark Fuel Hazard:	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Elevated fuel layer (Assess over a 10m radius)															
Elevated % Cover:	%					%					%				
Elevated % Dead	%					%					%				
Elevated Fuel Ave Height (m)	m					m					m				
Elevated Fuel Hazard:	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Near-surface fuel layer (Assess over a 10m radius)															
Near-surface % Cover:	%					%					%				
Near-surface % Dead	%					%					%				
NS Average Height (cm):	cm					cm					cm				
NS Fuel Hazard:	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

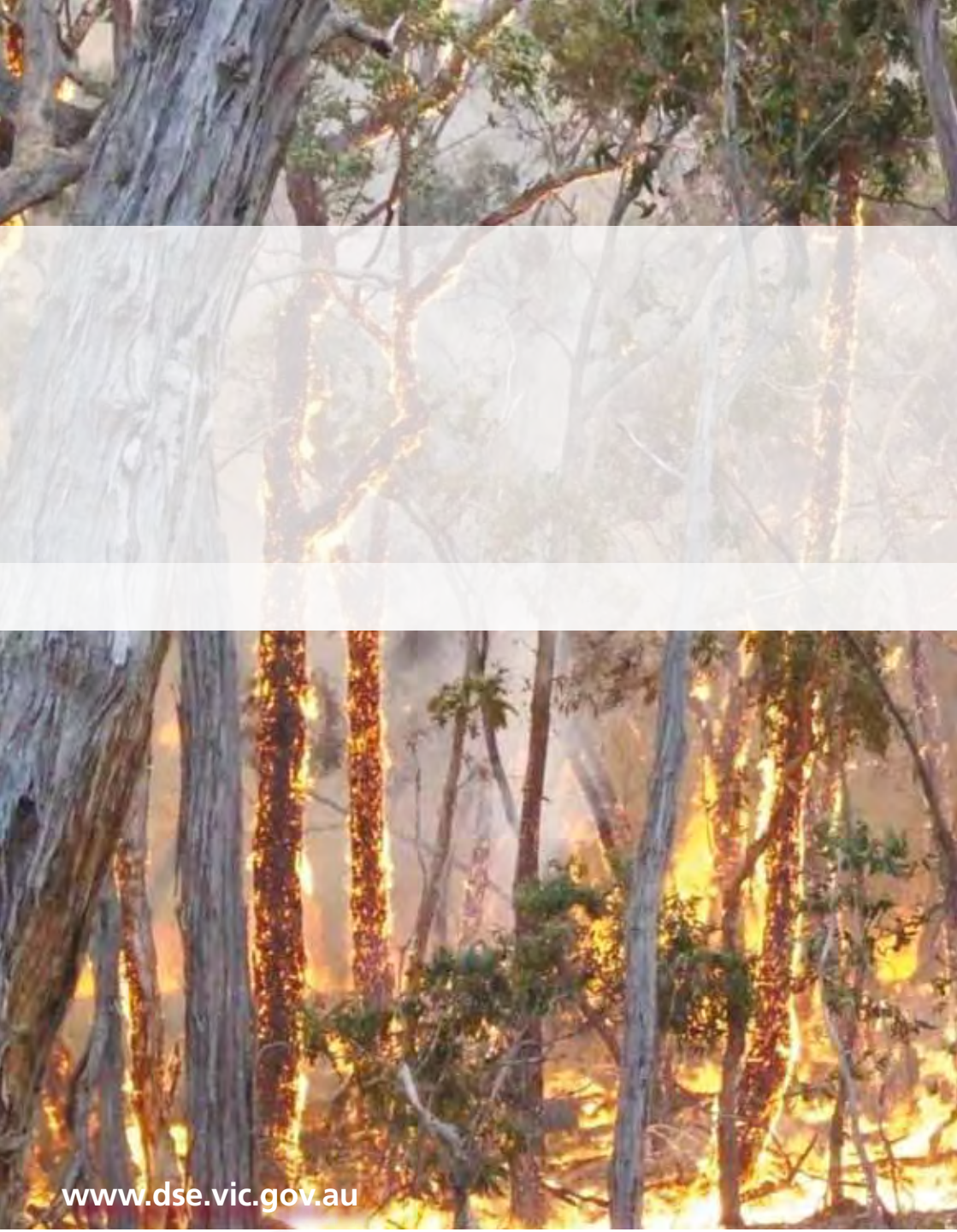
Surface fuel layer (Assess over a 10m radius)															
Surface Litter % Cover:	%					%					%				
Average Litter Depth (mm):	mm					mm					mm				
Surface Fuel Hazard	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Combined Surface and Near-surface Fine Fuel Hazard calculation (refer Section 7)															
Combined Hazard	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Overall Fuel Hazard calculation (refer Section 8)															
Overall Fuel Hazard	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Are the plots representative of the average fuels across the sampling location?	Yes	No

If no, explain any significant difference between plots. For example, wet gully runs through the sampling area, no plots were located in this gully.



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APPENDIX F

Habitat quality method

Summary

The habitat quality score for each matter of national environmental significance (MNES) will be assessed based on a combination of assessment methods outlined in the Queensland Herbarium's BioCondition Manual, the *Guide to Determining Terrestrial Habitat Quality* (version 1.3; DES, 2020) and the methods outlined below in order to be consistent with the requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (Qld; EPBC Act) guideline for the offsets assessment guide.

MNES habitat quality scoring method

The habitat quality for each MNES for use in the offsets assessment guide, is required to consider three attributes:

- site condition
- site context
- species stocking rate.

The following sections provide an overview of the methodology used to calculate habitat quality. All three components will be assessed for threatened fauna and flora; however, for threatened ecological communities (i.e. Brigalow TEC) only site condition and site context components will form the habitat quality score.

Site condition

Method

The site condition score for each MNES will be calculated generally in accordance with the site-based attribute assessment methodology of the BioCondition Assessment Manual (Eyre et al., 2015), outlined in the *Guide to Determining Terrestrial Habitat Quality* (version 1.3; DES, 2020). Site condition is determined through a site-based assessment of 13 ecological attributes to describe the structure and function of the vegetation community, compared to the expected range for a relatively undisturbed (intact) community (i.e. regional ecosystem benchmark).

The results of site-based assessment are scored based on the scoring guide provided in the BioCondition Assessment Manual to determine the site condition score for each MNES at each relevant monitoring site, out of 80.

Offset assessment guide requirements

In accordance with the offsets assessment guide the condition of a site is considered in relation to the ecological requirements of a threatened species or ecological community including:

- What is the structure and condition of the vegetation on the site?
- What is the diversity of relevant habitat species present (including both endemic and non-endemic)?
- What relevant habitat features are on the site?

Table F1 summarises how each of the requirements of the offsets assessment guide are considered as part of determining the site condition score for an offset value.

Table F1: Assessment of site condition

Habitat quality component	Assessment process
What is the structure and condition of the vegetation on the site?	The structure and condition of the vegetation is assessed generally in accordance with the site-based attribute assessment methodology from the BioCondition Assessment Manual. This assessment measures a suite of ecological attributes to describe the structure, function and integrity of the vegetation community, compared to the same vegetation community in a relatively undisturbed (intact) state (i.e. a benchmark). The condition of the vegetation community has a direct influence on its ability to support and provide habitat for biodiversity values.
What is the diversity of relevant habitat species present (including endemic and non-endemic)?	The site condition component from the BioCondition Assessment Manual assesses different attributes of a vegetation community comparing the relevant species richness for particular attributes against a published benchmark, including native tree, shrub, grass and forb species richness. The results of these assessments can be used to confirm the presence and diversity of habitat species relevant to the offset value.
What relevant habitat features are on the site?	The offset area for each value was initially determined based on ground-truthed RE and the presence of known habitat features identified as part of field surveys of the area, in accordance with species conservation advice and other species-specific sources endorsed by Queensland and/or Commonwealth Governments. Ongoing site condition assessments for each offset value will continue to confirm the presence of relevant habitat features within previously shortlisted, suitable vegetation communities as well as assessing their condition against the published benchmark.

Site context

Method

The method to calculate site context for a site is based on a combination of the landscape context attributes assessment method outlined in Section 6 of the BioCondition Assessment Manual as well as an assessment of threats that occur on or near the site to ensure the requirements for site context under the offsets assessment guide are adequately assessed.

Subregion assessment

The first step is to determine whether the given site is located within a fragmented or intact subregion in Queensland. Fragmented subregions are defined in the BioCondition Assessment Manual as those subregions where the amount of remnant vegetation is less than 65%, with remaining subregions considered intact. Section 6 of the BioCondition Assessment Manual identifies the bioregions and subregions considered either fragmented or intact. All impact and offset monitoring sites were located within fragmented subregions.

The following components were assessed through a GIS desktop analysis at each relevant monitoring site for each MNES.

Patch size (fragmented subregion)

Patch size is the size of the patch/assessment unit being assessed and any directly connecting remnant vegetation. To calculate the patch size score:

1. The area of remnant vegetation in which the monitoring site is located is measured, summing together with this all other directly connecting areas of remnant vegetation.

Where a monitoring site is within an area not considered remnant vegetation (i.e. regrowth vegetation), the patch size is 0 ha.

2. Determine the score for this attribute by matching with the class ranges in Table F2.

Connectedness (fragmented subregion)

The proportion of the assessment unit's boundary which is connected to remnant vegetation is measured. To calculate the connectedness score:

1. The percentage of remnant vegetation along the boundary of the assessment unit patch containing the monitoring site was measured.
2. Determine the score for this attribute by matching with the class ranges in Table F2.

Context (fragmented subregion)

Assessment of context involves measuring the percentage of remnant vegetation within a one kilometre buffer around the monitoring site. To calculate the context score:

1. Create a 1 km buffer around the monitoring site.
2. Measure the percentage of remnant vegetation within the 1 km buffer.
3. Determine the score for this attribute by matching with the thresholds in Table F2.

Table F2: Site context scoring guide

Attribute		Score				
Size of Patch	Score	0	2	5	7	10
	Description	<5 ha	5-25 ha	26-100 ha	101-200 ha	>200 ha
Connectedness	Score	0	2		4	5
	Description	0-10%	>10%-<50%		50-75%	>75% or >500 ha
Context	Score	0	2		4	5
	Description	<10%	>10-30%		>30-75%	>75%

Threats

The measure of threat is calculated for each MNES and is undertaken generally in accordance with Section 2.4.4.4 (Absence of threats) of the Guide to Determining Terrestrial Habitat Quality (DES, 2020). This attribute indicates the magnitude of all known or potential threats within, or within close proximity to, the matter area that may negatively impact on the species' habitat and/or the species' ability to exist and persist in the matter area.

A list of known and potential threats are first collated from the literature, including relevant conservation advices and other matter-specific sources endorsed by Queensland and/or Commonwealth Governments. Through a combination of desktop assessments and site-based assessments, a refinement of identified threats for each matter is undertaken (whether involving the removal or addition of threats), resulting in a final list of threats considered to retain a level of scope or severity.

Scope refers to the proportion of the matter's habitat or local population within the matter area that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends. Scope is scored on a five-point rating scale:

1. *Very High*: The threat is likely to be pervasive in its scope, affecting the species' habitat or the species' local population across all or most (80-100%) of its occurrence or population within the matter area.
2. *High*: The threat is likely to be widespread in its scope, affecting the species' habitat or the species' local population across a majority (60-79%) of its occurrence or population within the matter area.
3. *Medium*: The threat is likely to be restricted in its scope, affecting the species' habitat or the species' local population across some (40-59%) of its occurrence or population within the matter area.
4. *Low*: The threat is likely to be narrow in its scope, affecting the species' habitat or the species' local population across small proportion (20-39%) of its occurrence or population within the matter area.
5. *Very Low*: The threat is likely to be very narrow in its scope, affecting the species' habitat or the species' local population across a negligible proportion (1-19%) of its occurrence or population within the matter area.

Severity refers to the level of damage (given the identified scope) from the given threat to the matters' habitat/local population that can reasonably be expected given the continuation of current circumstances and trends. As with scope, severity is scored on a five-point rating scale:

1. *Very High*: Within the scope, the threat is likely to destroy or reduce the species' habitat/local population by 80-100% within ten years or three generations.
2. *High*: Within the scope, the threat is likely to seriously degrade or reduce the species' habitat/local population by 40-79% within ten years or three generations.
3. *Medium*: Within the scope, the threat is likely to moderately degrade or reduce the species' habitat/local population by 11-39% within ten years or three generations.
4. *Low*: Within the scope, the threat is likely to only slightly degrade or reduce the species' habitat/local population by 6-10% within ten years or three generations.
5. *Very Low*: Within the scope, the threat is likely to have a negligible damage or will only degrade or reduce the species' habitat/local population by 1-5% within ten years or three generations.

Using the rating scores for scope and severity, a score is assigned between 1 and 25 for each matters' threat factor in accordance with the threat matrix in Table F3 below, whereby a score of 1 represents a very high threat and 25 poses very low threat.

Table F3: Threat matrix for scoring each threat factor according to its scope and severity

Threat Matrix			**Severity**				
			Very High	High	Medium	Low	Very Low
			1	**2**	**3**	**4**	**5**
Scope	Very High	**1**	1	2	3	4	5
	High	**2**	2	4	6	8	10
	Medium	**3**	3	6	9	12	15
	Low	**4**	4	8	12	16	20
	Very Low	**5**	5	10	15	20	25

The methodology prescribed in the Guide to Determining Terrestrial Habitat Quality (DES 2020) calculates the final score for the 'absence of threats' attribute as that of the lowest scoring (i.e., most threatening) threat factor. However, the current method has taken a more conservative approach by considering the average score for all threat factors, excluding all those with a score of 25 (i.e., excluding threat factors characterised as ones of very low severity and very low scope).

The total site context score for each MNES at each relevant monitoring site is calculated out of 45, based on the following:

1. Summing the patch size, connectedness and context scores, out of 20.
2. Calculating the average threats score, out of 25.
3. Calculating a final weighted score for site context as:
    a. 50% weighting of the combined patch size, connectedness and context
    b. 50% weighting of the threats score.

Offsets assessment guide requirements

In accordance with the offsets assessment guide, site context is assessed based on the relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community, as well as identifying known or potential threats including:

- What is the connectivity with other suitable/known habitat or remnants?
- What is the importance of the site in relation to the overall species population or the occurrence of the community?
- What threats occur on or near site?

Table F4 summarises how each of the requirements above are considered as part of determining the site context score for an offset value.

Table F4: Assessment of site context

Habitat quality component	Assessment process
What is the connectivity with other suitable/known habitat or remnants?	This component is assessed through: • Patch size – measuring the size of the patch of remnant vegetation being assessed and any directly connecting remnant vegetation. • Connectedness – measuring the proportion of the remnant patch that a given monitoring site is located within which is connected to remnant vegetation.
What is the importance of the site in relation to the overall species population or the occurrence of the community?	This component is assessed through the BioCondition Assessment Manual measure of context, representing the percentage of remnant vegetation within a 1 km buffer around a given monitoring site. The greater the proportion of suitable/known habitat and remnant vegetation within the buffer area the more likely the site and surrounding areas will support a viable, self-sustaining, source-meta-population of the species or community.
What threats occur on or near site?	This component is based on the assessment of the scope and severity of confirmed and potential threats occurring within, or within close proximity to the site for each MNES. A list of matter-specific threats is provided in Tables F9 – F17.

Species habitat index

Method

Species habitat index was calculated generally in accordance with the species habitat attribute assessment methodology outlined in the Guide to Determining Terrestrial Habitat Quality (DES, 2020), as well as the requirements for species stocking rate under the offsets assessment guide. Table F5 summarises the method to be used to calculate the species habitat index score, out of 20. Species habitat attributes indicate a matter area's capacity to support a species for all or part of its life cycle, whether permanently or from time to time.

Each sub-component of species habitat index scoring method has been tailored for each MNES to take into account species-specific habitat requirements in accordance with conservation advices and other species specific sources endorsed by Queensland and/or Commonwealth Governments, as well as an assessment of the role of the site population in regards to the overall species population.

Table F5: Method to assess species habitat index

Component	Sub-component/scoring	Score
Quality and availability of food and habitat required for foraging	A species-specific assessment of the quality and availability of food and habitat required for foraging, assigned as a score between 1 and 5, where: • a score of **1** represents very limited species-specific foraging habitat (e.g., litter and stone cover for collared delma), conditions or food resources available • a score of **5** represents species-specific foraging habitat, conditions or food resources are present for all relevant stages of the life cycle.	**1 – 5**
Quality and availability of habitat required for shelter and breeding	A species-specific assessment of the quality and availability of habitat required for shelter and breeding. Habitat required for shelter may include habitat factors required to avoid predation or other threats, rest or seeking shelter from the elements. The result of the assessment assigns a score between 1 and 5, where: • a score of **1** represents very limited species-specific shelter and breeding habitat (e.g., presence of large coarse woody debris for yakka skink), conditions or resources available • a score of **5** represents presence of abundant, available species-specific shelter and breeding habitat, conditions and resources for all relevant stages of the life cycle	**1 – 5**
Quality and availability of habitat required for mobility	A species-specific assessment of quality and availability of habitat required for mobility. Habitat required for mobility relates to the species' ability to move within the matter and, if relevant, to and from adjacent patches of habitat. The result of the assessment assigns a score between 1 and 5, where: • a score of **1** represents an almost complete barrier to mobility between patches of suitable habitat for the given matter, either by natural barriers (e.g., steep mountain ranges, cliffs, unsuitable habitats) or artificial barriers (e.g., infrastructure (roads, rail, mines) or extensive areas of treeless, unsuitable habitat) • a score of **5** represents limited barriers to mobility, with contiguous remnant vegetation affording relatively unimpeded movement or functional connectivity between suitable habitat patches for the given matter.	**1 – 5**

Role of site location to species overall population	Site not or unlikely to be critical to species' survival – Site is unlikely to support a population of the species and the site is within the given species' geographical range. The site contains low quality food, foraging and shelter habitat, with limited mobility capacity to other areas of suitable habitat.	**1**
	Site likely to support habitat critical to species' survival – the site is likely to support a population of the species and the site is within the given species' geographical range. The site contains moderate quality food, foraging and shelter habitat, with moderate mobility capacity to other areas of suitable habitat.	**3**
	Site known to support habitat critical to species' survival – there is evidence of one or more species records within the last 10 years within 5 km of the site and site contains greater than moderate quality food, foraging and shelter habitat, with greater than moderate mobility capacity to other areas of suitable habitat.	**4**
	Site is critical to the species' survival – there is evidence of multiple species records within the last 10 years and site contains high quality food, foraging and shelter habitat, with limited mobility to other areas of suitable habitat.	**5**

Offsets assessment guide requirements

In accordance with the offsets assessment guide species stocking rate is assessed based on the usage and/or density of a species at a particular site and the role of the site population in regards to the overall species population viability or community extent, including:

- What is the presence of the species on the site? (i.e. confirmed / modelled).
- What is the density of species known to utilise the site?
- What is the role of the site population in regards to the overall species population?

Table F6 summarises how each of the requirements above are considered as part of determining the species habitat index score for an offset value.

Table F6: Assessment of species stocking rate

Habitat quality component	Assessment process
What is the presence of the species on the site? (i.e. confirmed / modelled).	The components assessed as part of the method quantify the presence, density and role of the site's ability to actually or likely support a species population. It also provides a measure of the quality and availability of food, foraging habitat, shelter and breeding habitat for each species. The relative presence and density of the MNES on the site will be assessed as part of ongoing targeted surveys undertaken in accordance with the DSITIA Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al., 2014), Survey Guidelines for Australia's Threatened Birds (DEWHA, 2010), Survey guidelines for Australia's threatened reptiles (DSWEPaC, 2011) and other species-specific survey guidelines endorsed by Queensland and/or Commonwealth Government.
What is the density of species known to utilise the site?	
What is the role of the site population in regards to the overall species population?	

Final habitat quality score

Table F7 provides a summary of the components used to score habitat quality for each MNES and the maximum score and relevant weighting for each component. The habitat quality score for each MNES is calculated as the average score across each of the monitoring sites within a given assessment unit (regional ecosystem), area-weighted for the contribution of those REs to the offset area.

Table F7: Scores for each attribute contributing to each of the three habitat quality score components, including their weightings. These scores are assigned for each monitoring point

Site condition			Site context				Species habitat index			
Attributes	**Score**	**Weighting**	**Attributes**	**Score**	**Weighting**		**Attributes**	**Score**	**Weighting**	
Recruitment of woody perennial species	5	6.25%	Size of patch	10	50%	25%	Quality and availability of food and habitat required for foraging	5	50%	16.7%
Native plant species richness - trees	5	6.25%	Connectivity	5		12.5%	Quality and availability of habitat required for shelter and breeding	5		16.7%
Native plant species richness - shrubs	5	6.25%	Context	5		12.5%	Quality and availability of habitat required for mobility	5		16.7%
Native plant species richness - grasses	5	6.25%	Threats	25	50%		Role of site location to species overall population in the state	5	50%	
Native plant species richness - forbs	5	6.25%								
Tree canopy height	5	6.25%								
Tree canopy cover	5	6.25%								
Shrub canopy cover	5	6.25%								
Native perennial grass cover	5	6.25%								
Organic litter	5	6.25%								
Large trees	15	18.75%								
Coarse woody debris	5	6.25%								
Non-native plant cover	10	12.5%								
Total	**/80**	**100%**	**Total**	**/45**	**100%**		**Total**	**/20**	**100%**	
Site condition weighting		**30%**	**Site context weighting**		**30%**		**Species habitat index weighting**		**40%**	

Table F8: Threats and species-specific considerations informing site context (threats) and habitat quality scoring for northern quoll.

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Poisoning through ingestion of cane toads (*Rhinella marina*) • Loss of ground cover as a consequence of unsuitable fire, resulting in risk of increased predation and/or reduced food • Loss of ground cover as a consequence of livestock grazing • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds • Predation by feral predators (e.g., cats, foxes, wild dogs) • Poisoning through 1080 baiting
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and quality of habitat for prey (i.e., insects, small vertebrates), namely the abundance and diversity of litter, woody debris, logs, surface rocks, crevices, grass and shrub layers. • Proximity of foraging habitat and food within 1 km of shelter sites
	Quality and availability of habitat required for shelter and breeding	• Presence and proximity to rocky den sites, characterised by deep clefts and fissures in rocks
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover • Presence and quality of grass and shrub layers • Presence of temporary shelter such as boulders, logs. • Presence of known or potential predators (e.g., cats, dogs) • Proximity of shelter sites within 5 km

Table F9: Threats and species-specific considerations informing habitat quality scoring for collared delma

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Alteration of ground cover as a consequence of unsuitable fire regime • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds • Predation by feral predators (e.g., cats, foxes, wild dogs) • Removal of foraging and shelter habitat (e.g., rocks, coarse woody debris, ground litter) • Change in ground layer composition as a consequence of livestock grazing and feral horse browsing
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and abundance of evidence of small invertebrates • Presence and cover of leaf litter and loose stones, used as shelter by prey
	Quality and availability of habitat required for shelter and breeding	• Presence and cover of leaf litter and loose stones considered suitable for sheltering
	Quality and availability of habitat required for mobility	• Presence and cover of litter and loose stones • Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F10: Threats and species-specific considerations informing habitat quality scoring for Dunmall's snake

Component	Attribute	Species-specific considerations
Site context	Threats	• Alteration of ground cover as a consequence of unsuitable fire regime • Change in ground layer composition as a consequence of livestock grazing and feral horse browsing • Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Predation by feral predators (e.g., cats, foxes, pigs) • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and cover of leaf litter and coarse woody debris, used as shelter by prey
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of coarse woody debris, particularly large, hollow-bearing logs used as shelter
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F11: Threats and species-specific considerations informing habitat quality scoring for large-eared pied bat

Component	Attribute	Species-specific considerations
Site context	Threats	• Potential of reduced foraging opportunities and flying invertebrate productivity as a consequence of unsuitable fire regime • Loss of sandstone roosting/maternity sites, whether through occupation by pest animal species (e.g., goats) or impacts to structural integrity from uncontrolled wildfire • Predation by feral predators (e.g., foxes)
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence of an intact, mature canopy cover • Presence of heterogenous forest matrix providing forest edges suitable/favourable for foraging
	Quality and availability of habitat required for shelter and breeding	• Presence of sandstone cliff lines with deep fissures, particularly horizontal fissures and/or caves
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F12: Threats and species-specific considerations informing habitat quality scoring for red goshawk

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable foraging habitat through land clearing and effects associated with fragmentation of large contiguous patches of forest and woodland, particularly large trees in alluvial valleys • Potential of reduced prey (e.g., medium sized birds) as a consequence of unsuitable fire regime • Potential of reduced prey as a consequence of impacts such as grazing, reducing productivity • Lack of permanent freshwater, both in proximity to shelter habitat (i.e. tall trees) as well as role in supporting medium-sized bird prey
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and abundance of medium-sized birds • Presence and abundance of suitable habitat for medium-sized birds (i.e. intact canopy, shrubs, wetlands etc)
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of trees ≥ 18 m, • Presence of an intact, contiguous canopy cover • Remoteness from human disturbance, characterised by large contiguous tracts of remnant and regrowth vegetation
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F13: Threats and species-specific considerations informing habitat quality scoring for squatter pigeon (southern)

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Change in ground layer composition as a consequence of grazing and ecosystem engineering actions by rabbits (e.g. burrowing, soil turnover) • Change in ground layer composition and trampling ground nests as a consequence of livestock grazing and feral horse browsing, especially in grassy, alluvial areas • Change in ground layer composition, including thickening of understorey structure, as a consequence of unsuitable fire regime • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds • Predation by feral predators (e.g., cats, foxes)
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and quality of low, open grassy woodland • Proximity to water • Presence of sparse to mid-dense native grass cover
	Quality and availability of habitat required for shelter and breeding	• Presence and quality of open grassy woodland
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F14: Threats and species-specific considerations informing habitat quality scoring for yakka skink

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Predation by feral predators (e.g., cats, foxes, pigs) • Alteration of ground cover as a consequence of unsuitable fire regime • Removal of foraging and shelter habitat (e.g., rocks, coarse woody debris, ground litter) • Destruction of potential shelter habitat associated with rabbit warren ripping • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
Species habitat index	Quality and availability of food and habitat required for foraging	• Evidence and abundance of insect and other arthropod prey • Presence and quality of ground foraging habitat, particularly leaf litter and native grass cover
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of coarse woody debris, particularly large, hollow-bearing logs used as shelter • Any direct evidence of occupation (e.g., burrows, communal defecation sites)
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F15: Threats and species-specific considerations informing habitat quality scoring for south-eastern long-eared bat

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Alteration of the structure of suitable habitat (e.g. mix of shrubby and open structure habitat) including loss of hollow-bearing trees as a consequence of unsuitable fire regime • Impacts on understorey habitat suitability as a consequence of livestock grazing and feral horse browsing, impacting habitat for flying invertebrate prey in the understorey • Competition for hollows from native fauna species (e.g., parrots and cockatoos) and non-native fauna species (e.g., European honeybees, common myna), especially where hollows are limited
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence of an intact, mature canopy cover • Presence and extent of white cypress pine (*Callitris glaucophylla*) favoured as foraging habitat
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of decorticating and loose bark on trees used for shelter and breeding • Presence and abundance of small tree hollows used for shelter and breeding
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

Table F16: Threats and species-specific considerations informing habitat quality scoring for koala

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Mortality due to vehicle collision • Predation by feral predators, particularly wild or domesticated dogs • Alteration of the structure of suitable habitat, including loss of primary feed trees, as well as direct mortality as a consequence of unsuitable fire regime • Evidence for the presence of disease within the population (i.e., *Chlamydia pecorum*)
Species habitat index	Quality and availability of food and habitat required for foraging	• Extent and dominance of myrtaceous trees (i.e., *Eucalyptus*, *Angophora*, *Corymbia*) • Abundance and extent of large trees used for foraging • Presence of favoured feed species (e.g., *E. tereticornis, E. camaldulensis, E. major, E. longirostrata*), as well as other feed trees (*E. chloroclada, E. populnea, E. crebra, E. melanophloia, E. orgadophila, Corymbia citriodora*) • Presence of nearby waterbodies and ephemeral or perennial watercourses
	Quality and availability of habitat required for shelter and breeding	• Presence and extent of large myrtaceous trees (i.e., *Eucalyptus*, *Angophora*, *Corymbia*)
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

APPENDIX B

Springwater Offset Area Management Plan

Santos

Santos GLNG

Springwater Offset Area Management Plan

Document Number: 0007-650-EMP-0021

Date	Rev	Reason for Issue	Reviewed	Endorsed	Approved
21/07/2021	0	For DAWE submission	MB	MB	JC/ED

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Appendices

Appendix A – Offsets Assessment Guides for the Springwater offset area

Appendix B – Baseline habitat quality score for Springwater offset area

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Abbreviations

Acronym	Description
BPA	Biodiversity Planning Assessment
CSG	Coal Seam Gas
DAF	Department of Agriculture and Forestry (Qld)
DAWE	Department of Agriculture, Water and the Environment; formerly Department of the Environment and Energy (DEE)
DES	Department of Environment and Science; formerly Department of Environment and Heritage Protection (DEHP)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GIS	Geographical Information System
GLNG	Gladstone Liquefied Natural Gas
GTDTHQ	Guide to Determining Terrestrial Habitat Quality
GTP	Gas Transmission Pipeline
MNES	Matters of National Environmental Significance
OAMP	Offset Area Management Plan
PMAV	Property Map of Assessable Vegetation
RE	Regional Ecosystem
REDD	Reginal Ecosystem Description Database
SEVT	Semi Evergreen Vine Thicket
SOA	Springwater Offset Area
spp	species
TEC	Threatened Ecological Community
VM	*Vegetation Management Act 1999* (Qld)

Executive Summary

This offset area management plan (OAMP) has been prepared to address the requirements of the Santos GFD Project approval EPBC 2012/6615 to provide suitable offsets for MNES and a rehabilitation area offset to compensate for direct and indirect adverse impacts on matters of national environmental significance (MNES).

Santos will secure an 837.5 ha offset area on the northeast sections of the Springwater property (Lot 8 on Plan SP261936) and will be referred to as the Springwater Offset Area (SOA). The offset area will partially acquit requirements for impacts on MNES under EPBC 2012/6615 as well as provide surplus offset values to be used by Santos to acquit future project offset requirements (Table ES 1). For MNES where a surplus is noted, Santos proposes to draw down on these to acquit future offset requirements under approvals related that are yet to be granted. In addition to the remnant and regrowth vegetation areas in the Springwater offset identified below, there are areas of non-remnant vegetation (i.e., immature regrowth) that is likely to regenerate and benefit from management in accordance with this plan. Consequently, these areas may be combined with surplus areas identified below to meet future offset requirements. The remaining obligations under EPBC EPBC 2012/6615 will be satisfied elsewhere.

The Springwater property is located within the Santos GFD Project tenements approximately 36 km north-east of Injune. Current land uses at the Site include cattle grazing, irrigated cropping, tree plantations and petroleum activities. The property is contiguous with large areas of remnant vegetation in the north on Beilba State Forest, 'Fairview' Holding and Expedition (Limited Depth) National Park, to the northeast on Expedition Resource Reserve, and to the south on Hallett State Forest. Desktop and field surveys of the Springwater property have been completed to confirm the presence of offset values and suitability to satisfy the Project's offset obligations as follows:

1. During 2015
    - Preliminary desktop assessment of biodiversity offset values
    - Detailed field assessment to ground truth vegetation and confirm presence of environmental values
    - Targeted flora and fauna surveys and habitat assessments

2. October 2017 (Spring/early summer)
    - Detailed offset monitoring in accordance with commitments in the Stage 1 Offset Plan

3. November 2018 (Spring/early summer)
    - Rapid offset monitoring in accordance with commitments in the Stage 1 Offset Plan

4. October 2020 (Spring/early summer)
    - Rapid offset monitoring in accordance with commitments in the Stage 1 Offset Plan

The results of these assessments were used to identify the values and quality of the offsets in the SOA.

The outcome of this OAMP is to acquit the offset obligations under EPBC 2012/6615. The SOA will be managed and monitored, based on an adaptive management framework, to achieve the interim performance targets and completion criteria presented in Table ES 2.

The key management actions to be implemented include:

- restricting access to the offset area
- management and restoration of regrowth TEC

- maintenance and upgrades of existing access tracks, fencing and firebreaks
- fire management through strategic grazing and fuel hazard reduction burns
- weed management
- pest animal management.

Ongoing monitoring events will be undertaken to assess the effectiveness of the management actions and progress of the offset area in achieving the interim performance targets and completion criteria, including:

- biannual offset area inspections
- biomass monitoring
- fuel load monitoring
- weed monitoring
- pest animal monitoring
- rapid monitoring events
- habitat quality assessments
- brigalow stem counts
- photo monitoring.

Annual reports will be prepared to detail progress of the offset area in achieving the interim performance targets and completion criteria for each management year including the results of management and monitoring activities completed.

Within 12 months following approval of this OAMP, Santos will apply to have the offset area protected via a Voluntary Declaration under section 19E and 19F of the Queensland Vegetation Management Act 1999 (including surplus areas identified in Table ES1). The Voluntary Declaration will remain in place for the life of EPBC 2012/6615.

Table ES 1: Summary of Santos GFD Project MNES offset requirements acquit on the Springwater offset area

MNES	Status under EPBC Act	Total MNES Offsets	Used for Stage 2	Used for Stage 3	Used for Stage 4	Surplus Remaining
Threatened ecological communities						
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	369.3	53	198.0	65.6	4.1
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	57.5	No Impact	No Impact	26	18.5
Threatened ecological communities						
Black-breasted button-quail (*Turnix melanogaster*)	V	57.5	No Impact	5.7	19	18.5
Red goshawk *(Erythrotriorchis radiatus)*	V	837.5	No Impact	288.0	N/A^	549.5
Squatter pigeon (southern) *(Geophaps scripta scripta)*	V	429.6	No Impact	75.0	N/A^	354.6
South-eastern long-eared bat *(Nyctophilus corbent)*	V	837.5	340	371.0	N/A^	126.5
Koala *(Phascolarctos cinereus*)	V	429.6	217	156.0	N/A^	56.6
Large-eared pied bat (*Chalinolobus dwyeri)*	V	837.5	No Impact	251.0	N/A^	586.5
Northern quoll *(Dasyurus hallucatus)*	E	837.5	No Impact	251.0	N/A^	586.5
Collared delma *(Delma torquata)*	V	768.4	284	339.5	N/A^	144.9
Dunmall's snake *(Furina dunmalli)*	V	768.4	284	351.5	N/A^	132.9
Yakka skink (*Egernia rugosa)*	V	768.4	279	350.5	N/A^	138.9

*Total offset obligation under EPBC approval 2012/6615

Total area is based on 823.1 ha impact to essential habitat and 131.6 ha impact to general habitat as per the yakka skink habitat associations described in Boobook (2020). Offset area for yakka skink includes high quality habitat only.

^Offset requirement satisfied on another property

Table ES 2: Interim performance targets and completion criteria

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Assessment Units - Advanced regrowth REs: 11.9.5, 11.9.7 and Young regrowth REs: 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	Increased	Increased to within 50% of remnant height	Increased to within 75% of remnant height	Remnant (VMA) Structure and floristics
Canopy recruitment	Increased, or 100%	Increased, or 100%	Increased, or 100%	Increased, or 100%
Tree canopy cover	Increased	Increased to within 50% of remnant cover	Increased to within 75% of remnant cover	Remnant (VMA) Structure and floristics
Shrub layer cover	Increased	Increased	Increased	Increased
Coarse woody debris	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Native plant species richness	Increased for four life forms	Increased for four life forms	Increased for four life forms	Increased for four life forms
Non-native plant cover	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%
Native perennial grass cover	Increased	Increased	Increased	Increased
Litter cover	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Access and development	Limited	Limited	Limited	Limited
BioCondition metric scores	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing
Clearing	No clearing has occurred	No clearing has occurred	No clearing has occurred	No clearing has occurred
Weeds	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover
Pest animals	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.
Assessment Unit - Remnant REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	Has not decreased	Has not decreased	Has not decreased	Has not decreased
Canopy recruitment	Increased, or 100%	Increased, or 100%	Increased, or 100%	Increased, or 100%
Tree canopy cover	Has not decreased	Has not decreased	Has not decreased	Has not decreased
Shrub layer cover	Increased	Increased	Increased	Remnant (VMA) Structure and floristics
Coarse woody debris	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Native plant species richness	Increased for four life forms	Increased for four life forms	Increased for four life forms	Increased for four life forms
Non-native plant cover	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%
Native perennial grass cover	Increased	Increased	Increased	Increased
Litter cover	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Access and development	Limited	Limited	Limited	Limited
BioCondition metric scores	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Clearing	No clearing has occurred	No clearing has occurred	No clearing has occurred	No clearing has occurred
Weeds	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover
Pest animals	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.

1.0 Introduction

The Santos GFD Project involves the development of Coal Seam Gas (CSG) resources in the Surat and Bowen Basins in Queensland, to supply gas via a 430 km gas transmission pipeline (GTP) to the liquified natural gas (LNG) facility located on Curtis Island. Throughout the development of the Santos GFD Project and in accordance with Santos GFD Project approvals, potentially impacted environmental values are systematically identified and assessed and in order of preference are avoided, minimised, or mitigated.

The Santos GFD Project is required to provide environmental offsets for significant residual impacts on matters of national environmental significance (MNES) in accordance with approvals granted under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The purpose of this Offset Management Plan is to outline the management objectives, actions and outcomes necessary to fulfil Santos GFD's statutory offset requirements. Under the Santos GFD Project approval (EPBC 2012/6615), Santos GFD may carry out the action in project stages over time. Santos GFD must deliver environmental offsets for residual significant impacts to Matters of National Environmental Significance (MNES) over time. This Offset Management Plan has been prepared for Stage 4 of the GFD Project.

For the purposes of the GFD Project approval (EPBC 2012/6615), this Offset Management Plan will offset impacts associated with Stage 4 of the GFD Project by means of the Springwater Offset Area (SOA). Stage 4 includes proposed development in the Fairview gas fields, on Petroleum Lease (PL) 100, PL 232, PL91 and PL92. The impacts to be offset are outlined in Table 1.

Table 1: Stage 4 Impacts to MNES associated with disturbance under EPBC 2012/6615

MNES	Status under EPBC Act[1]	Disturbance area (ha)
Listed threatened ecological communities		
Brigalow *(Acacia harpophylla* dominant and co-dominant)	E	5.5
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	2.0
Listed threatened species		
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	V	500
Koala (*Phascolarctos cinereus*)	V	343
Greater Glider (*Petauroides volans*)	V	343
Collared Delma (*Delma torquata*)	V	492
Yakka Skink (*Egernia rugosa*)	V	497
Northern Quoll (*Dasyurus hallucatus*)	E	151
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	151
Red Goshawk (*Erythrotriorchis radiatus*)	V	500
Black-breasted Button-quail (*Turnix melanogaster*)	V	2.3

MNES	Status under EPBC Act[1]	Disturbance area (ha)
Dunmall's Snake (*Furina dunmalli*)	V	496
Squatter Pigeon (southern) (*Geophaps scripta scripta*)	V	496
White Throated Needletail (*Hirundapus caudacutus*)	V	499

1.1 Purpose

This OAMP provides a detailed management and monitoring framework for the SOA in accordance with the requirements of EPBC 2012/6615 as presented in Table 2 below.

Table 2: Approval conditions satisfied through this OAMP

Condition		How the conditions are met
EPBC Act approval 2012/6615		
11	The approval holder must ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy.	This plan complies with the principles of the EPBC Act Environmental Offsets. An assessment against these principles for each of the matters potentially impacted by Stage 4 of the project is provided in Section 2.9.
12	The approval holder may carry out the action in project phases. The approval holder must deliver environmental offsets for residual significant impacts to protected matters for each project phase.	The action will be carried out in phases. This Project Offset Plan covers Stage 4 of the GFD Project as described in Section 1.0.
13	The approval holder must submit an Offset Management Plan for the Minister's written approval. The Offset Management Plan may be prepared and submitted to the Minister for written approval in stages. If the approval holder submits the Offset Management Plan in stages, each version of the Offset Management Plan must address the known and predicted impacts of the completed, current, and next proposed project phases.	This plan has been submitted for the Minister's written approval. This Project Offset Plan covers Stage 4 of the GFD Project as described in Section 1.0.
14	The Offset Management Plan must include for the first project phase: a. a method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities. b. results from pre-disturbance surveys and/or an alternative approved methodology (if used) for the project phase as required under conditions 4 and 5; c. details of the offset areas required to address predicted residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities for the project phase; d. a survey and description of the current condition (prior to any management activities) of each offset area proposed, including existing vegetation (the baseline condition). This must include a shapefile of each offset property boundary; e. information about how the offset areas provide connectivity with other relevant habitats and biodiversity corridors, including a map depicting the offset areas in relation to other habitats and biodiversity corridors; f. performance and completion criteria for evaluating the management of the offset area, and criteria for triggering remedial action (if necessary); g. a description of the management measures that will be implemented for the protection of EPBC threatened species, EPBC migratory species and EPBC communities, including a discussion of how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans; h. a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria; i. a description of potential risks to the successful implementation of the plan, and a description of the contingency measures that would be implemented to mitigate against these risks; j. a timeline for when actions identified in the Offset Management Plan will be implemented for each offset area; and k. the proposed legal mechanism and timing for legally securing the offset.	a) The method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities is discussed in Section 3.2 Acquittal document. b) Details of the relevant field assessments are provided in Section 2.4 c) The offset area is the Springwater Offset Area (SOA) details of the SOA are provided in Section 2.6. d) Details of the baseline surveys are provided in Section 3.2 e) The connectivity and the landscape context of the SOA are discussed in detail in Section 2.2. f) Performance criteria, trigger levels, completion criteria and remedial actions for management activity undertaken in the SOA are discussed in Section 4.0. g) Management measures implemented for the protection of MNES, including how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans are provided in Section 6.0. h) The monitoring program for the SOA is outlined in Section **7.0.** i) Risks to the successful implementation of this plan are outlined in Section 2.8. j) An implementation Schedule is provided in Section 9.0. k) Section 2.8 details how the offset for GFD Project has been legally secured.
15	The currently approved Offset Management Plan must be implemented by the approval holder.	This offsets plan complements previous offsets plans and proposals submitted for approval. Once approved, this plan will be implemented.
16	The approval holder must register and legally secure offsets for the first project phase identified in the Offset Management Plan within two years of commencement of the first project phase.	On 6 April 2018, a voluntary declaration over the SOA was certified, thereby satisfying the legal security requirement. The SOA is an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999.* See Section 2.8 for details.
17	The approval holder must register and legally secure offsets for a project stage which are sufficient to acquit the predicted residual significant impacts of that project phase.	The offset for Stage 4 of the GFD Project is secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. See Section 2.8 for details.
18	If the approval holder submits the Offset Management Plan in stages, the approval holder must prepare and submit the Offset Management Plan revised to address each subsequent project stage, for written approval by the Minister. Each revised Offset Management Plan must: 1. include the information required for the Offset Management Plan at condition 14 for the next project phase.	A new offset plan will be submitted for all subsequent stages of the project. A reconciliation of the actual residual significant impacts associated with Stage 1, Stage 2, and Stage 3 of the GFD Project is provided in Section 4.0 Acquittal document.

Condition		How the conditions are met
	2. include a reconciliation of actual and predicted (but yet to be actualised) residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities against offsets secured for the commenced project phases. Secured offsets in excess of requirements arising from actual and predicted (but yet to be actualised impacts) of any commenced project phases may be subtracted from the obligations required for subsequent project phases. Any shortfall in secured offsets relative to the requirements arising from actual and predicted (but yet to be actualised impacts) of any commenced project phases must be added to the obligations required for the next project phase; and 3. demonstrate how the offset builds on offsets already secured for previous project phases and will contribute to a larger strategic offset for cumulative project impacts.	
19	The approval holder must not commence the subsequent project stage until the Offset Management Plan for that project phase, has been approved by the Minister in writing.	This management plan is submitted for the approval of the Minister.

2.0 Springwater Property

2.1 Property Overview

As discussed in the Stage 1 and Stage 2 Offset Management Plans, Santos GLNG has identified the Springwater property as containing suitable environmental values to acquit offset obligations incurred by the development of GFD Project.

Springwater is a 12,636-ha grazing property described as Lot 8 on Plan SP261936 and is located within the local government area of Maranoa Regional Council, approximately 46 km east-northeast of Injune, Queensland (Figure 1). The offset management area is in the northeast sections of the Springwater property. The SOA is bounded by the Hutton Creek in the west and the property boundary of Fairview Station in the north and the east.

Springwater is located within subregion 24 (Carnarvon Ranges) of the Brigalow Belt South bioregion (Sattler and Williams 1999). Current land uses at the Site include cattle grazing, irrigated cropping, tree plantations and petroleum activities. The property is contiguous with large areas of remnant vegetation in the north on Beilba State Forest, 'Fairview' Holding and Expedition (Limited Depth) National Park, to the northeast on Expedition Resource Reserve, and to the south on Hallett State Forest. The Site is owned and managed by Santos (Table 3).

Surface geology mapping for the Springwater property shows that it is comprised entirely of Lower Jurassic sediments (Forbes 1968). The west and much of the southeast of the Site features plateaux of the Boxvale Sandstone Member, falling to valleys and low undulating hills with sandy and clay soils derived from the Evergreen Formation. Plateaux of the Boxvale Formation are also present in the far northeast of the Site. Hutton Creek enters the Site in the central north and cuts a steep gorge eastward through the Precipice Sandstone to meet the Dawson River in the central east of the Site. Soils in this region are coarse sands with expansive areas of surface rock especially within close proximity to Hutton Creek and the Dawson River. Vegetation is dominated by dry sclerophyll Eucalyptus and Acacia woodlands with pockets of semi-evergreen vine thicket (SEVT) in sheltered south-facing parts of the plateau scarps and slopes and within gorges. The dominant land zone (Sattler and Williams 1999) in this area is land zone 10 (coarse-grained sediments) with a small areas of land zone 9 (fine-grained sediments) on slopes and valleys and land zone 3 (alluvium) along Hutton Creek and the Dawson River.

The sandstone plateaus throughout the SOA have historically been cleared for grazing and are currently utilised for timber plantations. The steep slopes that have formed between the tops of the plateaus and the valleys and gorges associated with Hutton Creek are largely intact remnant and regrowth vegetation. These valleys and gorges as well as the waterway itself provide a natural barrier to prevent cattle access to the SOA from the north, west and east. The presence of Hutton Creek enhances the overall value of the offset area, particularly the narrow patches in the west of the SOA. Much of the riparian vegetation associated with Hutton Creek is not part of the SOA because it falls outside of the Springwater property. However, this vegetation together with the narrow patches of offset in the west of the SOA provides a valuable corridor on a local scale.

Infrastructure in the SOA includes gas-gathering infrastructure predominately located within the timber plantation. Within the areas utilised as an environmental offset there are minor access tracks and fire trails. A large pipeline corridor has been retained along the south-eastern edge of the SOA. This pipeline corridor has been located to ensure that the connectivity between the SOA and the larger patches of remnant vegetation to the north remains unaffected. At present, there is no immediate plans to develop the proposed pipeline and the vegetation within the pipeline corridor is being managed in the same way as the surrounding offset areas.

Hutton Creek and the Dawson River are part of the Fitzroy River Basin. The nearest weather station to the Site is at Injune within 46 km of the Site. Yearly average temperatures range from a maximum of 33.6°C in January to a minimum of 3.1°C in July (BOM 2015). Average annual rainfall is 636.3 mm, with the highest monthly average rainfall occurring in December (89.1 mm) and the lowest occurring in August (25.2 mm) (BOM 2015).

Table 3: Springwater landholder and property details

Landholder and Property Details	
Registered Owner/s on Title:	Santos GLNG Pty Ltd (JV representative) Total GNG Australia PAPL (Downstream) Pty Ltd KGLNG Liquefaction Pty Ltd
ABN/ACN:	ABN 12 131 271 648 (Santos GLNG Pty Ltd)
Postal Address:	PO Box 329, Roma Queensland 4455
Lot on plan(s):	Lot 8 on Plan SP261936
Tenure:	Freehold
Area:	12,636 ha
Primary Local Government Area:	Maranoa Regional Council
Non-Petroleum Permits	
Coal Exploration Permit:	EPC 1110 EPC 1110 TILOX RESOURCES PTY LTD

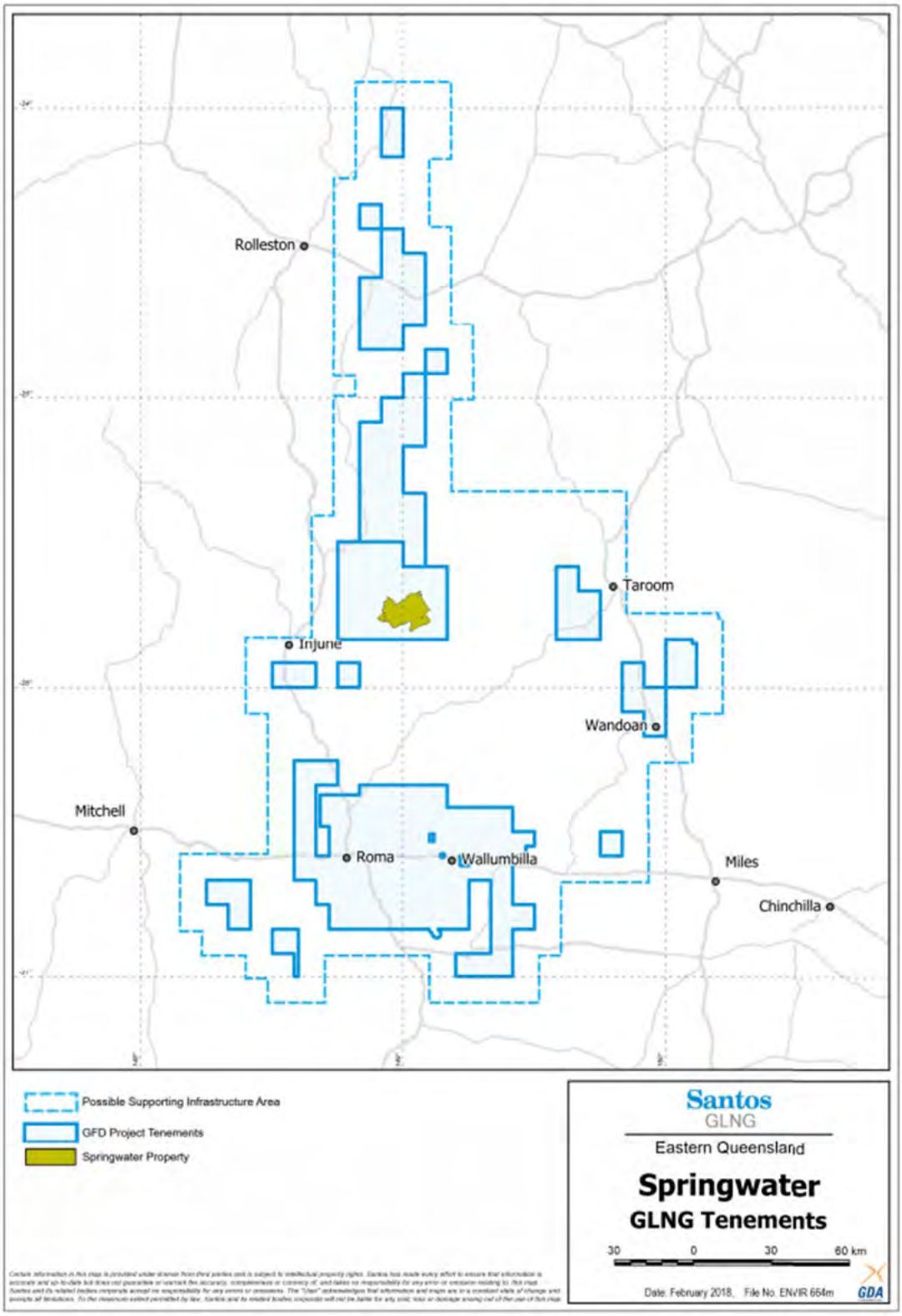


Figure 1: Springwater Property Overview

2.2 Connectivity

On a continental scale the SOA forms part of the great eastern ranges (GER) corridor, identified as one of Australia's large-scale connectivity conservation areas. The GER extends more than 2,800 kilometres from the Australian Alps near Melbourne to the Atherton Tablelands near Cairns and beyond in far north Queensland. The location of the Springwater property within the GER is shown in Figure 2 and see (Mackey et al. 2010) for original.

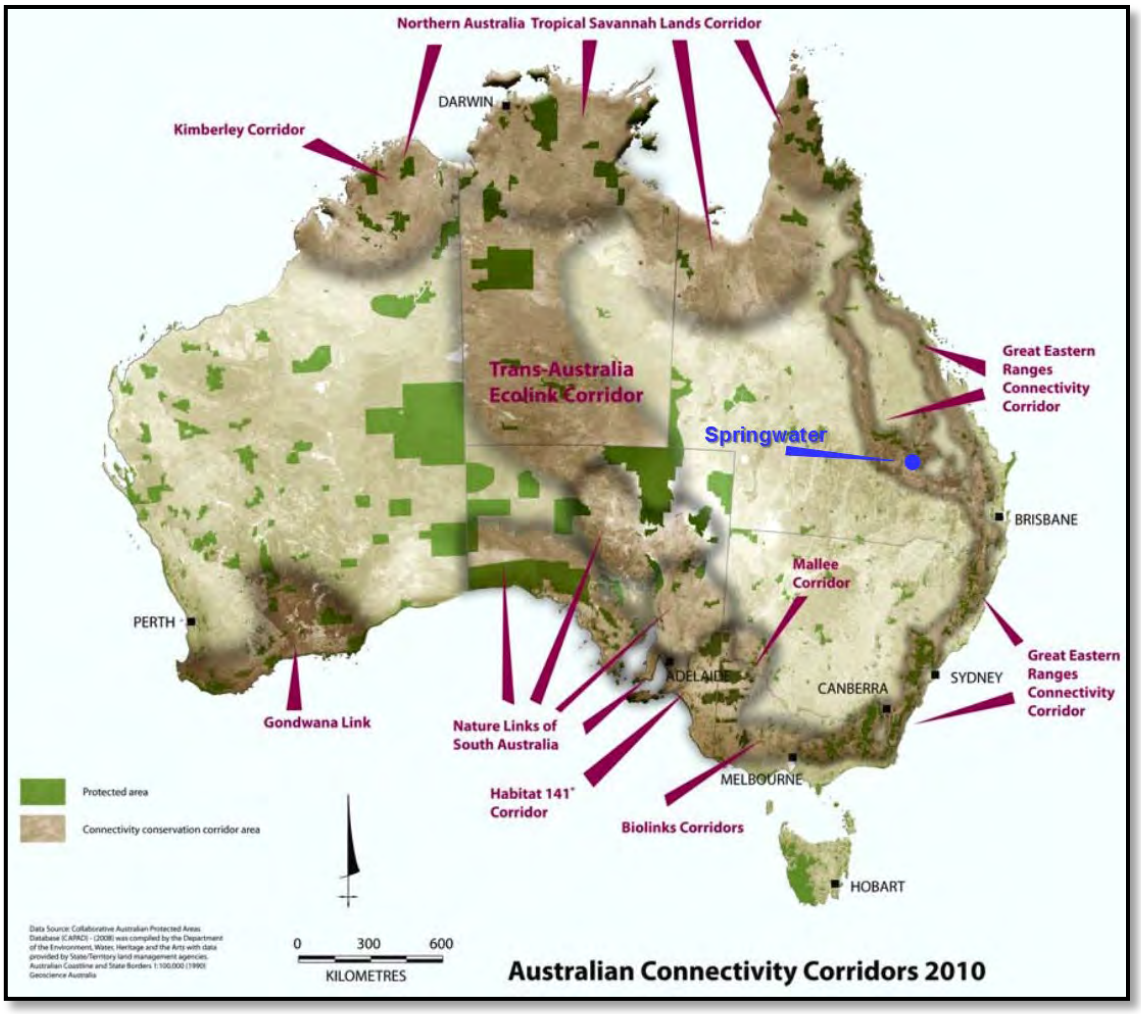


Figure 2: The Location of the Springwater Property within the GER

At a state and regional scale, the SOA lies at the southern extent of a large patch of vegetation linking Expedition National Park in the north and Carnarvon National Park in the west. These large tracks of remnant vegetation have been identified in the Biodiversity Planning Assessment (BPA) mapping. A BPA identifies the terrestrial ecological values in a region, or bioregion, according to their conservation significance. A Biodiversity Planning Assessment (BPA) is available for the Brigalow Belt Bioregion and contains the corridors criteria (Criteria J) and the Context and Connection criteria (Criteria G):

Corridors (Criteria J) - Areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity including regrowth or cleared areas that could serve this

purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Context and Connection (Criteria G) – this criterion represents the extent to which a Remnant Unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems, and the degree to which a Remnant Unit is connected to other vegetation.

A review of this data at a regional scale shows that these large tracks of remnant vegetation have predominantly been identified in the BPA data as having “State” or “Regionally” significant corridors (Criteria J) and having a “Very High” or “High” context and connection (Criteria G). The location of the SOA in relation to these BPA areas is shown in Figure 4 4 below. Any increase in extent or condition of the ecological communities within the SOA will increase the extent and quality of these significant areas of habitat and biodiversity corridors.

2.3 Climate

The Springwater property is characterised by a hotter wet season (typically November to March) and a cooler dry season (typically April to October) (see Figure 3). Weather records from the Injune weather station (#43015), approximately 36 km south-west of Springwater, show the mean monthly rainfall for the period 1961-1990 ranges from 24.9 mm (September) to 94.6 mm (January). Mean monthly maximum temperatures range from 19.6 °C (July) to 33.7°C (January) and mean monthly minimum temperatures range from 3°C (July) to 19.2°C (January).

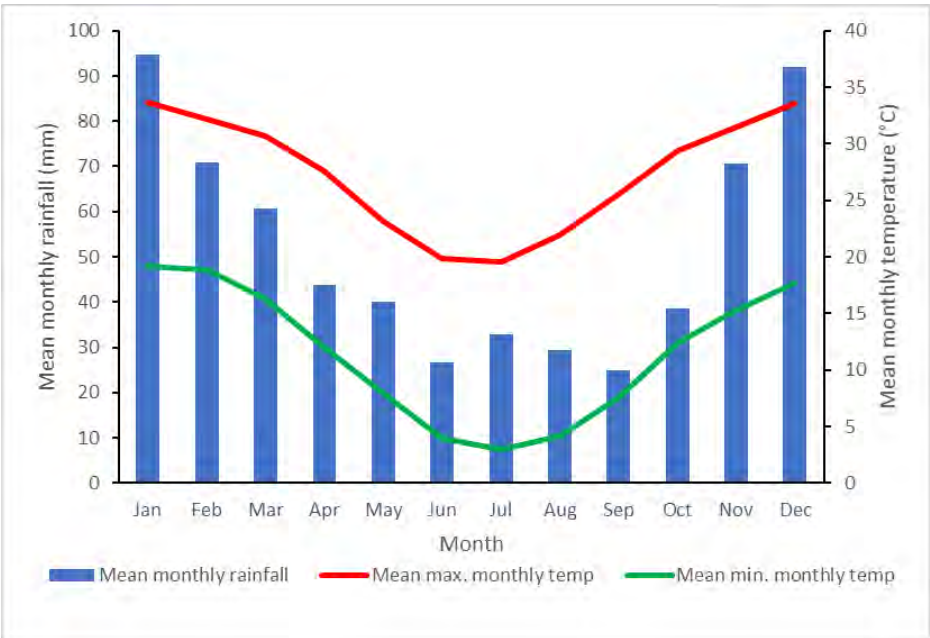


Figure 3: Mean monthly temperature and rainfall records from Injune Post Office weather station (ID: 43015) 1961-1990 (www.bom.gov.au)

2.4 On-ground property assessments

2.4.1 Biodiversity Offset Values 2015

During 2015, Boobook Ecological Consulting were engaged to provide a detailed report of the potential biodiversity offset values at Springwater property (Boobook, 2015). Ecological values of the property were assessed to determine the property's value in terms of meeting offset requirements.

2.4.2 Assessment and Monitoring Events

In 2016 the Santos GLNG Gas Fields Development Project Stage 1 Offset Plan 2016 – 2021 (Offset Plan) for the Springwater Offset Area (SOA) was approved (Santos, 2016). In October 2017, Terrestria Pty Ltd conducted a detailed offset monitoring event in the SOA in accordance with commitments made in the Stage 1 Offset Plan. As part of that plan Santos GLNG have committed to complete several ecological assessment and monitoring tasks over the next 20 years. The field assessments are informed by the results of previous assessments.

2.4.2.1 Detailed assessment and monitoring event spring/early summer 2017

The monitoring event was scheduled to coincide with spring / early summer, the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et.al., 2012). Between the 16th and 21st of October 2017, Terrestria Pty Ltd conducted a detailed monitoring event (Terrestria, 2018). The results of the 2015 and the 2017 assessments were used to identify the values and quality of the offsets in the SOA. The requirements for the detailed monitoring event conducted in 2017 included:

- General field assessment as outlined in Section 9.1.2 of the Stage 1 Offset Plan;
- Establishing and completing 10 BioCondition sites; one in each of the vegetation units identified in Table 4 of the Stage 1 Offset Plan as well as photo monitoring points;
- Threatened flora survey and assessment to identify the locations of any threatened flora species and to map the extent of threatened flora habitat for all EVNT species listed under either the NC Act or the EPBC Act present within the SOA. All flora species observed whilst undertaking threatened flora surveys were documented;
- Fauna surveys targeting the species listed in Table 5 of the Stage 1 Offset Plan (Note: all fauna species observed during fauna surveys were documented); and
- In addition to the BioCondition canopy cover, additional canopy cover analysis was conducted to assess the two Brigalow regrowth communities (regrowth and young regrowth). This involved an additional 2 x 50m transects to assess canopy cover. The location of the start and finish were marked with flagging tape and GPS so the same transect can be assessed in 2018. Note: This assessment replaces the Geographic Information System (GIS) canopy analysis discussed in Section 9.1.1 of the Stage 1 Offset Plan.

2.4.2.2 Rapid assessment and monitoring event spring/early summer 2018

Field assessments of the SOA were conducted during spring and early summer (12 - 16 November 2018) to coincide with the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et al., 2012). The location of the field assessment was informed by the results of previous site assessments (i.e., yeah noBoobook, 2015). During flora and fauna surveys, fences, tracks and existing gas field infrastructure were inspected to ensure access and development has been excluded from the SOA and that grazing can be properly controlled.

2.4.2.3 Rapid assessment and monitoring event spring/early summer 2020

In Spring and early Summer 2020 (12-16 October 2020), Terrestria conducted offset monitoring in the SOA in accordance with commitments made in the Stage 1 Offset Plan. This assessment fulfils the commitments to perform yearly 'Rapid Assessment' of the baseline BioCondition sites established in February 2020.

During each rapid monitoring field assessment, the following will be conducted:

- Fences tracks and existing gas field infrastructure will be inspected to ensure grazing has been excluded from all the Springwater Management Areas and access and development has been excluded from the SOA.
- An unbounded timed meander flora and fauna survey will be conducted. The survey will be conducted in accordance with the timed meander survey methodology contained within the Queensland Department of Environment and Heritage Protection's Flora Survey Guidelines. The following will be conducted:
    - An assessment of the presence and abundance of dominant flora and fauna species.
    - A dedicated flora survey of the ground layer to assess groundcover species richness and recruitment of native flora species.
    - The presence and abundance of weed species.
    - The presence of pest fauna.
    - Photos will be taken at designated and fixed photo monitoring points.
    - General observations regarding the presence and condition of erosion, the presence and extent of any other threatening processes.
    - The condition of regrowth Brigalow and the presence of any areas containing >10,000 stems per hectare that may requiring thinning.
    - The presence and extent of any other threatening processes

A summary of the BioCondition scores and other ecological input data is provided in Appendix A.

2.5 Ground-truthed vegetation and habitat mapping

The vegetation communities within the SOA have been classified and mapped in accordance with Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner et al. 2012). In addition, the quality of the patches was divided into four categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy (Neldner et al. 2012).

Non-Remnant

- Advanced Regrowth: areas previously cleared or disturbed (e.g., by wildfire) and containing well advanced woody vegetation floristically and structurally consistent with the RE but typically <70% of the height

- Young regrowth: areas previously cleared or disturbed (e.g., by wildfire) and containing varying densities of woody vegetation floristically consistent with the RE type. These areas may represent potential future biodiversity offset areas.
- Cleared: areas previously cleared or otherwise significantly disturbed which have little or no woody vegetation present and are currently unsuitable as biodiversity offsets. and <50% density of the RE. Such regrowth with appropriate management will likely achieve remnant status.

2.5.1 Vegetation description

The SOA contains five regional ecosystem vegetation communities. A summary of the vegetation communities present, the relevant BioCondition scores and whether the vegetation community is also an EPBC Act listed TEC are discussed in Table 4 below and shown in Figure 5 Vegetation Communities. A detailed summary of the BioCondition scores and other calculator inputs for the offset site is provided in Appendix A.

Table 4: Summary of flora offset values within the SOA

Veg Unit	General vegetation description	Area (ha)	Survey sites	Site Condition Score out of 80
VC1 11.10.7 Remnant	*Eucalyptus crebra* and *E. melanophloia* woodland with associated *Callitris glaucophylla*; midlayer composed of C. *glaucophylla, Acacia decora* and *A. longispicata*; shrub layer composed of *Hovea longipes, Notelaea microcarpa* and *Cryptandra amara*; grassy ground layer composed of *Aristida spp*., *Chrysopogon fallax* and *Ancistrachne uncinulata*.	342.4	BP01	45.75
			BP02	50
			BP06	51.75
			BP08	45.75
			BP15	62.5
VC2 11.10.7 Regrowth	*Eucalyptus melanophloia* low woodland; midlayer composed of *Psydrax johnsonii, Notelaea microcarpa, Eremophila mitchellii* and *Callitris glaucophylla*; grassy ground layer dominated by *Themeda triandra*.	48.6	BP12	56.75
VC3 11.10.7 Young Regrowth	*Eucalyptus crebra* and / or *E. melanophloia, Acacia longispicata* low open forest (young regrowth); sparse midlayer dominated by *Alphitonia excelsa* and canopy recruits; grassy ground layer dominated by *Aristida* spp. and *Eremochloa bimaculata*	9.1	Not assessed*	
VC4[1] 11.9.5 Remnant	*Acacia harpophylla* open woodland; midlayer composed of canopy recruits, *Eremophila mitchellii, Geijera parviflora* and *Pittosporum spinescens*; low shrub layer dominated by *Carissa ovata*; grassy ground layer composed of *Paspalidium caespitosum, Enteropogon ramosus, Ancistrachne uncinulata* and *Aristida sp*.	312.1	BP04	56.75
			BP07	46.5
			BP09	68
VC5 11.9.5[1] Regrowth	*Acacia harpophylla* low open forest (advanced regrowth); very sparse shrub layer of canopy recruits; very sparse ground layer of *Paspalidium caespitosum*.	38.3	BP13	44.75
VC6 11.9.5 Young Regrowth	*Acacia harpophylla* low woodland (young regrowth); shrub layer composed of *Carissa harpophylla, Eremophila mitchellii* and canopy recruits; grassy ground layer dominated by *Cenchrus ciliaris*.	18.9	BP14	51.75

Veg Unit	General vegetation description	Area (ha)	Survey sites	Site Condition Score out of 80
VC7 11.3.25 Remnant	*Angophora floribunda, Eucalyptus camaldulensis* and *Casuarina cunninghamiana* fringing woodland; midlayer (confined to channel edges) composed of *Melaleuca viminalis;* dense ground layer dominated by *Lomandra longifolia, Imperata cylindrica* and *Entolasia marginata.*	11.6	BP03	46.5
VC8[2] 11.9.4 Remnant	Semi-evergreen vine thicket	57.5	BP05	71.75
VC9 11.9.7 Remnant	*Eucalyptus populnea* woodland; midlayer comprised of canopy recruits, *Eremophila mitchellii, Geijera parviflora, Atalaya hemiglauca, Psydrax odorata* and *Denhamia oleaster*; shrub layer composed of *Hovea longipes* and *Carissa ovata*; grassy ground layer dominated by *Aristida* sp., *Bothriochloa decipiens, Themeda triandra* and *Chloris ventricosa*.	27	BP10	43
VC10 11.9.7 Young Regrowth	*Eucalyptus populnea* low woodland; midlayer dominated by *Eremophila mitchellii;* grassy ground layer composed of *Cenchrus ciliaris* and *Aristida* sp.	9.9	BP12	56.75

2.5.2 Habitat description

Following the results of detailed field assessments, known habitat requirements for each fauna species surveyed were assessed against on-ground microhabitat observations within each habitat type to categorise the quality of habitat present into Essential or General Habitat (Boobook, 2021). The habitat definitions, 'essential' and 'general', used by Boobook were provided in the Santos Fauna Habitat model (Aurecon, 2014) and are as follows:

Following the results of detailed field assessments, known habitat requirements for each fauna species surveyed for were assessed against on-ground microhabitat observations within each habitat type to categorise the quality of habitat present into Essential or General Habitat (Boobook, 2021). The habitat definitions, 'essential' and 'general', used by Boobook were provided in the Santos Fauna Habitat model (Aurecon, 2014) and are as follows:

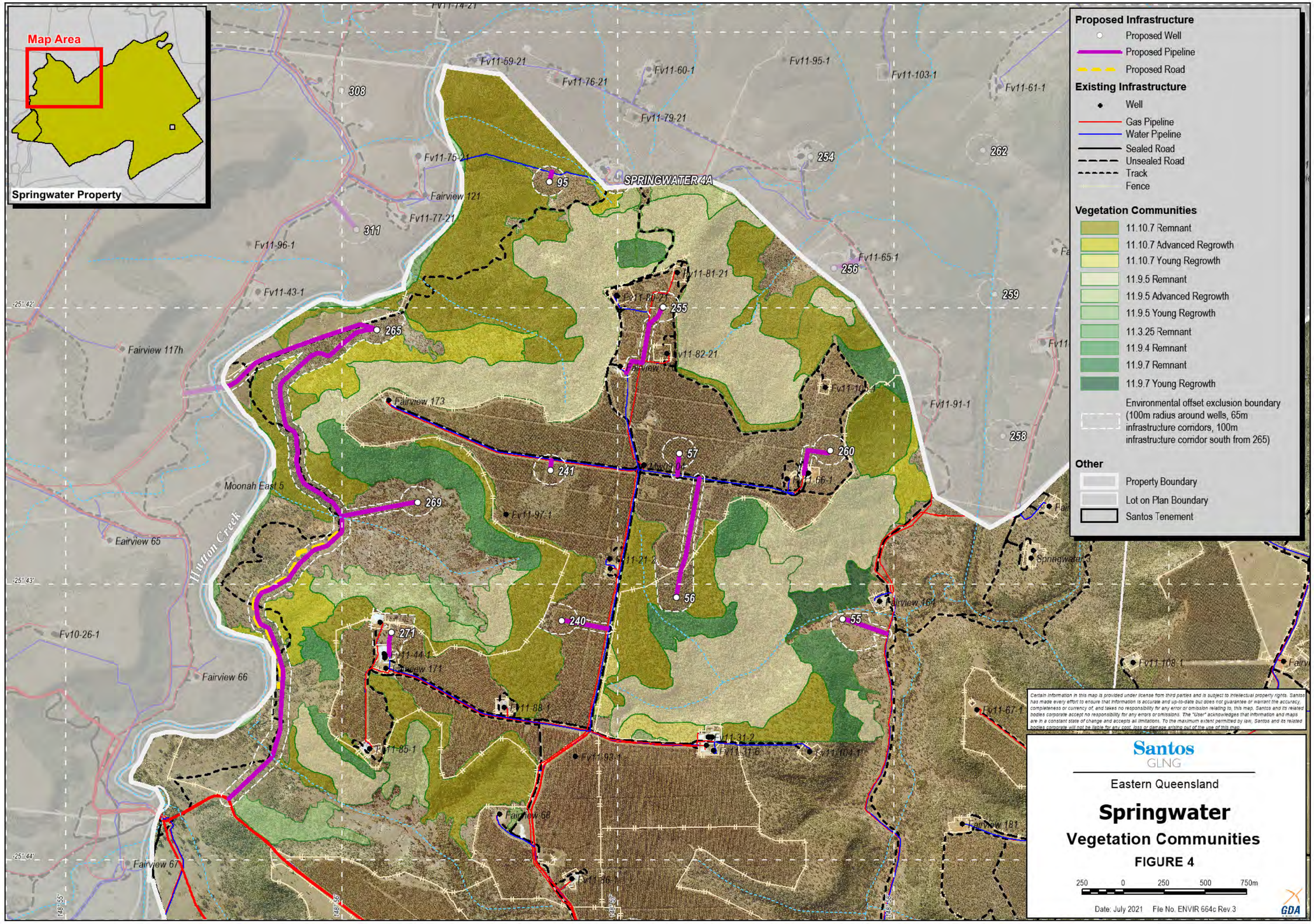
- Essential habitat is defined as an area containing essential resources for the maintenance of species populations (e.g., habitat for breeding, roosting, foraging and shelter), for either migratory or non-migratory species, from known records and/or expert advice.
- General habitat is defined as areas 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 habitat'. It may be defined from known records and expert knowledge of habitat relationships, despite the absence of records. Areas classified as 'general' may include areas of sub optimal habitat.
-

Table 5 provides a summary of the extent of suitable habitat available within the Springwater offset area for the project's MNES offset requirements based on the results of detailed field assessments (Boobook, 2015). An additional description of the offset area for each MNES is provided in Section 3.0.

Table 5: Extent of suitable habitat for MNES on the Springwater offset area

Species name	Potentially suitable RE	Habitat mapping rules	Habitat available (ha)	
			Total	Used for Stage 4
Brigalow TEC	11.9.5	Remnant and regrowth RE 11.9.5 where *Acacia harpophylla* are dominant in the canopy and that the vegetation otherwise met condition criteria (DoTE 2013)).	369.3	65.6
SEVT TEC	11.9.4	Remnant RE 11.9.4, listed as a component RE for this TEC (TSSC 2001).	57.5	26
Large-eared Pied Bat	11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped Essential Habitat includes all areas of remnant and regrowth vegetation of the nominated RE within 5 km of potentially suitable shelter habitat.	837.5	N/A^
Northern Quoll	11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a	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.	837.5	N/A^
South-eastern Long-eared Bat	11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all areas of remnant and regrowth vegetation that may be suitable for foraging or shelter.	837.5	N/A^
Koala	11.3.25, 11.9.7, 11.10.7, 11.10.7a	*High Quality Habitat* includes remnant eucalypt woodland and forest associated with Hutton Creek. *Lesser Quality Habitat* includes all immature regrowth of suitable REs.	429.6	N/A^
Red Goshawk	11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a	This 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 vegetation of the nominated RE.	837.5	N/A^

Species name	Potentially suitable RE	Habitat mapping rules	Habitat available (ha)	
			Total	Used for Stage 4
Squatter Pigeon (southern)	11.3.25, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all areas of remnant and regrowth vegetation of the nominated RE.	429.6	N/A^
Black-breasted Button-quail	11.9.4	Mapped General Habitat includes all areas of remnant and regrowth vegetation of the nominated RE. Note that this species is dependent on large patches of habitat, such that small, isolated patches of otherwise suitable habitat may not be occupied.	57.5	19
Collared Delma	11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all areas of remnant and regrowth vegetation of the nominated RE.	768.4	N/A^
Yakka Skink	Essential Habitat: 11.9.7, 11.10.7, 11.10.7a General Habitat: 11.9.5	Mapped Essential Habitat is based on known records within the nominated RE and includes all remnant and regrowth vegetation of the nominated RE. Mapped General Habitat includes all remnant and regrowth vegetation of the nominated RE. This may include sub-optimal habitat.	768.4	N/A^
Dunmall's Snake	11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all remnant and regrowth vegetation of the nominated RE.	768.4	N/A^


Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Vegetation Communities
11.10.7 Remnant
11.10.7 Advanced Regrowth
11.10.7 Young Regrowth
11.9.5 Remnant
11.9.5 Advanced Regrowth
11.9.5 Young Regrowth
11.3.25 Remnant
11.9.4 Remnant
11.9.7 Remnant
11.9.7 Young Regrowth
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Hutton Creek
Fairview 121
Fairview 117h
Fairview 173
Moonah East 5
Fairview 65
Fairview 66
Fv10-26-1
Fairview 67
Fairview 68
Fairview 164
Fairview 181
Springwater 3
Fv11-108-1
Fv11-67-1
Fv11-91-1
Fv11-61-1
Fv11-103-1
Fv11-95-1
Fv11-60-1
Fv11-69-21
Fv11-76-21
Fv11-79-21
Fv11-75-21
Fv11-77-21
Fv11-96-1
Fv11-43-1
Fv11-65-1
Fv11-81-21
Fv11-82-21
Fv11-97-1
Fv11-44-1
Fv11-88-1
Fv11-85-1
Fv11-93-1
Fv11-31-2
Fv11-104-1
Fv11-86-1
95
311
308
265
255
256
254
262
259
258
260
241
57
269
56
240
271
55
-25°42'
-25°43'
-25°44'
148°55'
148°56'
148°57'
148°58'
Santos
GLNG
Eastern Queensland
Springwater
Vegetation Communities
FIGURE 4
250 0 250 500 750m
Date: July 2021 File No. ENVIR 664c Rev.3
GDA

2.6 Offset Area

The offset area is in the northeast sections of the Springwater property and is bounded by the Hutton Creek in the west and the property boundary of Fairview Station in the north and the east.

The sandstone plateaus throughout the SOA have historically been cleared for grazing and are currently utilised for timber plantations. The steep slopes that have formed between the tops of the plateaus and the valleys and gorges associated with Hutton Creek are largely intact remnant and regrowth vegetation. These valleys and gorges as well as the waterway itself provide a natural barrier to prevent cattle access to the SOA from the north, west and east. The presence of Hutton Creek enhances the overall value of the offset area, particularly the narrow patches in the west of the SOA. Much of the riparian vegetation associated with Hutton Creek is not part of the SOA because it falls outside of the Springwater property.

However, this vegetation together with the narrow patches of offset in the west of the SOA provides a valuable corridor on a local scale.

Infrastructure in the SOA includes gas-gathering infrastructure predominately located within the timber plantation. Within the areas utilised as an environmental offset there are minor access tracks and fire trails. A large pipeline corridor has been retained along the south-eastern edge of the SOA. This pipeline corridor has been located to ensure that the connectivity between the SOA and the larger patches of remnant vegetation to the north remains unaffected. At present, there is no immediate plans to develop the proposed pipeline and the vegetation within the pipeline corridor is being managed in the same way as the surrounding offset areas.

Environmental offsets for the Santos GFD project will be acquit in stages (refer to Section 3.1 and 3.2 of the Acquittal document). This offset plan has been prepared for Stage 4 of the GFD project in accordance with Condition 18 of EPBC 2012/6615.

The following offset plans have been prepared for Stage 1, Stage 2, and Stage 3 of the GFD project:

- The Santos GLNG Gas Fields Development Project Stage 1 Offset Plan 2016 – 2021 Document Number: 0007-650-PLA-0008 was approved on 31 October 2016 and was written to support gas filed developments in Scotia Gas Field Petroleum Lease (PL) 176.

- The Santos GLNG Gas Fields Development Project, Stage 2 Offset Plan, Document Number: 0030-650-EMP-0001 (Rev 2) was approved on 29 June 2018 and was written to support gas field developments in Maisey Gas Field (PL 176).

- The Santos GLNG Gas Fields Development Stage 3 Offset Plan, Revision 1, 12 April 2021 was approved on 17 May 2021 and was written to support gas field developments in Scotia Gas Field (PL 176), and Arcadia Gas Field on (PL 90, PL 234 and PL 421).

Table 6: Summary of the Springwater offset area and acquittal

MNES	Status under EPBC Act	Impact area (ha)	Habitat/TEC Values within SOA	Offset area secured under EPBC 2012/6615 Stage 1	Offset area secured under EPBC 2012/6615 Stage 2	Offset area secured under EPBC 2012/6615 Stage 3	Offset area secured under EPBC 2012/6615 Stage 4	
							Values secured by Stage 4	Offset requirement satisfied
Listed threatened ecological communities								
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	5.5	340.4	0	53	198	65.6	Yes
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	2.0	57.5	0	0	0	26	Yes
Listed threatened species								
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	V	500	837.3	**0**	340	371	0	No*
Koala (*Phascolarctos cinereus*)	V	343	429.7	**0**	217	156	**0**	No*
Collared Delma (*Delma torquata*)	V	492	779.8	**0**	284	339.5	**0**	No*
Yakka Skink (*Egernia rugosa*)	V	497	768.1	**0**	279	350.5	**0**	No*
Northern Quoll (*Dasyurus hallucatus*)	E	301	837.3	**0**	0	251	**0**	No*
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	377	837.3	**0**	0	251	**0**	No*
Red Goshawk (*Erythrotriorchis radiatus*)	V	500	837.3	**0**	0	288	**0**	No*
Black-breasted Button-quail (*Turnix melanogaster*)	V	2.3	57.5	**0**	0	5.7	**19**	Yes
Dunmall's Snake (*Furina dunmalli*)	V	496	779.8	**0**	284	351.5	**0**	No*
Squatter Pigeon (southern) (*Geophaps scripta scripta*)	V	496	779.8	**0**	0	75	**0**	No*

*Offset obligation satisfied on another property

2.7 Development

Santos has comitted to excluding any development for the project from the Springwater offset area.

The areas on the Springwater property outside of the offset area may be utilised for petroleum and/or farming infrastructure and facilities; however, no infrastructure will be located within the offset area or impact the offset area's ability to achieve the completion criteria outlined in this OAMP.

2.8 Offset Protection

Under Queensland legislation, one option of a legal securing mechanism for an offset area is declaring the area of high nature conservation value under section 19F of the Vegetation Management Act 1999, where it is secured in perpetuity for the purposes of an environmental offset.

In October 2017 Santos GLNG wrote to the Queensland Department of Natural Resources Mines and Energy (DNRME) requesting that the SOA be declared as an area of high nature conservation value under section 19F of the Vegetation Management Act 1999 (a voluntary declaration). On 26 February 2018 the DNRME wrote to the Santos GLNG informing that the SOA meets the requirements of a Voluntary Declaration under the Vegetation Management Act 1999 and on 1 April 2018 Santos GLNG agreed to the offer. On 6 April 2018, the voluntary declaration was certified, thereby satisfying the legal security requirement of Condition 16.

The offset area will be mapped as a Category A area on the Property Map of Assessable Vegetation (PMAV). A Category A area on a PMAV is described as an "Area subject to compliance notices, offsets and voluntary declarations". The Voluntary Declaration will remain in place for the life of EPBC 2012/6615. The Voluntary Declaration may only be removed in accordance with the provisions of the VM Act or if the chief executive the Queensland Department of Natural Resources, Mines and Energy considers it necessary.

2.9 EPBC Act Environmental Offset Policy

Table 7 outlines how the GLNG Project offset obligations acquit on the Springwater offset area to meet the requirements of the EPBC Act Environmental Offsets Policy.

Table 7: Assessment against Principles of the Offset Policy

Principle	How the principle is met in this offset proposal
1. deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	The Springwater offset area partially acquits MNES offset requirements under EPBC 2012/6615 as outlined in Table 6. The Springwater offset area will be managed and monitored to improve the quality of Brigalow TEC, SEVT TEC and viability of habitat for threatened fauna species. This will include the management of regrowth vegetation to become self-sustaining functional remnant vegetation communities. This OAMP sets out specific management objectives with interim performance targets and completion criteria. Management actions are outlined with accompanying adaptive management triggers and corrective actions in the event that monitoring identifies that interim performance targets are not attained, or completion criteria are not attained and/or maintained. The offset area will be managed and monitored from approval of the OAMP for a minimum of 20 years. It is anticipated that the completion criteria will be achieved within a 20 year period.
2. be built around direct offsets but may include other compensatory measures	MNES offset obligations under EPBC 2012/6615 will be acquit through the delivery of direct land-based offsets on the Springwater offset area and additional land based offset areas to be secured by Santos.
3. be in proportion to the level of statutory protection that applies to the protected matter	The threatened status of the impacted protected matters is considered in the OAG in calculating the area of the offset to be provided.
4. be of a size and scale proportionate to the residual impacts on the protected matter	The size of the offset area to be secured for offset obligations has been calculated in accordance with the OAG (Appendix A).
5. effectively account for and manage the risks of the offset not succeeding	This OAMP has been developed in consideration of known and identified threats to the offset values to manage the risk of failing to the achieve the completion criteria and overall environmental outcomes for the offset area. Threats to the offset site are managed by through the implementation of the management measures discussed in Section 7.0, including: • Fire prevention and management • Weed monitoring and control • Clearing protection • Management of grazing • Restricted access The relevant risks were identified based on a review of current literature (i.e., conservation advices, recovery plans etc) and identification of potential site-specific risks based on the results of field surveys and discussions with the landholder. The results of the risk assessment, presented in Appendix C, have informed the adaptive management process including the identification of threats to offset values, management objectives, performance criteria,

Principle	How the principle is met in this offset proposal
	management actions, monitoring programs, adaptive management triggers and corrective actions. If the offset cannot attain and maintain the completion criteria, then additional offsets will be provided to compensate for the impact and the failed offset (see Section 5.0)
6. be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)	The environmental outcomes proposed to be achieved through the implementation of this OAMP are based on additional management and monitoring measures conducted as part of business as usual on the Springwater property. For example, under the *Biosecurity Act 2014* a person has a general biosecurity obligation to: take all reasonable and practical steps to prevent or minimise each biosecurity risk. The steps proposed in this OAMP are above reasonable and practical steps required to control feral animals and weeds in central Queensland. Once the Voluntary Declaration has been secured over the offset area, environmental laws prevent other land uses inconsistent with this OAMP being approved over this part of the property.
7. be efficient, effective, timely, transparent, scientifically robust, and reasonable	The Springwater offset area has been identified to be suitable using an evidence based and scientifically robust approach. The environmental outcomes to be achieved through this OAMP will be delivered progressively over 20 years. The offset area will be legally secured through a Voluntary Declaration under the VM Act, therefore any vegetation clearing contravention of this OAMP is not permissible without specific Queensland government approval. The preparation and implementation of this OAMP supports the efficient, effective, timely, transparent, and scientifically robust approach to providing offsets.
8. have transparent governance arrangements including being able to be readily measured, monitored, audited, and enforced.	This OAMP includes a detailed monitoring program which will assess the effectiveness of the management actions undertaken and the progress of the offset area in achieving the environmental outcomes. The results of all management and monitoring programs will be included in annual reports. An implementation schedule for monitoring and management is provided in Section 8.6 which will be reviewed at least annually to ensure the timely implementation of this OAMP.

3.0 Offset Values

The following sections provide a description of the offset area and potential threats that will be managed as part of this OAMP for each MNES offset value. Figure 5 to Figure 9 presents the MNES offset areas on Springwater.

3.1.1 Brigalow TEC

3.1.1.1 Offset area

Brigalow TEC within the offset area comprises areas of remnant and mature regrowth RE 11.9.5. The location of these REs is shown in Figure 4.

Areas of remnant and mature regrowth are in relatively good condition and meet the requirements for Brigalow TEC (as listed under the EPBC Act). Canopy cover is relatively closed, weed cover is negligible and abundant fallen timber is generally present. This habitat provides suitable foraging values for a variety of forest bird species that prefer a closed canopy. There is abundant shelter for ground fauna (particularly reptiles) in the form of fallen logs and low shrubs. Peeling bark is common in this habitat providing refuge for arboreal reptiles. These communities have low disjunct canopies ranging from dense to very sparse, little to no shrub layer development and ground layers devoid of fallen woody material and litter being dominated by exotic grasses and bare earth.

3.1.1.2 Threats

The following key threats to Brigalow TEC identified on the property will be addressed through the implementation of this OAMP (DAWE, 2020a):

- clearing of regrowth vegetation
- inappropriate fire regimes and management
- pest plant infestation
- potential knowledge gaps
- increased grazing by livestock.

3.1.2 SEVT TEC

3.1.2.1 Offset area

The SEVT TEC within the offset area comprises areas of remnant and mature regrowth RE 11.9.4. The location of these REs is shown in Figure 4.

These areas include the presence of large rocks with extensive areas of rocky crevice habitat. The canopy is relatively low and tended to be sparse in some areas. The shrub and ground layer is patchy but dense in some areas. Where a suitable shrub/low tree layer occurs, there is a thick leaf litter layer. Fallen timber is generally abundant. This habitat provides significant value in the form of potential shelter sites for several target threatened species including northern Quoll, large-eared pied bat and collared Delma and yakka skink (Terrestria, 2020).

A number of larger fauna on the site will use this habitat as daytime shelter areas including a range of macropods such as Herbert's Rock-wallaby and Wallaroo (*Macropus robustus*). This habitat also provides suitable foraging values for a variety of smaller forest bird species that prefer a closed canopy and dense low vegetation such as White-browed Scrubwren, fantails and fairywrens. Fan-tailed Cuckoo

(*Cacomantis flabelliformis*) and Eastern Yellow Robin were only recorded in this habitat. There is abundant shelter for ground fauna (particularly reptiles) in the form of rock crevices and low shrubs, particularly reptiles but also small mammals such as dasyurids and rodents (Terrestria, 2020).

3.1.2.2 Threats

The following key threats to SEVT TEC identified on the property will be addressed through the implementation of this OAMP (DAWE, 2020b):

- clearing of regrowth vegetation
- inappropriate fire regimes
- invasion by introduced pasture species
- increased grazing by livestock
- disturbance by pest animals.

3.1.3 Northern Quoll

3.1.3.1 Offset area

Habitat for northern quoll within the offset area comprises areas of RE 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

This species is dependent on the presence of suitable shelter habitat in the form of caves and deep crevices in extensive rock formations (commonly sandstone) and forages in associated woodland and forest habitat (DAWE, 2020e). Patches of Brigalow TEC and SEVT TEC provides significant value in the form of potential den and shelter habitat suitable den sites.

The offset area is located within the species historical range, although recent records for the species are lacking (DAWE, 2020e).

3.1.3.2 Threats

The following key threats to northern quoll were identified on the property and will be addressed through the implementation of this OAMP (DAWE 2020e):

inappropriate fire regimes

- overgrazing by stock
- predation by feral species
- weed invasion.

3.1.4 South eastern long eared bat

3.1.4.1 Offset area

Habitat on the Springwater offset area for south eastern long eared bat includes RE 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

The species is known to occur in a variety of dry forest habitats including River Red Gum, open woodland, mallee, brigalow and other arid and semi-arid habitats. The preferred habitat is mallee and Callitris woodlands (Pennay et al., 2011), and habitats that have a distinct canopy with a dense, cluttered understorey (Turbill and Ellis, 2006). It roosts in tree hollows or under bark (NSW NPWS, 2003). Surveys

suggest the species requires large tracts of forest to occur (Turbill et al., 2008). Older growth communities contain good structure in the form of developed shrub and ground layers and fallen timber and deep leaf litter.

3.1.4.2 Threats

The following key threats to south eastern long eared bat will be addressed through the implementation of this OAMP (DAWE, 2020a):

- Habitat loss and fragmentation due to clearing of vegetation
- Habitat loss and mortality through inappropriate fire regimes
- Reduction in hollow availability
- overgrazing of habitat by livestock
- invasion of habitat by predatory animals.

3.1.5 Large-eared Pied Bat

3.1.5.1 Offset area

Habitat for large eared pied bat within the offset area comprise RE 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

Suitable foraging habitat for the species occurs across much of the offset area within areas of adjacent remnant and mature regrowth vegetation. The species requires a combination of sandstone cliffs/escarpments to provide roosting habitat that is adjacent to fertile woodlands preferably box gum or river/rainforest corridors for foraging (TSSC, 2012).

3.1.5.2 Threats

The following known and potential threats to large eared pied bat will be addressed through the implementation of this OAMP (BOOBOOK, 2015):

- damage to and abandonment of nursery sites and roosting hollows,
- clearing of habitat
- predation by foxes.

3.1.6 Red Goshawk

3.1.6.1 Offset area

Habitat for red goshawk within the offset area comprise RE 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

Red goshawk is a highly mobile species with a large home range. Breeding habitat is in intact tall forest associated with major drainage lines; however, the species may often forage much further away from these areas (DAWE, 2020g).

3.1.6.2 Threats

The following known and potential threats to red goshawk will be addressed through the implementation of this OAMP (BOOBOOK, 2015; DAWE, 2020g):

- habitat loss through clearing
- overgrazing, or other changes in land management could reduce prey availability
- fire, and changed burning regimes have the potential to impact breeding sites and reduce prey availability

3.1.7 Koala

3.1.7.1 Offset area

Habitat for the koala within the offset area comprises areas of remnant and regrowth RE 11.3.25, 11.9.7, 11.10.7, 11.10.7a.

Koala habitat is broadly defined as eucalypt forests and woodlands or shrubland with emergent eucalypt species and can include both remnant and regrowth communities, provided adequate mature Koala food trees are present (DAWE 2020k). Potential habitat for the Koala within the Springwater offset area is widespread.

3.1.7.2 Threats

The following key threats to the koala identified on the property will be addressed through the implementation of this OAMP (DAWE, 2020k):

- degradation and fragmentation of habitat
- predation by domestic dogs or feral predators, and
- drought and incidence of extreme heat

3.1.8 Squatter Pigeon

3.1.8.1 Offset area

Habitat for squatter pigeon within the offset area comprise RE 11.3.25, 11.9.7, 11.10.7, 11.10.7a.

The squatter pigeon favours open-forests to sparse, open-woodlands and scrub that are close to water bodies or watercourses. Permanent water associated with the large permanent dam provides habitat opportunities for this species.

3.1.8.2 Threats

The following key threats to squatter pigeon will be addressed through the implementation of this OAMP (TSSC 2015):

- ongoing vegetation clearance and fragmentation
- degradation of habitat by overgrazing livestock
- trampling of nests by livestock
- weed invasion
- habitat degradation by rabbits
- predation by feral cats and foxes
- inappropriate fire regimes
- thickening of understorey vegetation.

3.1.9 Black-breasted Button-quail

3.1.9.1 Offset area

Habitat for black-breasted button quail within the offset area comprises RE 11.9.4.

SEVT (RE 11.9.4) and Brigalow (RE 11.9.5) communities provide suitable habitat for black-breasted button-quail which is known to support the species in the Brigalow Belt South bioregion (DAWE, 2020f). Black-breasted button-quail is known to prefer SEVT communities and other closed forest types with dense leaf litter and low shrubs (DAWE, 2020f). Within areas of SEVT vegetation where a suitable shrub/low tree layer occurs there is a thick leaf litter layer. Within areas of remnant Brigalow vegetation areas of scattered shrubs are present, often of SEVT species. The managed recovery of regrowth vegetation (particularly SEVT) to remnant status over time is considered one of the best ways to provide habitat for this species.

3.1.9.2 Threats

The following key threats to black-breasted button-quail were identified on the property and will be addressed through the implementation of this OAMP (DAWE 2020f):

- habitat loss through clearing
- habitat degradation by overgrazing by stock and pest animals (e.g., feral pigs)
- fire regimes that remove understorey, course woody debris and ground litter.

3.1.10 Collared Delma

3.1.10.1 Offset area

Habitat for collared delma within the offset area comprises areas of RE 11.3.25, 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

Collared delma is known to occur in REs on land zones 3, 9 and 10 (DAWE 2020h). The species appears to require rocks, timber, bark, or other surface debris for shelter (DAWE 2020h). The patches of Brigalow and SEVT understorey also provides significant value in the form of potential shelter sites including areas comparing abundant fallen timber and thick leaf litter layer in addition to presence of large rocks and extensive rock crevice habitat.

3.1.10.2 Threats

The following key threats to collared delma were identified on the property and will be addressed through the implementation of this OAMP (BOOBOOK, 2015):

- habitat loss through clearing
- habitat degradation by overgrazing by stock
- fire regimes that remove course woody debris and ground litter.

3.1.11 Yakka Skink

3.1.11.1 Offset area

Habitat for yakka skink within the offset area comprise RE 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

The species is commonly found under partly buried rocks and logs, or in abandoned animal burrows. Older growth communities contain good structure in the form of developed shrub and ground layers and fallen timber and deep leaf litter. Fallen woody material is common in this community and large boulders providing potential shelter opportunities.

3.1.11.2 Threats

The following key threats to yakka skink will be addressed through the implementation of this OAMP (DAWE, 2020j):

- clearing of habitat
- overgrazing of habitat by livestock
- loss of fallen timber and ground litter through inappropriate fire regimes
- invasion of habitat by predatory animals and introduced weeds.

3.1.12 Dunmall's Snake

3.1.12.1 Offset area

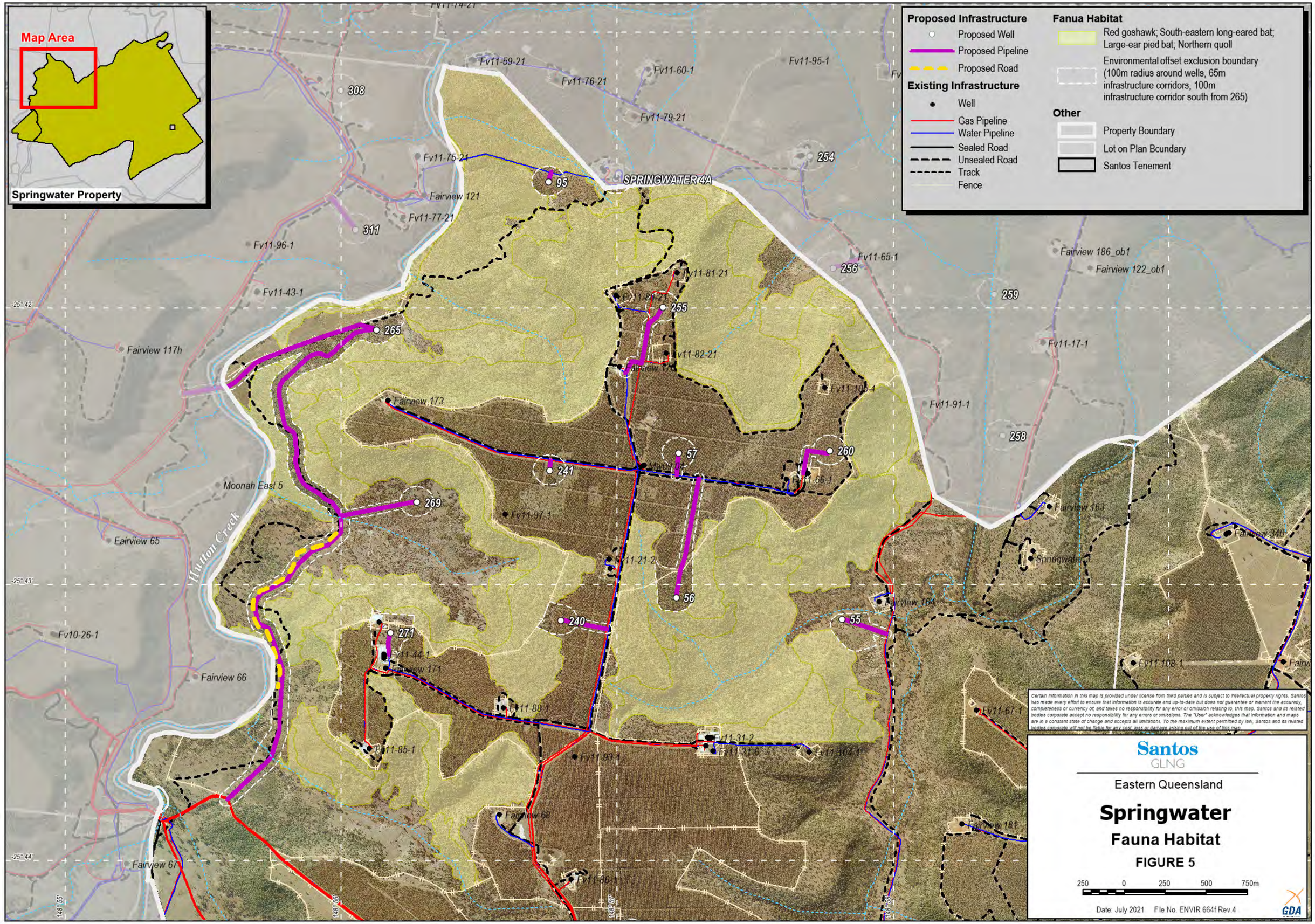
Habitat for Dunmall's snake within the offset area comprises RE 11.9.5, 11.9.7, 11.10.7, 11.10.7a.

The species occurs in a variety of habitats including forests to woodlands (including Eucalyptus, Acacia Callitris species) on sandy soils, cracking clay soils with Brigalow scrub, and dry vine scrub (Terrestria, 2020). Areas of remnant and mature regrowth REs on land zones 3, 9 and 10 are considered suitable foraging and shelter.

3.1.12.2 Threats

The following known and potential threats to Dunmall's snake will be addressed through the implementation of this OAMP (BOOBOOK, 2015):

- habitat loss through clearing
- habitat degradation by overgrazing by stock.
- fire regimes that remove course woody debris and ground litter.



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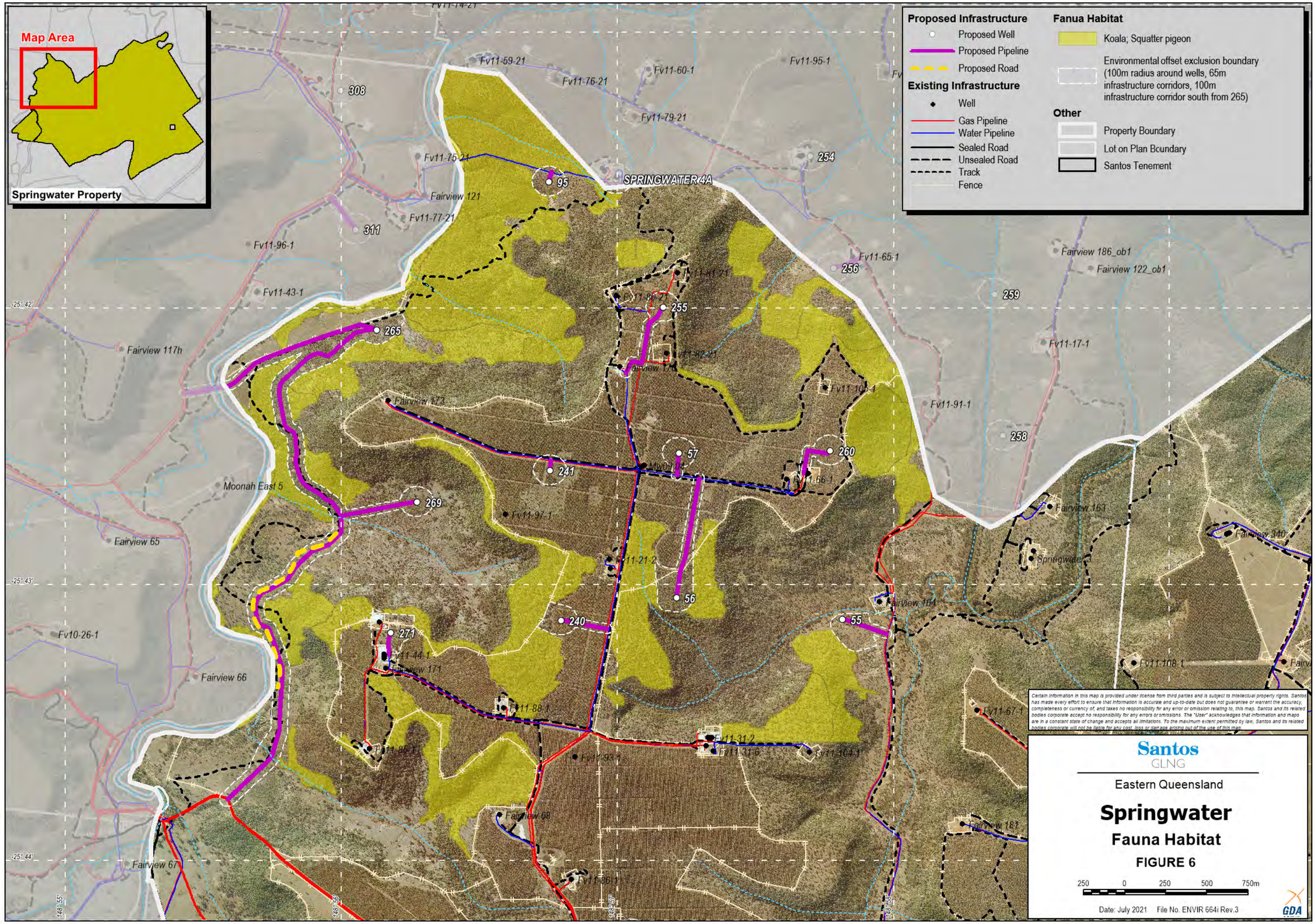
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Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Fanua Habitat
Koala; Squatter pigeon
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Fv11-59-21
Fv11-76-21
Fv11-60-1
Fv11-95-1
Fv11-79-21
Fv11-75-21
Fairview 121
Fv11-77-21
Fv11-96-1
Fv11-43-1
Fairview 117h
Fv11-65-1
Fairview 186_ob1
Fairview 122_ob1
Fv11-17-1
Fv11-91-1
Fairview 173
Moonah East 5
Fairview 65
Fv11-97-1
Fairview 163
Fairview 340
Springwater 1
Fairview 164
Fv10-26-1
Fairview 66
Fv11-44-1
Fairview 171
Fv11-88-1
Fv11-31-2
Fv11-104-1
Fv11-108-1
Fv11-67-1
Fv11-93-1
Fv11-86-1
Fairview 68
Fairview 181
Fairview 67
308
311
95
254
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259
265
255
258
241
57
260
269
56
240
55
271
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
148° 57'
148° 58'
Santos
GLNG
Eastern Queensland
Springwater
Fauna Habitat
FIGURE 6
250 0 250 500 750m
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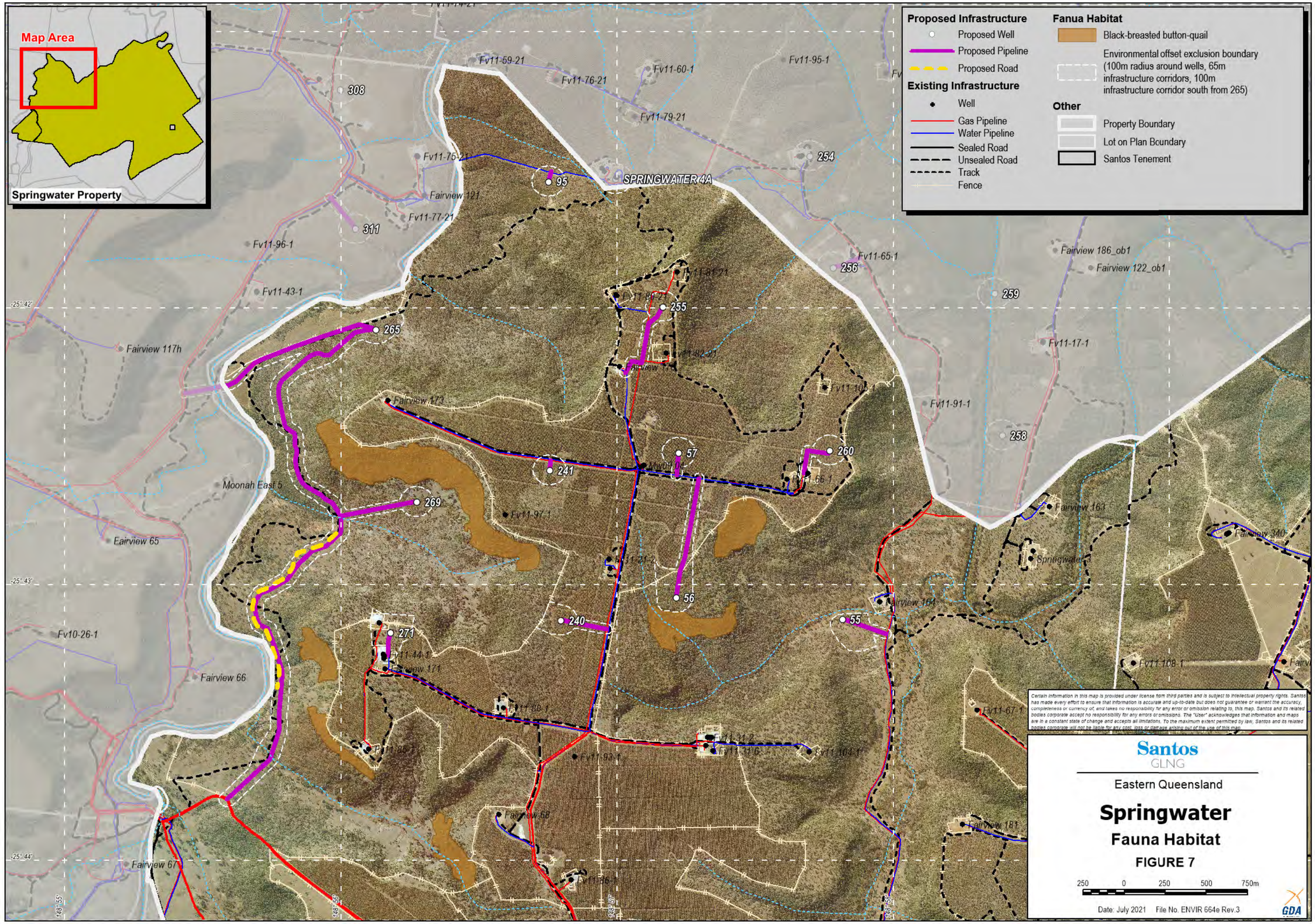
Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Fanua Habitat
Black-breasted button-quail
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
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SPRINGWATER 4A
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Fv11-60-1
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Fv11-75-21
Fairview 121
Fv11-77-21
Fv11-96-1
Fv11-43-1
Fairview 117h
Fv11-65-1
Fairview 186_ob1
Fairview 122_ob1
Fv11-17-1
Fv11-91-1
Fairview 173
Moonah East 5
Fv11-97-1
Fairview 65
Fairview 163
Fairview 340
Springwater
Fairview 164
Fv10-26-1
Fairview 66
Fairview 171
Fv11-108-1
Fv11-67-1
Fv11-93-1
Fairview 68
Fairview 181
Fairview 67
Fv11-86-1
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
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311
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256
255
265
259
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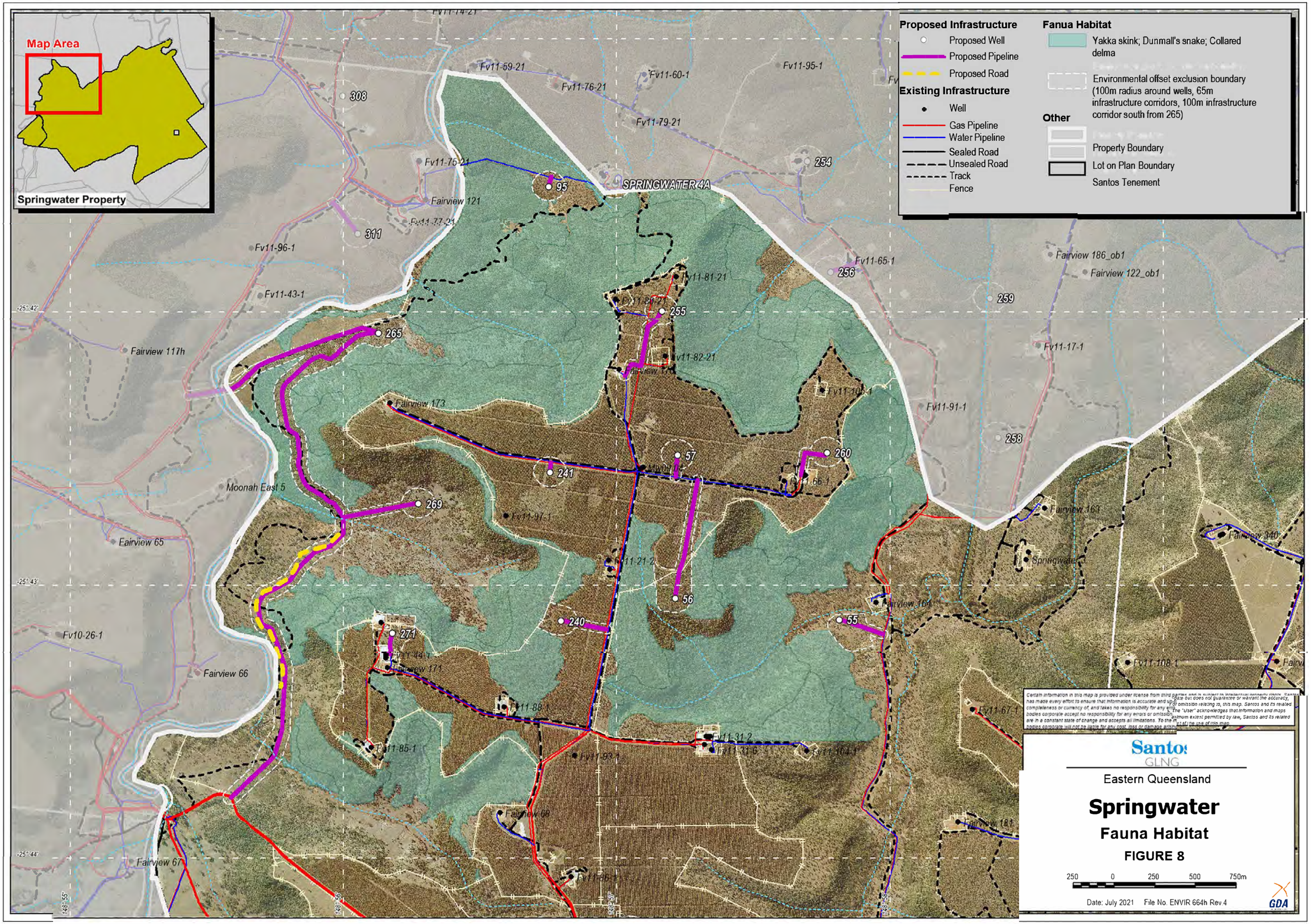
Santos
GLNG
Eastern Queensland
Springwater
Fauna Habitat
FIGURE 7
250 0 250 500 750m
Date: July 2021 File No. ENVIR 664e Rev.3
GDA


Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Fanua Habitat
Yakka skink; Dunmall's snake; Collared delma
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Fairview 121
Fairview 117h
Moonah East 5
Fairview 65
Fairview 66
Fairview 67
Fairview 173
Fairview 171
Fairview 186_ob1
Fairview 122_ob1
Fairview 163
Fairview 340
Fairview 181
Springwater
Fv11-59-21
Fv11-76-21
Fv11-60-1
Fv11-95-1
Fv11-79-21
Fv11-75-21
Fv11-77-21
Fv11-96-1
Fv11-43-1
Fv11-65-1
Fv11-81-21
Fv11-82-21
Fv11-17-1
Fv11-91-1
Fv11-97-1
Fv11-21-2
Fv11-44-1
Fv11-88-1
Fv11-85-1
Fv11-31-2
Fv11-31-6
Fv11-104-1
Fv11-93-1
Fv11-108-1
Fv11-67-1
Fv10-26-1
308
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240
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271
-25°42'
-25°43'
-25°44'
148°55'
148°56'
148°57'
148°58'
Santos
GLNG
Eastern Queensland
Springwater
Fauna Habitat
FIGURE 8
250 0 250 500 750m
Date: July 2021 File No. ENVIR 664h Rev.4
GDA

4.0 Environmental Outcomes to be Achieved

The outcome of this OAMP is to acquit the offset obligations under EPBC 2012/6615.

Progress towards achieving these outcomes will be measured against the interim performance targets and criteria defined in Table 8.

Table 8: Interim performance targets and completion criteria for the Springwater offset area

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Assessment Units - Advanced regrowth REs: 11.9.5, 11.9.7 and Young regrowth REs: 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	Increased	Increased to within 50% of remnant height	Increased to within 75% of remnant height	Remnant (VMA) Structure and floristics
Canopy recruitment	Increased, or 100%	Increased, or 100%	Increased, or 100%	Increased, or 100%
Tree canopy cover	Increased	Increased to within 50% of remnant cover	Increased to within 75% of remnant cover	Remnant (VMA) Structure and floristics
Shrub layer cover	Increased	Increased	Increased	Increased
Coarse woody debris	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Native plant species richness	Increased for four life forms	Increased for four life forms	Increased for four life forms	Increased for four life forms
Non-native plant cover	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%
Native perennial grass cover	Increased	Increased	Increased	Increased
Litter cover	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Access and development	Limited	Limited	Limited	Limited
BioCondition metric scores	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing
Clearing	No clearing has occurred	No clearing has occurred	No clearing has occurred	No clearing has occurred
Weeds	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover
Pest animals	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.
Assessment Unit - Remnant REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	Has not decreased	Has not decreased	Has not decreased	Has not decreased
Canopy recruitment	Increased, or 100%	Increased, or 100%	Increased, or 100%	Increased, or 100%
Tree canopy cover	Has not decreased	Has not decreased	Has not decreased	Has not decreased
Shrub layer cover	Increased	Increased	Increased	Remnant (VMA) Structure and floristics
Coarse woody debris	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Native plant species richness	Increased for four life forms	Increased for four life forms	Increased for four life forms	Increased for four life forms
Non-native plant cover	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%
Native perennial grass cover	Increased	Increased	Increased	Increased
Litter cover	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Access and development	Limited	Limited	Limited	Limited

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
BioCondition metric scores	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing
Clearing	No clearing has occurred	No clearing has occurred	No clearing has occurred	No clearing has occurred
Weeds	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover
Pest animals	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.

5.0 Approach to Management

5.1 Adaptive Management

This Offset Plan is based on an adaptive management approach which involves 'flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood' (National Research Council 2004).

Adaptive management includes two key phases:

- establishment of the key components of a management framework including engaging stakeholders, developing clear and measurable objectives and performance criteria, identification and selection of potential management actions and the development of monitoring protocols which enable the evaluation of progress towards achieving objectives, and which will effectively contribute to the adaptive management decision making process.

- an iterative learning phase which involves utilisation of the management framework to learn about the natural resource system and iteratively adapt management strategies and approaches based on what is learned (Williams 2011)

The implementation of this Offset Plan will use the adaptive management framework, as illustrated in Figure 10 to detect changes in the condition of offset values, incorporate learnings from other similar management activities/conservation advice and inform decisions on corrective actions to ensure that interim performance targets and completion criteria are attained and maintained for the life of the approval. The offset site will be managed and monitored, as a minimum for the life of the approval and until the completion criteria have been achieved.

Section 6.0 details the overall environmental outcome of this Offset Plan, interim performance targets and completion criteria for each offset value and management objectives to be achieved as part of this Offset Plan. Attainment and maintenance of the completion criteria will be assessed based on the results of ongoing management and monitoring events and will be presented as part of compliance reporting commitments to DAWE (see Section 8.2).

If an interim performance target has not been achieved, or a completion criterion (once attained) has not been maintained, or an adaptive management trigger is identified, corrective actions will be implemented. Where there is uncertainty as to the cause of the management trigger (e.g., failure to achieve the interim performance target), the event or circumstance triggering corrective action will be reviewed, and management actions in this Offset Plan may be revised accordingly.

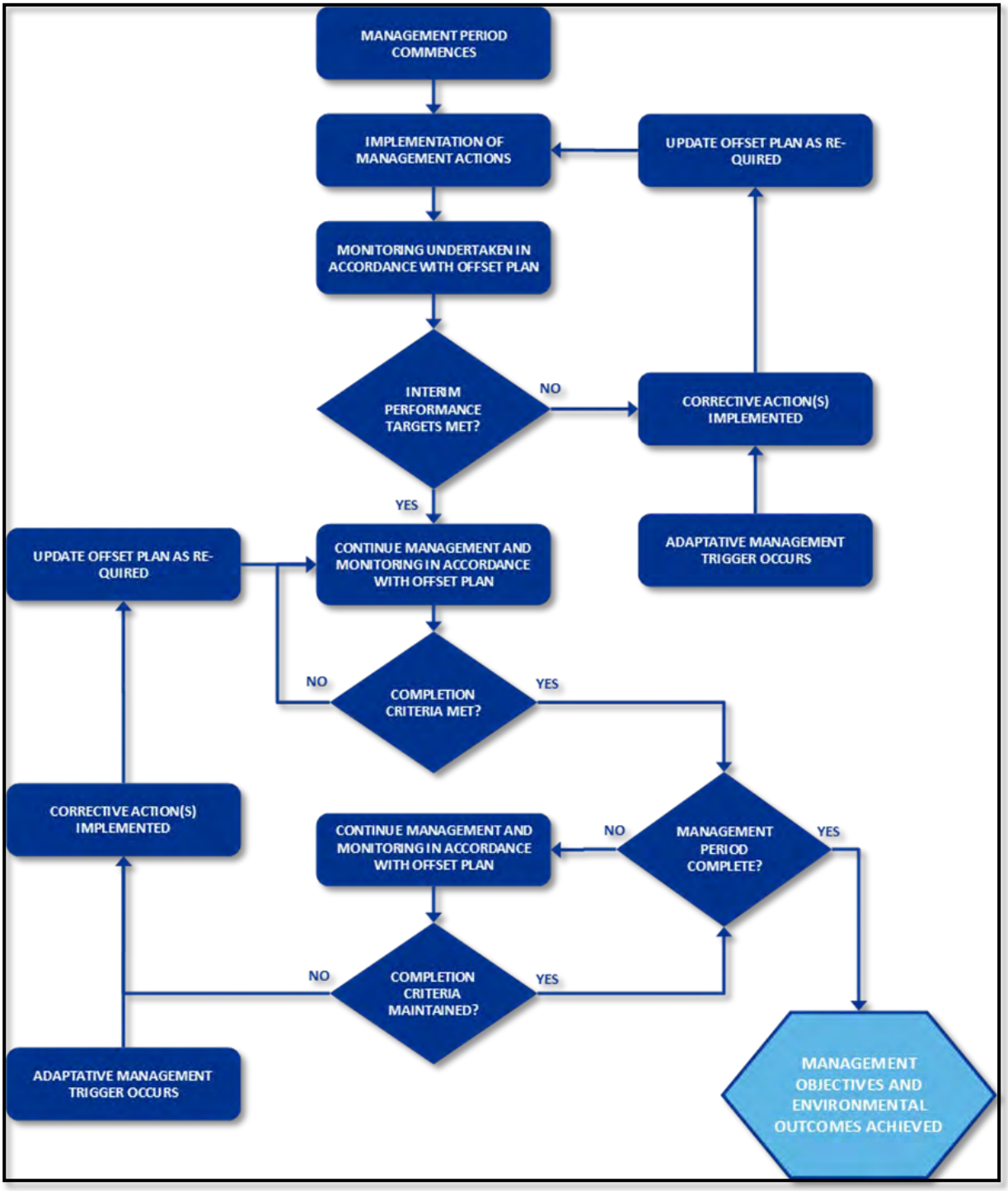

Figure 9: Adaptive management process for implementation of the Offset Plan

5.2 Managing uncertainty

The management of natural systems involves uncertainty which can affect the success of the management measures in achieving the objectives and performance criteria. Williams (2011) and Williams and Brown (2016) identify four kinds of uncertainty, outlined Table 9, with how they have been addressed through the development of this Offset Plan.

Table 9: Four kinds of uncertainty (Williams and Brown 2016)

Uncertainty	Description	Addressed How
Environmental variation	**C**aused by external factors that act upon natural systems, but which are not influenced by the resource conditions and dynamics, for example variation in rainfall or temperature.	Largely outside of the control of the manager (Williams 2011). Influence is considered in the analysis of the effectiveness of the adaptive management approach, the analysis of the ability to achieve and maintain performance criteria and when considering the need for corrective actions.
Partial observability	Includes potential uncertainty arising from variation in the collection of data during monitoring events, and from being unable to completely observe the natural system in its entirety (Williams & Brown 2016).	Addressed in this OAMP through the development of a monitoring program based on scientifically tested and repeatable methods.
Partial controllability	Relates to the difference between the intended effect of the management measures to be implemented through this OAMP and the actual effect of their implementation on the ground (Williams & Brown 2016).	Address through adherence to an adaptive management approach including regular monitoring of conformance with performance criteria, assessment of adaptive management triggers, the implementation of corrective actions, review, and amendments to the OAMP, and reporting to ensure that management measures are being effectively implemented on the ground.
Structural and process uncertainty	concerns a lack of knowledge or understanding regarding biological and ecological processes and relationships, and differing views regarding how natural systems respond to management (Williams & Brown 2016).	Addressed through the adaptive management approach. Following the results of ongoing management, monitoring and reporting, the OAMP will be reviewed and updated as required to incorporate learnings, updated conservation advice and best practice management techniques.

5.3 Timing for implementation of the Offset Plan

The offset area will be managed and monitored until the interim performance targets and completion criteria are achieved. It is anticipated that through the adaptive management approach, interim performance targets and completion criteria will be achieved within the proposed 20-year management period. However, if the interim performance targets and/or completion criteria for offset values have not been achieved within the anticipated timeframes, management and monitoring will continue beyond the 20-year management period in accordance with this Offset Plan until the completion criteria have been achieved. Once attained, completion criteria will be maintained for at least the life of the EPBC Act Approval.

5.4 Risk of offset failure

Appendix C presents an assessment of the risk of failure to achieve the Offset Plan objectives for the offset values.

Based on the adaptive approach to management and the proposed management and monitoring program, it is considered that the management objectives, interim performance targets and completion criteria (see Table 10) will be successfully achieved.

If interim performance targets are not achieved for one or more offset values by year 5, 10 or 15 for those offset values, Santos will obtain advice from suitably qualified people / groups with the aim of identifying appropriate additional management interventions.

It should be noted that unavoidable temporary perturbations such as severe drought, or insect/fungal pest invasion that may cause a temporary decrease in metrics such as canopy or shrub cover from which the community still may recover within the next 5-year period should not preclude assessment of a satisfactory increase in ecological condition by the completion date.

If it is considered that the completion criteria cannot be achieved, Santos will update this Offset Plan proposing alternative offset areas in order to acquit the required Stage 3 offset requirements in accordance with the offsets assessment guide. The revised Offset Plan will be submitted to the Commonwealth Government.

6.0 Management Outcomes

The environmental outcome sought through this Offset Plan is to improve the condition of vegetation in the SOA according to the interim performance targets and completion criteria detailed in Table 10, such that the habitat quality score for each MNES is improved from the baseline, as summarised in Table 11.

6.1 Interim performance targets and completion criteria

Table 10 details the interim performance targets and completion criteria for improving vegetation condition, and therefore MNES habitat quality, in the SOA, to demonstrate the success of the Offset Plan in achieving the overall environmental outcome.

The completion criteria align with the future habitat quality score included in the offsets assessment guides in Appendix C. Through the implementation of management and monitoring activities outlined in Section 7.0, the condition of the vegetation and offset values within the offset area will be improved from the baseline habitat quality to achieve the completion criteria within 20 years of commencement of the OAMP and be maintained for the life of the approval (i.e. until 31 March 2066).

All determinations of habitat quality will be made in accordance with the Guide to assessing terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy (Version 1.3, 2020), and converted to scores out of 10 via the spreadsheets included at Appendices A and B to the plan, unless agreed otherwise in writing by the Commonwealth Department of the Agriculture, Water and the Environment. The completion criteria for this plan are the offset site future state quality scores shown at Appendix A, for each metric included therein.

Table 10: Interim Performance Targets and Completion Criteria

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Assessment Units - Advanced regrowth REs: 11.9.5, 11.9.7 and Young regrowth REs: 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	Increased	Increased to within 50% of remnant height	Increased to within 75% of remnant height	Remnant (VMA) Structure and floristics
Canopy recruitment	Increased, or 100%	Increased, or 100%	Increased, or 100%	Increased, or 100%
Tree canopy cover	Increased	Increased to within 50% of remnant cover	Increased to within 75% of remnant cover	Remnant (VMA) Structure and floristics
Shrub layer cover	Increased	Increased	Increased	Increased
Coarse woody debris	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Native plant species richness	Increased for four life forms	Increased for four life forms	Increased for four life forms	Increased for four life forms
Non-native plant cover	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%
Native perennial grass cover	Increased	Increased	Increased	Increased
Litter cover	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Access and development	Limited	Limited	Limited	Limited
BioCondition metric scores	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Clearing	No clearing has occurred	No clearing has occurred	No clearing has occurred	No clearing has occurred
Weeds	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover
Pest animals	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.
Assessment Unit - Remnant REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	Has not decreased	Has not decreased	Has not decreased	Has not decreased
Canopy recruitment	Increased, or 100%	Increased, or 100%	Increased, or 100%	Increased, or 100%
Tree canopy cover	Has not decreased	Has not decreased	Has not decreased	Has not decreased
Shrub layer cover	Increased	Increased	Increased	Remnant (VMA) Structure and floristics
Coarse woody debris	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant
Native plant species richness	Increased for four life forms	Increased for four life forms	Increased for four life forms	Increased for four life forms
Non-native plant cover	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%	Decreased, or is below 5%
Native perennial grass cover	Increased	Increased	Increased	Increased
Litter cover	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant	Increased, or remains constant

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Access and development	Limited	Limited	Limited	Limited
BioCondition metric scores	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing	Have not declined as a result of fire or grazing
Clearing	No clearing has occurred	No clearing has occurred	No clearing has occurred	No clearing has occurred
Weeds	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover	Weed control activities have prevented an increased in weed cover
Pest animals	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.	Decrease in Pest fauna trapped during trapping events.

6.2 MNES habitat quality – baseline scores, interim targets and completion scores

Table 11 summarises habitat quality scores for each offset value in the SOA:

- Baseline habitat quality scores (calculated in accordance with the Guide to Determining Terrestrial Habitat Quality)
- Habitat quality score required at completion

Table 11: SOA Baseline Habitat Quality Scores

Offset Value	Baseline habitat quality score (area-weighted)	Rounded baseline quality score	Completion habitat quality score (Year 20)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	6.93	7	8
SEVT	8.35	8	9
Red Goshawk	5.84	6	7
Squatter Pigeon	6.03	6	7
Black-breasted Button Quail	6.31	6	7
South-eastern Long-eared Bat	6.15	6	7
Koala	5.54	6	7
Collared Delma	5.55	6	7
Yakka Skink	5.92	6	7
Dunmall's Snake	5.61	6	7

7.0 Offset Area Management

7.1 Overview

Figure 10 shows the three management areas in the SOA. Table 12 summarises management actions in each area.

Table 12: Summary of Management Actions in Each Management Area

Management activity	Management area(s)
Access and Development to be limited	All management areas
Fire to be Excluded	All management areas
Livestock exclusion	All management areas (with the exception of strategic grazing events)
Strategic Grazing	Management Area 1 and potentially Management Area 2 if needed.
Clearing Prohibition	All management areas
Weed Control	All management areas
Feral Animal Control	All management areas
Regrowth Thinning of Brigalow TEC	Regrowth Brigalow where thickening has occurred to >10,000 stems per hectare (Brigalow TEC only, parts of Management Area 3)

The management measures to be implemented within the SOA have been developed considering the relevant conservation advice for each MNES value and are consistent with the measures in relevant recovery plans and threat abatement plans. Table 13 details the species threats and relevant management measures for each MNES being offset.

Table 13: Relevant conservation priorities and management measures to be implemented within the SOA

Species	Species threats identified in relevant conservation advice and threat abatement plans	Management Activity
Flora Species		
Acacia grandifolia	Habitat modification through timber harvesting	Clearing Prohibition
	Inappropriate fire regimes	Fire to be Excluded
	Inappropriate grazing regimes	Grazing to be Excluded
Arthraxon hispidus (Hairy-joint grass)	Weed invasion, in particular from the Mist flower (*Ageratina riparia*), Crofton weed (*Ageratina adenophora*) and Lantana (*Lantana camara*)	Weed Control
	Competition from introduced grasses such as Paspalum (*Paspalum dilatatum*) and Kikuyu *(Pennisetum clandestinum*)	Weed Control
	Trampling by stock	Grazing to be Excluded

Species	Species threats identified in relevant conservation advice and threat abatement plans	Management Activity
	Clearing for agriculture and development	Clearing Prohibition
	Slashing or mowing of habitat	Clearing Prohibition
	Inappropriate fire regimes	Fire to be Excluded
	Over-grazing by domestic stock	Grazing to be Excluded
Bertya opponens	Grazing by feral goats	Pest Animal Control
	Seedling viability	Non-manageable Threat
	Inappropriate fire regimes	Fire to be Excluded
	Clearing	Clearing Prohibition
	Drought	Non-manageable Threat
Cadellia pentastylis (Ooline)	Clearing for agriculture	Clearing Prohibition
	Localised extinction due to small and scattered populations	Non-manageable Threat
	Inbreeding which threatens genetic diversity in small populations	Non-manageable Threat
	Damage to roadside populations during roadworks	Clearing Prohibition
	Grazing and soil compaction by domestic stock including feral goats (*Capra hircus*) and pigs (*Sus scrofa*)	Pest Animal Control Grazing to be Excluded
	Invasion of habitat by weeds, such as Tiger Pear (*Opuntia aurantiaca*)	Weed Control
	Frequent fires	Fire to be Excluded
	Tunnel and sheet erosion	Clearing Prohibition
	Low seed viability which threatens breeding success	Non-manageable Threat
	High insect attack	Non-manageable Threat
Daviesia discolor	High frequency fires, including deliberate fuel reduction burns or wildlife	Fire to be Excluded
	Cattle grazing	Grazing to be Excluded
Eucalyptus beaniana (Bean's ironbark)	Destruction of trees for timber	Clearing Prohibition Access and Development to be Limited

Species	Species threats identified in relevant conservation advice and threat abatement plans	Management Activity
	Road widening and maintenance activity	Clearing Prohibition
Phaius australis (Swamp orchid)	Illegal collection for horticulture or cut flowers	Access and Development to be Limited
	Habitat loss through clearing and fragmentation and drainage for development, agriculture and road works	Clearing Prohibition
	Timber harvesting	Clearing Prohibition
	Mining	Clearing Prohibition
	Trampling and browsing by feral pigs and domestic livestock	Pest Animal Control
	Invasion by weeds, in particular Lantana (*Lantana camara*), Umbrella tree (*Schefflera actinophylla*), Groundsel (*Baccharis halmifolia*) and Brazilian cherry (*Eugenia uniflora*)	Weed Control
	Inappropriate fire regimes	Fire to be Excluded
Xerothamnella herbacea (Xerothamnella)	Competition from invasive plant species (primary species threat)	Fire to be Excluded
	Road widening and maintenance activities	Clearing Prohibition
	Surface erosion	Clearing Prohibition
	Grazing and trampling by cattle and native macropods	Grazing to be Excluded
Fauna Species		
Botaurus poiciloptilus (Australasian bittern)	Reduction in the extent and quality of habitat due to the diversion of water away from wetlands	Access and Development to be Limited
	Clearing of wetlands for urban development or agriculture	Clearing Prohibition
	Reduction of water quality	Access and Development to be Limited
	Peat mining impacts on habitat	Clearing Prohibition
	Overgrazing by livestock	Grazing to be Excluded
	Inappropriate fire regimes	Fire to be Excluded
	Predation of eggs and juveniles by foxes and cats	Pest Animal Control
	Disturbance and damage at primary nursery roosts, particularly by goats	Pest Animal Control

Species	Species threats identified in relevant conservation advice and threat abatement plans	Management Activity
Chalinolobus dwyeri (Large-eared pied bat)	Potential threat - Loss of foraging habitat	Clearing Prohibition
	Potential threat - Vegetation clearance in the proximity of roosts	Clearing Prohibition
	Potential threat - Loss of genetic diversity	Non-manageable Threat
	Potential threat - Mine induced subsidence of cliff lines	Non-manageable Threat
	Potential threat - Disturbance from human recreational activities	Access and Development to be Limited
	Potential threat - Habitat disturbance by other animals, including livestock and feral animals	Pest Animal Control Grazing to be Excluded
	Potential threat - Predation by introduced predators	Pest Animal Control
	Potential threat - Fire in the proximity of roosts	Fire to be Excluded
Dasyurus hallucatus (Northern quoll)	Lethal toxic ingestion of Cane toad toxin	Non-manageable Threat
	Feral predators	Pest Animal Control
	Weeds	Weed Control
	Disease	Non-manageable Threat
	Inappropriate fire regimes	Fire to be Excluded
	Habitat degradation	Access and Development to be Limited Clearing Prohibition
	Population isolation	Access and Development to be Limited Clearing Prohibition
	Hunting and persecution	Access and Development to be Limited Clearing Prohibition
Delma torquata (Collared delma)	Loss and modification of habitat from urban and agricultural development	Access and Development to be Limited
	Removal of surface rocks during the development process or landscaping activities	Access and Development to be Limited
	Fire	Fire to be Excluded
	Invasive weeds, particularly *Lantana montividensis*	Weed Control

Species	Species threats identified in relevant conservation advice and threat abatement plans	Management Activity
Egernia rugosa (Yakka skink)	Continued legacy of past broadscale land clearing and habitat degradation	Clearing Prohibition
	Removal of wood debris and rock microhabitat features	Access and Development to be Limited
	Inappropriate roadside management	N/A
	Ripping of rabbit warrens	Pest Animal Control
	Predation by feral animals, in particular by feral cats and foxes	Pest Animal Control
Erythrotriorchis radiatus (Red goshawk)	Habitat loss and fragmentation	Access and Development to be Limited Clearing Prohibition
	Threats to nest sites i.e. by egg collectors, clearing of mature trees, fires	Access and Development to be Limited Clearing Prohibition Fire to be Excluded
	Threats to the prey base and prey availability i.e., via the degradation of rivers and wetlands utilised by potential prey species, burning, heavy grazing	All Activities
	Information and communication gaps	Non-manageable Threat
Furina dunmalli (Dunmall's snake)	Past legacy of broadscale land clearing and habitat modification	Non-manageable Threat
	Modification of habitat due to agriculture and urban development	Access and Development to be Limited
	Overgrazing of habitat	Grazing to be Excluded
Geophaps scripta scripta (Squatter pigeon [southern])	Clearance of habitat	Clearing Prohibition
	Grazing of habitat by livestock and feral herbivores	Grazing to be Excluded Pest Animal Control
	Predation, in particular by Feral cats and foxes	Pest Animal Control
Nyctophilus corbeni (South-eastern long-eared bat)	Habitat loss and fragmentation	Clearing Prohibition
	Reduction in hollow availability	Clearing Prohibition
	Exposure to agrichemicals	Access and Development to be Limited

Species	Species threats identified in relevant conservation advice and threat abatement plans	Management Activity
	Grazing	Grazing to be Excluded
	Predation by feral animals	Pest Animal Control
	Fire	Fire to be Excluded
Phascolarctos cinereus (Koala)	Loss and fragmentation of habitat	Clearing Prohibition
	Vehicle strike	Access and Development to be Limited
	Predation by dogs	Pest Animal Control
	Disease	Non-manageable Threat
Rostratula australis (Australian painted snipe)	Loss and degradation of wetlands through drainage and diversion of water	Access and Development to be Limited
	Grazing and trampling, nutrient enrichment and disturbance by livestock to species habitat	Grazing to be Excluded
	Potential threat - Climate change	Non-manageable Threat
	Potential threat – Weed invasion	Weed Control
	Potential threat – Predation by feral animals	Pest Animal Control
	Potential threat – Coastal port and infrastructure development	N/A
	Potential threat – Shale oil mining	N/A
Turnix melanogaster (Black-breasted button-quail)	Loss of habitat and habitat fragmentation due to clearing for a range of purposes (timber-harvesting and other forestry-related practices, agriculture, infrastructure construction and urban development)	Clearing Prohibition
	Habitat loss or degradation due to inappropriate fire regimes	Fire to be Excluded
	Habitat degradation as a result of domestic stock and feral pigs utilising Black-breasted button-quail habitat	Pest Animal Control
	Predation by feral animals	Pest Animal Control

7.2 General restrictions

The general restrictions presented in Table 14 will be implemented to ensure the completion criteria and management objectives are achieved.

Table 14: Offset Area Restrictions

Restriction	Details
Access	• Access into the offset area will be restricted to authorised personnel only. • The SOA will be demarcated as an exclusion zone in the Santos GIS • Existing and new fences will be used to restrict access into offset area. Fences will be installed along southern perimeter of Hutton Creek providing a natural access barrier to the north, west and east • Signs will be installed in prominent locations (i.e., at access points into the offset area) which recognise that the areas are protected for conservation purposes. The signs will advise that access into the offset area is restricted to authorised personnel only
Weed hygiene	• Weed hygiene measures will be implemented to prevent the movement of weed material into the offset area. • All persons entering the offset area will be required to ensure vehicles and equipment are weed free. • All contractors entering the offset area must hold a current weed hygiene certificate or equivalent for all vehicles and equipment. • Evidence is to be provided on request to the landowner and Santos environmental advisors that vehicles, slashers, or any machinery implementing management actions are clean prior to entry to minimise potential weed spread.
Vehicles	• Vehicle movement will be limited to designated access tracks in the offset area and access will be restricted to authorised personnel only. • Vehicles will travel to track conditions to minimise the risk of vehicle strike to fauna.
Vegetation clearing	• Clearing will be excluded from the offset area through demarcation and protection by means of Voluntary Declaration under the VM Act. Clearing for timber gathering and development will also be excluded. • Clearing of native vegetation will not be permitted within the SOA as part of any management and monitoring activities associated with the Offset Plan, except for clearing that is required for: o maintenance of access tracks and/or fire breaks o fence construction and maintenance and o ensure public safety or as directed by emergency management response personnel in the event of unplanned fire or other emergency or associated procedure. • If vegetation clearing is required for fencing, access, firebreaks or public safety, all activities will be appropriately planned, recorded, and monitored. • Machinery will not be allowed on site after heavy or prolonged rainfall events until after the site has dried to allow for safe movement of traffic.

7.3 Access tracks

Existing access tracks will be utilised to facilitate necessary management, maintenance, and monitoring activities as part of this Offset Plan. If existing access tracks become impassable (through erosion or vegetation regrowth), maintenance activities of these tracks (e.g., grading) will be prioritised over alternative track alignments. Gully crossings are likely to be subject to periodic, ongoing maintenance because of erosion following rain events.

Existing and new access tracks will be no wider than 5 m and vegetation disturbance will be minimised.

7.4 Fencing

To support strategic grazing and the exclusion of livestock at other times, fences in the SOA will be assessed and, where required to assist with livestock control for weed and fuel load management, additional fencing will be installed. To minimise impacts to birds and bats all new fences will use a single strand of high tensile steel wire on the top strand (barbed wire will not be used).

Any vegetation disturbance associated with new fence construction will be minimised in accordance with Table 15.

Regular inspections of all fencing will be undertaken in accordance with Section 8.1, and repairs to the fences will be made as required.

7.5 Fire management

Fire will be excluded from the SOA. Unplanned fire risk will be managed through:

- establishment and regular maintenance (grading) of a firebreak around the SOA
- carefully monitored and managed fuel loads

The firebreak will be maintained by grading along:

- all existing/proposed fence lines
- all existing access tracks bordering or traversing offset area
- Strategic grazing will be used to control fuel loads, where appropriate/necessary (see Section 7.5). As increasing grazing intensity is correlated with an increase in weedy cover (Franks 2002), and a decrease in native grass species richness, grazing will be permitted in the offset area on a managed and limited basis to control weeds and reduce fuel loads. Best management practices will be employed as follows:
- a minimum of 1,500 kg/ha of dry matter will be retained at the end of the dry season
- stock will only be permitted in the offset area to reduce fuel loads and reduce exotic pasture grass cover.

The suitability of conditions for undertaking a grazing event will be informed by biomass monitoring events (see Section 8.2). Following a wet season spell and prior to a strategic grazing event in pasture areas of the offset area, a feed budgeting assessment will be undertaken. The feed budgeting assessment will determine the stocking rate based on the amount of feed available within pasture areas and the amount of feed desired in these areas at the end of the grazing event.

7.6 Grazing

Livestock grazing will be excluded from all offset management areas except during strategic grazing events, which will play an important role in reducing fuel loads. As increasing grazing intensity is correlated with an increase in weedy cover (Franks 2002), and a decrease in native grass species richness (ELA 2017). Best management practices will be employed as follows:

- minimum of 1,500 kg/ha of dry matter will be retained at the end of the dry season
- stock will only be permitted in the offset area to reduce fuel loads, avoid weed seed set and reduce weed cover

To minimise erosion and subsequent impacts on water quality, strategic grazing will be excluded where rainfall causes inundated or waterlogged soils. The location and extent of grazing exclusion areas will be reviewed annually based on the results of management and monitoring events.

The suitability of conditions for undertaking a grazing event will be informed by biomass monitoring events as described in Section 8.2. Regular inspections of all fencing will be undertaken in accordance with Section 8.1 and repairs to the fences will be made as required.

7.7 Weed management

Weed management in the SOA will aim to minimise the introduction, establishment and spread of restricted and prohibited pest plants under the Biosecurity Act 2014 (Qld) and other invasive species, not regulated under the *Biosecurity Act 2014*, that present a threat to vegetation communities and species habitat in the offset area. Weed management will focus on reducing the extent of existing weeds as well as minimising the risk of introduction of additional weed species to the offset areas.

The presence of buffel grass and parthenium as well as other exotic weed and pasture species poses the greatest threat to vegetation communities in the offset area, with areas supporting buffel grass contributing to a groundcover biomass up to 20 times that of similar, intact vegetation communities (Walker et al. 1981). Elevated biomass increases the risk of uncontrolled fires, particularly in Brigalow TEC (Butler & Fairfax 2003).

Reductions in the extent of buffel grass and parthenium are most effectively achieved by maximising the competitive advantage of native ground cover species. This requires native species richness and abundance to be maximised. In historically grazed environments the most effective way to ensure high species richness is through conservatively managed cattle grazing (Fensham 1998). Conservative cattle grazing requires maintenance of enough biomass to maximise grass growth and appropriate spelling to allow for native species to set seed.

Accordingly, a strategic grazing regime will be implemented to reduce the presence and biomass of exotic pasture grasses in the offset areas (refer to Section 7.6). To supplement this, weeds will be managed using chemical and/or mechanical control in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets, for the relevant weed species.

7.8 Pest Animal Management

Pest animals are present or have the potential to be present within or in the immediate vicinity of the SOA, and pose the following threats:

- predation of fauna (including South-Eastern Long-eared Bat, Koala, Dunmall's snake and yakka skink) by wild dogs, foxes, and cats, and
- erosion and degradation of habitat and competition by feral pigs and rabbits.

Pest animal control activities will be conducted generally in accordance with the Biosecurity Act 2014 (Qld). Table 15 provides examples of approved species-specific pest animal control measures recommended by the Queensland and Commonwealth governments. Results of pest animal assessments will be reviewed following each reporting event to inform the need for, location and timing of species-specific control measures in subsequent years.

Table 15: Examples of Species-Specific Control Methods for Pest Animal Species

Species	Status[a]	Example control method	Reference
Wild dog (*Canis familiaris*)	Category 3,4,6	Ground baiting Foot hold traps Shooting	(DAF 2017)
Fox (*Vulpes vulpes*)	Category 3,4,5,6	Ground baiting Trapping Shooting	(DAF 2016a)
Feral cat (*Felis catus*)	Category 3,4,6	Night shooting Poisoning Trapping	(DAF 2016b)
Pig (*Sus scrofa*)	Category 3,4,6	Trapping Shooting Poisoning	(DAF 2016c)
Rabbit (*Oryctolagus cuniculus*)	Category 3,4,5,6	Baiting Fumigation Trapping Shooting	(DAF 2016d)

[a] Status under the Biosecurity Act 2014 (Qld)

7.9 Brigalow Vegetation Management

Selective regrowth thinning of Brigalow TEC may be required where regrowth of Brigalow vegetation (RE 11.9.5) occurs at >10,000 stems per hectare. Restoration thinning using mechanical methods can accelerate structural development.

The requirement for management by mechanical thinning will be informed by monitoring events (see Section 8.5).

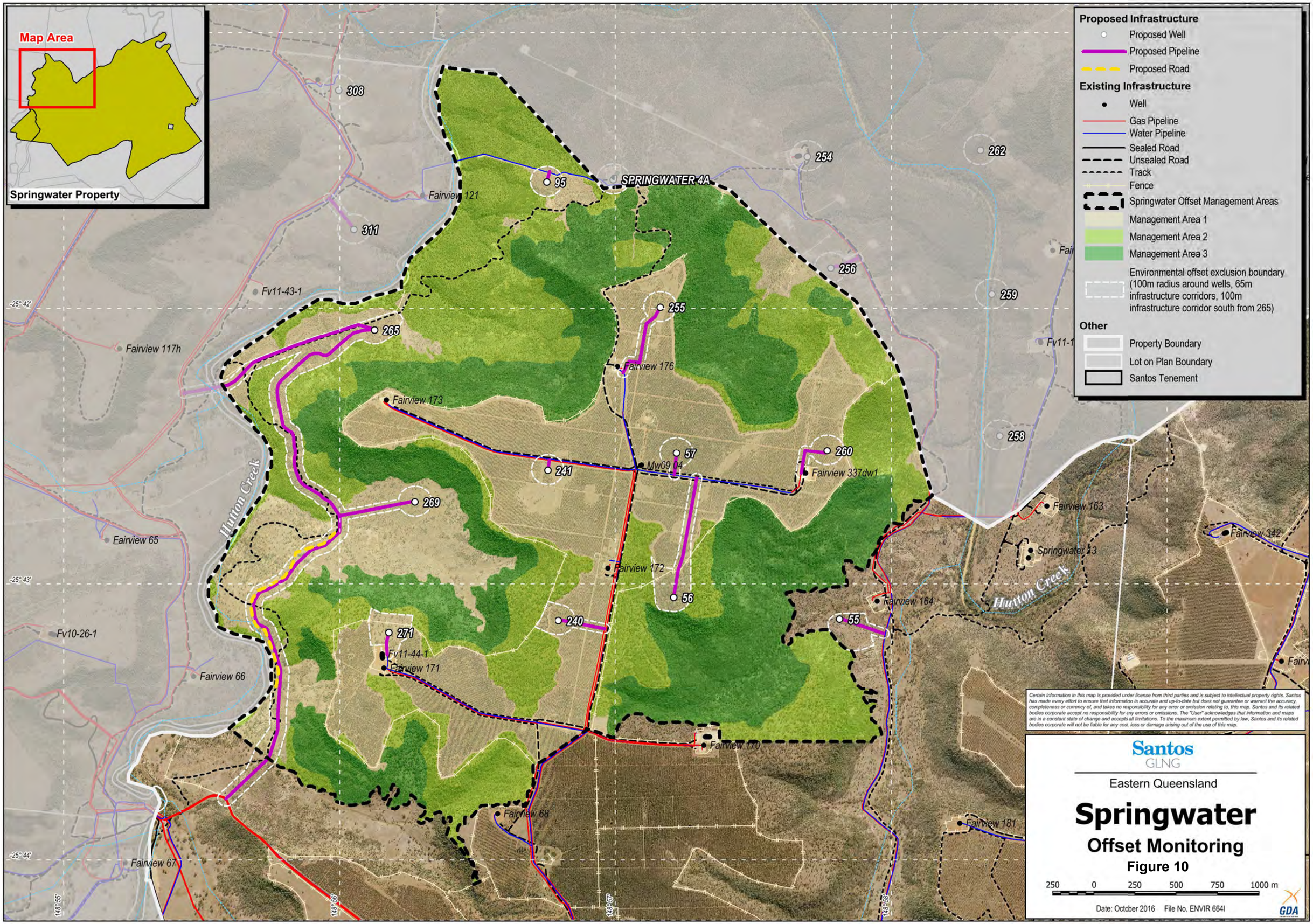
Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Springwater Offset Management Areas
Management Area 1
Management Area 2
Management Area 3
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Hutton Creek
Fairview 121
Fv11-43-1
Fairview 117h
Fairview 176
Fairview 173
Mw09 04
Fairview 337dw1
Fairview 163
Springwater 13
Fairview 342
Fairview 172
Fairview 164
Fairview 65
Fv10-26-1
Fv11-44-1
Fairview 171
Fairview 66
Fairview 170
Fairview 68
Fairview 181
Fairview 67
308
311
95
254
262
256
259
255
265
258
57
260
241
269
56
240
55
271
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
148° 57'
148° 58'
Santos
GLNG
Eastern Queensland
Springwater
Offset Monitoring
Figure 10
250 0 250 500 750 1000 m
Date: October 2016 File No. ENVIR 664I
GDA

Table 16: Springwater Offset Area Management Actions

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
Degradation of habitat	Achieve the completion criteria and habitat quality improvements for offset values, which include the habitat quality scores in this Offset Plan	Increase the habitat quality scores for each offset value at each habitat quality assessment site based on the results of baseline and subsequent monitoring events to achieve the scores in the completion criteria	Implementation of the management actions and adaptive management framework as outlined in this Offset Plan	Monitoring of offset value habitat quality scores will be undertaken in accordance with Section 8.0. Including: Offset area inspections (Section 8.1). Habitat quality assessments to determine habitat quality scores (Section 8.5). The results of monitoring events will be compared against the habitat quality scores in the interim performance targets and completion criteria to determine the progress of the offset area and recorded as part of reporting (Section 8.7)	Habitat quality scores for interim performance targets are not achieved for one or more offset values by: • Year 5 • Year 10. • Year 15 or • Year 20	Step 1: Investigate cause of trigger: • Investigate reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. • Re-evaluate the suitability of the relevant management measures in the Offset Plan. • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include: • Third party review of the OAMP to provide input on the effectiveness of the management actions. • Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented. • For offset values that have not achieved interim performance targets by year 15, for those offset values, Santos will obtain advice from scientific advisory groups with the aim of identifying appropriate additional management interventions. • In the very unlikely event that it is considered that the completion criteria will not be achieved, Santos will discuss the provision of additional offset options with the Commonwealth Government
Habitat or vegetation loss through land clearing	Maintain the extent of offset value habitat within the SOA	No unapproved and/or intentional clearing of habitat within the offset area, except for clearing that is required for fencing, access, firebreaks and public safety.	Protection of the SOA offset area via a Voluntary Declaration under section 19E and 19F of the VMA, as described in Section 2.8.	Reporting to the Commonwealth Government consistent with any EPBC approval	Any activities in contravention of the Voluntary Declaration	Step 1: Investigate cause of trigger e.g., unauthorised access Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include additional fencing and/or signage and security for the SOA
			Comply with the restrictions outlined in Section 7.2. Construction and maintenance of access tracks, fencing and firebreaks will be undertaken in accordance with Sections 7.2 and 7.5. If vegetation clearing is required for fencing, access, firebreaks or public safety, all activities will be planned, recorded and monitored.	Compliance with restrictions for vegetation clearing associated with maintenance and establishment of access tracks, fencing and firebreaks will also be assessed as part of offset area inspections	Clearing for access, fencing, firebreaks or public safety is not undertaken in accordance with the restrictions outlined in Sections 7.2 and 7.5.	Step 1: Investigate cause of trigger • If restrictions for clearing associated with fencing, access, firebreaks or public safety are not adhered to, Santos will ensure that all clearing activities cease immediately. • Investigate the reason for unapproved or unintentional clearing. • Following clearing, the area is to be assessed by a suitably qualified ecologist/expert to determine the total clearing extent of offset value habitat. a. Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include: • Reviewing and modifying protocols for the establishment of fences, access tracks, and firebreaks. • Prior to the establishment of fences, access tracks, and firebreaks, the area to be cleared will be clearly marked out with flagging tape and checked prior to clearing.

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
						• Rehabilitation of the impacted area.
Degradation of habitat by overgrazing	Ensure that any livestock grazing for fire management and weed control maintains and enhances the ground cover attributes for MNES and does not result in the degradation of habitat and vegetation	Increase the richness and average % cover of native perennial grasses at each habitat quality assessment site based on the results of baseline and subsequent monitoring events	Implementation of strategic grazing to reduce fuel loads and control exotic pasture grasses in accordance with Section 7.6. Implementation of strategic grazing to promote the establishment of preferred foraging grass species including modifying the frequency, intensity and/or duration of grazing events. Excluding livestock grazing during wet periods (approximately December to March), which is typically the peak growing and flowering season for native grasses. Construct additional fencing should the current fencing be considered insufficient to manage the strategic grazing regime	Habitat quality assessments will be undertaken in accordance with Section 8.5.2. These will include assessment of % cover of native perennial grasses	Decrease in the richness and average ground layer cover at one or more habitat quality assessment sites based on the results of baseline and subsequent monitoring events	Step 1: Investigate cause of trigger • Investigate the reason for the decrease in richness and average % cover of native perennial grasses. • Identify appropriate corrective actions. Step 2: Implementation of corrective action(s) The appropriate corrective actions will be implemented and may include: • Modifying the strategic grazing regime, including modifying the frequency, intensity and/or duration of grazing events. • Constructing additional fencing should the current fencing be considered insufficient to manage livestock in accordance with the grazing regime. • Installing additional watering points for livestock to manage livestock in accordance with the grazing regime.
		Biomass levels of at least 1,500 kg/ha are retained at each of the monitoring sites at the end of the dry season.	Implementation of the strategic grazing regime to protect and maintain environmental values in accordance with Section 7.6.	Biomass monitoring will be undertaken in accordance with Section 8.1	Biomass monitoring results indicate less than 1,500 kg/ha of biomass is present at any of the monitoring sites at the end of the dry season.	Step 1: Investigate cause of trigger • Investigate the reason for the decrease in biomass at the end of the dry season • Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • Re-evaluating the strategic grazing regime to assess the suitability of grazing to ensure no less than 1,500 kg/ha of biomass is retained at the end of the dry season. • Removal of stock or spelling grazing from the offset management area in which less than 1,500kg/ha of biomass was identified. • Amending livestock management practices in the Offset Plan, including amending stocking rates, and/or duration and/or frequency of strategic grazing. • Evaluating the location of existing fencing to ensure it is enough to control livestock as part of strategic grazing and investigate if additional fencing is required to be constructed. • Constructing additional fencing to control livestock movements.
		Livestock are only observed to be in the offset management areas undertaking strategic grazing.	Existing fencing is always maintained as outlined in Section 7.4. Construction of additional fencing as required.	Offset area inspections will be undertaken at least twice a year (Section 8.1) and will include monitoring to assess the: • condition of fencing to identify any necessary maintenance requirements. • presence of livestock within the offset management area.	Livestock are observed within an offset management area when not permitted within that area. Damaged fencing is observed.	Step 1: Investigate cause of trigger • Investigate the reason why livestock have entered the offset area • Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following:

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
						• If livestock are identified in the offset management areas, notify the onsite Environmental Supervisor or relevant responsible person, and remove stock immediately. • Repair fencing to ensure its condition is satisfactory to exclude livestock. • Construct additional fencing should the current fencing be considered insufficient to exclude livestock.
Degradation of Brigalow TEC habitat	Manage regrowth of Brigalow TEC vegetation (RE 11.9.5) to accelerate structural development	Maintenance of Brigalow TEC regrowth in accordance with interim performance targets and completion criteria.	Selective regrowth thinning of Brigalow TEC where regrowth of Brigalow vegetation (RE 11.9.5) occurs at >10,000 stems per hectare, using mechanical methods	Habitat quality assessment in accordance with Section 8.5	Brigalow TEC regrowth exceeds 10,000 stems per hectare based on previous monitoring events.	Step 1: Investigate cause of trigger Identify whether mechanical thinning is appropriate Step 2: Implementation of corrective action(s) Corrective actions including mechanical thinning of regrowth Brigalow TEC may be carried out.
Invasion of habitat by weed species, including exotic grasses	Manage invasive weed species to reduce degradation of MNES habitat	Decrease in relative abundance of weed species at 80% of monitoring sites from subsequent monitoring events. No new weed species are identified at any monitoring site (based On subsequent monitoring events	Implement weed control actions in accordance with Section 7.7 Adhere to weed hygiene restrictions.	Undertake weed monitoring in accordance with Section 8.3.	An increase in relative abundance of weed species at more than 15% of monitoring sites from subsequent monitoring events. A new weed species is identified at one or more monitoring sites.	Step 1: Investigate cause of trigger Investigate the increase in relative weed abundance Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • Reviewing adherence to weed management control measures as outlined in Section 7.7. • Amending weed hygiene restrictions. • Providing additional weed awareness training for all staff and contractors to ensure weed hygiene restrictions are adhered to. • Revising weed control methods. • Increasing the frequency and intensity of weed control. • Updating weed control methods in the Offset Plan and targeted weed control programs.
Predation by pest animals (feral foxes, cats, and wild dogs)	Minimise predation risk by pest animals to threatened fauna species	Reduction in Catling* Index for the relevant pest animal from the first year of offset management	Implement control actions for pest animals in accordance with Section 7.8.	Undertake monitoring for pest animals in accordance with Section 8.4.	An increase in Catling* Index for the relevant pest animal from the first year of offset management and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate the reason for the increase in Catling index (or relative abundance, or change in rabbit impact category) from year 1/subsequent monitoring events • Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • Reviewing adherence to pest management control measures. • Increasing the frequency and intensity of pest animal control. • Revising methods of pest animal control in accordance with Queensland Department of Agriculture and Fisheries (DAF) guidelines, and coordinate with neighbouring landowners to ensure a consistent approach. • Updating pest animal control methods in the Offset Plan and targeted pest animal control programs.
Degradation of habitat by rabbits	Minimise degradation of MNES habitat by rabbits.	Maintain rabbit impact category as 'acceptable'.	Implement control actions for rabbits in accordance with Section 7.8.	Undertake monitoring for rabbits in accordance with Section 8.4.	Rabbit impact category measured as 'monitor closely', or 'unacceptable'.	
Degradation of habitat by feral pigs	Minimise degradation of MNES habitat by feral pigs.	Reduction in mean feral pig abundance score from the first year of management	Implement control actions for feral pigs in accordance with Section 7.8	Undertake monitoring for feral pigs in accordance with Section 8.4.	An increase in mean feral pig abundance score from first year and subsequent monitoring events.	

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
Fire	Reduce the risk of adverse impacts on MNES habitat associated with unplanned fire	No unplanned fire within the SOA Increase in habitat quality scores as a result of implementation of any fire management measures.	Implement fire management according to Section 7.5.	Habitat quality assessments to determine habitat quality scores will be undertaken in accordance with Section 8.5.	As a result of fire management measures, or an unplanned fire, there is a decrease in the habitat quality score for any offset value from baseline and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate reasons why the fire management measures have resulted in a decrease in habitat quality scores. • Review adherence to the fire management measures. • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include: • Increasing the frequency of biomass monitoring. • Increasing the frequency of weed control measures. • Reviewing effectiveness of firebreaks, and establishment of additional fire breaks.
Offset fails to achieve the interim performance targets and completion criteria within the anticipated 5, 10-, 15- and 20-year timeframes, respectively	Achieve the interim performance targets and completion criteria for each offset value within 5, 10, 15 and 20 years, respectively.	The interim performance targets are achieved for all offset values by year 5,10 and 15. The completion criteria are achieved for all offset values by year 20.	All management actions outlined in Section 7.0 will be implemented to ensure that the interim performance targets and completion criteria are achieved.	Monitoring of the offset area will be undertaken in accordance with Section 8.0 including: Offset area inspections (Section 8.1). Habitat quality assessments to determine habitat quality scores (Section 8.5.) The results of monitoring events will be compared against the interim performance targets and completion criteria to determine the progress of offset area and recorded as part of reporting (Section 8.7).	Interim performance targets are not achieved for one or more offset values by year 5, 10 or 15 Completion criteria are not achieved for one or more offset values by year 20.	Step 1: Investigate cause of trigger • Investigate reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. • Re-evaluate the suitability of the relevant management measures in the OAMP. • Identify appropriate corrective actions. Step 2: Implementation of Corrective Action/s The appropriate corrective actions will be implemented and may include: • Third party review of the Offset Plan to provide input on the effectiveness of the management actions. • Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented. • Modifying the fire management measures, to better support enhancement of offset values.

8.0 Monitoring

Ongoing monitoring is required to ensure the Offset Plan meets the performance criteria and management objectives, and ultimately attains the completion criteria. A monitoring programme has been developed, detailed in the following sections and in Table 19.

The results of the monitoring program will be used to inform operational management decisions, including adaptive implementation of this Offset Plan to ensure the performance criteria and management objectives, and ultimately interim performance targets and completion criteria are met.

The monitoring results will also be used to assess adherence to performance criteria, and to determine when corrective actions are required to be implemented. The results will also be compared to those from previous monitoring events to assess change over time and to inform the ongoing implementation of the OAMP

8.1 Offset Area Inspections

The aim of offset area inspections is to enable a general assessment of the offset area to identify any potential issues that may require remedial action to be undertaken. Inspections will be undertaken twice per year for the duration of the management period to assess the following:

- condition of fencing, gates and signs and existing gas field infrastructure
- condition of access tracks
- condition of firebreaks
- compliance with restrictions for vegetation clearing associated with maintenance and establishment of access tracks, fencing and firebreaks
- incidence of erosion within offset area, particularly around permanent and semi-permanent water bodies, or areas subject to inundation or waterlogging
- damage/degradation resulting from pest animal activity within the offset area
- signs of land degradation and over-grazing
- presence of weed/invasive species
- exclusion of livestock
- incidental fauna observations and any additional risks to offset values (i.e., evidence of vehicle strike)

8.2 Biomass monitoring

Biomass monitoring for fire management will be undertaken twice a year, at the end of the wet season and end of the dry season, to:

- determine the risk of fire to the offset site and
- inform fire management strategies.

Biomass is at its greatest at the end of the wet season (around April) with fire risk greatest towards the end of the dry season (September/October). Biomass will be monitored within the offset areas using appropriate photo standards which will be used to determine dry matter yields and subsequently fuel loads. Biomass monitoring will be undertaken at the same permanent weed monitoring sites established as part of the baseline surveying.

Fuel loads will be managed through strategic grazing events (see Section 7.6) if the biomass assessment at the end of the wet season shows that biomass is greater than 1,500 kg/ha.

The stocking rate of these strategic grazing events will be determined through a feed budgeting assessment (see Section 8.2.1) undertaken prior to a grazing event in the offset area. A feed budgeting assessment is a recognised method of determining the stocking rate based on the amount of feed available and the amount of feed desired at the end of the grazing event (i.e., >1,500 kg/ha).

8.2.1 Feed Budgeting Assessment

The process for undertaking a feed budget assessment will include the following sequence of activities:

- determine the current amount of feed present (kg/ha) using appropriate photo standards available on the Future Beef website[1].
- determine the amount of feed desired (kg/ha) at the end of the grazing event.
- calculate the total useable feed (kg/ha) by subtracting the feed desired from the feed present.
- determine utilisation (i.e., the proportion of useable feed that livestock can use).
- determine the feed available for the grazing animal (kg/ha) by multiplying the total useable feed by the utilisation rate.
- calculate the safe stocking rate by:
    - determining the feed consumption per day (kg/day)
    - determining the number of days feed is required (days)
    - calculating the feed requirement per head (kg/hd) by multiplying the feed consumption per day by the number of days
    - calculating the stocking rate (ha/hd) by dividing the feed requirement per head by feed available
    - calculate the number of stock (head) by dividing the area of the paddock by the stocking rate.

The amount of feed available prior to the grazing event will be estimated using the appropriate photo standards available on the Future Beef website. The “Dry Season Feed Budget” worksheet will then be used to calculate the required stocking rate for the grazing event.

At the completion of the grazing event, photo standards will be used to assess ground cover and ecosystem biomass. Should the grazing event be required to be extended (e.g., as a result of additional rainfall and resultant grass growth and potential weed flowering), the feed budget assessment will be recalculated using the “Dry Season Feed Budget” worksheet.

8.3 Weed monitoring

Weed monitoring sites will be randomly stratified, fixed monitoring sites representative of offset values and incorporating natural variability such as aspect (e.g., a mix of north-, east-, south- and west-facing monitoring sites), community type – (e.g. woodland, riparian). There will also be fixed monitoring sites at strategic trafficable areas (e.g., entry gates, creek crossings, stock watering points) to monitor potential introduction and/or irruptions of prohibited and restricted weed species.

[1] https://futurebeef.com.au/knowledge-centre/pastures-forage-crops/pasture-photo-standards/

The offset area will be monitored for weeds every two years (post wet season) to determine the species richness and abundance, for the duration of the management period. The results of this monitoring will inform the methods for weed treatment and control (see Section 7.7).

Non-native plant cover is also assessed as part of the habitat quality assessments detailed in Section 8.5, and the presence of weed species will also be recorded as part of the general offset area inspections (see Section 8.1), where noted.

Weed monitoring will target the declared and environmental weeds known to occur over Springwater: Buffel Grass (*Cenchrus ciliaris*), Green Panic (*Megathyrsus maximus*), Parthenium (*Parthenium hysterophorus*) and Harrisia Cactus (*Harrisia martini*).

8.4 Pest Animal Monitoring

In partnership with the Queensland Murray-Darling Committee (QMDC), Santos GLNG conduct a feral animal research, monitoring and control project across the Fairview gas field. This includes the Springwater property. The methodology employed in this program included wild dog and feral cat trapping at known hot spots and feral pig trapping and control. This will continue for the period of offset area management.

Pest animal control will occur twice annually. Each trapping program is over a two-week period with the first trapping program occurring during March to April and the second trapping program occurring during October to December. This timing aligns with increased dog activity during the breeding season and avoids the colder months where cat activity and breeding is limited.

In addition to the above program, evidence of pest fauna species is documented during the offset area inspections (see Section 8.1).

8.5 Habitat Quality Assessments

The first detailed monitoring event of the SOA was completed in spring/summer 2017, including BioCondition sites established in all major vegetation assessment units.

All determinations of habitat quality will be made in accordance with the *Guide to assessing terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy (Version 1.3, 2020)*, and converted to scores out of 10 via the spreadsheets included at Appendices A and B to the plan, unless agreed otherwise in writing by the Commonwealth Department of Agriculture, Water and the Environment. The completion criteria for this plan are the offset site future state quality scores shown at Appendix B, for each metric included therein.

8.5.1 Rapid Monitoring Event

Rapid monitoring events will be carried out each year there is not full monitoring of habitat quality (BioCondition, Section 8.5.2, targeted fauna survey, Section 8.5.4 and flora surveys, Section 8.5.5).

These will be aligned with the offset area inspections (see Section 8.1) and carried out by suitably qualified ecologists during spring and early summer (September – mid December) to coincide with the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et al. 2014).

During each rapid monitoring field assessment, the following will be conducted:

- An unbounded timed meander flora survey will be conducted. The survey will be conducted in accordance with the timed meander survey methodology contained within the Queensland Department of Environment and Heritage Protection's Flora Survey Guidelines.

- Fauna surveys will be conducted throughout the rapid monitoring events. Early morning and late evening bird surveys will be conducted during floristic surveys and surveys for the presence of all fauna species will be conducted throughout the day by the ecologists.

8.5.2 Habitat quality assessment (BioCondition)

Vegetation condition and habitat quality for each MNES will be assessed in accordance with the Guide to Determining Terrestrial Habitat Quality, developed by the Queensland Government to measure the habitat quality of a land-based offset. The guide is based on the methodology set out in the BioCondition Assessment Manual (Eyre et al. 2015) and compared to control sites (BioCondition benchmarks), as developed by the Queensland Herbarium.

Fixed transects were established in 2017 and these will be repeated every two years for the first six years following the 2017 baseline, and then every three years thereafter.

All ecological surveys and assessments will be undertaken by suitably qualified ecologists.

8.5.3 Photo monitoring

For each BioCondition site, photo-monitoring points have been established.

Photo monitoring is a qualitative analysis technique that provides the opportunity for visual time series analysis of changes in vegetation composition, structure, and integrity. In areas where active management is being undertaken, photo monitoring offers a simple and effective visual means by which to capture the response of the vegetation to management actions. Photo monitoring will be conducted at all fixed habitat quality assessment monitoring sites, in accordance with the Guide to Determining Terrestrial Habitat Quality. Timing of photo monitoring will therefore align with habitat quality assessment monitoring.

8.5.4 Targeted Fauna Surveys

Targeted fauna surveys are conducted to assess fauna species richness of the SOA. The targeted fauna survey methods will focus on the relevant specific significant species that are unlikely to be detected effectively during the rapid assessment surveys due to cryptic behaviour or localised habitat requirements. Targeted surveys for species are based on the ecology, habitat requirements and behavioural aspects of the species of interest. Methodology, search effort and timing are provided in Table 17.

Targeted fauna surveys will be carried out in conjunction with BioCondition surveys, every two years for the first six years following the 2017 baseline, and then every three years thereafter.

Table 17: Fauna Species Survey Methods

Technique	Regime	Target and method
Elliot B (Box Trap) or Cage Trap	Four per site over four consecutive nights, checked early morning, reopened late afternoon.	Baited with a mixture of oats, peanut butter, vegetable oil and sardines. Placed within suitable micro-habitat for Northern Quoll.
Funnel Trap	Six at each of five trap sites over four consecutive nights, checked early morning and afternoon.	Placed in pairs either side along a 30m drift-fence. Targeting Dunmall's Snake and Collared Delma.
Anabat	Three units overnight for four consecutive nights	Left overnight on site near entrances to possible roost sites for Large Pied Bat, if considered present, and/or along flyways and near waterbodies.
Harp Trap	Two per night for four consecutive nights, locations chosen based on presence of suitable flyways	Targeting South-eastern Long-eared Bat, which is not identifiable by ultrasonic calls. Also Large-eared Pied Bat.
Camera Trap	10 over at least 14 consecutive nights	Focused on stations baited with a mixture of oats, peanut butter, vegetable oil and sardines. Targeting Northern Quoll and possibly Yakka Skink. (Fleming et al., 2014).
Spotlighting	Meander along watercourses.	Targeting Koala. This will also target Dunmall's Snake.
Spotlighting	Rocky areas.	Targeting Northern Quoll and Collared Delma.
Spotlighting	By vehicle along tracks.	Targeting Dunmall's Snake.
Scat Search	Conducted in habitat considered suitable for target species.	Targeting Koala and Northern Quoll. The Spot Assessment Technique (SAT), or a variation, were used to survey for Koalas within suitable habitat within the site.
Bird Survey	At waterbodies.	Targeting Australian Painted Snipe, Australasian Bittern and Squatter Pigeon.
Bird Survey	Meander along watercourses during the day.	Targeting nest sites for Red Goshawk. Includes diurnal Koala Search.
Track Traverse	By vehicle and on foot.	Targeting Squatter Pigeon.
Diurnal Herpetofauna Search	Late morning/early afternoon.	Conducted by two searchers, duration is determined by site-specific habitat quality and presence of suitable micro-habitat. Targeting Collared Delma, Dunmall's Snake and Yakka Skink.
Platelet Search	In suitable habitat.	Targeting Black-breasted Button-quail.

8.5.5 Flora Surveys and Habitat Mapping

Threatened flora surveys will be conducted throughout the SOA. Timed meander surveys are conducted in each of the vegetation units listed in Table 4 to identify and locate EVNT plants. The timed meander survey are conducted in accordance with Section 4.1 of the *Queensland Department of Environment and Heritage Protection's Flora Survey Guidelines - Protected Plants - Nature Conservation Act 1992*, located here: https://www.ehp.qld.gov.au/licences-permits/plants-animals/documents/flora-survey-guidelines.pdf

Flora surveys and habitat mapping will be carried out in conjunction with BioCondition surveys and targeted fauna surveys, every two years for the first six years following the 2017 baseline, and then every three years thereafter.

8.6 Implementation Schedule

Table 18 and Table 19 summarise the implementation schedule for the management, monitoring and reporting activities presented in this OAMP.

Table 18: Implementation of management actions

Activity		Management years ✓ Activity required ▪ Activity to be carried out as required																				Timing	Related monitoring
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
General restrictions (Section 7.2)	Access, vehicles, vegetation clearing, weed hygiene	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	At all times	General offset inspections (see Section 8.1).
Access tracks (Section 7.3)	Maintenance/new tracks	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required	
Fencing (Section 7.4)	Construction of additional fencing to support livestock exclusion and strategic grazing	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required	
	Maintenance	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		
Fire management (Section 7.5)	Fire excluded	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	At all times	Biomass monitoring (Section 8.2.1).
Grazing (Section 7.6)	Strategic grazing	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	As required based on the results of biomass monitoring, and informed by weed monitoring	Biomass monitoring (Section 8.2.1). Weed monitoring (Section 8.3).
Weed management (Section 7.7)	Buffel grass and other weeds	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	Control activities in addition to strategic grazing to be undertaken as required	Weed monitoring (Section 8.3).
Pest animal management (Section 7.8)	Wild dog (*Canis familiaris*); Feral cat (*Felis catus*); Fox (*Vulpes vulpes*); Rabbit (*Oryctolagus cuniculus*); Pig (*Sus scrofa*)	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	Control activities to be undertaken as required	Pest animal monitoring (Section 8.4)
Brigalow vegetation management (Section 7.9).	Restoration/regrowth Brigalow vegetation (RE 11.9.5)	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	Thinning to be undertaken as required, according to habitat quality assessments	Habitat quality assessment (Section 8.5)
Reporting (Section 8.7)	Annual reporting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Offset Plan audit every 5 years	Reporting (Section 8.7)
	Update Offset Plan					▪					▪					▪					▪		

Table 19: Offset Plan Monitoring Events

Survey or monitoring objective	Monitoring activity	Management years ✓ Activity required ▪ Activity to be carried out as required																				Timing	Survey/monitoring guidelines	Reliability
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Offset area inspections (Section 8.1)	Twice yearly inspections of: • fencing, gates, signs and existing • access tracks • firebreaks • compliance with restrictions for vegetation clearing associated with • incidence of erosion • damage/ degradation resulting from pest animal activity within the offset area • signs of land degradation and over-grazing • weed/invasive species • exclusion of livestock • incidental fauna observations and any additional risks to offset values (i.e., evidence of vehicle strike	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Inspections will be undertaken at least twice a year, Usually at the end of the wet season and the end of the dry season, with one of the inspections occurring prior to the submission of the annual report		General assessment of the offset management areas to identify any potential issues that may require remedial action to be undertaken within the subsequent year of management.
Biomass monitoring (Section 8.2.1)	Biomass monitoring for fire management and to inform strategic grazing regime	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Twice every year at the end of the wet season (March/April) and towards the end of the dry season (October)	Assessment against Future Beef photo standards (Section 8.2.1)	Methodology developed by the Queensland Government Department of Nation Resources.
Weed monitoring (Section 8.3)	Ongoing weed surveys to assess the effectiveness of weed control		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	Every two years including a survey in the dry season and a survey post wet season	NSW Guidelines for Monitoring Weed Control and recovery of native vegetation (Auld 2009) Photo monitoring of selected sites to assess visual changes in weed species and infestations over time.	Assessment undertaken generally in accordance with guidelines developed by Bruce Auld from the NSW Department of Primary Industries.

Survey or monitoring objective	Monitoring activity	Management years ✓ Activity required ■ Activity to be carried out as required																				Timing	Survey/monitoring guidelines	Reliability
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
																							The use of precision unmanned aerial vehicles (drone) technology, aerial imagery and/or remote sensing.	
Pest animal monitoring (Section 8.4)	Ongoing pest animal surveys to assess the effectiveness of pest animal control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Twice annually, according to Section 8.4	Methods as detailed in Santos partnership with Queensland Murray-Darling Committee (QMDC	
Habitat quality assessment (baseline surveys completed in 2017) (Section 8.5)	Rapid monitoring events		✓		✓		✓	✓		✓	✓		✓	✓		✓	✓		✓	✓		Every year there is no full BioCondition assessment	See Section	
	Targeted fauna and flora surveys	✓		✓		✓			✓			✓			✓			✓			✓	Every two years from the 2017 baseline, and then every three years thereafter.	Guide to Determining Terrestrial Habitat Quality (DEHP 2017) Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2018) Survey Guidelines for Australia's Threatened Birds (DEWHA 2010) Survey guidelines for Australia's threatened reptiles (DSEWPaC 2011).	Assessment undertaken in accordance with method developed by the Queensland Government and aligns with the EPBC Act Environmental Offsets Policy measure of 'habitat quality' and is intended to provide a consistent framework for environmental offsets in Queensland.
	BioCondition transects	✓		✓		✓			✓			✓			✓			✓			✓			
	Photo monitoring	✓		✓		✓			✓			✓			✓			✓			✓		Photos at each photo monitoring point will be taken in a north, east, south and westerly direction. A record of the photographs will be maintained, including GPS co-ordinates, date and time of each photograph and the direction in which the photograph was taken.	Based on best practice photo monitoring techniques, see Appendix 4 of BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. (Eyre *et al.* 2015)

8.7 Reporting

Reports detailing the progress against the management outcomes detailed in Section 6 will be prepared by the suitably qualified ecologist responsible for conducting the monitoring, within two weeks following each monitoring event. The report will contain, at a minimum:

- A description of the monitoring conducted, when it was conducted, and by whom;
- A discussion of the weather in the lead up to and during the monitoring;
- Results of photo monitoring;
- Site data including site description and location and results for all site-based condition attributes
- Rapid assessment site data including site description and location and results (if relevant that year);
- An overview of the management actions that were implemented since the last report (i.e., if thinning of Brigalow occurred, or pest animal and weed control);
- Details of any triggers that have been exceeded and the remedial actions that are implemented;
- An overview of the progress of the management area in achieving the performance criteria and how any risks or threats have impacted on the area; and
- An indication of any risks or potential threats that have become apparent to the management area since the development of this management plan, and activities to be undertaken to manage these threats and/or risks.
- This plan will be reviewed and audited every 5 years and/or if the risks to the offsets success identified in Section 5.4 have been identified.
- Annual reports discussing compliance with the commitments within this plan will be published on the Santos website.

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APPENDIX A

Offsets Assessment Guides for the Springwater offset area

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Brigalow
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**	5.5	Hectares	GFD Project EPBC Act Offset Plan - Stage 3
			Quality	**8**	Scale 0-10	
			Total quantum of impact	4.40	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	4.40	Adjusted hectares	Springwater Offset Area	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	65.6	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	4.65	105.70%	Yes		
									Future area without offset (adjusted hectares)	65.6	**Future area with offset (adjusted hectares)**	65.6									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	90%	0.90	0.71					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	4.4	4.65	105.70%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	SEVT
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**	2	Hectares	GFD Project EPBC Act Offset Plan - Stage 3
			Quality	**9**	Scale 0-10	
			Total quantum of impact	1.80	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	1.80	Adjusted hectares	Springwater Offset Area	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	26	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	1.84	102.41%	Yes		
									Future area without offset (adjusted hectares)	26.0	**Future area with offset (adjusted hectares)**	26.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**8**	**Future quality with offset (scale of 0-10)**	**9**	1.00	90%	0.90	0.71					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	1.8	1.84	102.41%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black-breasted Button Quail
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	2.3	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**7**	Scale 0-10	
			Total quantum of impact	1.61	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0										
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	1.61	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	19	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	1.64	102.05%	Yes		
									Future area without offset (adjusted hectares)	19.0	**Future area with offset (adjusted hectares)**	19.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	1.61	1.64	102.05%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

APPENDIX B

Summary Scores for Springwater Offset Area

Current State

	11.10.7	11.10.7	11.3.25	11.9.5	11.9.4	11.10.7	11.9.5	11.10.7	11.9.5	11.9.7	11.9.7	11.10.7	11.9.5	11.9.5	11.10.7
Condition	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Remnant**	**Young Regrowth**	**Advanced Regrowth**	**Advanced Regrowth**	**Young Regrowth**	**Remnant**
Recruitment of woody perennial species in EDL	3	3	5	3	5	5	5	5	5	5	5	5	3	3	5
Native plant species richness - trees	2.5	2.5	2.5	5	5	2.5	5	2.5	2.5	2.5	2.5	2.5	5	5	5
Native plant species richness - shrubs	0	2.5	5	5	5	2.5	5	2.5	5	5	2.5	5	5	2.5	2.5
Native plant species richness - grasses	3.75	2.5	3.75	5	1.25	2.5	2.5	2.5	5	2.5	3.75	2.5	5	3.75	2.5
Native plant species richness - forbs	2.5	2.5	5	3.75	2.5	1.25	0	1.25	2.5	1.25	1.25	3.75	3.75	1.25	2.5
Tree canopy height (average of emergent, canopy, sub-canopy)	5	5	5	5	5	5	5	5	5	5	3	5	3	3	5
Tree canopy cover (average of emergent, canopy, sub-canopy)	2	5	5	5	5	2	5	2	2	3	5	5	2	5	5
Shrub canopy cover	5	3	5	3	3	5	3	3	3	3	5	3	5	5	5
Native grass cover	3	5	3	5	5	3	3	2	3	4	5	5	5	5	5
Organic litter	4	4	3	5	5	5	3	5	5	3	5	5	3	5	5
Large trees (euc plus non-euc)	0	0	0	0	15	10	5	5	15	0	0	0	0	5	15
Coarse woody debris	5	5	5	2	5	5	2	5	5	5	5	5	2	2	2
Non-native plant cover	10	10	5	10	10	3	3	5	10	10	0	10	3	3	3
Final Score	**45.75**	**50**	**52.25**	**56.75**	**71.75**	**51.75**	**46.5**	**45.75**	**68**	**49.25**	**43**	**56.75**	**44.75**	**48.5**	**62.5**
Out of possible maximum	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***	***80***
Adjusted score out of 7	**4.003125**	**4.375**	**4.571875**	**4.965625**	**6.278125**	**4.528125**	**4.06875**	**4.003125**	**5.95**	**4.309375**	**3.7625**	**4.965625**	**3.915625**	**4.24375**	**5.46875**
Adjusted score out of 3	**1.715625**	**1.875**	**1.959375**	**2.128125**	**2.690625**	**1.940625**	**1.74375**	**1.715625**	**2.55**	**1.846875**	**1.6125**	**2.128125**	**1.678125**	**1.81875**	**2.34375**

Context															
Size of patch	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectedness	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Context	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ecological Corridors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final Score	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Out of possible maximum	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	**26**
Adjusted score out of 3	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**
Combined score (Condition + Context) out of 6	**3.792548**	**3.951923**	**4.036298**	**4.205048**	**4.767548**	**4.017548**	**3.820673**	**3.792548**	**4.626923**	**3.923798**	**3.689423**	**4.205048**	**3.755048**	**3.895673**	**4.420673**
Combined score (Condition + Context) out of 10	**6.080048**	**6.451923**	**6.648798**	**7.042548**	**8.355048**	**6.605048**	**6.145673**	**6.080048**	**8.026923**	**6.386298**	**5.839423**	**7.042548**	**5.992548**	**6.320673**	**7.545673**
Weighting by Size	**0.079104**	**0.079104**	**0.0134**	**0.120173**	**0.06642**	**0.079104**	**0.120173**	**0.079104**	**0.120173**	**0.031189**	**0.011436**	**0.055446**	**0.044242**	**0.021832**	**0.079104**
Weighted score from 6	**0.300004**	**0.312611**	**0.054085**	**0.505331**	**0.316662**	**0.317803**	**0.45914**	**0.300004**	**0.556029**	**0.122378**	**0.042192**	**0.233155**	**0.16613**	**0.085051**	**0.349691**
Weighted score from 10	**0.480954**	**0.51037**	**0.089091**	**0.846321**	**0.554944**	**0.522483**	**0.738541**	**0.480954**	**0.964615**	**0.19918**	**0.066779**	**0.390484**	**0.26512**	**0.137993**	**0.59689**

Species Stocking Rate	Brigalow TEC	SEVT	SELE Bat	Koala	Collared Delma	Yakka Skink	Dunmall's Snake	Squatter Pigeon	Red Goshawk	Black-breasted button Quail
Quality and availability of food and foraging habitat (score per DEHP Guide)	N/A	N/A	5	5	5	5	5	5	5	5
Quality and availability of shelter (score per DEHP Guide)	N/A	N/A	5	5	5	5	5	5	5	5
Role of site location to species/TEC overall population in the state (score per DEHP Guide)			1	1	1	1	1	1	1	1
Threats to the species/TEC (score per DEHP Guide)	N/A	N/A	7	7	7	7	7	7	7	7
Species mobility capacity (score per DEHP Guide)	N/A	N/A	10	7	7	7	7	10	10	7
Species/TEC present on site (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Species/TEC present on adjacent properties (Yes/No)	N/A	N/A	Yes - 5	No	No	Yes - 5	No	Yes - 5	No	No
Evidenced species usage of site (not habitat, dispersal, feeding, breeding)	N/A	N/A	No	No	No	No	No	No	No	No
Key source population for breeding (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Key source population for dispersal (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Necessary for maintaining genetic diversity (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Near the limit of the species range (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Species density in LGA (as a range)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Final Score	**N/A**	**N/A**	**33**	**25**	**24**	**30**	**25**	**33**	**28**	**25**
Out of possible maximum	**N/A**	**N/A**	*65*	*65*	*65*	*65*	*65*	*65*	*65*	*65*
Species Stocking Rate - Adjusted out of 4	**N/A**	**N/A**	**2.031**	**1.538**	**1.477**	**1.846**	**1.538**	**2.031**	**1.723**	**1.538**
Weighted condition - Adjusted out of (7 for TECs) (3 for fauna)	**4.85889**	**6.278125**	**2.042**	**1.922**	**1.999**	**1.999**	**1.999**	**1.922**	**2.042**	**2.691**
Weighted Context - Adjusted out of 3	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**
Final Score	**6.936**	**8.355**	**6.149**	**5.538**	**5.553**	**5.922**	**5.615**	**6.030**	**5.842**	**6.306**
Final Combined score out of 10, with rounding	**7**	**8**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**

Future State (Completion Criteria)

Condition	11.10.7 Remnant	11.10.7 Remnant	11.3.25 Remnant	11.9.5 Remnant	11.9.4 Remnant	11.10.7 Remnant	11.9.5 Remnant	11.10.7 Remnant	11.9.5 Remnant	11.9.7 Remnant	11.9.7 Young Regrowth	11.10.7 Advanced Regrowth	11.9.5 Advanced Regrowth	11.9.5 Young Regrowth	11.10.7 Remnant
Recruitment of woody perennial species in EDL	3	3	5	3	5	5	5	5	5	5	5	5	3	3	5
Native plant species richness - trees	2.5	2.5	2.5	5	5	2.5	5	2.5	2.5	2.5	2.5	2.5	5	5	5
Native plant species richness - shrubs	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness - grasses	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness - forbes	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Tree canopy height (average of emergent, canopy, sub-canopy)	5	5	5	5	5	5	5	5	5	5	3	5	3	3	5
Tree canopy cover (average of emergent, canopy, sub-canopy)	2	5	5	5	5	2	5	2	2	3	5	5	2	5	5
Shrub canopy cover	5	3	5	3	3	5	3	3	3	3	5	3	5	5	5
Native grass cover	3	5	3	5	5	3	3	2	3	4	5	5	5	5	5
Organic litter	4	4	3	5	5	5	3	5	5	3	5	5	3	5	5
Large trees (euc plus non-euc)	0	0	0	0	15	10	5	5	15	0	0	0	0	5	15
Coarse woody debris	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Non-native plant cover	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Final Score	**54.5**	**57.5**	**58.5**	**61**	**78**	**67.5**	**64**	**59.5**	**70.5**	**55.5**	**60.5**	**60.5**	**56**	**66**	**80**
Out of possible maximum	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**
Adjusted score out of 7	**4.76875**	**5.03125**	**5.11875**	**5.3375**	**6.825**	**5.90625**	**5.6**	**5.20625**	**6.16875**	**4.85625**	**5.29375**	**5.29375**	**4.9**	**5.775**	**7**
Adjusted score out of 3	**2.04375**	**2.15625**	**2.19375**	**2.2875**	**2.925**	**2.53125**	**2.4**	**2.23125**	**2.64375**	**2.08125**	**2.26875**	**2.26875**	**2.1**	**2.475**	**3**

Context															
Size of patch	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectedness	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Context	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ecological Corridors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final Score	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	18
Out of possible maximum	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	26
Adjusted score out of 3	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**
Combined score (Condition + Context) out of 6	**4.120673**	**4.233173**	**4.270673**	**4.364423**	**5.001923**	**4.608173**	**4.476923**	**4.308173**	**4.720673**	**4.158173**	**4.345673**	**4.345673**	**4.176923**	**4.551923**	**5.076923**
Combined score (Condition + Context) out of 10	**6.845673**	**7.108173**	**7.195673**	**7.414423**	**8.901923**	**7.983173**	**7.676923**	**7.283173**	**8.245673**	**6.933173**	**7.370673**	**7.370673**	**6.976923**	**7.851923**	**9.076923**
Weighting by Size	**0.079104**	**0.079104**	**0.0134**	**0.120173**	**0.06642**	**0.079104**	**0.1201725**	**0.079104**	**0.120173**	**0.031189**	**0.011435832**	**0.05544646**	**0.044241654**	**0.021832043**	**0.079104**
Weighted score from 6	**0.32596**	**0.334859**	**0.057225**	**0.524484**	**0.332229**	**0.364523**	**0.53800303**	**0.340792**	**0.567295**	**0.129688**	**0.049696388**	**0.240952182**	**0.184793983**	**0.099377781**	**0.401603**
Weighted score from 10	**0.541517**	**0.562282**	**0.096419**	**0.89101**	**0.591268**	**0.631498**	**0.92255503**	**0.576125**	**0.990903**	**0.216236**	**0.08428978**	**0.408677722**	**0.308670614**	**0.171423524**	**0.718017**

Species Stocking Rate	Brigalow TEC	SEVT	SELE Bat	Koala	Collared Delma	Yakka Skink	Dunmall's Snake	Squatter Pigeon	Red Goshawk	Black-breasted button Quail
Quality and availability of food and foraging habitat (score per DEHP Guide)	N/A	N/A	5	10	5	5	5	10	5	5
Quality and availability of shelter (score per DEHP Guide)	N/A	N/A	10	10	10	10	10	10	10	10
Role of site location to species/TEC overall population in the state (score per DEHP Guide)			1	1	1	1	1	1	1	1
Threats to the species/TEC (score per DEHP Guide)	N/A	N/A	15	15	15	15	15	15	15	15
Species mobility capacity (score per DEHP Guide)	N/A	N/A	10	7	7	7	7	7	10	7
Species/TEC present on site (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Species/TEC present on adjacent properties (Yes/No)	N/A	N/A	Yes - 5	No	No	Yes - 5	No	Yes - 5	No	No
Evidenced species usage of site (not habitat, dispersal, feeding, breeding)	N/A	N/A	No	No	No	No	No	No	No	No
Key source population for breeding (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Key source population for dispersal (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Necessary for maintaining genetic diversity (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Near the limit of the species range (Yes/No)	N/A	N/A	No	No	No	No	No	No	No	No
Species density in LGA (as a range)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Final Score	**N/A**	**N/A**	**46**	**43**	**38**	**43**	**38**	**48**	**41**	**38**
Out of possible maximum	**N/A**	**N/A**	*65*	*65*	*65*	*65*	*65*	*65*	*65*	*65*
Species Stocking Rate - Adjusted out of 4	**N/A**	**N/A**	**2.831**	**2.646**	**2.338**	**2.646**	**2.338**	**2.954**	**2.523**	**2.338**
Weighted condition - Adjusted out of (7 for TECs) (3 for fauna)	**5.622631**	**6.825**	**2.415**	**2.352**	**2.381**	**2.381**	**2.381**	**2.352**	**2.415**	**2.925**
Weighted Context - Adjusted out of 3	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**
Final Score	**7.700**	**8.902**	**7.322**	**7.075**	**6.796**	**7.104**	**6.796**	**7.383**	**7.015**	**7.340**
Final Combined score out of 10, with rounding	**8**	**9**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**

APPENDIX C

Risk Assessment

Risk Assessment Summary

The following risk assessment assess the potential risk of failing to achieve the management objectives, interim performance targets and completion criteria for the offset area as outlined in this OAMP.

For each risk identified, the potential consequence of the risk (rated from 1 (no impact) to 6 (irreversible impact; Table D1) was assessed against the likelihood of that risk occurring (Table D2) to determine a risk rating. The risk rating was evaluated by using the matrix in Table D2.

The consequence and likelihood of each risk was first considered without the management measures in place to provide an initial risk rating. The consequence and likelihood of each risk occurring was then reassessed following the implementation of the management measures to provide a residual risk rating.

Table D3 provides the risk register which was used to document the findings of the risk assessment process.

Table D1: Consequence rating relative to offset value

	Consequence
I	No impact to MNES Value
II	Small-scale impact to MNES
III	Moderate-scale impact to MNES
IV	Large-scale impact to MNES
V	Extensive population or community scale impact to MNES
VI	Irreversible impact to MNES.

Santos

Table D2: Likelihood classification and risk matrix

Santos Risk Matrix

Santos

Consequence						
Safety	**Negligible Harm** + No bodily damage or minimal harm or impairment (hours to days)	**Minor Harm** + Short term impairment (days to weeks)	**Moderate Harm** + Temporary disablement or medium term impairment (weeks to months)	**Severe Harm** + Long term/life altering disablement or impairment	**Single Fatality OR Critical Life Threatening Injuries**	**Multiple Fatalities**
Environment	+ No impact to Environmental Value (EV).	+ Small-scale impact to EV(s) of conservation significance + Potential surface or groundwater impact.	+ Moderate-scale impact to EV(s) of conservation significance + Localised surface or groundwater impact.	+ Large-scale impact to EV(s) of conservation significance + Moderate-scale surface water impact; + Localised impact to groundwater with potential or known beneficial use.	+ Extensive population or community scale impact to EV(s) of conservation significance + Extensive impact to other EV(s).	+ Irreversible impact to EV(s).
Community & Reputation	+ No actual or potential community criticism + Details remain within Santos sites and/or offices	+ Minor level local community criticism (< week) + No reputation impact	+ Local community criticism (> week) or one-day community protest + Local company reputation impacted	+ State-level community criticism or protest over multiple days/locations + State-based company reputation impacted + Very short-term share price impact (< week)	+ National community criticism or large scale protest + Company reputation and approvals impacted + Shareholder intervention or short-term share price impact (< month)	+ Sustained national community criticism or widespread protest + Industry reputation and approvals impacted + Changes at executive/board level or long-term share price impact (> month)
Financial (A$)	< $30k	$30k to $300k	$300k to $3m	$3m to $30m	$30m to $300m	> $300m
Workforce	+ Will require some staff attention over several days. + No actual or potential impact to culture	+ Will require several days local management time. + Minor impact to employee engagement and limited staff turnover	+ Will require head office staff and take several weeks of site management time. + Moderate impact to employee engagement and staff turnover above industry average with some key roles	+ Will require several weeks of senior management time + Impact to employee engagement (< 6 months), moderate turnover of key roles and no succession	+ Will require several months of senior management time + Impact to employee engagement (< 18 months), high staff turnover and attraction issues	+ Will require more than a year of senior management involvement and operations severely disrupted + Impact to employee engagement (> 18 months), significant key role turnover and attraction issues
Compliance	+ Non-conformance with legislation, instruments (e.g. tenure licence) or contract + No regulatory or punitive action	+ Minor breach of legislation, instruments or contract + Notification/report to; request for information by; and/or administrative/ warning notice from the regulator + LOCI Tier 3 or non-hydrocarbon releases notifiable to the regulator	+ Limited number of minor breaches of legislation, instruments or contract + Statutory notice from the regulator + LOCI Tier 2 or non-hydrocarbon releases immediately reportable to the regulator	+ Systemic minor breaches (or one moderate breach) of legislation, instruments or contract + Company charged with an offence with minor penalty/fine + LOCI Tier 1 or cumulative regulator notification of non-hydrocarbon releases	+ Systemic moderate breaches (OR single material breach) of legislation, instruments or contract + Company charged with an offence with moderate penalty/fine	+ Material breaches of legislation, instruments or contract + Company or officers charged with an offence with material penalty/fine, or loss of tenure/operatorship

Likelihood		I	II	III	IV	V	VI
ALMOST CERTAIN (< 4 monthly) Occurs in almost all circumstances OR could occur *within days to weeks*	f	Low	Medium	High	Very High	Very High	Very High
LIKELY (4 monthly - 1 yearly) Occurs in most circumstances OR could occur *within weeks to months*	e	Low	Medium	High	High	Very High	Very High
OCCASIONAL (1 - 3 yearly) Has occurred before in Santos OR could occur *within months to years*	d	Low	Low	Medium	High	High	Very High
POSSIBLE (3 - 10 yearly) Has occurred before in the industry OR could occur *within the next few years*	c	Very Low	Low	Low	Medium	High	Very High
UNLIKELY (10 - 30 yearly) Has occurred elsewhere OR could occur *within decades*	b	Very Low	Very Low	Low	Low	Medium	High
REMOTE (30 - 100 yearly) Requires exceptional circumstances and is unlikely even in the long term OR only occurs as a *"one in 100 year event"*	a	Very Low	Very Low	Very Low	Low	Medium	Medium

Table D3: Risk assessment

Management objective	Risk description	Initial risk rating			Control strategies	Residual risk rating		
		Likelihood	Consequence	Overall risk rating		Likelihood	Consequence	Overall risk rating
Achieve the completion criteria and habitat quality improvements for offset values and remnant status for those regrowth vegetation communities.	Completion criteria and habitat quality improvements are not achieved	D	IV	H	• Implementation of this OAMP, including the management actions and monitoring program outlined in Section 7.0 and Section 8.0. • Implementation of the adaptive management process outlined in Section 5.1. • Obtain advice with the aim of identifying appropriate additional management interventions if interim performance targets are not achieved for one or more offset values by year 5,10 or 15. • If it is considered that the completion criteria cannot be achieved, Santos will update this OAMP proposing alternative offset areas in order to acquit the required offset requirements in accordance with the offsets assessment guide. The revised OAMP will be submitted to the Commonwealth Government.	B	IV	L
Maintain the extent of offset value habitat within the offset area.	Habitat or vegetation loss through land clearing.	D	V	H	• Protection of the offset area via a Voluntary Declaration under section 19E and 19F of the VMA, as described in Section 2.8. • Construction and maintenance of access tracks, fencing and firebreaks will be undertaken in accordance with Sections 7.0. • Restoration of impacted areas subject to any unauthorised clearing.	B	V	M
Ensure that the livestock grazing restrictions for fire management and weed control assist in the enhancement of ground cover attributes for offset values and does not result in the degradation of habitat.	Degradation of offset value habitat quality as a result of livestock grazing	E	III	H	• Implementation of strategic grazing to reduce fuel loads and control exotic pasture grasses and promote the establishment of native perennial grass species in accordance with Section 7.6. • Annual biomass monitoring to inform strategic grazing regimes. • Rapid monitoring events and habitat quality assessments will be undertaken in accordance with Section 8.0 an assessment of % cover of native perennial grasses.	B	III	L
Minimise predation risk by wild dogs to threatened fauna species.	Predation of threatened fauna by wild dogs.	D	III	M	• Regular monitoring for pest animals will be undertaken in accordance with the methods detailed in Section 8.4 and pest animal control will be implemented following the results of monitoring in accordance with Section 8.0.	C	III	L
Minimise predation risk by foxes to threatened fauna species.	Predation of threatened fauna by foxes.	D	III	M		C	III	L
Minimise predation risk by feral cats to threatened fauna species.	Predation of threatened fauna by cats.	D	III	M		C	III	L
Minimise degradation of offset value habitat by feral pigs.	Degradation of habitat by feral pigs.	D	III	M		C	III	L
Minimise degradation of offset value habitat by feral horses.	Degradation of habitat by feral horses.	D	III	M		C	III	L

Management objective	Risk description	Initial risk rating			Control strategies	Residual risk rating		
		Likelihood	Consequence	Overall risk rating		Likelihood	Consequence	Overall risk rating
Manage invasive weed species to reduce degradation of offset value habitat.	Invasion of habitat by weed species, including exotic grasses.	D	III	M	• Regular weed monitoring will be undertaken in accordance with Section 7.7. • Based on the results of monitoring events, weeds will be managed using biological, chemical and/or mechanical control in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets, for the relevant weed species (see Section 7.7)	C	III	L
Reduce the risk of adverse impacts to offset value habitat by inappropriate fire regimes or unplanned fire.	Decrease in the habitat quality score for any offset value from baseline and subsequent monitoring events as a result of fire management measures, or an unplanned fire.	D	IV	H	• Fuel loads within the offset area will be managed through strategic livestock grazing and fuel hazard reduction burns as outlined in Section 7.5. • Firebreaks will be established and maintained around the boundary of the offset area, with green firebreaks established where the offset area joins native vegetation. Firebreaks will be maintained at least annually in mid / late autumn and, or early spring to remove overhanging trees or fallen debris and dense vegetation	B	IV	L
Regrowth Brigalow vegetation managed to meet the criteria for remnant status.	Regrowth Brigalow does not achieve remnant status within the OAMP timeframes	D	III	M	• Selective regrowth thinning of Brigalow TEC where regrowth of Brigalow vegetation (RE 11.9.5) occurs at >10,000 stems per hectare.	C	III	L
Achieve the interim performance targets and completion criteria for each offset value within 5, 10, 15 and 20 years, respectively.	Interim performance targets are not achieved for offset values by year 5, 10 or 15. Completion criteria are not achieved for offset values by year 20.	E	III	H	• Monitoring of the offset area will be undertaken in accordance with Section 8.0 including: o Offset area inspections o Offset value assessments • The results of monitoring events will be compared against the interim performance targets and completion criteria to determine the progress of offset area and recorded as part of reporting.	B	III	L

APPENDIX C

Impact area habitat quality scoring method for MNES

Summary

The habitat quality score for each MNES will be assessed based on a combination of assessment methods outlined in the Queensland Herbarium's BioCondition Manual (version 2.2; Eyre *et al*., 2015), the Guide to Determining Terrestrial Habitat Quality (version 1.3; DES, 2020b) and the methods outlined below in order to be consistent with the requirements under the EPBC Act guideline for the offsets assessment guide.

MNES habitat quality scoring method

The habitat quality for each MNES, for use in the offsets assessment guide, is required to consider three attributes:

- site condition
- site context
- species stocking rate.

The following sections provide an overview of the methodology used to calculate habitat quality. All three components will be assessed for threatened fauna and flora; however, for TECs (i.e. Brigalow TEC, SEVT TEC) only site condition and site context components will form the habitat quality score.

Site condition

Method

The site condition score for each MNES will be calculated generally in accordance with the site-based attribute assessment methodology of the BioCondition Assessment Manual (Eyre *et al*., 2015), outlined in the Guide to Determining Terrestrial Habitat Quality (version 1.3; DES, 2020b). Site condition is determined through a site-based assessment of 13 ecological attributes to describe the structure and function of the vegetation community, compared to the expected range for a relatively undisturbed (intact) community (i.e. RE benchmark).

The results of the site-based assessment are scored based on the scoring guide provided in the BioCondition Assessment Manual (Eyre *et al*., 2015) to determine the site condition score for each MNES at each relevant monitoring site, out of 80.

Offset assessment guide requirements

In accordance with the offsets assessment guide the condition of a site is considered in relation to the ecological requirements of a threatened species or ecological community including:

- What is the structure and condition of the vegetation on the site?
- What is the diversity of relevant habitat species present (including both endemic and non-endemic)?
- What relevant habitat features are on the site?

Table C1 summarises how each of the requirements of the offsets assessment guide are considered as part of determining the site condition score for an offset value.

Table C1: Assessment of site condition

Habitat quality component	Assessment process
What is the structure and condition of the vegetation on the site?	The structure and condition of the vegetation is assessed generally in accordance with the site-based attribute assessment methodology from the BioCondition Assessment Manual. This assessment measures a suite of ecological attributes to describe the structure, function and integrity of the vegetation community, compared to the same vegetation community in a relatively undisturbed (intact) state (i.e. a benchmark). The condition of the vegetation community has a direct influence on its ability to support and provide habitat for biodiversity values.
What is the diversity of relevant habitat species present (including endemic and non-endemic)?	The site condition component from the BioCondition Assessment Manual assesses different attributes of a vegetation community comparing the relevant species richness for particular attributes against a published benchmark, including native tree, shrub, grass and forb species richness. The results of these assessments can be used to confirm the presence and diversity of habitat species relevant to the offset value.
What relevant habitat features are on the site?	The offset area for each value was initially determined based on ground-truthed RE and the presence of known habitat features identified as part of field surveys of the area, in accordance with species conservation advice and other species-specific sources endorsed by Queensland and/or Commonwealth Governments. Ongoing site condition assessments for each offset value will continue to confirm the presence of relevant habitat features within previously shortlisted, suitable vegetation communities as well as assessing their condition against the published benchmark.

Site context

Method

The method to calculate site context for a site is based on a combination of the landscape context attributes assessment method outlined in Section 6 of the BioCondition Assessment Manual as well as an assessment of threats that occur on or near the site to ensure the requirements for site context under the offsets assessment guide are adequately assessed.

Subregion assessment

The first step is to determine whether the given site is located within a fragmented or intact subregion in Queensland. Fragmented subregions are defined in the BioCondition Assessment Manual as those subregions where the amount of remnant vegetation is less than 65%, with remaining subregions considered intact. Section 6 of the BioCondition Assessment Manual identifies the bioregions and subregions considered either fragmented or intact. All impact and offset monitoring sites were located within fragmented subregions.

The following components were assessed through a GIS desktop analysis at each relevant monitoring site for each MNES.

Patch size (fragmented subregion)

Patch size is the size of the patch/assessment unit being assessed and any directly connecting remnant vegetation. To calculate the patch size score:

1. The area of remnant vegetation in which the monitoring site is located is measured, summing together with this all other directly connecting areas of remnant vegetation. Where a monitoring site is within an area not considered remnant vegetation (i.e. regrowth vegetation), the patch size is 0 ha.

2. Determine the score for this attribute by matching with the class ranges in Table C2.

Connectedness (fragmented subregion)

The proportion of the assessment unit's boundary which is connected to remnant vegetation is measured. To calculate the connectedness score:

1. The percentage of remnant vegetation along the boundary of the assessment unit patch containing the monitoring site was measured.
2. Determine the score for this attribute by matching with the class ranges in Table C2.

Context (fragmented subregion)

Assessment of context involves measuring the percentage of remnant vegetation within a 1 km buffer around the monitoring site. To calculate the context score:

1. Create a 1 km buffer around the monitoring site.
2. Measure the percentage of remnant vegetation within the 1 km buffer.
3. Determine the score for this attribute by matching with the thresholds in Table C2.

Threats

The measure of threat is calculated for each MNES and is undertaken generally in accordance with Section 2.4.4.4 (Absence of threats) of the Guide to Determining Terrestrial Habitat Quality (DES, 2020b) by considering scope and severity of threats. This attribute indicates the magnitude of all known or potential threats within, or within close proximity to, the matter area that may negatively impact on the species' habitat and/or the species' ability to exist and persist in the matter area.

A list of known and potential threats are first collated from the literature, including relevant conservation advices and other matter-specific sources endorsed by Queensland and/or Commonwealth Governments. Through a combination of desktop assessments and site-based assessments, a refinement of identified threats for each matter is undertaken (whether involving the removal or addition of threats), resulting in a final list of threats.

A conservative estimate of an 'absence of threat' was assessed, considering scope and severity, with scores assigned between 0 to 5 where:

- A score of zero (0) implies identified threats are likely to be widespread or pervasive in their scope, affecting the species' habitat or the species' local population across a majority (>60%) of its occurrence or population within the matter area. The severity of the threats is also likely to destroy, seriously degrade, or otherwise reduce the species' habitat/local population by >40% within ten years or three generations.
- A score of five (5) implies identified threats are likely to be very narrow in their scope, affecting the species' habitat or the species' local population across a negligible proportion (<20%) of its occurrence or population within the matter area. The severity of the threats is likely to have negligible damage or will only degrade or reduce the species' habitat/local population by <5% within ten years or three generations.

The total site context score for each MNES at each relevant monitoring site is calculated out of 45, based on the following:

1. Summing the patch size, connectedness and context scores, out of 20.
2. Calculating the average threats score, out of 25.
3. Calculating a final weighted score for site context as:

a. 50% weighting of the combined patch size, connectedness and context

b. 50% weighting of the threats score.

Table C2: Site context scoring guide

Attribute		Score				
Size of patch	Score	0	2	5	7	10
	Description	<5 ha	5-25 ha	26-100 ha	101-200 ha	>200 ha
Connectedness	Score	0	2		4	5
	Description	0-10%	>10%-<50%		50-75%	>75% or >500 ha
Context	Score	0	2		4	5
	Description	<10%	>10-30%		>30-75%	>75%
Level of threat	Score	0	2	3	4	5
	Description	Very high	High	Medium	Low	Very low

Offsets assessment guide requirements

In accordance with the offsets assessment guide, site context is assessed based on the relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community, as well as identifying known or potential threats including:

- What is the connectivity with other suitable/known habitat or remnants?
- What is the importance of the site in relation to the overall species population or the occurrence of the community?
- What threats occur on or near site?

Table C3 summarises how each of the requirements above are considered as part of determining the site context score for an offset value.

Table C3: Assessment of site context

Habitat quality component	Assessment process
What is the connectivity with other suitable/known habitat or remnants?	This component is assessed through: • Patch size – measuring the size of the patch of remnant vegetation being assessed and any directly connecting remnant vegetation. • Connectedness – measuring the proportion of the remnant patch that a given monitoring site is located within which is connected to remnant vegetation.
What is the importance of the site in relation to the overall species population or the occurrence of the community?	This component is assessed through the BioCondition Assessment Manual measure of context, representing the percentage of remnant vegetation within a 1 km buffer around a given monitoring site. The greater the proportion of suitable/known habitat and remnant vegetation within the buffer area the more likely the site and surrounding areas will support a viable, self-sustaining, source-meta-population of the species or community.
What threats occur on or near site?	This component is based on the assessment of the scope and severity of confirmed and potential threats occurring within, or within close proximity to the site for each MNES. A list of matter-specific threats is provided in Tables C8 – C17.

Species habitat index

Method

Species habitat index was calculated generally in accordance with the species habitat attribute assessment methodology outlined in the Guide to Determining Terrestrial Habitat Quality (DES, 2020b), as well as the requirements for species stocking rate under the offsets assessment guide. Table C4 summarises the method to be used to calculate the species habitat index score, out of 20. Species habitat attributes indicate a matter area's capacity to support a species for all or part of its life cycle, whether permanently or from time to time.

Each sub-component of species habitat index scoring method has been tailored for each MNES to take into account species-specific habitat requirements in accordance with conservation advices and other species-specific sources endorsed by Queensland and/or Commonwealth Governments, as well as an assessment of the role of the site population in regards to the overall species population.

Table C4: Method to assess species habitat index

Component	Sub-component/scoring	Score
Quality and availability of food and habitat required for foraging	A species-specific assessment of the quality and availability of food and habitat required for foraging, assigned as a score between 1 and 5, where: • a score of **1** represents very limited species-specific foraging habitat (e.g. litter and stone cover for Collared Delma), conditions or food resources available • a score of **5** represents species-specific foraging habitat, conditions or food resources are present for all relevant stages of the life cycle.	**1 – 5**
Quality and availability of habitat required for shelter and breeding	A species-specific assessment of the quality and availability of habitat required for shelter and breeding. Habitat required for shelter may include habitat factors required to avoid predation or other threats, rest or seeking shelter from the elements. The result of the assessment assigns a score between 1 and 5, where: • a score of **1** represents very limited species-specific shelter and breeding habitat (e.g. presence of large coarse woody debris for Yakka Skink), conditions or resources available • a score of **5** represents presence of abundant, available species-specific shelter and breeding habitat, conditions and resources for all relevant stages of the life cycle.	**1 – 5**
Quality and availability of habitat required for mobility	A species-specific assessment of quality and availability of habitat required for mobility. Habitat required for mobility relates to the species' ability to move within the matter and, if relevant, to and from adjacent patches of habitat. The result of the assessment assigns a score between 1 and 5, where: • a score of **1** represents an almost complete barrier to mobility between patches of suitable habitat for the given matter, either by natural barriers (e.g. steep mountain ranges, cliffs, unsuitable habitats) or artificial barriers (e.g. infrastructure (roads, rail, mines) or extensive areas of treeless, unsuitable habitat) • a score of **5** represents limited barriers to mobility, with contiguous remnant vegetation affording relatively unimpeded movement or functional connectivity between suitable habitat patches for the given matter.	**1 – 5**
Role of site location to species overall population	Site not or unlikely to be critical to species' survival – Site is unlikely to support a population of the species and the site is within the given species' geographical range. The site contains	**1**

Component	Sub-component/scoring	Score
	low quality food, foraging and shelter habitat, with limited mobility capacity to other areas of suitable habitat.	
	Site likely to support habitat critical to species' survival – the site is likely to support a population of the species and the site is within the given species' geographical range. The site contains moderate quality food, foraging and shelter habitat, with moderate mobility capacity to other areas of suitable habitat.	**3**
	Site known to support habitat critical to species' survival – there is evidence of one or more species records within the last 10 years within 5 km of the site and site contains greater than moderate quality food, foraging and shelter habitat, with greater than moderate mobility capacity to other areas of suitable habitat.	**4**
	Site is critical to the species' survival – there is evidence of multiple species records within the last 10 years and site contains high quality food, foraging and shelter habitat, with limited mobility to other areas of suitable habitat.	**5**

Offsets assessment guide requirements

In accordance with the offsets assessment guide species stocking rate is assessed based on the usage and/or density of a species at a particular site and the role of the site population in regards to the overall species population viability or community extent, including:

- What is the presence of the species on the site (i.e. confirmed / modelled)?
- What is the density of species known to utilise the site?
- What is the role of the site population in regards to the overall species population?

Table C5 summarises how each of the requirements above are considered as part of determining the species habitat index score for an offset value.

Table C5: Assessment of species stocking rate

Habitat quality component	Assessment process
What is the presence of the species on the site? (i.e. confirmed / modelled).	The components assessed as part of the method quantify the presence, density and role of the site's ability to actually or likely support a species population. It also provides a measure of the quality and availability of food, foraging habitat, shelter and breeding habitat for each species. The relative presence and density of the MNES on the site will be assessed as part of ongoing targeted surveys undertaken in accordance with the Department of Science, Information Technology, Innovation and the Arts Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al*., 2014), Survey Guidelines for Australia's Threatened Birds (Department of Environment, Water, Heritage and the Arts, 2010), Survey guidelines for Australia's threatened reptiles (Department of Sustainability, Environment, Water, Population and Communities, 2011) and other species-specific survey guidelines endorsed by Queensland and/or Commonwealth Government.
What is the density of species known to utilise the site?	
What is the role of the site population in regards to the overall species population?	

<u>Final habitat quality score</u>

Table C6 provides a summary of the components used to score habitat quality for each MNES and the maximum score and relevant weighting for each component. The habitat quality score for each MNES is calculated as the average score across each of the monitoring sites within a given assessment unit (RE), area-weighted for the contribution of those REs to the area of interest (i.e. impact area).

Table C6: Scores for each attribute contributing to each of the habitat quality score components, including their weightings. These scores are assigned for each monitoring point

Site condition			Site context				Species habitat index			
Attributes	**Score**	**Weighting**	**Attributes**	**Score**	**Weighting**		**Attributes**	**Score**	**Weighting**	
Recruitment of woody perennial species	5	6.25%	Size of patch	10	50%	25%	Quality and availability of food and habitat required for foraging	5	50%	16.7%
Native plant species richness - trees	5	6.25%	Connectivity	5		12.5%	Quality and availability of habitat required for shelter and breeding	5		16.7%
Native plant species richness - shrubs	5	6.25%	Context	5		12.5%	Quality and availability of habitat required for mobility	5		16.7%
Native plant species richness - grasses	5	6.25%	Threats	5	50%		Role of site location to species overall population in the state	5	50%	
Native plant species richness - forbs	5	6.25%								
Tree canopy height	5	6.25%								
Tree canopy cover	5	6.25%								
Shrub canopy cover	5	6.25%								
Native perennial grass cover	5	6.25%								
Organic litter	5	6.25%								
Large trees	15	18.75%								
Coarse woody debris	5	6.25%								
Non-native plant cover	10	12.5%								
Total	**/80**	**100%**	**Total**	**/25**	**100%**		**Total**	**/20**	**100%**	
MNES – Fauna Site condition weighting		**30%**	**Site context weighting**		**30%**		**Species habitat index weighting**		**40%**	
MNES - TEC Site condition weighting		**70%**	**Site context weighting**		**30%**					

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Table C7: Threats and species-specific considerations informing site context (threats) and habitat quality scoring for northern quoll

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Poisoning through ingestion of cane toads (*Rhinella marina*) • Loss of ground cover as a consequence of unsuitable fire, resulting in risk of increased predation and/or reduced food • Loss of ground cover as a consequence of livestock grazing • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds • Predation by feral predators (e.g. cats, foxes, wild dogs) • Poisoning through 1080 baiting
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and quality of habitat for prey (i.e. insects, small vertebrates), namely the abundance and diversity of litter, woody debris, logs, surface rocks, crevices, grass and shrub layers. • Proximity of foraging habitat and food within 1 km of shelter sites
	Quality and availability of habitat required for shelter and breeding	• Presence and proximity to rocky den sites, characterised by deep clefts and fissures in rocks
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover • Presence and quality of grass and shrub layers • Presence of temporary shelter such as boulders, logs. • Presence of known or potential predators (e.g. cats, dogs) • Proximity of shelter sites within 5 km

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Table C8: Threats and species-specific considerations informing habitat quality scoring for collared delma

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Alteration of ground cover as a consequence of unsuitable fire regime • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds • Predation by feral predators (e.g. cats, foxes, wild dogs) • Removal of foraging and shelter habitat (e.g. rocks, coarse woody debris, ground litter) • Change in ground layer composition as a consequence of livestock grazing and feral horse browsing
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and abundance of evidence of small invertebrates • Presence and cover of leaf litter and loose stones, used as shelter by prey
	Quality and availability of habitat required for shelter and breeding	• Presence and cover of leaf litter and loose stones considered suitable for sheltering
	Quality and availability of habitat required for mobility	• Presence and cover of litter and loose stones • Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C9: Threats and species-specific considerations informing habitat quality scoring for Dunmall's snake

Component	Attribute	Species-specific considerations
Site context	Threats	• Alteration of ground cover as a consequence of unsuitable fire regime • Change in ground layer composition as a consequence of livestock grazing and feral horse browsing • Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Predation by feral predators (e.g. cats, foxes, pigs) • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and cover of leaf litter and coarse woody debris, used as shelter by prey
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of coarse woody debris, particularly large, hollow-bearing logs used as shelter
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C10: Threats and species-specific considerations informing habitat quality scoring for large-eared pied bat

Component	Attribute	Species-specific considerations
Site context	Threats	• Potential of reduced foraging opportunities and flying invertebrate productivity as a consequence of unsuitable fire regime • Loss of sandstone roosting/maternity sites, whether through occupation by pest animal species (e.g., goats) or impacts to structural integrity from uncontrolled wildfire • Predation by feral predators (e.g., foxes)
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence of an intact, mature canopy cover • Presence of heterogenous forest matrix providing forest edges suitable/favourable for foraging
	Quality and availability of habitat required for shelter and breeding	• Presence of sandstone cliff lines with deep fissures, particularly horizontal fissures and/or caves
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C11: Threats and species-specific considerations informing habitat quality scoring for red goshawk

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable foraging habitat through land clearing and effects associated with fragmentation of large contiguous patches of forest and woodland, particularly large trees in alluvial valleys • Potential of reduced prey (e.g., medium sized birds) as a consequence of unsuitable fire regime • Potential of reduced prey as a consequence of impacts such as grazing, reducing productivity • Lack of permanent freshwater, both in proximity to shelter habitat (i.e. tall trees) as well as role in supporting medium-sized bird prey
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and abundance of medium-sized birds • Presence and abundance of suitable habitat for medium-sized birds (i.e. intact canopy, shrubs, wetlands etc)
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of trees ≥ 18 m • Presence of an intact, contiguous canopy cover • Remoteness from human disturbance, characterised by large contiguous tracts of remnant and regrowth vegetation
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C12: Threats and species-specific considerations informing habitat quality scoring for squatter pigeon

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Change in ground layer composition as a consequence of grazing and ecosystem engineering actions by rabbits (e.g. burrowing, soil turnover) • Change in ground layer composition and trampling ground nests as a consequence of livestock grazing and feral horse browsing, especially in grassy, alluvial areas • Change in ground layer composition, including thickening of understorey structure, as a consequence of unsuitable fire regime • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds • Predation by feral predators (e.g. cats, foxes)
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence and quality of low, open grassy woodland • Proximity to water • Presence of sparse to mid-dense native grass cover
	Quality and availability of habitat required for shelter and breeding	• Presence and quality of open grassy woodland
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C13: Threats and species-specific considerations informing habitat quality scoring for yakka skink

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Predation by feral predators (e.g. cats, foxes, pigs) • Alteration of ground cover as a consequence of unsuitable fire regime • Removal of foraging and shelter habitat (e.g. rocks, coarse woody debris, ground litter) • Destruction of potential shelter habitat associated with rabbit warren ripping • Alteration of habitat suitability through the presence and extent of non-native, invasive weeds
Species habitat index	Quality and availability of food and habitat required for foraging	• Evidence and abundance of insect and other arthropod prey • Presence and quality of ground foraging habitat, particularly leaf litter and native grass cover
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of coarse woody debris, particularly large, hollow-bearing logs used as shelter • Any direct evidence of occupation (e.g. burrows, communal defecation sites)
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C14: Threats and species-specific considerations informing habitat quality scoring for south-eastern long-eared bat

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Alteration of the structure of suitable habitat (e.g. mix of shrubby and open structure habitat) including loss of hollow-bearing trees as a consequence of unsuitable fire regime • Impacts on understorey habitat suitability as a consequence of livestock grazing and feral horse browsing, impacting habitat for flying invertebrate prey in the understorey • Competition for hollows from native fauna species (e.g. parrots and cockatoos) and non-native fauna species (e.g. European honeybees, common myna), especially where hollows are limited
Species habitat index	Quality and availability of food and habitat required for foraging	• Presence of an intact, mature canopy cover • Presence and extent of white cypress pine (*Callitris glaucophylla*) favoured as foraging habitat
	Quality and availability of habitat required for shelter and breeding	• Presence and abundance of decorticating and loose bark on trees used for shelter and breeding • Presence and abundance of small tree hollows used for shelter and breeding
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C15: Threats and species-specific considerations informing habitat quality scoring for koala

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Mortality due to vehicle collision • Predation by feral predators, particularly wild or domesticated dogs • Alteration of the structure of suitable habitat, including loss of primary feed trees, as well as direct mortality as a consequence of unsuitable fire regime • Evidence for the presence of disease within the population (i.e. *Chlamydia pecorum*)
Species habitat index	Quality and availability of food and habitat required for foraging	• Extent and dominance of myrtaceous trees (i.e. *Eucalyptus*, *Angophora*, *Corymbia*) • Abundance and extent of large trees used for foraging • Presence of favoured feed species (e.g. *E. tereticornis, E. camaldulensis, E. major, E. longirostrata*), as well as other feed trees (*E. chloroclada, E. populnea, E. crebra, E. melanophloia, E. orgadophila, C. citriodora*) • Presence of nearby waterbodies and ephemeral or perennial watercourses
	Quality and availability of habitat required for shelter and breeding	• Presence and extent of large myrtaceous trees (i.e., *Eucalyptus*, *Angophora*, *Corymbia*)
	Quality and availability of habitat required for mobility	• Extent of suitable habitat as well as presence and extent of contiguous remnant/regrowth cover

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Table C16: Threats informing habitat quality scoring for Brigalow TEC

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through land clearing and effects associated with fragmentation of habitat • Alteration of the structure and integrity of TEC habitat as a consequence of unsuitable fire regime • Invasive weeds, particularly introduced grasses • Disturbance by pest animals, particularly feral pigs • Inappropriate grazing regimes

Table C17: Threats informing habitat quality scoring for SEVT TEC

Component	Attribute	Species-specific considerations
Site context	Threats	• Loss of suitable habitat through clearing of regrowth and effects associated with fragmentation of habitat • Alteration of the structure and integrity of TEC habitat as a consequence of unsuitable fire regime • Invasive weeds, particularly introduced grasses • Disturbance by pest animals, particularly feral pigs • Inappropriate grazing regimes

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APPENDIX D

Impact area habitat quality scores

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Table D1: Impact area habitat quality scores for site 768-S01 to 768-S20

Site ID				768-S01	768-S02	768-S03	768-S04	768-S05	768-S06	768-S07	768-S08	768-S09	768-S10	768-S11	768-S12	768-S13	768-S14	768-S15	768-S16	768-S17	768-S18	768-S19	768-S20
RE				11.10.7	11.10.13	11.10.7	11.10.13	11.10.1	11.10.7	11.10.13	11.10.1	11.10.13	11.10.7	11.10.1	11.10.8	11.9.2	11.10.1	11.10.13	11.10.7	11.9.4	11.3.25	11.10.7	11.10.9
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	rem*	rem*
Site condition	Total number of large trees/ha	15	19%	15	5	10	5	15	10	5	15	0	10	15	15	5	15	10	5	5	15	5	10
	Canopy height	5	6%	5	4	5	5	3	5	4	5	1.5	5	5	5	5	3	4	4	4	5	5	5
	Recruitment canopy sp.	5	6%	5	5	5	5	5	0	0	5	5	5	5	0	5	5	0	5	0	5	0	5
	Canopy cover	5	6%	3.5	4	4	2.5	5	4	4	3	2.5	5	5	4.3	4	5	4	2	3.5	3	5	5
	Shrub canopy cover	5	6%	5	0	0	3	3	0	5	5	0	3	0	5	5	0	5	5	3	3	3	0
	Woody debris length/ha	5	6%	5	5	5	5	5	5	2	2	0	5	2	3	5	2	2	2	2	2	5	5
	Native sp. richness	20	25%	17.5	12.5	7.5	15	15	20	15	12.5	15	10	12.5	15	12.5	10	15	10	17.5	15	17.5	17.5
	Non-native plant cover	10	13%	10	10	10	10	10	10	10	10	10	10	10	10	5	10	10	10	10	10	10	10
	Native perennial grass cover	5	6%	1	1	5	1	5	5	1	5	5	5	5	5	5	0	5	5	5	1	5	5
	Litter cover	5	6%	5	3	5	3	5	5	5	3	5	5	5	5	5	5	5	5	5	3	5	5
	Total/80	80	100%	72	49.5	56.5	54.5	71	64	51	65.5	44	63	64.5	67.3	56.5	55	60	53	55	62	60.5	67.5
Northern quoll																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10.0	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5.0	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5.0	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	3	3	3	3	4	3	4	3	2	2	3	4.0	2	2	3	2	3	3	3	3
	Total/25	25	100%	11.3	20.0	20.0	20.0	12.5	8.8	15.6	20.0	14.4	10.0	20.0	22.5	17.5	17.5	20.0	8.1	19.4	19.4	19.4	20.0
Species habitat index	Quality as foraging habitat	5	17%	3	3	3	3	3	4	4	3	1	2	4	4.0	2	2	3	2	4	3	3	3
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	3	2	0	0	0	4	5.0	0	0	0	0	2	2	0	0
	Quality as mobility habitat	5	17%	3	3	3	4	4	5	5	4	2	2	4	5.0	3	2	3	3	2	2	3	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	10.1	10.1	10.1	10.8	10.8	14.2	13.5	10.8	8.0	8.7	14.2	15.5	9.4	8.7	10.1	9.4	11.4	10.8	10.1	10.1
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	11.3	20.0	20.0	20.0	12.5	8.8	15.6	20.0	14.4	10.0	20.0	22.5	17.5	17.5	20.0	8.1	19.4	19.4	19.4	20.0
	Species habitat index	20	40%	10.1	10.1	10.1	10.8	10.8	14.2	13.5	10.8	8.0	8.7	14.2	15.5	9.4	8.7	10.1	9.4	11.4	10.8	10.1	10.1
	Total/10	10	100%	6.1	7.1	7.1	7.3	6.4	6.6	7.3	7.3	6.0	5.6	7.9	8.5	6.7	6.5	7.1	5.6	7.3	7.2	7.0	7.1
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**6**	**7**	**7**	**7**	**6**	**6**	**8**	**9**	**7**	**7**	**7**	**6**	**7**	**7**	**7**	**7**
Koala																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	2	2	2	2	2	2	3	2	3	3	3	3	3	3	2	2	3	3	3
	Total/25	25	100%	8.8	17.5	17.5	17.5	7.5	6.3	10.6	20.0	14.4	12.5	20.0	20.0	20.0	20.0	20.0	8.1	16.9	19.4	19.4	20.0

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Site ID				768-S01	768-S02	768-S03	768-S04	768-S05	768-S06	768-S07	768-S08	768-S09	768-S10	768-S11	768-S12	768-S13	768-S14	768-S15	768-S16	768-S17	768-S18	768-S19	768-S20
RE				11.10.7	11.10.13	11.10.7	11.10.13	11.10.1	11.10.7	11.10.13	11.10.1	11.10.13	11.10.7	11.10.1	11.10.8	11.9.2	11.10.1	11.10.13	11.10.7	11.9.4	11.3.25	11.10.7	11.10.9
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	rem*	rem*
Species habitat index	Quality as foraging habitat	5	17%	2	2	2	2	3	3	2	4	2	3	4	1	3	3	2	2	1	4	2	0
	Quality as shelter, breeding habitat	5	17%	2	2	2	2	3	3	2	3	2	2	4	2	2	4	4	1	1	3	2	1
	Quality as mobility habitat	5	17%	3	3	3	3	3	3	3	5	2	4	4	2	3	4	4	3	2	4	3	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	10.8	10.8	10.8	10.8	12.1	12.1	10.8	14.2	10.1	12.1	14.2	9.4	11.4	13.5	12.8	10.1	8.7	13.5	10.8	8.7
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	8.8	17.5	17.5	17.5	7.5	6.3	10.6	20.0	14.4	12.5	20.0	20.0	20.0	20.0	20.0	8.1	16.9	19.4	19.4	20.0
	Species habitat index	20	40%	10.8	10.8	10.8	10.8	12.1	12.1	10.8	14.2	10.1	12.1	14.2	9.4	11.4	13.5	12.8	10.1	8.7	13.5	10.8	8.7
	Total/10	10	100%	5.9	7.0	7.0	7.0	6.0	5.9	6.1	7.9	6.4	6.6	7.9	7.0	7.4	7.8	7.7	5.7	6.5	7.7	7.2	6.8
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**6**	**6**	**6**	**8**	**6**	**7**	**8**	**7**	**7**	**8**	**8**	**6**	**6**	**8**	**7**	**7**
Large-eared pied bat																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/25	25	100%	8.8	20.0	20.0	20.0	10.0	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
Species habitat index	Quality as foraging habitat	5	17%	3	3	3	3	3	5	3	4	2	2	4	4	3	3	3	2	4	4	3	3
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	3	0	0	0	0	5	5	0	0	0	0	2	2	0	0
	Quality as mobility habitat	5	17%	4	4	4	4	4	5	4	4	2	3	5	5	4	4	4	4	4	4	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	10.8	10.8	10.8	10.8	10.8	14.8	10.8	11.4	8.7	9.4	15.5	15.5	10.8	10.8	10.8	10.1	12.8	12.8	10.8	10.8
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	8.8	20.0	20.0	20.0	10.0	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
	Species habitat index	20	40%	10.8	10.8	10.8	10.8	10.8	14.8	10.8	11.4	8.7	9.4	15.5	15.5	10.8	10.8	10.8	10.1	12.8	12.8	10.8	10.8
	Total/10	10	100%	5.9	7.3	7.3	7.3	6.1	6.7	6.4	7.4	6.5	6.1	8.2	8.2	7.3	7.3	7.3	6.0	7.6	7.6	7.2	7.3
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**6**	**7**	**6**	**7**	**6**	**6**	**8**	**8**	**7**	**7**	**7**	**6**	**8**	**8**	**7**	**7**
South-eastern long-eared bat																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	4	3	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/25	25	100%	13.8	20.0	22.5	22.5	12.5	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
Species habitat index	Quality as foraging habitat	5	17%	3	3	3	3	3	5	3	3	2	2	3	2	4	2	4	3	4	5	4	4
	Quality as shelter, breeding habitat	5	17%	3	3	3	3	3	4	2	2	1	2	2	2	2	3	3	1	2	3	4	4

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Site ID				768-S01	768-S02	768-S03	768-S04	768-S05	768-S06	768-S07	768-S08	768-S09	768-S10	768-S11	768-S12	768-S13	768-S14	768-S15	768-S16	768-S17	768-S18	768-S19	768-S20
RE				11.10.7	11.10.13	11.10.7	11.10.13	11.10.1	11.10.7	11.10.13	11.10.1	11.10.13	11.10.7	11.10.1	11.10.8	11.9.2	11.10.1	11.10.13	11.10.7	11.9.4	11.3.25	11.10.7	11.10.9
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	rem*	rem*
	Quality as mobility habitat	5	17%	4	4	4	4	4	5	4	3	3	3	4	3	4	4	4	4	4	4	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	12.8	12.8	12.8	12.8	12.8	15.5	12.1	11.4	10.1	10.8	12.1	10.8	12.8	12.1	13.5	11.4	12.8	14.2	14.2	14.2
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	13.8	20.0	22.5	22.5	12.5	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
	Species habitat index	20	40%	12.8	12.8	12.8	12.8	12.8	15.5	12.1	11.4	10.1	10.8	12.1	10.8	12.8	12.1	13.5	11.4	12.8	14.2	14.2	14.2
	Total/10	10	100%	6.9	7.7	8.0	8.0	6.8	6.9	6.7	7.4	6.7	6.4	7.5	7.3	7.7	7.5	7.8	6.3	7.6	7.9	7.9	7.9
	Total/10 (rounded)			**7**	**8**	**8**	**8**	**7**	**7**	**7**	**7**	**7**	**6**	**8**	**7**	**8**	**8**	**8**	**6**	**8**	**8**	**8**	**8**
Red goshawk																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2
	Total/25	25	100%	8.8	17.5	17.5	17.5	7.5	6.3	10.6	17.5	14.4	10.0	17.5	17.5	17.5	17.5	17.5	8.1	16.9	19.4	16.9	17.5
Species habitat index	Quality as foraging habitat	5	17%	2	2	2	2	2	3	2	2	1	2	2	1	3	3	3	2	1	4	3	3
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	1	0	2	1	1	3	0	0	2	2	0	0	3	1	1
	Quality as mobility habitat	5	17%	4	4	4	4	4	4	4	4	3	3	4	2	4	4	4	4	4	4	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	10.1	10.1	10.1	10.1	10.1	11.4	10.1	11.4	9.4	10.1	12.1	8.0	10.8	12.1	12.1	10.1	9.4	13.5	11.4	11.4
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	8.8	17.5	17.5	17.5	7.5	6.3	10.6	17.5	14.4	10.0	17.5	17.5	17.5	17.5	17.5	8.1	16.9	19.4	16.9	17.5
	Species habitat index	20	40%	10.1	10.1	10.1	10.1	10.1	11.4	10.1	11.4	9.4	10.1	12.1	8.0	10.8	12.1	12.1	10.1	9.4	13.5	11.4	11.4
	Total/10	10	100%	5.8	6.8	6.8	6.8	5.6	5.7	6.0	7.1	6.3	5.9	7.2	6.4	7.0	7.2	7.2	5.7	6.6	7.7	7.0	7.1
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**6**	**6**	**6**	**7**	**6**	**6**	**7**	**6**	**7**	**7**	**7**	**6**	**7**	**8**	**7**	**7**
Squatter pigeon																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	3	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3	2	3	3	3
	Total/25	25	100%	11.3	20.0	20.0	20.0	10.0	8.8	13.1	20.0	14.4	12.5	20.0	17.5	20.0	20.0	20.0	10.6	16.9	19.4	19.4	20.0
Species habitat index	Quality as foraging habitat	5	17%	3	3	4	3	3	5	2	4	3	5	4	1	4	3	3	4	1	3	5	3
	Quality as shelter, breeding habitat	5	17%	3	3	4	3	4	5	2	3	2	4	3	1	4	3	3	3	1	3	4	4
	Quality as mobility habitat	5	17%	4	4	5	4	5	5	3	4	2	5	4	1	5	3	4	4	1	3	4	4

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Site ID				768-S01	768-S02	768-S03	768-S04	768-S05	768-S06	768-S07	768-S08	768-S09	768-S10	768-S11	768-S12	768-S13	768-S14	768-S15	768-S16	768-S17	768-S18	768-S19	768-S20
RE				11.10.7	11.10.13	11.10.7	11.10.13	11.10.1	11.10.7	11.10.13	11.10.1	11.10.13	11.10.7	11.10.1	11.10.8	11.9.2	11.10.1	11.10.13	11.10.7	11.9.4	11.3.25	11.10.7	11.10.9
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	rem*	rem*
	Role of the site population in regards to the overall species population	5	50%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Total/20	20	100%	14.8	14.8	16.8	14.8	16.2	18.2	12.8	15.5	12.8	17.5	15.5	10.0	16.8	14.1	14.8	15.5	10.0	14.1	16.8	15.5
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	11.3	20.0	20.0	20.0	10.0	8.8	13.1	20.0	14.4	12.5	20.0	17.5	20.0	20.0	20.0	10.6	16.9	19.4	19.4	20.0
	Species habitat index	20	40%	14.8	14.8	16.8	14.8	16.2	18.2	12.8	15.5	12.8	17.5	15.5	10.0	16.8	14.1	14.8	15.5	10.0	14.1	16.8	15.5
	Total/10	10	100%	7.0	8.1	8.5	8.1	7.1	7.4	6.8	8.2	7.0	7.7	8.2	6.8	8.5	7.9	8.1	7.1	6.7	7.8	8.4	8.2
	Total/10 (rounded)			**7**	**8**	**8**	**8**	**7**	**7**	**7**	**8**	**7**	**8**	**8**	**7**	**8**	**8**	**8**	**7**	**7**	**8**	**8**	**8**
Black-breasted button-quail																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	2	2	2
	Total/25	25	100%	8.8	17.5	17.5	17.5	7.5	6.3	10.6	17.5	14.4	10.0	17.5	20.0	17.5	17.5	17.5	8.1	19.4	16.9	16.9	17.5
Species habitat index	Quality as foraging habitat	5	17%	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	0	0	0
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0
	Quality as mobility habitat	5	17%	2	2	2	2	2	3	2	2	1	1	2	3	1	1	2	1	3	2	2	2
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	7.4	7.4	7.4	7.4	7.4	8.0	7.4	7.4	6.7	6.7	7.4	12.8	6.7	6.7	7.4	6.7	12.8	7.4	7.4	7.4
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	8.8	17.5	17.5	17.5	7.5	6.3	10.6	17.5	14.4	10.0	17.5	20.0	17.5	17.5	17.5	8.1	19.4	16.9	16.9	17.5
	Species habitat index	20	40%	7.4	7.4	7.4	7.4	7.4	8.0	7.4	7.4	6.7	6.7	7.4	12.8	6.7	6.7	7.4	6.7	12.8	7.4	7.4	7.4
	Total/10	10	100%	5.2	6.3	6.3	6.3	5.1	5.1	5.4	6.3	5.8	5.2	6.3	7.7	6.1	6.1	6.3	5.0	7.6	6.2	6.2	6.3
	Total/10 (rounded)			**5**	**6**	**6**	**6**	**5**	**5**	**5**	**6**	**6**	**5**	**6**	**8**	**6**	**6**	**6**	**5**	**8**	**6**	**6**	**6**
Collared delma																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	2	2	2	3	2	2	2	1	2	3	3	2	2	3	2	3	2	3	3
	Total/25	25	100%	8.8	17.5	17.5	17.5	10.0	6.3	10.6	17.5	11.9	10.0	20.0	20.0	17.5	17.5	20.0	8.1	19.4	16.9	19.4	20.0
Species habitat index	Quality as foraging habitat	5	17%	4	2	4	3	4	3	4	3	3	2	3	2	2	3	3	2	4	4	4	4
	Quality as shelter, breeding habitat	5	17%	3	2	3	3	4	3	4	2	0	1	4	3	2	2	2	2	4	4	4	4
	Quality as mobility habitat	5	17%	3	3	3	3	4	3	4	2	2	1	4	3	2	2	3	2	3	3	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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Site ID				768-S01	768-S02	768-S03	768-S04	768-S05	768-S06	768-S07	768-S08	768-S09	768-S10	768-S11	768-S12	768-S13	768-S14	768-S15	768-S16	768-S17	768-S18	768-S19	768-S20
RE				11.10.7	11.10.13	11.10.7	11.10.13	11.10.1	11.10.7	11.10.13	11.10.1	11.10.13	11.10.7	11.10.1	11.10.8	11.9.2	11.10.1	11.10.13	11.10.7	11.9.4	11.3.25	11.10.7	11.10.9
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	rem*	rem*
	Total/20	20	100%	12.8	10.8	12.8	12.1	14.2	12.1	14.2	10.8	9.4	8.7	13.5	11.4	10.1	10.8	11.4	10.1	13.5	13.5	14.2	14.2
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	8.8	17.5	17.5	17.5	10.0	6.3	10.6	17.5	11.9	10.0	20.0	20.0	17.5	17.5	20.0	8.1	19.4	16.9	19.4	20.0
	Species habitat index	20	40%	12.8	10.8	12.8	12.1	14.2	12.1	14.2	10.8	9.4	8.7	13.5	11.4	10.1	10.8	11.4	10.1	13.5	13.5	14.2	14.2
	Total/10	10	100%	6.3	7.0	7.4	7.2	6.7	5.9	6.8	7.0	6.0	5.6	7.8	7.4	6.8	7.0	7.4	5.7	7.7	7.4	7.9	7.9
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**7**	**6**	**7**	**7**	**6**	**6**	**8**	**7**	**7**	**7**	**7**	**6**	**8**	**7**	**8**	**8**
Yakka skink																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2
	Total/25	25	100%	8.8	17.5	17.5	17.5	10.0	8.8	10.6	17.5	14.4	10.0	17.5	17.5	17.5	17.5	17.5	8.1	16.9	16.9	19.4	17.5
Species habitat index	Quality as foraging habitat	5	17%	4	2	4	2	4	3	2	3	3	3	3	1	3	3	4	3	1	2	3	2
	Quality as shelter, breeding habitat	5	17%	1	2	2	2	4	2	2	2	1	2	1	1	2	1	2	1	1	1	3	2
	Quality as mobility habitat	5	17%	5	3	3	3	4	4	3	3	3	2	2	2	3	3	4	3	2	3	3	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	12.8	10.8	12.1	10.8	14.2	12.1	10.8	11.4	10.8	10.8	10.1	8.7	11.4	10.8	12.8	10.8	8.7	10.1	12.1	10.8
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	8.8	17.5	17.5	17.5	10.0	8.8	10.6	17.5	14.4	10.0	17.5	17.5	17.5	17.5	17.5	8.1	16.9	16.9	19.4	17.5
	Species habitat index	20	40%	12.8	10.8	12.1	10.8	14.2	12.1	10.8	11.4	10.8	10.8	10.1	8.7	11.4	10.8	12.8	10.8	8.7	10.1	12.1	10.8
	Total/10	10	100%	6.3	7.0	7.2	7.0	6.7	6.2	6.1	7.1	6.6	6.1	6.8	6.5	7.1	7.0	7.4	5.8	6.5	6.7	7.4	7.0
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**7**	**6**	**6**	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**7**	**7**	**7**
Dunmall's snake																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	2	2	2	2	3	2	2	2	3	2	2	3	3	2	3	2	3	3	3	3
	Total/25	25	100%	8.8	17.5	17.5	17.5	10.0	6.3	10.6	17.5	16.9	10.0	17.5	20.0	20.0	17.5	20.0	8.1	19.4	19.4	19.4	20.0
Species habitat index	Quality as foraging habitat	5	17%	3	2	3	2	4	3	2	3	2	2	2	3	3	2	3	2	3	3	4	3
	Quality as shelter, breeding habitat	5	17%	1	2	2	2	2	3	2	2	2	2	2	3	2	2	2	1	3	3	4	4
	Quality as mobility habitat	5	17%	4	3	4	3	4	4	3	3	3	2	2	3	3	2	3	2	3	3	4	4
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	11.4	10.8	12.1	10.8	12.8	12.8	10.8	11.4	10.8	10.1	10.1	12.1	11.4	10.1	11.4	9.4	12.1	12.1	14.2	13.5
	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72

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Site ID				768-S01	768-S02	768-S03	768-S04	768-S05	768-S06	768-S07	768-S08	768-S09	768-S10	768-S11	768-S12	768-S13	768-S14	768-S15	768-S16	768-S17	768-S18	768-S19	768-S20
RE				11.10.7	11.10.13	11.10.7	11.10.13	11.10.1	11.10.7	11.10.13	11.10.1	11.10.13	11.10.7	11.10.1	11.10.8	11.9.2	11.10.1	11.10.13	11.10.7	11.9.4	11.3.25	11.10.7	11.10.9
Attributes		Max. score	Weighting	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	rem*	rem*
Habitat quality score	Site context	25	30%	8.8	17.5	17.5	17.5	10.0	6.3	10.6	17.5	16.9	10.0	17.5	20.0	20.0	17.5	20.0	8.1	19.4	19.4	19.4	20.0
	Species habitat index	20	40%	11.4	10.8	12.1	10.8	12.8	12.8	10.8	11.4	10.8	10.1	10.1	12.1	11.4	10.1	11.4	9.4	12.1	12.1	14.2	13.5
	Total/10	10	100%	6.0	7.0	7.2	7.0	6.5	6.0	6.1	7.1	6.9	5.9	6.8	7.5	7.4	6.8	7.4	5.6	7.4	7.4	7.9	7.8
	Total/10 (rounded)			**6**	**7**	**7**	**7**	**6**	**6**	**6**	**7**	**7**	**6**	**7**	**8**	**7**	**7**	**7**	**6**	**7**	**7**	**8**	**8**
Brigalow TEC																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/25	25	100%	11.3	20.0	20.0	20.0	10.0	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
Habitat quality score	Site condition	80	70%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	11.3	20.0	20.0	20.0	10.0	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
	Total/10	10	100%	7.7	8.7	8.7	8.7	7.5	7.4	7.9	8.7	8.3	7.8	8.7	8.7	8.7	8.7	8.7	7.6	8.6	8.6	8.6	8.7
	Total/10 (rounded)			**8**	**9**	**9**	**9**	**8**	**7**	**8**	**9**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**8**	**9**	**9**	**9**	**9**
SEVT TEC																							
Site context	Patch size	10	25%	2	10	10	10	0	0	5	10	7	2	10	10	10	10	10	0	10	10	10	10
	Connectivity	5	13%	0	5	5	5	0	0	0	5	4	2	5	5	5	5	5	0	5	5	5	5
	Context	5	13%	4	5	5	5	4	2	4	5	4	4	5	5	5	5	5	5	4	4	4	5
	Absence of threats	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/25	25	100%	11.3	20.0	20.0	20.0	10.0	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
Habitat quality score	Site condition	80	70%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	11.3	20.0	20.0	20.0	10.0	8.8	13.1	20.0	16.9	12.5	20.0	20.0	20.0	20.0	20.0	10.6	19.4	19.4	19.4	20.0
	Total/10	10	100%	7.7	8.7	8.7	8.7	7.5	7.4	7.9	8.7	8.3	7.8	8.7	8.7	8.7	8.7	8.7	7.6	8.6	8.6	8.6	8.7
	Total/10 (rounded)			**8**	**9**	**9**	**9**	**8**	**7**	**8**	**9**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**8**	**9**	**9**	**9**	**9**

*rem = remnant vegetation; reg = regrowth vegetation.

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Table D2: Impact area habitat quality scores for site 768-S21 to 768-S45, BBKFL9, WB02 and B33-EXRR

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
Site condition	Total number of large trees/ha	15	19%	15	0	0	15	15	10	15	15	15	15	15	15	15	10	15	5	15	15	5	5	10	15	5	0	15	5	5	5
	Canopy height	5	6%	5	3	1.5	5	1.5	5	3	5	5	5	5	4	5	5	0	5	5	2.5	3	3	0	0	4	1.5	4	2.5	2.5	5
	Recruitment canopy sp.	5	6%	5	5	5	5	5	5	5	5	5	5	5	5	5	0	5	5	5	5	5	5	5	5	5	5	5	3	5	5
	Canopy cover	5	6%	5	3.5	2.5	4	2.5	2	5	5	5	3.5	3.5	4	5	4	3.5	2	5	3.5	5	5	3	3.5	5	2.5	5	2.5	2.5	2.5
	Shrub canopy cover	5	6%	5	3	0	3	3	3	5	0	0	3	5	5	0	3	3	0	0	3	3	5	3	5	0	0	5	5	5	0
	Woody debris length/ha	5	6%	5	0	0	5	0	2	0	5	5	5	2	5	2	5	2	5	5	5	2	5	5	5	5	5	5	2	5	5
	Native sp. richness	20	25%	15	15	12.5	12.5	15	7.5	10	12.5	12.5	10	15	12.5	10	15	17.5	7.5	10	17.5	12.5	12.5	10	15	10	15	12.5	17.5	20	15
	Non-native plant cover	10	13%	10	10	5	10	10	10	10	10	10	10	10	10	5	10	10	10	10	10	10	10	10	10	10	10	10	5	10	5
	Native perennial grass cover	5	6%	1	1	1	3	0	0	1	5	3	1	5	3	1	3	1	3	5	3	1	3	3	0	1	1	3	1	5	3
	Litter cover	5	6%	3	3	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	3	5	5	3	3	5	5	5
	Total/80	80	100%	69	43.5	32.5	67.5	57	49.5	57	67.5	65.5	62.5	70.5	68.5	53	60	62	47.5	65	69.5	51.5	58.5	52	63.5	50	43	67.5	48.5	65	50.5
Northern quoll																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	2	1	1	2	0	2	3	2	2	3	3	3	3	3	2	2	2	2	2	2	3	2	2	2	1	1	2	2
	Total/25	25	100%	16.9	10.6	9.4	7.5	0.0	10.6	13.1	15.6	11.3	20.0	20.0	20.0	20.0	20.0	16.3	16.3	17.5	17.5	15.0	16.3	16.9	14.4	15.0	10.6	6.3	5.0	17.5	7.5
Species habitat index	Quality as foraging habitat	5	17%	2	1	2	1	0	2	3	1	1	2	3	2	3	3	2	1	1	2	1	1	3	2	1	2	2	3	3	1
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	3	0	1
	Quality as mobility habitat	5	17%	2	1	2	1	0	2	4	2	2	2	3	2	3	3	2	1	1	2	1	1	2	2	2	3	2	2	4	2
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	8.7	7.4	8.7	7.4	6.0	8.7	11.4	8.7	8.0	8.7	10.1	8.7	11.4	10.1	8.7	7.4	7.4	8.7	7.4	7.4	9.4	8.7	8.0	9.4	9.4	11.4	10.8	8.7
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	16.9	10.6	9.4	7.5	0.0	10.6	13.1	15.6	11.3	20.0	20.0	20.0	20.0	20.0	16.3	16.3	17.5	17.5	15.0	16.3	16.9	14.4	15.0	10.6	6.3	5.0	17.5	7.5
	Species habitat index	20	40%	8.7	7.4	8.7	7.4	6.0	8.7	11.4	8.7	8.0	8.7	10.1	8.7	11.4	10.1	8.7	7.4	7.4	8.7	7.4	7.4	9.4	8.7	8.0	9.4	9.4	11.4	10.8	8.7
	Total/10	10	100%	6.5	5.4	5.6	5.1	3.9	5.7	6.6	6.3	5.7	6.8	7.1	6.8	7.4	7.1	6.4	6.1	6.3	6.5	6.0	6.1	6.6	6.2	6.1	5.9	5.3	5.6	7.0	5.3
	Total/10 (rounded)			**6**	**5**	**6**	**5**	**4**	**6**	**7**	**6**	**6**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**6**	**7**	**6**	**6**	**7**	**6**	**6**	**6**	**5**	**6**	**7**	**5**
Koala																															
	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0

UNCONTROLLED IF PRINTED

Santos

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
Site context	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	1	1	2	1	2	2	3	2	3	3	3	2	3	3	2	2	3	2	2	3	3	2	2	2	1	2	2
	Total/25	25	100%	19.4	10.6	9.4	7.5	2.5	10.6	10.6	18.1	11.3	20.0	20.0	20.0	17.5	20.0	18.8	16.3	17.5	20.0	15.0	16.3	16.9	16.9	15.0	10.6	8.8	5.0	17.5	7.5
Species habitat index	Quality as foraging habitat	5	17%	5	0	0	5	1	2	1	2	2	1	4	3	1	4	3	1	1	2	3	3	5	4	2	2	4	0	1	3
	Quality as shelter, breeding habitat	5	17%	4	0	0	3	1	2	1	2	3	2	4	3	2	4	3	1	1	2	1	2	4	4	1	2	4	0	2	3
	Quality as mobility habitat	5	17%	3	1	1	3	1	2	2	3	3	2	4	3	2	4	3	2	1	3	2	2	5	4	2	3	2	2	4	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	14.2	6.7	6.7	13.5	8.0	10.1	8.7	10.8	11.4	9.4	14.2	12.1	9.4	14.2	12.1	8.7	8.0	10.8	10.1	10.8	15.5	14.2	9.4	10.8	12.8	7.4	10.8	12.1
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	10.6	9.4	7.5	2.5	10.6	10.6	18.1	11.3	20.0	20.0	20.0	17.5	20.0	18.8	16.3	17.5	20.0	15.0	16.3	16.9	16.9	15.0	10.6	8.8	5.0	17.5	7.5
	Species habitat index	20	40%	14.2	6.7	6.7	13.5	8.0	10.1	8.7	10.8	11.4	9.4	14.2	12.1	9.4	14.2	12.1	8.7	8.0	10.8	10.1	10.8	15.5	14.2	9.4	10.8	12.8	7.4	10.8	12.1
	Total/10	10	100%	7.9	5.3	5.2	6.3	4.6	6.0	5.7	7.0	6.3	7.0	7.9	7.5	6.7	7.9	7.4	6.4	6.4	7.3	6.5	6.8	7.8	7.6	6.4	6.1	6.3	4.8	7.0	6.0
	Total/10 (rounded)			**8**	**5**	**5**	**6**	**5**	**6**	**6**	**7**	**6**	**7**	**8**	**8**	**7**	**8**	**7**	**6**	**6**	**7**	**7**	**7**	**8**	**8**	**6**	**6**	**6**	**5**	**7**	**6**
Large-eared pied bat																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	1	1	2	0	3	3	3	3	2	3	3	3	3	3	2	2	3	3	3	3	3	3	3	1	2	4	2
	Total/25	25	100%	19.4	10.6	9.4	7.5	0.0	13.1	13.1	18.1	13.8	17.5	20.0	20.0	20.0	20.0	18.8	16.3	17.5	20.0	17.5	18.8	16.9	16.9	17.5	13.1	6.3	7.5	22.5	7.5
Species habitat index	Quality as foraging habitat	5	17%	3	2	2	3	0	2	4	2	2	2	3	3	2	3	3	1	1	2	1	1	3	3	1	2	2	2	3	1
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Quality as mobility habitat	5	17%	3	1	1	3	0	3	5	3	3	3	4	4	3	4	3	3	3	3	3	3	4	4	2	3	1	2	4	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	10.1	8.0	8.0	10.1	6.0	9.4	12.1	9.4	9.4	9.4	10.8	10.8	10.1	10.8	10.1	8.7	8.7	9.4	8.7	8.7	10.8	10.8	8.0	9.4	8.0	9.4	10.8	8.7
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	10.6	9.4	7.5	0.0	13.1	13.1	18.1	13.8	17.5	20.0	20.0	20.0	20.0	18.8	16.3	17.5	20.0	17.5	18.8	16.9	16.9	17.5	13.1	6.3	7.5	22.5	7.5
	Species habitat index	20	40%	10.1	8.0	8.0	10.1	6.0	9.4	12.1	9.4	9.4	9.4	10.8	10.8	10.1	10.8	10.1	8.7	8.7	9.4	8.7	8.7	10.8	10.8	8.0	9.4	8.0	9.4	10.8	8.7

UNCONTROLLED IF PRINTED

Santos

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
	Total/10	10	100%	7.0	5.6	5.4	5.6	3.9	6.2	6.7	6.8	6.2	6.7	7.3	7.3	7.1	7.3	7.0	6.4	6.5	7.0	6.5	6.7	6.9	6.9	6.4	6.2	5.1	5.5	7.6	5.3
	Total/10 (rounded)			**7**	**6**	**5**	**6**	**4**	**6**	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**5**	**5**	**8**	**5**
South-eastern long-eared bat																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	2	2	3	1	2	3	4	4	3	4	4	4	4	4	3	3	4	3	3	4	4	3	2	2	2	4	3
	Total/25	25	100%	19.4	13.1	11.9	10.0	2.5	10.6	13.1	20.6	16.3	20.0	22.5	22.5	22.5	22.5	21.3	18.8	20.0	22.5	17.5	18.8	19.4	19.4	17.5	10.6	8.8	7.5	22.5	10.0
Species habitat index	Quality as foraging habitat	5	17%	4	1	2	3	1	2	3	5	5	4	4	4	4	4	4	3	3	3	2	2	4	3	2	2	2	2	4	3
	Quality as shelter, breeding habitat	5	17%	4	1	1	3	1	2	2	5	5	4	4	4	2	4	4	2	2	3	2	2	2	2	2	1	3	2	3	2
	Quality as mobility habitat	5	17%	3	2	2	3	1	2	4	5	5	5	5	5	4	5	4	3	3	4	3	3	4	4	2	3	2	2	4	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	13.5	8.7	9.4	12.1	8.0	10.1	12.1	16.2	16.2	14.8	14.8	14.8	12.8	14.8	14.2	11.4	11.4	12.8	10.8	10.8	12.8	12.1	10.1	10.1	10.8	10.1	13.5	11.4
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	13.1	11.9	10.0	2.5	10.6	13.1	20.6	16.3	20.0	22.5	22.5	22.5	22.5	21.3	18.8	20.0	22.5	17.5	18.8	19.4	19.4	17.5	10.6	8.8	7.5	22.5	10.0
	Species habitat index	20	40%	13.5	8.7	9.4	12.1	8.0	10.1	12.1	16.2	16.2	14.8	14.8	14.8	12.8	14.8	14.2	11.4	11.4	12.8	10.8	10.8	12.8	12.1	10.1	10.1	10.8	10.1	13.5	11.4
	Total/10	10	100%	7.7	6.0	6.0	6.3	4.6	6.0	6.7	8.4	7.9	8.1	8.4	8.4	8.0	8.4	8.1	7.2	7.4	8.0	7.0	7.1	7.6	7.4	6.8	6.0	5.9	5.6	8.1	6.2
	Total/10 (rounded)			**8**	**6**	**6**	**6**	**5**	**6**	**7**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**7**	**7**	**8**	**7**	**7**	**8**	**7**	**7**	**6**	**6**	**6**	**8**	**6**
Red goshawk																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Total/25	25	100%	16.9	13.1	11.9	7.5	5.0	10.6	10.6	15.6	11.3	17.5	17.5	17.5	17.5	17.5	16.3	16.3	17.5	17.5	15.0	16.3	14.4	14.4	15.0	10.6	8.8	7.5	17.5	7.5
Species habitat index	Quality as foraging habitat	5	17%	3	1	2	3	1	2	1	0	0	1	3	3	0	3	3	1	1	2	2	2	3	3	1	2	1	1	3	2
	Quality as shelter, breeding habitat	5	17%	2	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1
	Quality as mobility habitat	5	17%	4	2	2	3	3	3	2	2	2	4	4	4	2	4	4	3	3	4	4	4	4	4	2	3	2	2	4	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	12.1	8.0	8.7	10.1	8.7	10.1	8.0	7.4	7.4	9.4	11.4	10.8	7.4	11.4	11.4	8.7	8.7	10.1	10.1	10.1	11.4	10.8	8.0	9.4	8.0	8.0	10.8	10.1

UNCONTROLLED IF PRINTED

Santos

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	16.9	13.1	11.9	7.5	5.0	10.6	10.6	15.6	11.3	17.5	17.5	17.5	17.5	17.5	16.3	16.3	17.5	17.5	15.0	16.3	14.4	14.4	15.0	10.6	8.8	7.5	17.5	7.5
	Species habitat index	20	40%	12.1	8.0	8.7	10.1	8.7	10.1	8.0	7.4	7.4	9.4	11.4	10.8	7.4	11.4	11.4	8.7	8.7	10.1	10.1	10.1	11.4	10.8	8.0	9.4	8.0	8.0	10.8	10.1
	Total/10	10	100%	7.1	5.9	5.9	5.6	5.0	6.0	5.6	6.0	5.5	6.7	7.1	7.0	6.3	7.1	6.9	6.4	6.5	6.8	6.5	6.7	6.7	6.6	6.1	5.9	5.4	5.2	7.0	5.6
	Total/10 (rounded)			**7**	**6**	**6**	**6**	**5**	**6**	**6**	**6**	**6**	**7**	**7**	**7**	**6**	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**5**	**5**	**7**	**6**
Squatter pigeon																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	2	2	3	1	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	3	2	2	2	2	3	3
	Total/25	25	100%	19.4	13.1	11.9	10.0	2.5	13.1	13.1	15.6	11.3	20.0	20.0	20.0	20.0	20.0	16.3	16.3	20.0	20.0	17.5	18.8	16.9	16.9	15.0	10.6	8.8	7.5	20.0	10.0
Species habitat index	Quality as foraging habitat	5	17%	4	2	2	4	1	2	1	2	2	3	4	3	2	4	3	3	4	3	4	4	4	4	1	3	2	1	3	3
	Quality as shelter, breeding habitat	5	17%	3	1	1	3	1	2	1	2	2	3	3	3	2	3	2	2	4	3	3	4	4	3	1	3	2	1	3	3
	Quality as mobility habitat	5	17%	4	2	3	3	1	3	2	2	2	4	4	3	3	4	3	3	4	4	4	4	4	4	2	3	3	1	3	4
	Role of the site population in regards to the overall species population	5	50%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Total/20	20	100%	15.5	11.4	12.1	14.8	10.0	12.8	10.7	12.1	12.1	14.8	15.5	14.1	12.8	15.5	13.4	13.4	16.2	14.8	15.5	16.2	16.2	15.5	10.7	14.1	12.8	10.0	14.1	14.8
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	13.1	11.9	10.0	2.5	13.1	13.1	15.6	11.3	20.0	20.0	20.0	20.0	20.0	16.3	16.3	20.0	20.0	17.5	18.8	16.9	16.9	15.0	10.6	8.8	7.5	20.0	10.0
	Species habitat index	20	40%	15.5	11.4	12.1	14.8	10.0	12.8	10.7	12.1	12.1	14.8	15.5	14.1	12.8	15.5	13.4	13.4	16.2	14.8	15.5	16.2	16.2	15.5	10.7	14.1	12.8	10.0	14.1	14.8
	Total/10	10	100%	8.1	6.6	6.5	6.9	5.0	6.8	6.4	7.0	6.5	8.1	8.2	7.9	7.7	8.2	7.3	7.3	8.3	8.1	7.9	8.2	8.0	7.8	6.6	6.8	6.3	5.6	7.9	6.9
	Total/10 (rounded)			**8**	**7**	**7**	**7**	**5**	**7**	**6**	**7**	**6**	**8**	**8**	**8**	**8**	**8**	**7**	**7**	**8**	**8**	**8**	**8**	**8**	**8**	**7**	**7**	**6**	**6**	**8**	**7**
Black-breasted button-quail																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	2	2	2	2	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
	Total/25	25	100%	16.9	13.1	11.9	7.5	5.0	8.1	13.1	13.1	8.8	15.0	15.0	15.0	15.0	15.0	13.8	13.8	15.0	15.0	12.5	13.8	11.9	11.9	12.5	8.1	6.3	7.5	15.0	5.0
Species habitat index	Quality as foraging habitat	5	17%	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	3	1	0
	Quality as shelter, breeding habitat	5	17%	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Quality as mobility habitat	5	17%	1	2	2	1	0	2	2	1	0	2	1	0	0	1	0	0	0	1	0	0	0	1	1	1	1	2	1	0
	Role of the site population in	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

UNCONTROLLED IF PRINTED

Santos

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
	regards to the overall species population																														
	Total/20	20	100%	6.7	7.4	8.0	6.7	6.0	8.7	10.1	6.7	6.0	7.4	6.7	6.0	6.0	6.7	6.0	6.0	6.0	7.4	6.0	6.0	6.0	7.4	6.7	7.4	7.4	10.8	7.4	6.0
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	16.9	13.1	11.9	7.5	5.0	8.1	13.1	13.1	8.8	15.0	15.0	15.0	15.0	15.0	13.8	13.8	15.0	15.0	12.5	13.8	11.9	11.9	12.5	8.1	6.3	7.5	15.0	5.0
	Species habitat index	20	40%	6.7	7.4	8.0	6.7	6.0	8.7	10.1	6.7	6.0	7.4	6.7	6.0	6.0	6.7	6.0	6.0	6.0	7.4	6.0	6.0	6.0	7.4	6.7	7.4	7.4	10.8	7.4	6.0
	Total/10	10	100%	6.1	5.7	5.7	4.9	4.5	5.4	6.3	5.6	5.0	6.0	5.8	5.7	5.7	5.8	5.6	5.6	5.7	6.0	5.4	5.6	5.3	5.6	5.5	5.1	4.9	5.8	6.0	4.5
	Total/10 (rounded)			**6**	**6**	**6**	**5**	**5**	**5**	**6**	**6**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**5**	**6**	**5**	**6**	**6**	**5**	**5**	**6**	**6**	**5**
Collared delma																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	2	2	3	2	1	3	2	2	3	3	2	3	3	3	1	2	3	2	2	2	3	3	2	2	2	3	2
	Total/25	25	100%	19.4	13.1	11.9	10.0	5.0	8.1	13.1	15.6	11.3	20.0	20.0	17.5	20.0	20.0	18.8	13.8	17.5	20.0	15.0	16.3	14.4	16.9	17.5	10.6	8.8	7.5	20.0	7.5
Species habitat index	Quality as foraging habitat	5	17%	3	1	2	2	1	1	4	3	3	4	3	2	1	3	3	1	2	3	2	2	2	3	2	3	3	3	3	2
	Quality as shelter, breeding habitat	5	17%	3	2	2	2	1	1	4	3	2	4	3	2	1	2	3	1	2	3	1	2	2	3	1	2	3	3	3	2
	Quality as mobility habitat	5	17%	3	1	3	3	0	1	4	3	2	3	3	2	2	3	3	1	2	3	1	2	2	3	1	3	2	2	3	2
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	12.1	8.7	10.8	10.8	7.4	8.0	14.2	12.1	10.8	13.5	12.1	10.1	8.7	11.4	12.1	8.0	10.1	12.1	8.7	10.1	10.1	12.1	8.7	11.4	11.4	11.4	12.1	10.1
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	13.1	11.9	10.0	5.0	8.1	13.1	15.6	11.3	20.0	20.0	17.5	20.0	20.0	18.8	13.8	17.5	20.0	15.0	16.3	14.4	16.9	17.5	10.6	8.8	7.5	20.0	7.5
	Species habitat index	20	40%	12.1	8.7	10.8	10.8	7.4	8.0	14.2	12.1	10.8	13.5	12.1	10.1	8.7	11.4	12.1	8.0	10.1	12.1	8.7	10.1	10.1	12.1	8.7	11.4	11.4	11.4	12.1	10.1
	Total/10	10	100%	7.4	6.0	6.3	6.1	4.8	5.3	7.1	7.0	6.2	7.8	7.5	6.8	6.8	7.4	7.4	6.0	6.8	7.5	6.2	6.7	6.4	7.1	6.5	6.3	6.0	5.9	7.5	5.6
	Total/10 (rounded)			**7**	**6**	**6**	**6**	**5**	**5**	**7**	**7**	**6**	**8**	**8**	**7**	**7**	**7**	**7**	**6**	**7**	**8**	**6**	**7**	**6**	**7**	**7**	**6**	**6**	**6**	**8**	**6**
Yakka skink																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	2	2	3	2	2	3	3	3	3	3	3	3	3	3	2	3	3	2	2	3	3	3	3	3	2	3	2
	Total/25	25	100%	19.4	13.1	11.9	10.0	5.0	10.6	13.1	18.1	13.8	20.0	20.0	20.0	20.0	20.0	18.8	16.3	20.0	20.0	15.0	16.3	16.9	16.9	17.5	13.1	11.3	7.5	20.0	7.5
Species habitat index	Quality as foraging habitat	5	17%	3	1	1	3	0	2	2	3	3	4	4	3	3	4	4	2	2	3	2	3	3	3	2	3	3	1	2	3
	Quality as shelter, breeding habitat	5	17%	3	0	0	3	0	1	1	4	3	3	3	2	1	2	4	1	2	2	2	2	3	3	0	1	3	1	0	2

UNCONTROLLED IF PRINTED

Santos

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
	Quality as mobility habitat	5	17%	2	1	1	2	1	2	3	4	3	4	4	4	2	4	4	3	3	3	2	2	3	4	2	3	3	2	3	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	11.4	7.4	7.4	11.4	6.7	9.4	10.1	13.5	12.1	13.5	13.5	12.1	10.1	12.8	14.2	10.1	10.8	11.4	10.1	10.8	12.1	12.8	8.7	10.8	12.1	8.7	9.4	11.4
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	13.1	11.9	10.0	5.0	10.6	13.1	18.1	13.8	20.0	20.0	20.0	20.0	20.0	18.8	16.3	20.0	20.0	15.0	16.3	16.9	16.9	17.5	13.1	11.3	7.5	20.0	7.5
	Species habitat index	20	40%	11.4	7.4	7.4	11.4	6.7	9.4	10.1	13.5	12.1	13.5	13.5	12.1	10.1	12.8	14.2	10.1	10.8	11.4	10.1	10.8	12.1	12.8	8.7	10.8	12.1	8.7	9.4	11.4
	Total/10	10	100%	7.3	5.7	5.6	6.2	4.6	5.9	6.3	7.6	6.8	7.8	7.8	7.5	7.1	7.7	7.8	6.7	7.3	7.4	6.5	6.8	7.1	7.3	6.5	6.4	6.5	5.3	7.0	5.9
	Total/10 (rounded)			**7**	**6**	**6**	**6**	**5**	**6**	**6**	**8**	**7**	**8**	**8**	**8**	**7**	**8**	**8**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**5**	**7**	**6**
Dunmall's snake																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	2	2	3	2	2	3	2	2	3	3	3	2	3	3	2	3	3	2	2	3	3	3	3	2	2	3	3
	Total/25	25	100%	19.4	13.1	11.9	10.0	5.0	10.6	13.1	15.6	11.3	20.0	20.0	20.0	17.5	20.0	18.8	16.3	20.0	20.0	15.0	16.3	16.9	16.9	17.5	13.1	8.8	7.5	20.0	10.0
Species habitat index	Quality as foraging habitat	5	17%	4	1	2	2	1	2	4	2	2	5	4	3	2	3	4	2	2	4	1	1	2	4	2	2	3	3	3	2
	Quality as shelter, breeding habitat	5	17%	4	1	1	2	1	2	3	1	1	5	3	2	1	2	3	2	2	3	1	1	2	3	1	2	2	3	3	2
	Quality as mobility habitat	5	17%	3	2	3	3	1	2	4	2	2	5	4	3	2	4	3	2	3	3	1	1	2	3	2	3	2	2	3	3
	Role of the site population in regards to the overall species population	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/20	20	100%	13.5	8.7	10.1	10.8	8.0	10.1	13.5	9.4	9.4	16.2	13.5	11.4	9.4	12.1	12.8	10.1	10.8	12.8	8.0	8.0	10.1	12.8	9.4	10.8	10.8	11.4	12.1	10.8
Habitat quality score	Site condition	80	30%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	13.1	11.9	10.0	5.0	10.6	13.1	15.6	11.3	20.0	20.0	20.0	17.5	20.0	18.8	16.3	20.0	20.0	15.0	16.3	16.9	16.9	17.5	13.1	8.8	7.5	20.0	10.0
	Species habitat index	20	40%	13.5	8.7	10.1	10.8	8.0	10.1	13.5	9.4	9.4	16.2	13.5	11.4	9.4	12.1	12.8	10.1	10.8	12.8	8.0	8.0	10.1	12.8	9.4	10.8	10.8	11.4	12.1	10.8
	Total/10	10	100%	7.7	6.0	6.1	6.1	4.9	6.0	7.0	6.5	5.9	8.3	7.8	7.4	6.7	7.5	7.5	6.7	7.3	7.7	6.1	6.3	6.7	7.3	6.7	6.4	5.9	5.9	7.5	6.1
	Total/10 (rounded)			**8**	**6**	**6**	**6**	**5**	**6**	**7**	**6**	**6**	**8**	**8**	**7**	**7**	**8**	**8**	**7**	**7**	**8**	**6**	**6**	**7**	**7**	**7**	**6**	**6**	**6**	**8**	**6**
Brigalow TEC																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	2	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/25	25	100%	19.4	13.1	11.9	10.0	7.5	13.1	10.6	18.1	13.8	20.0	20.0	20.0	20.0	20.0	18.8	18.8	20.0	20.0	17.5	18.8	16.9	16.9	17.5	13.1	11.3	10.0	20.0	10.0

UNCONTROLLED IF PRINTED

Santos

Site ID				768-S21	768-S22	768-S23	768-S24	768-S25	768-S26	768-S27	768-S28	768-S29	768-S30	768-S31	768-S32	768-S33	768-S34	768-S35	768-S36	768-S37	768-S38	768-S39	768-S40	768-S41	768-S42	768-S43	768-S44	768-S45	BBKFL9	WB02	B33-EXRR
RE				11.3.2	11.9.5	11.9.5	11.10.11	11.9.5	11.10.7	11.9.5	11.10.9	11.10.9	11.9.10	11.9.10	11.10.11	11.10.9	11.10.11	11.9.5	11.10.9	11.10.9	11.9.10	11.3.2	11.3.2	11.3.25	11.9.10	11.10.9	11.10.13	11.9.7	11.9.4	11.10.3	11.3.19
Attributes		Max. score	Weighting	rem*	reg*	reg*	rem*	reg*	reg*	reg*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	rem*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	reg*	reg*	rem*	rem*	rem*	reg*
Habitat quality score	Site condition	80	70%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	13.1	11.9	10.0	7.5	13.1	10.6	18.1	13.8	20.0	20.0	20.0	20.0	20.0	18.8	18.8	20.0	20.0	17.5	18.8	16.9	16.9	17.5	13.1	11.3	10.0	20.0	10.0
	Total/10	10	100%	8.6	7.9	7.7	7.5	7.2	7.9	7.6	8.5	8.0	8.7	8.7	8.7	8.7	8.7	8.6	8.6	8.7	8.7	8.4	8.6	8.3	8.3	8.4	7.9	7.7	7.5	8.7	7.5
	Total/10 (rounded)			**9**	**8**	**8**	**8**	**7**	**8**	**8**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**8**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**9**	**8**
SEVT TEC																															
Site context	Patch size	10	25%	10	7	7	2	0	5	5	10	5	10	10	10	10	10	10	10	10	10	10	10	7	7	7	5	2	2	10	0
	Connectivity	5	13%	5	2	2	0	0	2	2	2	0	5	5	5	5	5	4	4	5	5	2	4	4	4	4	2	2	0	5	0
	Context	5	13%	4	4	2	2	0	2	2	5	5	5	5	5	5	5	4	4	5	5	4	4	4	4	5	2	2	2	5	4
	Absence of threats	5	50%	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Total/25	25	100%	19.4	15.6	14.4	10.0	7.5	13.1	13.1	18.1	13.8	20.0	20.0	20.0	20.0	20.0	18.8	18.8	20.0	20.0	17.5	18.8	16.9	16.9	17.5	13.1	11.3	10.0	20.0	10.0
Habitat quality score	Site condition	80	70%	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
	Site context	25	30%	19.4	15.6	14.4	10.0	7.5	13.1	13.1	18.1	13.8	20.0	20.0	20.0	20.0	20.0	18.8	18.8	20.0	20.0	17.5	18.8	16.9	16.9	17.5	13.1	11.3	10.0	20.0	10.0
	Total/10	10	100%	8.6	8.2	8.0	7.5	7.2	7.9	7.9	8.5	8.0	8.7	8.7	8.7	8.7	8.7	8.6	8.6	8.7	8.7	8.4	8.6	8.3	8.3	8.4	7.9	7.7	7.5	8.7	7.5
	Total/10 (rounded)			**9**	**8**	**8**	**8**	**7**	**8**	**8**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**8**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	**9**	**8**

*rem = remnant vegetation; reg = regrowth vegetation.

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Table D3: Habitat quality scores for RE contributing to the impact area for each MNES

RE	Dominant RE considered for habitat quality scoring	Area (ha)	Red goshawk	Squatter pigeon	Black-breasted button-quail	Large-eared pied bat	Northern quoll	South-eastern long- eared bat	Koala - general	Koala - essential	Collared delma	Yakka skink - general	Yakka skink - essential	Dunmall's snake	Brigalow TEC	Semi evergreen vine thicket TEC
11.10.1	11.10.1	39.5	6.75	7.75		7.0	7.0	7.5	7.5		7.25		7	6.75		
11.10.1/11.10.13a/11.10.7	11.10.1	0.1	6.75	7.75		7.0	7.0	7.5	7.5		7.25		7	6.75		
11.10.1/11.10.7	11.10.1	0.5	6.75	7.75		7.0	7.0	7.5	7.5		7.25		7	6.75		
11.10.1/11.10.7/11.10.3	11.10.1	3.1	6.75	7.75		7.0	7.0	7.5	7.5		7.25		7	6.75		
11.10.11	11.10.11	31.3	6.67	7.67		6.7	6.3	7.33	7.33		6.67		7.33	7		
11.10.11/11.10.7a	11.10.11	2.4	6.67	7.67		6.7	6.3	7.33	7.33		6.67		7.33	7		
11.10.13	11.10.13	85.7	6.5	7.5		6.5	6.7	7.33	6.67		6.67	6.67		6.67		
11.10.3/11.3.25	11.10.3	1.4	7	8		8.0	7.0	8	7		8	7		8		
11.10.2	11.10.2	<0.01														
11.10.3	11.10.3	11.2	7	8		8.0	7.0	8	7		8	7		8		
11.10.7	11.10.7	145.2	6.29	7.43		6.4	6.4	6.86	6.43		6.29		6.29	6.43		
11.10.7a	11.10.7	3	6.29	7.43		6.4	6.4	6.86	6.43		6.29		6.29	6.43		
11.10.8	11.10.8	0.3	6		8	8.0	9.0	7								
11.10.9	11.10.9	139.6	6.29	7.29		6.6	6.3	7.57			6.86		7.14	6.86		
11.3.2	11.3.2	1.2	7	8		7.0	6.0	7.33		7.33	6.67		7.00	6.67		
11.3.19	11.3.19	1.7	6	7		5.0	5.0	6		6	6		6	6		
11.3.25	11.3.25	3.4	7.5	8		7.5	7.0	8		8						
11.5.9	11.5.9	0.4														
11.9.10	11.9.10	6.2	7	8		7.0	6.8	7.75	7.5		7.75	7.5		7.75		
11.9.2	11.9.2	7.1	7	8		7.0	7.0	8	7		7		7	7		
11.9.4	11.9.4	0.7	6		7	6.5	6.5	7								8.5
11.9.4a	11.9.4	<0.1	6		7	6.5	6.5	7								8.5
11.9.5	11.9.5	4.4	6			5.8	5.6	6.4				6.2		6.4	8	
11.9.7	11.9.7	3.1	5	6		5.0	5.0	6	6		6		6	6		

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Table D4: Final area-weighted habitat quality score contribution for each MNES per RE

RE	Dominant RE considered for habitat quality scoring	Area (ha)	Red goshawk	Squatter pigeon	Black-breasted button-quail	Large-eared pied bat	Northern quoll	South-eastern long-eared bat	Koala - general	Koala - essential	Collared delma	Yakka skink - general	Yakka skink - essential	Dunmall's snake	Brigalow TEC	Semi evergreen vine thicket TEC
11.10.1	11.10.1	39.5	0.53	0.62		0.55	0.55	0.59	0.85		0.58		0.73	0.54		
11.10.1/11.10.13a/11.10.7	11.10.1	0.1	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01		<0.01		<0.01	<0.01		
11.10.1/11.10.7	11.10.1	0.5	0.01	0.01		0.01	0.01	0.01	0.01		0.01		0.01	0.01		
11.10.1/11.10.7/11.10.3	11.10.1	3.1	0.04	0.05		0.04	0.04	0.05	0.07		0.05		0.06	0.04		
11.10.11	11.10.11	31.3	0.42	0.48		0.42	0.40	0.46	0.66		0.42		0.61	0.44		
11.10.11/11.10.7a	11.10.11	2.4	0.03	0.04		0.03	0.03	0.04	0.05		0.03		0.05	0.03		
11.10.13	11.10.11	85.7	1.24	1.44		1.24	1.27	1.39	1.82		1.29	5.34		1.28		
11.10.3/11.3.25	11.10.3	1.4	0.02	0.02		0.02	0.02	0.02	0.03		0.02	0.08		0.02		
11.10.2	11.10.2	<0.01	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
11.10.3	11.10.3	11.2	0.16	0.18		0.18	0.16	0.18	0.22		0.18	0.66		0.18		
11.10.7	11.10.7	145.2	1.82	2.18		1.86	1.86	1.99	2.67		1.85		2.42	1.88		
11.10.7a	11.10.7	3	0.04	0.04		0.04	0.04	0.04	0.06		0.04		0.05	0.04		
11.10.8	11.10.8	0.3	<0.01		2.5	<0.01	0.01	<0.01								
11.10.9	11.10.9	139.6	1.75	2.05		1.83	1.75	2.11			1.94		2.64	1.93		
11.3.2	11.3.2	1.2	0.02	0.02		0.02	0.01	0.02		1.42	0.02		0.02	0.02		
11.3.19	11.3.19	1.7	0.02	0.02		0.02	0.02	0.02		1.60	0.02		0.03	0.02		
11.3.25	11.3.25	3.4	0.05	0.05		0.05	0.05	0.05		4.32						
11.5.9	11.5.9	0.4	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
11.9.10	11.9.10	6.2	0.09	0.10		0.09	0.08	0.10	0.13		0.10	0.39		0.10		
11.9.2	11.9.2	7.1	0.10	0.11		0.10	0.10	0.11	0.14		0.10		0.13	0.10		
11.9.4	11.9.4	0.7	0.01		4.7	0.01	0.01	0.01								8.25
11.9.4a	11.9.4	<0.1	<0.01		0.1	<0.01	<0.01	<0.01								0.25
11.9.5	11.9.5	4.4	0.05			0.05	0.05	0.06				0.23		0.06	8.00	
11.9.7	11.9.7	3.1	0.03	0.04		0.03	0.03	0.04	0.05		0.04		0.05	0.04		
Final weighted habitat quality score			**6**	**7**	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**8**	**9**

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