



Department of Transport and Main Roads

**Bruce Highway Cooroy to Curra
(Section D - Woondum to Curra) Detailed Design
Job No. 232/10A/7, Invitation No. WBYD-1335
Lowland Rainforest TEC EPBC Act Offset Strategy**

May 2020

Executive summary

The Department of Transport and Main Roads (TMR) proposes to upgrade and realign 26 km of the Bruce Highway between Woondum and Curra. This Project, entitled the Bruce Highway Cooroy to Curra (Section D: Woondum to Curra) Project, was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2017/7941) and was approved, subject to conditions, by DAWE on 24 September 2019.

The purpose of this report is to meet the requirements of Condition 13 as stated in the Project Approval (EPBC 2017/7941), under the EPBC Act, for the Project. Condition 13 states that an Offset Strategy is required to guide the delivery of the offset required for impacts to Lowland Rainforest of Subtropical Australia threatened ecological community (TEC) and to demonstrate how delivery of the offset for the Lowland Rainforest TEC will be achieved.

A direct land-based offset totalling approximately 18.20 ha of Lowland Rainforest of Subtropical Australia habitat is proposed to compensate for direct (0.19 ha) and indirect (1.81 ha) impacts (total impact of 2.0 ha) to the TEC, resulting from construction of the Project. The proposed offset will be across two sites consisting of properties within Gympie Region at Woondum Road, Kybong (Woondum site) and Sunshine Coast Region at Kawana Way, Birtinya (Kawana site). The Woondum site is described as Lot 2 on SP302526, contains 2.72 ha of TEC and the Kawana site, described as Lot 802 on SP244924 contains 15.48 ha of TEC.

The Lowland Rainforest of Subtropical Australia habitat was assessed through desktop review and field surveys as meeting the diagnostic characteristics and condition thresholds for the TEC. It is also proposed to secure and manage an additional 3.8 ha of vegetated buffer on the Woondum offset site and 10.4 ha of vegetated buffer on the Kawana offset site in order to further protect the existing TEC.

The ecological outcomes proposed to be achieved within the 10 year to ecological benefit timeframe (5 year active management duration) in order to improve the overall habitat quality of the TEC offset areas are:

1. Increase the species richness of the existing Lowland Rainforest of Subtropical Australia habitat
2. Reduce the extent of weed infestations within the existing Lowland Rainforest of Subtropical Australia habitat
3. Protect and rehabilitate the vegetated buffers zones around the existing Lowland Rainforest of Subtropical Australia habitat

The offset areas will be managed in accordance with this Offset Strategy, which describes in detail the management requirements of the offset area and includes actions, timing, reporting, remedial actions and responsibilities for the management activities. The Offset Strategy includes performance indicators and completion criteria that will be used to evaluate progress and completion of the active management measures in achieving the above ecological outcomes.

Table of contents

1.	Introduction	1
1.1	Project description	1
1.2	EPBC Act approval	1
1.3	Purpose of this report.....	3
1.4	Roles and responsibilities	3
1.5	Report structure	4
1.6	Assumptions	5
1.7	Limitations.....	5
2.	Offset delivery	6
2.1	Direct offsets	6
2.2	Indirect actions.....	11
3.	Verification of offset sites	14
3.1	Method.....	14
3.2	Results	18
4.	Baseline and monitoring survey programs.....	29
4.1	Purpose.....	29
4.2	Survey timing	29
4.3	Personnel.....	30
4.4	Survey methods.....	30
4.5	Reporting	35
5.	Ecological outcomes and completion criteria.....	37
5.1	Ecological outcomes	37
5.2	Performance indicators and completion criteria	37
6.	Management and monitoring programs	39
6.1	Offset management responsibility	39
6.2	Auditing and review.....	39
6.3	Compliance reporting.....	39
6.4	Revegetation and regeneration management	40
6.5	Weed management.....	46
6.6	Land use and access management.....	52
6.7	Other management actions	56
7.	Risk framework	57
8.	Compliance with EMP Guidelines.....	64
9.	Compliance with Offsets Policy.....	65
10.	References	67

Table index

Table 1-1	Approval conditions reference table	2
Table 1-2	Responsible agency contact details	4
Table 2-1	Description of Lowland Rainforest TEC offset sites	6
Table 2-2	Timing of legally securing and approval requirements	11
Table 2-3	Biological control releases	12
Table 3-1	Site condition score categories	16
Table 3-2	Site context scoring categories	17
Table 3-3	Species stocking rate scoring categories	17
Table 3-4	Assessment of offset sites against key diagnostic characteristics	23
Table 3-5	Assessment of offset sites against condition thresholds	24
Table 3-6	Habitat quality scores.....	25
Table 3-7	Future habitat quality scores (with offset).....	25
Table 3-8	Future habitat quality scores (without offset).....	26
Table 3-9	TEC offset calculator guide.....	26
Table 5-1	Performance indicators and completion criteria for TEC offset areas	38
Table 6-1	Revegetation and regeneration management	41
Table 6-2	Weed management.....	48
Table 6-3	Land use and access management.....	53
Table 7-1	Likelihood of occurrence	57
Table 7-2	Level of consequence	57
Table 7-3	Risk matrix	57
Table 7-4	Current risks to achieving management outcomes	58
Table 8-1	Lowland Rainforest Offset Compliance with EMP Guidelines	64
Table 9-1	Lowland Rainforest Offset Compliance with Environmental Offsets Policy.....	65

Figure index

Figure 1	Location of Woondum Offset Site	8
Figure 2	Location of Kawana Offset Site	9

Appendices

Appendix A – Offset Assessment Guide Lowland Rainforest TEC

Appendix B – Modified QLD Habitat Quality template

1. Introduction

1.1 Project description

The Department of Transport and Main Roads (TMR) proposes to upgrade and realign 26 km of the Bruce Highway between Woondum and Curra. This project, entitled the Bruce Highway Cooroy to Curra (Section D: Woondum to Curra) Project ('the Project') is the fourth and final section of a 62 km upgrade of the Bruce Highway, between Cooroy and Curra. The Project includes a bypass of the Gympie township, which is expected to result in a significant reduction in traffic and truck volumes through Gympie, improving safety and congestion. Commencement of the Project action is scheduled to occur in June 2020.

1.2 EPBC Act approval

The Project was deemed a 'controlled action' on 7 June 2017, to be assessed by Preliminary Documentation for the controlling provisions of Section 18 and 18A (listed threatened species and ecological communities). The Project was referred to the DAWE under the EPBC Act on 16 May 2017 (EPBC 2017/7941).

The Project was approved, subject to conditions, by DAWE on 24 September 2019. A post approval variation notice (dated April 2020) altered the impact area and part of the definition of Lowland Rainforest, and removed the definition of buffers. The approval has effect until 30 June 2040. The conditions include offset requirements for a number of impacted matters of national environmental significance (MNES). This Offset Strategy has been prepared as a condition of the EPBC Act approval, as outlined below.

1.2.1 Offset requirements for Lowland Rainforest Ecological Community

Condition 13 of the EPBC Act approval requires an offset strategy specific to the Lowland Rainforest of Subtropical Australia threatened ecological community (TEC) in order to indicate to DAWE how the offset sites will be secured and managed, and to guide the delivery and compliance of the offset.

Condition 13 states:

To compensate for the loss of 2 hectares of Lowland rainforest, the approval holder must submit an Offset Strategy prepared by a suitably qualified person in accordance with the Environmental Management Plan Guidelines and the principles of the EPBC Act Environmental Offsets Policy. The action must not commence until the Offset Strategy has been approved by the Minister in writing. The approved Offset Strategy must be implemented and published on the website. The Offset Strategy must:

- a. Provide a written description and map that clearly defines the location and boundaries of the proposed offset area(s) for Lowland rainforest and includes offset attributes and shapefiles*
- b. Include timelines and mechanisms for legally securing the offset area(s)*
- c. Demonstrate the presence of Lowland rainforest in the proposed offset area(s) and the quality of the Lowland rainforest in the proposed offset area(s), including evidence that it meets the threshold criteria for Lowland rainforest*
- d. Commit to ecological outcomes and offset completion criteria for Lowland rainforest and the timeframes in which these will be achieved*

- e. *Include time bound performance and completion criteria for evaluating that ecological outcomes have been achieved and criteria for triggering remedial action*
- f. *Commit to a program to monitor and report on progress against the performance and completion criteria.*

The Lowland Rainforest of Subtropical Australia TEC is listed as critically endangered under the EPBC Act. It primarily occurs from Maryborough in Queensland to the Clarence River (near Grafton) in New South Wales. The TEC is generally a tall, closed forest vegetation community with a relatively low abundance of species from the genera *Eucalyptus*, *Melaleuca* and *Casuarina*. This TEC typically has a high diversity of rainforest species and is closely associated with a number of Regional Ecosystems (REs) that are known to occur in the Project region, including RE 12.3.1 and RE 12.11.10.

The Project will directly impact two areas of Lowland Rainforest TEC, totalling 0.19 ha, including the riparian zone of Six Mile Creek (0.16 ha) and an area in the railway corridor (0.03 ha). The Commonwealth Listing Advice on Lowland Rainforest of Subtropical Australia (TSSC, 2011) prescribes a buffer zone that extends 50 m beyond the trunks of the outermost trees in the patch to assist in the preservation of the patch, as 50 m is the likely maximum height of a tree in the community and will encompass an area large enough to protect the root zone of the edge trees. Therefore the impact area has been increased by 1.81 ha of Lowland Rainforest TEC within 50 m of the Project clearing boundaries (to account for potential indirect impacts considered by DAWE to be a permanent loss in the future). Therefore the revised total impact area requiring offset has been mapped as 2.0 ha.

1.2.2 Timing of offset requirements

The commencement of the Project action is scheduled to occur in June 2020.

The Lowland Rainforest TEC Offset Strategy must be approved prior to commencement.

The offset areas will be legally secured prior to commencement, or at least within four months following commencement.

The actions and management outlined in this Offset Strategy shall be delivered and achieved by TMR (or on behalf of TMR) by the 10th anniversary of the baseline surveys of the offset areas, anticipated to occur by June 2030. Reporting of completion of ecological outcomes will be provided in annual compliance reporting at the end of the 5th year following baseline surveys, and at five-yearly intervals after that until the completion criteria have been met (and confirmed by DAWE), or the term of the approval (whichever is sooner).

1.2.3 Approval conditions reference table

The approval conditions are addressed in the relevant sections of this Offset Strategy as set out in Table 1-1.

Table 1-1 Approval conditions reference table

Condition	Timing	Evidence of compliance	Section of Report
13 Submit Offset Strategy for Lowland Rainforest TEC (this report) to DAWE for approval	Prior to commencement	Provide Offset Strategy (this report) to DAWE and publish approved Offset Strategy on website	Table 1-1 Approval conditions reference table Table 2-2 Timing of legally securing and approval requirements

Condition	Timing	Evidence of compliance	Section of Report
13 Prepare Offset Strategy in accordance with the Environmental Management Plan Guidelines and the principles of the EPBC Act Environmental Offsets Policy	Prior to commencement	Provide Offset Strategy (this report) to DAWE	Section 8 Compliance with EMP Guidelines Section 9 Compliance with Offsets Policy
13a Provide written description and map in Offset Strategy	Prior to commencement	Publish approved Offset Strategy on website	Section 2.1.1 Property descriptions
13b Timelines and mechanisms for legally securing	Prior to commencement, or at least within four months following commencement	Within 20 business days (bd) of legally securing (each offset site separately), provide to Department the date of legally securing and electronic spatial data and offset attributes	Section 2.1.2 Process for legally securing offset sites
13c Demonstrate presence of TEC (complete baseline surveys)	Prior to or within six months of legally securing	Compliance reporting (within one year of commencement)	Section 3.2 Results Section 4 Baseline surveys
13d Ecological outcomes and completion criteria	Commit prior to commencement	Compliance reporting (within one year of commencement)	Section 5 Ecological outcomes and performance indicators
13e Criteria for performance, completion and triggers for remedial action	Commit prior to commencement	Compliance reporting (within one year of commencement)	Section 5 Ecological outcomes and performance indicators Section 6 Management and monitoring programs
13f Program to monitor and report on progress	Commit prior to commencement	Compliance reporting (within one year of commencement)	Section 6 Management and monitoring programs

1.3 Purpose of this report

The purpose of this report is to address Condition 13 of the Project conditions of approval, under the EPBC Act. Condition 13 states that an Offset Strategy is required to guide the delivery of the offset for the Lowland Rainforest of Subtropical Australia TEC and to demonstrate how delivery of the offset for the Lowland Rainforest TEC will be achieved.

1.4 Roles and responsibilities

The overarching responsibility for the satisfaction of conditions relating to this Offset Strategy belongs to TMR.

The registered owners of the land will be responsible for the management of their relative offset areas in accordance with this Offset Strategy, being TMR and Sunshine Coast Council (SCC). The contact details for these agencies are provided in Table 1-2.

Table 1-2 Responsible agency contact details

No. land parcels	Offset site name	Registered owner	Contact details
1	Woondum offset area	Department of Transport and Main Roads (TMR)	Postal address: PO Box 183, Gympie QLD 4570 Phone: (07) 5482 0333 General email: brucehwyc2c@tmr.qld.gov.au Contact person 1: Adam Whittaker (mobile: 0490092665; email: adam.m.whittaker@tmr.qld.gov.au) Contact person 2: Justin Sanderson (mobile: 0429549275; email: justin.k.sanderson@tmr.qld.gov.au)
1	Kawana offset area	Sunshine Coast Council (SCC)	Postal address: Locked Bag 72, Sunshine Coast Mail Centre QLD 4560 Contact person: Steven Milner (mobile: 0488681001; email: steven.milner@sunshinecoast.qld.gov.au)

The owners and/or TMR will engage the following specialist contractors as required in accordance with this Offset Strategy:

- Suitably qualified person/s (SQP) to undertake baseline and monitoring surveys
- Planting contractors to undertake replanting and rehabilitation programs
- Weed control contractors to undertake weed management programs
- Contractors for maintenance or installation activities, such as fencing

It will be the responsibility of these contractors to undertake their operations in accordance with this Offset Strategy, as applicable.

1.5 Report structure

This Offset Strategy report contains the following information:

- In Section 1, the introduction provides a brief description of the Project, the EPBC Act approval and offset requirements.
- In Section 2, the proposed offset sites are described and the process for legally securing the offset sites is outlined.
- In Section 3, the field verification of suitability of offset sites is outlined, including the method and results of field studies.
- In Section 4, baseline and monitoring survey requirements to inform the management and monitoring activities.
- In Section 5, performance indicators and completion criteria are described, in terms of how the offset sites will achieve the ecological outcomes.
- Section 6, specific management and monitoring activities to achieve ecological outcomes and performance indicators.
- In Section 7, the Offset Strategy's compliance with the Environmental Management Plan Guidelines.
- In Section 8, the Offset Strategy's compliance with the Environmental Offsets Policy

1.6 Assumptions

Certain assumptions have been made in the preparation of this Lowland Rainforest Offset Strategy, based on knowledge to date of the sites, documented community characteristics and standard methods of assessment. Assumptions include:

- The proposed intent and management of the offset sites will satisfy the expectations of the Queensland Government for approving the Voluntary Declaration over the subject land.
- The on-site communities will be of a similar condition during baseline surveys as in previous site assessments. Vegetation condition was assessed at a point in time and in representative locations and can change in response to extreme events such as drought, flood or fire.
- The field assessment results are based on sample data from the sites (not a complete baseline survey) that were accessible and able to be surveyed within offset land parcels. Where available, desktop information and mapping was used to further inform results.
- The habitat quality scores can only be entered as whole amounts in the offset assessment guide calculator, therefore habitat quality scores have been rounded up or down to the nearest integer. Other assumptions have also been made in the offset assessment guide calculator, such as risk of loss percentage and confidence in result percentage. The offset assessment guide has been used to assess the adequacy of the proposed offset sites, however following legal securing of the offset sites, monitoring data will only be compared to baseline data (yet to be obtained) going forward.
- Once the offset areas are legally secured, the indicative dates (and potentially seasonal timing) of future survey events and milestones may need to be amended accordingly.

1.7 Limitations

This report: has been prepared by GHD for the Department of Transport and Main Roads (TMR) and may only be used and relied on by TMR for the purpose agreed between GHD and TMR as set out in Section 1.3 of this report.

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

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

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

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.6). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Offset delivery

2.1 Direct offsets

A direct land-based offset is proposed to compensate for impacts to the TEC. The proposed offset sites are formally described as Lot 2 on SP302526 (Woondum) and Lot 802 on SP244924 (Kawana), located within the Gympie Region (Kybong) and Sunshine Coast Region (Birtinya) respectively. These sites currently contain a total of approximately 18.20 ha of Lowland Rainforest of Subtropical Australia habitat (assessed through desktop review and field surveys as meeting the diagnostic characteristics and condition thresholds for the TEC). It is also proposed to secure and manage an additional 3.8 ha of vegetated buffer on the Woondum offset site and approximately 10.4 ha of vegetated buffer on the Kawana offset site in order to further protect the existing TEC.

Legal security will be provided over the offset areas within the subject land parcels to protect the TEC areas and associated vegetated buffer zones and allow for monitoring and management of the offsets. Protection will be in the form of a Voluntary Declaration under the *Vegetation Management Act 1999* (VMA), which is described in Section 2.1.2.

2.1.1 Property descriptions

The proposed offset sites have been verified based on desktop assessments and sample field validation. A description of each of these sites is included in Table 2-1.

Table 2-1 Description of Lowland Rainforest TEC offset sites

Offset Site Name	Property description	TEC Offset Area (ha)	Location and proximity to Project	Owner
Woondum	Lot 2 SP302526	2.72	93 Woondum Road, Kybong, Gympie Region. Positioned 215 m east of the Project area.	TMR
Kawana	Lot 802 SP244924	15.48	Kawana Way, Birtinya, Sunshine Coast Region. Positioned approx. 67 km south-east of the Project area.	SCC

Woondum

The Woondum site is located on land formally described as Lot 2 on SP302526 in the Gympie Regional Council (GRC) local government area (refer to Figure 1). The property is freehold tenure, owned by TMR. The offset site has a total area of 2.72 ha. There is a vegetated buffer zone to the north and south of the TEC patch covering 3.8 ha that will also be secured and managed along with the offset area.

Lot 2 on SP302526 is bordered to the north and east by freehold lots that adjoin Woondum State Forest, which also connects to the north-east boundary of Lot 2 on SP302526. To the west is cleared rural land and the existing and proposed Bruce Highway alignments. To the south is the existing and proposed Bruce Highway alignments.

The offset area will be managed by TMR in accordance with the Offset Strategy, along with adjacent offset areas to be included on the lot for koala habitat and black-breasted button-quail habitat (to be managed in accordance with the Offset Management Plan).

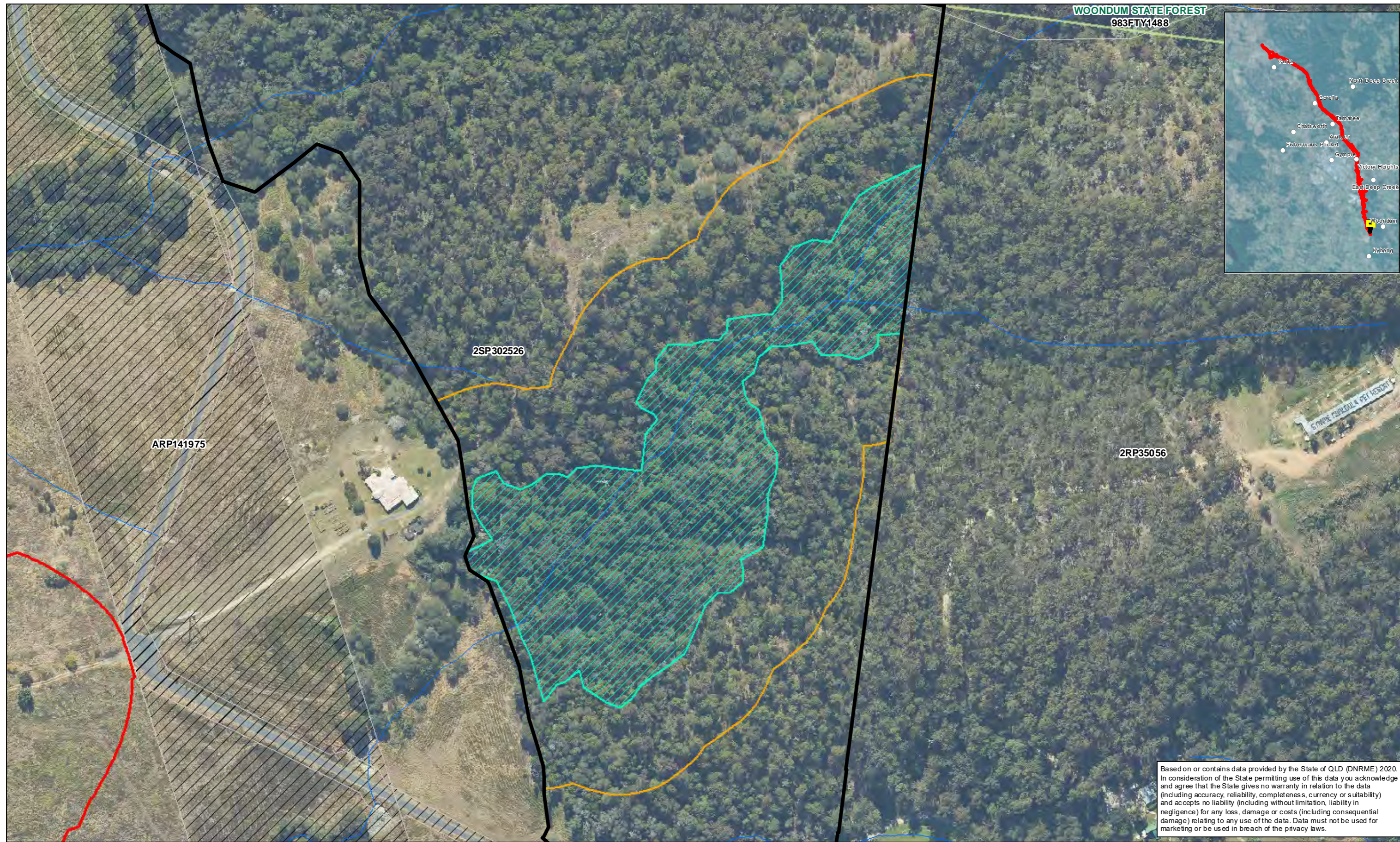
The existing residence within the cleared western portion of the lot will potentially be tenanted for the duration of the management period.

Kawana

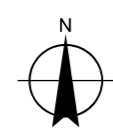
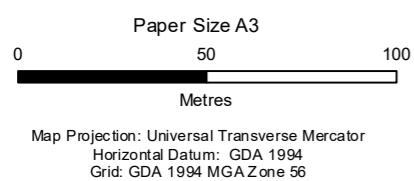
The Kawana site is located on land formally described as Lot 802 on SP244924 in the Sunshine Coast Council local government area (refer to Figure 2). The property is reserve tenure, in trust to Sunshine Coast Council. A patch of Lowland Rainforest TEC was identified in the south-west of Lot 802 and was mapped as covering an extent of 15.48 ha. There is a vegetated buffer zone surrounding the TEC patch covering 10.4 ha, however this zone is reduced on the northern and western sides due to clearing at the boundary and on the adjacent property. This buffer zone will also be managed in accordance with the Offset Strategy and as part of the Council reserve.

Lot 802 on SP244924 is bordered to the north and north-east by a freehold property containing the Kawana Sewage Treatment Plant. To the west is a freehold property (Lot 800 on SP243716), a reserve (Lot 455 SP244924) in trust of SCC, and Meridian Way (a local road). The Mooloolah River National Park is situated further north and north-east, separated from these areas by the Mooloolah River and its tributaries. To the east and south of Lot 802 are urban areas that are part of Birtinya township. There is a proposed pipeline easement along the north-western boundary of the property that adjoins the vegetated buffer zone.

The offset area will be legally secured, and managed by Sunshine Coast Council in accordance with the Offset Strategy. The Council will also manage surrounding reserve and freehold lots for environmental conservation purposes.



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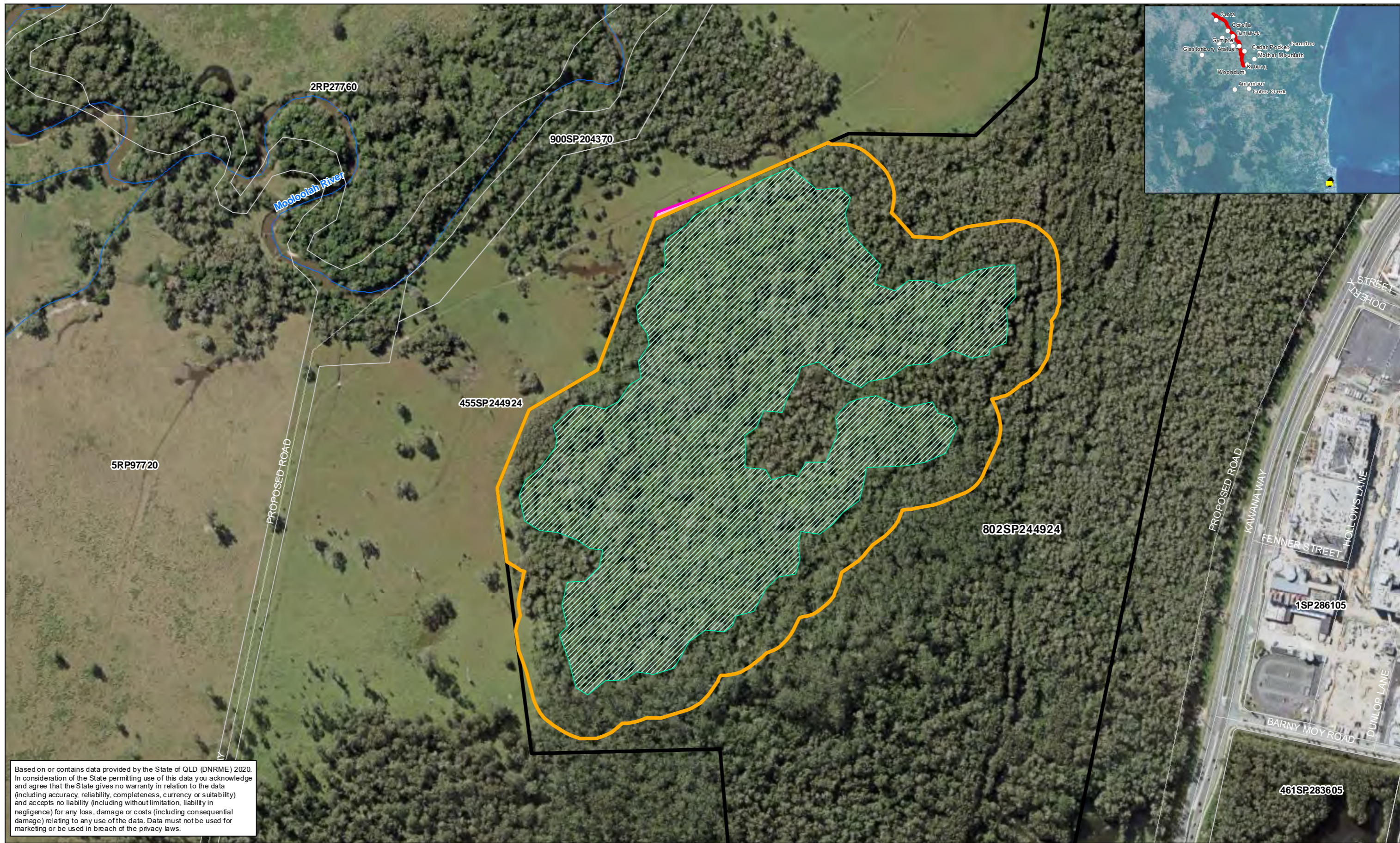


LEGEND	
	Watercourses
	State Forest
	Project Footprint
	Threatened Ecological Community (TEC)
	TEC Offset Vegetated Buffer
	Cadastral
	Easement



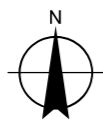
Department of Transport and Main Roads	Job Number	41-29914
Bruce Highway Cooroy to Curra (Section D: Woodnum to Curra)	Revision	C
	Date	21 Feb 2020

Woondum TEC Offset Area **Figure 1**



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Paper Size A3
0 20 40 60 80 100
Metres



Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Road/Track
- Watercourses
- Cadastre
- Lot Boundary
- Threatened Ecological Community (TEC)
- TEC Offset Vegetated Buffer
- Project Footprint
- Future Easement



Department of Transport and Main Roads
Bruce Highway Cooroy to Curra
(Section D: Woodnum to Curra)

Job Number 41-29914
Revision C
Date 20 Feb 2020

Kawana TEC Offset Area

Figure 2

2.1.2 Process for legally securing offset sites

TMR proposes to use a Voluntary Declaration (VDec) to secure the offset sites identified in Table 2-1. A VDec is an option under the VMA that provides a simplified, streamlined process for landholders to voluntarily protect areas of native vegetation not otherwise protected by the VMA. A VDec can be used to protect areas of high nature conservation values or areas vulnerable to land degradation, and to secure areas of land to satisfy statutory offset requirements. The TEC offset areas form part of a larger group of offset areas that will be legally secured through the VDec process to offset potential impacts to other MNES.

TMR will follow the process outlined in the *Guide to Voluntary Declarations under the Vegetation Management Act 1999 (effective 21 June 2019)* to obtain the VDec, which is summarised below.

TMR will send a Request for a Voluntary Declaration to the Queensland Department of Natural Resources, Mines and Energy (DNRME), which will include written consent from all registered owners of the proposed offset areas, a description of the purpose of the VDec and how the area meets the criteria of high nature conservation value, and a copy of the Offset Management Plan signed by TMR (which will include this Offset Strategy).

DNRME will assess the VDec request to ensure it meets all criteria required and to ensure the management plan contains the appropriate elements to ensure the declared area is managed to achieve the desired outcomes.

Once DNRME is satisfied that the VDec request meets the criteria for a declaration, a VDec offer will be sent to TMR for their consideration. The offer will contain a draft:

- Declaration notice
- Declared area code (if proposed)
- Property Map of Assessable Vegetation (PMAV) showing the area as Category A vegetation, giving it a similar level of protection as endangered regional ecosystems within a Category B area
- Declared area management plan, including map of the declared area

Once DNRME and TMR agree to the offer, DNRME will make the declaration and provide TMR with a finalised VDec package. The declaration takes effect from the date the chief executive signs the declaration notice. The Offset Management Plan has effect under the VDec process from the same date. The VDec will be applied over the sites in perpetuity.

There are no statutory timeframes for the VDec application and approval process, however an indicative timeframe for the process of legally securing the offset sites and the ongoing monitoring and compliance reporting requirements is provided in Table 2-2.

The timeframe for securing the Kawana offset site is uncertain as engaging Sunshine Coast Council requires a tender exemption application to use federal funds under a sole invitee arrangement. The timeframes for this process are variable and at the discretion of the relevant federal government department. Following the approval to use federal funds for the offset, an agreement with the council must be signed, which will then facilitate legally securing the Kawana offset area.

Table 2-2 Timing of legally securing and approval requirements

Stage of work	Timing	Indicative dates
Submission and approval of Offset Strategy (this document)	Prior to commencement	Q2 2020
Offset Strategy published on website	Prior to commencement	Q2 2020
Voluntary Declaration application submission	Prior to commencement, or at least within four months following commencement	Q2 2020
Voluntary Declaration approval and issue	Prior to commencement, or at least within four months following commencement	Q2 2020
Notification within 10 business days of construction works starting	Commencement of action	June 2020
Baseline surveys of TEC in Woondum and Kawana offset sites	Prior to or within six months of legally securing offset areas	Q2 2020 (e.g. May)
Biennial monitoring of TEC in Woondum and Kawana offset sites	Within one year of baseline survey	Q2 in years one, three and five until 2025 (five years), then five-yearly for the term of the approval, or until completion criteria met and as agreed by DAWE
Annual compliance reporting	Within one year of commencement	Annually until ecological outcomes demonstrated and as negotiated with DAWE

Note: The occurrence of the baseline surveys and subsequent monitoring surveys may be amended following legally securing the two offset areas so that timing of events are in appropriate seasons to demonstrate the condition of the sites.

2.2 Indirect actions

As a demonstration of their commitment to protecting and enhancing environmental values in the region, TMR has implemented, in association with local stakeholders, a control program for the restricted invasive pest species *Dolichandra unguis-cati* (cat's claw creeper), which was observed to be impacting the TEC during field surveys for the Project along Six Mile Creek. The cat's claw creeper control program has been developed in consultation with the Mary River Catchment Coordinating Committee (MRCCC) and GRC and will be undertaken in collaboration with Noosa and Gympie Landcare groups, who both have recent experience in undertaking successful control programs of this species within the region. These indirect actions are not currently part of this TEC strategy or the project approval conditions, however they were provided (as part of the Preliminary Documentation stage of the approval process) and implemented as a potential indirect offset that was intended to be included should the direct offsets not satisfy 100% of the offsets requirement.

The control program has been committed to for a period of five years initially, at a cost of \$200,000, with the option to extend it for another five years for an additional cost of \$170,000. TMR received approval from the Department of Infrastructure and Regional Development to allocate funds for this program ahead of construction funding being announced, in order to commence the works early and achieve a conservation gain as soon as reasonably practical.

The cat's claw creeper control program uses a mixture of biological and chemical control methods with the aim of ensuring long term sustainability of the TEC in the region. The

biological control methods involve the release of jewel beetles (*Hylaeogena jureceki*), which are target-specific, can severely damage cat's claw creeper and have been shown in studies to establish and disperse well when released.

The MRCCC undertook field surveys and prepared a map of the extent of cat's claw creeper upstream of the Six Mile Creek Bridge on the current Bruce Highway to the Gympie Regional Council (GRC) boundary near Traveston.

The MRCCC study identified two discrete areas of cat's claw creeper infestations:

- Area 1 – Six Mile Creek at Glanmire/Woondum, which contains heavy infestations on Six Mile Creek from Woondum Road to the confluence with the Mary River at Glanmire. This is the area most affected by the re-alignment of the Bruce Highway as a bridge is required to span Six Mile Creek.
- Area 2 – Six Mile Creek at Traveston, a smaller area that contains isolated moderate level infestations on Six Mile Creek in the Traveston area.

2018-2019 control plan

The key stakeholders (TMR, MRCCC and GRC) agreed to a broad plan of control for the initial year 2018-2019. The partners have worked collaboratively to continue to map the cat's claw creeper infestations, thus building the knowledge of its location. In October 2018, GRC sent a questionnaire to all riparian landholders on Six Mile Creek asking whether they had cat's claw creeper present on their property. Over 40 landholders responded, which has substantially built upon the existing knowledge base of the stakeholders.

Based on bushland regeneration principles of working from the smallest infestation of weeds towards the heaviest infestations, a containment strategy of working from the edges (which have the lightest infestations) towards the heaviest infestations has been identified as an initial control strategy for the first year of the project, particularly in Area 1 where the heaviest infestations occur.

Early detection and rapid response to weed infestations is being implemented in the zone between Area 1 and Area 2, to prevent infestations from becoming significant.

Biological control releases

The biological agent releases for the project are shown in Table 2-3. A new cat's claw vine infestation has been identified in Area 2 upstream of the Howe Road bridge crossing on Six Mile Creek, at the Green property. Biological agents were released and this property has been identified as a priority for 2019/20 works.

The project team has identified evidence of biological control activity and breeding at all release sites.

Table 2-3 Biological control releases

Property	Biocontrol	Number released
Area 1		
Roadcraft	Jewel Beetle	1000
Six Mile Rest Area	Jewel Beetle	1000
Woondum NP	Jewel Beetle	2500

Property	Biocontrol	Number released
Area 2		
Nine Mile Cobb & Co.	Jewel Beetle	1000
Sinclair	Jewel Beetle	600
Green property (39 Howe Rd Traveston, Lot 5 RP212211)	Jewel Beetle	800

Records of biological control releases in this project are being recorded by MRCCC in a database which also records the overall biological control releases throughout the catchment for all MRCCC projects. These releases are also being mapped.

A small number of biological control agents are planned to be released as an engagement tool for new landholders to become involved. This “soft” engagement tool is a method that MRCCC has utilised with other projects as a mechanism of enticing landholders into the program and opens lines of communication with potential landholders. These releases will assist to build viable populations for future control.

This control plan will be reviewed in 2019/20 with the stakeholder group to ensure targets are met and any revisions can be made to the following year control plan. The project team meets regularly with the contractors to track progress and resolve issues early. MRCCC already meet with representatives of Gympie and Noosa Landcare on a monthly basis to track progress of existing projects.

3. Verification of offset sites

3.1 Method

The delivery of offset outcomes has been aimed at achieving the objectives of the EPBC Act Environmental Offsets Policy and the Offsets Assessment Guide tool. The desktop and field assessment methods undertaken at the impact and offset sites and the resulting analysis of data has been comprehensive and guided by standard survey techniques and guidelines such as the:

- Condition thresholds of the Commonwealth Listing Advice on Lowland Rainforest of Subtropical Australia (TSSC, 2011)
- Queensland Guide to determining terrestrial habitat quality (versions 1.2, EHP 2017, current at the time of assessment)
- Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner *et al.*, 2019)
- Documented rapid vegetation condition assessment scale (Keighery scale) (Keighery (1994), cited in Casson *et al.*, (2009))

A combination of standard methods was used in the absence of any mandatory approach for EPBC Act approval offsets. The current method has been applied to both the impact and offset sites, therefore it is a suitable means to compare habitat quality between sites. The information used to demonstrate habitat quality has been suitable for the purpose of identifying the active management procedures and monitoring periods needed for delivering the offset outcomes.

3.1.1 Field assessment

Following a desktop assessment of potential offset sites, a field assessment was undertaken to verify the suitability of the properties listed in Table 2-1 for use as offset sites for Lowland Rainforest TEC.

Targeted field assessment of Lot 2 SP302526 was undertaken by two ecologists between 27 and 29 April 2017.

The field assessment of Lot 802 on SP244924 was undertaken by two ecologists as part of an ecological field survey of multiple properties over a four-day period between 19 and 22 August 2019.

The following activities were undertaken during the field assessment of both locations:

- Description of the vegetation communities and identification of RE types using Quaternary level vegetation assessments in accordance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner *et al.*, 2019 – current version), including the following information as evidence of the presence or absence of the Lowland Rainforest TEC:
 - Soil type and landform
 - Structure type of the vegetation community, including estimated height ranges, median heights and canopy covers
 - Flora species present in order to confirm whether the vegetation community includes more than 30 woody species from Appendix A of the Commonwealth's listing advice for the TEC, as well as the presence of persistent residual trees from Appendix B of the Commonwealth's listing advice

- Native vegetation cover and weed cover.
- Rapid vegetation condition assessment based on the vegetation condition scale developed by Keighery (1994), cited in Casson et al., (2009). The scale refers to the degree of change in the structure, density and species present in native vegetation communities, in relation to undisturbed 'pristine' native vegetation of the same type, and has been widely used in rapid assessment techniques of vegetation condition, particularly in Western Australia
- Targeted assessments were undertaken where potential areas of TEC were observed to determine whether the community meets the EPBC Act threshold criteria in terms of extent, structure, condition and species characteristics
- Spatial boundary of the vegetation community was captured using a hand-held global positioning system
- Recording of additional site characteristics such as:
 - Extent and vegetation communities present in areas adjoining the TEC patch
 - Existing disturbances/impacts
 - Weed cover and type
 - Presence of waterways
 - Erosion risk (based on stability of banks)
 - Site constraints (e.g. access, terrain)
- A BioCondition plot (Eyre et al., 2015) within the TEC community to collect more detailed information about the species composition and structure (Kawana site only)

3.1.2 Habitat quality assessment

In order to provide inputs relevant to the EPBC Act offsets calculator, relevant desktop and site assessment data was used to determine a habitat quality score (0-10), being a combination or average of scores for site condition, site context and species stocking rate. The scoring categories used are described in the sections below.

To obtain a final habitat quality score, each site was weighted according to its size (hectares) and weighted scores were added to determine the overall habitat quality score for the offset sites (score out of 10).

Site condition

This component is the condition of a site in relation to the ecological requirements of the ecological community, including considerations such as:

- Vegetation condition and structure
- Diversity of relevant habitat species present including endemic and non-endemic
- Number of relevant habitat features

As stated in the listing advice, patches that are larger, more species rich and less disturbed are likely to provide greater biodiversity value (TSSC, 2011). Site condition categories have been amended since the Preliminary Documentation stage to relate to the patch types in the listing advice (while still meeting the minimum condition thresholds in the listing advice), as well as key degrading factors present such as aggressive weed species, cleared/disturbed areas, and edge effects.

A score out of 10 was attributed for site condition for each offset area, as per Table 3-1.

Table 3-1 Site condition score categories

Score	Site condition description
1	Patch Type C: Non-remnant patch (cleared <15 years ago); >30 native woody species (Appendix A); some areas where canopy cover >70%; some areas of <50% native vegetation cover; patch size >2 ha
2	Patch Type C: Regrowth (not cleared for 15 years); >30 native woody species (Appendix A); some areas where canopy cover >70%; some areas of <50% native vegetation cover; patch size >2 ha
3	Patch Type C: Regrowth (not cleared for 15 years); >30 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; patch size >2 ha
4	Patch Type B: Mature regrowth or disturbed remnant with some residual/mature trees; >30 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; multiple sources of disturbance; evidence of edge effects; patch size >1 ha
5	Patch Type B: Remnant with some residual/mature trees; >30 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; multiple sources of disturbance; evidence of edge effects; patch size >1 ha
6	Patch Type B: Remnant with some residual/mature trees; >30 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; areas of aggressive weed infestations and/or other disturbances affecting canopy cover and/or native vegetation cover; patch size >1 ha
7	Patch Type A: Remnant with persistent residual/mature trees; >40 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; some areas of aggressive weed infestations; some other disturbances present/unmanaged; patch size >2 ha
8	Patch Type A: Remnant with persistent residual/mature trees; >45 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; little to no aggressive weeds present; limited other disturbances present; patch size >2 ha
9	Patch Type A: Remnant with persistent residual/mature trees; >45 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; little to no aggressive weeds present; patch size >5 ha
10	Patch Type A: Remnant with persistent residual/mature trees; >50 native woody species (Appendix A); canopy cover >70%; >50% native vegetation cover; no aggressive weeds present; patch size >10 ha

Site context

This component is 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 community, including considerations such as movement patterns of the species, threats on or near the site, connectivity to other areas of suitable habitat, and the role of the site in relation to the overall population or extent of a species or community (DSEWPC, 2012).

The method within the Queensland EHP's *Guide to determining terrestrial habitat quality* (version 1.2 April 2017, in which site context methods are consistent with the BioCondition Assessment Manual (Eyre, *et al.*, 2015)) was used as a basis for determining site context scoring method. This method involved a desktop-based assessment (using GIS mapping layers) that considered:

- Total remnant patch size
- Connectedness (proportion, as a percentage, of a site's boundary that is connected to remnant vegetation)
- Context (percentage of remnant vegetation within a 1 km buffer)
- Ecological corridors (proximity to mapped State, bioregional, regional or sub-regional terrestrial or riparian corridors)

Scores were allocated based on the categories shown in Table 3-2.

The score for each site was converted to a score out of 10 as per the following equation:
 $(\text{Sum of site context scores (measured)} / \text{Maximum site context score (26)}) \times 10 = \text{Site Context Score out of 10}$

Table 3-2 Site context scoring categories

Attribute	Scoring Categories					
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 % remnant	>10-30 % remnant	>30-75 % remnant	>75 % remnant	
Ecological Corridors	Score	0	4	6		
	Description	Not within a corridor	Sharing a common boundary	Within a corridor (whole or part)		

Species stocking rate

The species stocking rate considers usage and/or density of a species at a particular site, which in the case of a TEC may be a number of different species populations, and includes consideration of the role of the site population in regards to the overall species population viability or community extent (e.g. presence of the species/community, role of the site population in regards to the overall species populations). From the listing advice, values such as recruitment of key native plant species or presence of a range of age cohorts, good fauna habitat, presence of listed species, and where patches occur are regarded as important biodiversity values for assessing management and recovery of the TEC. Species stocking rate categories have been amended since the Preliminary Documentation stage to relate to the role of the site populations to overall population viability through key species recruitment and habitat linkage, and other species-related characteristics such as ecosystem functioning as valuable fauna habitat.

A score out of 10 was attributed for species stocking rates for each offset area as per Table 3-3.

Table 3-3 Species stocking rate scoring categories

Score	Ecosystem and population functioning	Role of site to overall populations
1	No evidence of canopy species recruitment; One or less fauna habitat feature types present (e.g. mature trees, waterways, habitat logs/hollows, movement corridors); No listed threatened species known or likely to occur	No ecological connectivity/linkage; surrounded by heavily cleared and degraded land
2	Rare canopy species recruitment; One or less fauna habitat feature types present; No listed threatened species known or likely to occur	Limited ecological connectivity/linkage; surrounded by heavily cleared and degraded land

Score	Ecosystem and population functioning	Role of site to overall populations
3	Occasional canopy species recruitment; Two or less fauna habitat feature types present; No listed threatened species known to occur, one or more may occur	Limited ecological connectivity/linkage; surrounded by heavily cleared and degraded land
4	Occasional canopy species recruitment; Two or less fauna habitat feature types present; No listed threatened species known to occur, one or more may occur	Some ecological connectivity/linkage; surrounded by both cleared and degraded land mixed with remnant habitats
5	Occasional canopy species recruitment; Greater than two fauna habitat feature types present; No listed threatened species known to occur, one or more may occur	Some ecological connectivity/linkage; surrounded by both cleared and degraded land mixed with remnant habitats
6	Frequent canopy species recruitment; Greater than two fauna habitat feature types present; No listed threatened species known to occur, one or more likely to occur	Some ecological connectivity/linkage; surrounded by both cleared and degraded land mixed with remnant habitats
7	Frequent canopy and other strata species recruitment; Greater than three fauna habitat feature types present; One listed threatened species known to occur in or around habitat	Some ecological connectivity/linkage; nearby and connecting with remnant and diverse habitats
8	Abundant canopy and other strata species recruitment; Greater than three fauna habitat feature types present; One listed threatened species known to occur in or around habitat	Good ecological connectivity/linkage; nearby and connecting with remnant and diverse habitats
9	Abundant canopy and other strata species recruitment; Presence of a range of age cohorts; Greater than five fauna habitat feature types present; One listed threatened species known to occur within the habitat	Good ecological connectivity/linkage; surrounded by remnant and diverse habitats
10	Abundant canopy and other strata species recruitment; Presence of a range of age cohorts; Greater than five fauna habitat feature types present; More than one listed threatened species known to occur within the habitat	Good ecological connectivity/linkage; surrounded by remnant and diverse habitats

3.2 Results

3.2.1 Site Characteristics

Woondum

An area of 2.72 ha of TEC (Araucarian vine forest) was identified during the field assessments of the Woondum site. The area contains RE 12.11.10 (mapped as RE 12.11.3), consistent with the TEC and meets the key diagnostic and condition thresholds, including the presence of 41 species from Appendix A of the listing advice for Lowland Rainforest TEC. The vegetation was described as closed vine forest dominated by *Araucaria cunninghamii* with an estimated canopy cover of 80% and median canopy height of 25 m. There is low weed cover (*Lantana camara* (lantana) and *Passiflora spp.* (passionflower)). Representative photos are provided in Plate 3-1 and Plate 3-2.

There is an ephemeral drainage line with stony soils and low erosion risk (moderately stable), with some access difficulties and the presence of an old logging track.

Buffer zones to the TEC patch on the same lot contain:

- RE 12.11.5 to the south (mapped as 12.11.3) with vegetation structure altered by multiple disturbances from past logging and weeds (dense lantana, passionflower), low erosion risk, no access tracks present.
- RE 12.11.10 to the north with vegetation structure altered by multiple disturbances from past logging and weeds (dense lantana and cat's claw creeper). This area was not considered to contain the Lowland Rainforest TEC due to being highly degraded with >50% weed cover and with open forest structure dominated by *Eucalyptus propinqua*. Waterway with channel erosion present.
- There is cleared land to the west of the TEC with an existing residence nearby.

Representative photos of the vegetated buffer zone are provided in Plate 3-3 and Plate 3-4.

Threats to the integrity of the TEC area include edge effects, weed introductions and spread, and clearing and weed disturbances within the buffer zone (high weed densities including lantana).

This parcel of land is connected through vegetated areas to Woondum State Forest, which also contains identified areas of Lowland Rainforest TEC.



Plate 3-1 Photographs of Woondum TEC patch (Source: GHD, 2017)



Plate 3-2 Photographs of Woondum TEC patch (Source: GHD, 2017)



Plate 3-3 Photographs of Woondum TEC buffer zone vegetation (Source: GHD, 2017)



Plate 3-4 Photographs of Woondum TEC buffer zone vegetation (Source: GHD, 2017)

Kawana

A large patch of TEC was identified in the south-west of the Kawana site and was mapped as covering an extent of 15.48 ha. The canopy layer was largely dominated by *Archontophoenix cunninghamiana* (piccabeen palm) with rainforest tree species also recorded in the canopy layer. The highest species diversity was recorded at the edges of the mapped TEC. This community met the structure and composition to constitute RE 12.3.1. The TEC is shown in Plate 3-5.

The results of the BioCondition assessment recorded a canopy cover of 91.7 percent across the 100 m transect. A total of 49 non-eucalypt trees with a diameter at breast height (DBH) of greater than or equal to 300 mm was recorded within the 50x100 m plot area. The cover of introduced species across the polygon was less than five percent, including lantana and *Solanum seaforthianum* (Brazilian nightshade). Areas of higher density weeds were often associated with the edges of vegetated areas or natural disturbance features such as fallen trees. A weed patch within the TEC is shown in Plate 3-6.

Buffer zones to the TEC patch on the same lot contain:

- To the west and north-west is a narrow vegetated buffer area containing up to 20 m wide regenerating ecotone mid-dense forest dominated by *Melaleuca* with a mix of vine species and juvenile canopy species from RE 12.3.1 and 12.3.5 in the understorey. Pioneers species such as *Macaranga* were also present on the very edge. This area has light to moderate weed cover (<15%) and is adjacent to cleared land with slashed introduced grasses on the adjoining property to the west and north-west. There is sparse occurrence of the weed *Schinus terebinthifolius* (broadleaf pepper tree) along the property boundary. This vegetation is shown in Plate 3-7.
- To the east and north-east is remnant RE 12.3.5 *Melaleuca quinquenervia* open forest.
- To the south is a band of RE 12.3.2 dominated by *Eucalyptus microcorys*.

There is an internal vehicle track to the east of the TEC and the broader surrounding vegetation is dominated by *Melaleuca quinquenervia* open forest.

The overall site undergoes periodic inundation during high rainfall events, making access difficult at these times.



Plate 3-5 Photograph of Kawana TEC patch (Source: GHD, 2019)



Plate 3-6 Photograph of lantana patch in area of fallen tree (Source: GHD, 2019)



Plate 3-7 Photograph of buffer zone (from outer edge) (Source: GHD, 2019)

3.2.2 Assessment against criteria

An assessment of the TEC polygons within the proposed offset sites against the key diagnostic characteristics of the Commonwealth Government’s listing advice is provided in Table 3-4. The Lowland Rainforest TEC also has minimum condition thresholds that describe condition class variables, such as overstorey projected foliage cover and native species diversity. Table 3-5 outlines the condition thresholds and the conformance of each of the proposed offset sites against those conditions.

Table 3-4 Assessment of offset sites against key diagnostic characteristics

Key diagnostic characteristics of Lowland Rainforest TEC	Characteristics of Woondum TEC	Characteristics of Kawana TEC
Distribution of the ecological community is primarily in the NSW North Coast and South Eastern Queensland bioregions, according to Interim Biogeographic Regionalisation for Australia (IBRA) version 7 (Commonwealth of Australia, 2012)	Located with the South Eastern Queensland bioregion	Located within the South Eastern Queensland bioregion
The ecological community occurs on soils derived from basalt or alluvium or enriched rhyolitic soils or basaltically enriched metasediments	The vegetation community occurs on sandy loam soils within a drainage line gully (alluvial)	The vegetation community occurs on alluvial soils

Key diagnostic characteristics of Lowland Rainforest TEC	Characteristics of Woondum TEC	Characteristics of Kawana TEC
The ecological community generally occurs at an altitude less than 300 m above sea level	Located between approximately 80 and 110 m above sea level	Located at approximately 10 m above sea level
The ecological community typically occurs in areas with high annual rainfall (>1,300 mm)	Occurs in an area with an average annual rainfall of 1,123.5 mm (Gympie weather station No. 40093) (although the average annual rainfall is below the key diagnostic characteristic of the TEC, there are multiple years within the available climatic data that exhibit rainfall data higher than 1,300 mm)	Occurs in an area with an average annual rainfall of 1,466.2 mm (Sunshine Coast Airport weather station No. 40861)
The ecological community is typically more than 2 km inland from the coast	Located approximately 36 km inland from the coast	Located approximately 3 km inland from the coast
The structure of the ecological community is typically tall (20 – 30 m) closed forest, often with multiple canopy layers	Vegetation community occurs as a closed forest (80% estimated canopy cover) with median canopy tree heights of approximately 25 m and multiple tree layers	Vegetation community occurs as a closed forest (91.7% canopy cover) with recorded canopy tree heights of approximately 25 m and multiple tree layers
Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A)	The vegetation community has patches with high species richness, including 41 woody species from Appendix A of the listing advice	The vegetation community has 42 woody species from Appendix A of the listing advice

Table 3-5 Assessment of offset sites against condition thresholds

Condition thresholds		Conformance with condition thresholds	
		Woondum	Kawana
Patch type (evidence of remnant vegetation and regeneration status)	Natural remnant evident by the persistence of mature residual trees from Appendix B AND	Conforms – vegetation is remnant vegetation with persistent mature trees from Appendix B	Conforms – vegetation is remnant vegetation with persistent mature trees from Appendix B

Condition thresholds		Conformance with condition thresholds	
		Woondum	Kawana
Patch size (excludes buffer zone)	≥ 0.1 ha AND	Conforms – vegetation community is approximately 2.72 ha	Conforms – vegetation community is approximately 15.48 ha
Canopy cover (over entire patch)	Emergent/canopy/sub-canopy cover is ≥ 70% AND	Conforms – canopy cover was estimated as 80%	Conforms – canopy cover was assessed as 91.7%
Species richness (over entire patch)	Contains ≥ 40 native woody species from Appendix A AND	Conforms – contains >41 woody species from Appendix A	Conforms – contains >42 woody species from Appendix A
Percent of total vegetation cover that is native (use sample plot)	≥ 70% of vegetation is native	Conforms – weeds were present only in low densities	Conforms – the cover of introduced species was approx. <5%

3.2.3 Habitat quality scores

The existing habitat quality scores for each TEC offset area and as a combined total (derived from desktop and field assessments) are provided in Table 3-6. The predicted future habitat quality scores are provided in Table 3-7 (with offset) and Table 3-8 (without offset).

Table 3-6 Habitat quality scores

Offset site	Area (ha)	Site condition	Site Context	Species Stocking Rate	Combined Score	Size Weighting	Weighted Score
Woondum	2.72	7	7.3	7	7.1	0.15	1.06
Kawana	15.48	7	8.1	6	7.0	0.85	5.98
						Total	7.04

Table 3-7 Future habitat quality scores (with offset)

Offset site	Area (ha)	Site condition	Site Context	Species Stocking Rate	Combined Score	Size Weighting	Weighted Score
Woondum	2.72	8	7.3	7	7.4	0.15	1.11
Kawana	15.48	8	8.1	7	7.7	0.85	6.55
						Total	7.66

Table 3-8 Future habitat quality scores (without offset)

Offset site	Area (ha)	Site condition	Site Context	Species Stocking Rate	Combined Score	Size Weighting	Weighted Score
Woondum	2.72	6	7.3	6	6.4	0.15	0.96
Kawana	15.48	6	8.1	5	6.4	0.85	5.42
						Total	6.38

3.2.4 Offset Assessment Guide Outcomes

The inputs and outputs of the offset assessment guidance tool are provided in Table 3-9.

The result of the Offsets Assessment Guide indicates that the proposed offset areas provide 107.73% direct offsetting of the potential impact to the TEC.

Table 3-9 TEC offset calculator guide

Components	Description of Input	Calculator Input
IMPACT CALCULATOR		
Area of community	2.0 ha of TEC habitat with a quality score of 7.2 (rounded down to 7 in the calculator) to be impacted (0.19 ha TEC directly cleared + 1.81 ha TEC potentially indirectly impacted adjacent the Project)	Total quantum of impact (adjusted) = 1.4 ha
OFFSET CALCULATOR		
Risk-related time horizon (max. 20 years)	A maximum 20 year period has been applied as the land will be legally secured	20 years
Time until ecological benefit	A 10 year period has been applied with active management measures proposed for the first five years (minimum) through weed control, access restriction, planting and monitoring for additional disturbances to be managed (both within the TEC and the vegetated buffer zone)	10 years
Start area (hectares)	18.20 ha in total (15.48 + 2.72 ha)	18.20 ha
Start quality (scale of 0-10)	A total weighted starting habitat quality score of 7 has been derived for the two TEC patches combined	7
Risk of loss (%) without offset	The risk of loss without the offset in place is low for the Kawana offset area, due to the site being on a reserve-tenured lot owned by Sunshine Coast Council and managed as an environmental reserve. However placing the patch of TEC and vegetated buffer zone under a Voluntary Declaration will afford it greater security from future development or other direct or indirect impacts. The area of mapped endangered RE 12.3.1 is significantly smaller than the verified TEC area that will be secured, in addition to the vegetated buffer zone. The risk of loss is higher for the Woondum offset area due to the land being freehold and zoned Industry Investigation Area under the Gympie Regional Council Planning Scheme 2013. There are existing and surrounding land uses that would be continued and likely intensified (without the need for an approval) if the offset proposal does not proceed that are likely to cause additional disturbances without the offset site and vegetated buffer zones being protected and	0 %

Components	Description of Input	Calculator Input
	<p>managed. The area of mapped RE 12.11.10 on this site is smaller than the verified TEC area, with a status of least concern, which has multiple exemptions for clearing on freehold land.</p> <p>However the risk of loss was kept at 0 % for the combined sites.</p>	
<p>Future quality without offset (scale of 0-10)</p>	<p>Without protection and management, the habitat quality is considered likely to decrease significantly over the 10 year timeframe in accordance with the habitat quality scoring categories (i.e. reduced species richness, increased aggressive weed infestations, additional or unmanaged disturbances, reduced canopy species recruitment, increased fragmentation, reduced patch size, decreased fauna habitat values). This is largely attributed to:</p> <ul style="list-style-type: none"> • The existence of aggressive weeds within the lowland rainforest patches, vegetated buffer zones and adjoining cleared or disturbed areas (such as lantana and cat's claw creeper), which if left unmanaged are likely to become prevalent, smother and outcompete native species, and alter the structure of the community. Species richness has been shown to decrease as the density of weed species such as lantana increases (Fensham et al., 1994; Adair & Groves, 1998). The allelopathic (biochemical) effects of lantana has been indicated to severely reduce seedling recruitment as well as reduce girth growth of mature trees and shrubs (Day et al., 2003). • The close proximity to adjacent cleared areas, residences and grazing activities, and infrastructure such as roads and powerlines, which would lead to increased maintenance activities, access and use by people and animals, with associated damage, waste, predation, weed infestation, introduction or spread of plant pathogens (such as myrtle rust), light penetration and other edge effects that can further reduce the ecological functioning, species diversity and structural integrity of the TEC areas. • Disturbances from continued and unrestricted use of the rural-residential freehold property at Woondum, including recreational activities, domestic or grazing animal access, and clearing of (for example) non-woody vegetation, individual trees to source construction timber, to establish a necessary fence or track, existing internal track or fence maintenance, bushfire protection, and adjacent buffer vegetation for onsite infrastructure purposes. Grazing stock can destroy the groundcover and understorey and alter the species composition (TSSC, 2011). 	<p>6</p>

Components	Description of Input	Calculator Input
	<ul style="list-style-type: none"> Increased fragmentation as a result of the above impacting factors, which can lead to isolation of populations, increase competition for resources, and decline and loss of species, including pollinators and seed dispersers (TSSC, 2011). <p>Therefore, as per the site condition and species stocking rate scoring categories, the above influences have the potential to cause significantly altered structural integrity and greater proportion of non-native vegetation and a reduction in species diversity over the long term, thereby reducing the future habitat quality score to 6.38 (rounded down to 6 in the offset calculator).</p>	
Risk of loss (%) with offset	The sites will be legally secured therefore will not be lost.	0 %
Future quality with offset (scale of 0-10)	<p>The sites will be legally secured, therefore the habitat quality will not be at risk of future clearing or major disturbances. The additional protection of the vegetated buffer zones will assist in the protection and management of the TEC. The key threats to this TEC include vegetation clearance, impacts associated with fragmentation of remnants, and weeds, therefore these threats within the offset areas will be prevented. With the removal of disturbing factors such as human activities and weed infestations, supplementary planting, and monitoring and management of any additional disturbances, the condition and species stocking rate (i.e. flora species diversity) will be able to increase, thereby increasing the future habitat quality score (predicted as 7.66, rounded up to 8 in calculator).</p> <p>Additional measures to supplement land-based offsets for the TEC within the Gympie region include the mapping and targeted control of the invasive weed cat's claw creeper, which will result in reduced extent and potential for spread of this weed in the Woondum region.</p> <p>The sites will be managed in accordance with the Offset Strategy.</p>	8
Confidence in result	<p>There is a high degree of confidence in this assessment due to repeated survey efforts covering large areas of the impact and offset sites that have provided comprehensive data on habitat quality and species diversity. Assessment methods are consistent and undertaken at representative locations. Impact extents are clearly defined and offsets will be in place prior to any construction impacts occurring. Management, monitoring and reporting measures proposed in the Offset Strategy provide confidence that the offset areas will achieve the habitat quality gains.</p>	80 %

Refer to Appendix A for a copy of the Offset Assessment Guide for the Lowland Rainforest TEC.

4. **Baseline and monitoring survey programs**

4.1 Purpose

TMR proposes to undertake baseline surveys of the two offset sites to provide a benchmark for management and monitoring activities. During the baseline surveys, monitoring plots and photo points will be established, characteristic and weed species present can be identified, and areas to be managed and/or replanted can be identified. The maintenance and improvement of the TEC habitat in the offset areas can then be measured using the criteria and condition thresholds, as per the listing advice for the TEC, and compared with baseline data from the offset assessment.

The baseline survey will be replicated for scheduled monitoring events.

Condition 13 of the EPBC Act approval (and variation notice) states that the presence and quality of Lowland Rainforest in the proposed offset areas must be demonstrated, where:

- Quality is defined in the approval document as a measure, as determined by a suitably qualified person, of site condition, site context and species individual or population persistence or species stocking rate calculated in accordance with the requirements of the EPBC Act offsets assessment guide or other biocondition assessment process agreed by the Department. The assessment process must use a scientifically robust and repeatable methodology over a timeframe that serves as a sound basis for comparison to baseline data acquired to demonstrate achievement of relevant milestones.
- Lowland rainforest means vegetation that is determined by surveys undertaken by a suitably qualified person as conforming to the Lowland Rainforest of Subtropical Australia listed as a threatened ecological community under the EPBC Act and defined in accordance with the Threatened Species Scientific Committee (2011). *Commonwealth Listing Advice on Lowland Rainforest of Subtropical Australia*. Department of Sustainability, Environment, Water, Population and Communities, Canberra. This includes areas where threatened ecological communities are within 50m of cleared area.

The Lowland rainforest areas and associated vegetated buffer zones are shown in Figures 1 and 2.

4.2 Survey timing

Baseline surveys will be completed prior to or within six months of legally securing the offset areas.

Monitoring surveys will be conducted at years one, three and five after baseline surveys. After year five, monitoring will then be undertaken on a five-yearly basis for the term of the approval, or as otherwise agreed with DAWE following satisfaction of the completion criteria. The monitoring assessments are scheduled biennially due to the potential for biocondition plot survey methods to cause damage if undertaken too frequently, therefore impacting the site condition and habitat quality being monitored. This timing is also consistent with the performance indicators and completion criteria timing to determine progress of the offset management actions.

It is not favourable to survey during the peak of summer or following a period of drought, due to a reduction in plant diversity. The ideal time for surveys is at the end of the summer rainfall growing season, when plant diversity is greatest (late March to late May, depending on local

seasonal conditions). The timing of baseline surveys will be aligned as closely as possible to favourable post-rainfall growing seasons, while complying with the requirements of the EPBC Act approval.

4.3 Personnel

The baseline surveys and scheduled monitoring must be conducted by a SQP. A SQP, as defined in the EPBC Act approval, is a person who has professional qualifications, training, skills and at least three years of relevant experience specific to locating, identifying and conserving the Lowland Rainforest of Subtropical Australia TEC. The SQP must be able to give authoritative independent assessment, advice and analysis specific to the TEC using the relevant protocols, standards, methods and/or literature. Where the person does not have the appropriate professional qualifications, they must have at least five years of relevant experience specific to the TEC.

The SQP will have suitable experience conducting surveys in accordance with the methods provided below.

4.4 Survey methods

4.4.1 Survey design

The baseline surveys must be undertaken with regard to the best practice guidelines in effect at the time of the surveys, such as:

- The Threatened Species Scientific Committee's *Commonwealth Listing Advice on Lowland Rainforest of Subtropical Australia* (TSSC, 2011) prepared by the Commonwealth of Australia describes different characteristics of the TEC and provides the key diagnostic criteria and threshold conditions for identifying the TEC
- In Queensland, the Department of Environment and Heritage Protection's *Guide to determining terrestrial habitat quality* ('the Guide') (EHP, 2017) is a best practice guideline appropriate for determining habitat quality for offset sites
- The Queensland Herbarium's *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland*. Assessment Manual (version 2.2) (Eyre, *et al.*, 2015) for further details on methods when undertaking plots as part of the habitat quality site condition assessments
- The Department of Environment and Science's *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland* (current version 5.0, March 2019) (Neldner *et al.*, 2019)

The survey team (including a SQP) shall prepare a detailed survey program that outlines the following:

- Survey effort - number of surveys for each aspect, including locations and number of days
- Survey methods, including guidelines and procedures adopted, timing, sampling method, details of targeted searches, criteria to be used
- Details of the SQP
- Map of survey sites
- Any relevant proformas and checklists for repeat surveys

The survey program shall be approved by TMR prior to implementation. The survey program should include the methods and reporting outlined in the following sections.

4.4.2 Habitat quality assessment

Assessments of TEC quality will be undertaken in accordance with the Guide, as well as the template provided by the DAWE titled *Modified QLD Habitat Quality spreadsheet – template* (provided December 2019, shown in Appendix B) as relevant, which will include desktop and field assessments as follows:

- Site condition:
 - Condition assessment plots will be permanently established during baseline surveys and used for scheduled monitoring survey events. These will follow the desktop and field assessment requirements and selecting sites/assessment units within the Guide. This condition assessment method is further described below.
- Site context:
 - Desktop assessment including the GIS attributes of size of patch, connectedness, context and ecological corridors from the Guide.
 - Additionally the attributes of threats to the species, and role of site location to TEC overall population in the state, may be inputted, in accordance with the Listing Advice and Guide, as considered relevant to the TEC.

The template to be used for deriving and inputting the desktop and field attributes is shown in Appendix B. The *Modified QLD Habitat Quality spreadsheet – template* refers to the *Guide to determining terrestrial habitat quality* version 1.2 (dated April 2017), which should be referred to for guidance.

Condition plot

The baseline surveys must be undertaken with regard to the best practice guidelines in effect at the time of the surveys, however there are currently no guidelines specific to assessing Lowland Rainforest of Subtropical Australia TEC. In order to satisfy the site condition assessment requirements, condition plot assessments will be undertaken that follows the methods within the Guide. At least one and up to two plots (minimum of two plots at Kawana offset site) of 100x50 m will be established at each offset site within the Lowland rainforest habitat to collect baseline data, as well as scheduled monitoring data.

The site condition assessment described in the Guide is derived from the Queensland Herbarium's *BioCondition Assessment Manual* (Eyre, *et al.*, 2015), therefore specific techniques used during condition plots will be undertaken with regard to this manual. The threshold criteria of the TEC listing advice and the Lowland Rainforest Offset Strategy will be referred to as guidelines. The BioCondition Assessment Manual provides an assessment protocol that gives a measure of how well an area of vegetation is functioning for the maintenance of biodiversity values, with a condition score that is comparable between and within ecosystems over space and time.

The plot will be permanently marked on site with markers (e.g. labelled pickets in ground) at the 0 m, 50 m and 100 m centre points. Photo monitoring points are taken at the 50 m point along and perpendicular to the centreline to provide a record of structure and general condition of the area. In accordance with the BioCondition Assessment Manual, baseline surveys within the plot will include recording of:

- Number of large native trees
- Recruitment of woody perennial species – the proportion of ecologically dominant layer species regenerating (<5cm diameter at breast height (DBH))
- Native tree canopy height and cover

- Native shrub (<2m) canopy cover
- Native tree species richness
- Native plant species richness (shrubs, forbs, grasses)
- Non-native plant cover
- Coarse woody debris
- Native perennial grass cover
- Organic litter

A score will be attributed to each site, which can be compared to a benchmark for that RE (i.e. the median or average characteristics of a mature and relatively undisturbed ecosystem of the same type) or reference site if no benchmark exists, as well as compared over time. BioCondition site data will be compared with the relevant benchmark (draft or published), values from the RE technical description and/or similar RE benchmark data, or a reference site undertaken at the time of the baseline surveys.

Specific attribute scores that are below the benchmark data can be highlighted for improvements through revegetation, natural regeneration and weed control.

The BioCondition Site Assessment Datasheet is included as Appendix C. If a reference site is required, the *Method for the Establishment and Survey of Reference Sites for BioCondition* (Eyre *et al.*, 2017) should be followed using the BioCondition Reference Datasheet.

4.4.3 Species richness

The above site condition method records native species richness within the plot area. These species can then be checked against the Appendix A of the listing advice to determine the number present as a baseline. This aspect is recorded to compare against thresholds and to determine progress towards the ecological outcome of increased species richness. Additional species from Appendix A of the listing advice recorded elsewhere within the patch should be added to this number.

Baseline surveys will also identify any potential locations and characteristics of disturbed areas to be targeted for revegetation activities, as well as additional plots of native species recruitment (e.g. all species <5cm DBH) within previously disturbed areas to be targeted for natural regeneration. These revegetation/regeneration areas should include the permanent biocondition plot areas in order to provide improvement of specific condition attributes that are below benchmark levels (refer to the method in Section 4.4.2) and therefore increase future habitat quality.

Observations should include sufficient information to design planting and other management requirements, such as the type of disturbance present, location and size of the area available for replanting or regeneration, community structure (canopy, shrub and ground cover), existing species, any landscape features (e.g. waterway/gully or steep slope), and other factors to be managed, such as erosion or weeds present.

4.4.4 Weed infestations

Baseline surveys will identify weed infestations to be targeted during weed control program, consisting of weeds of potential significance to the quality and extent of the Lowland Rainforest community. Surveys will describe (as a minimum):

- Target species present
- GPS locations of individuals or patches, as appropriate

- General rating of abundance (e.g. classes from Queensland Annual Pest Distribution Survey of: occasional and localised, occasional and widespread, common and localised, common and widespread, abundant and localised, abundant and widespread)
- Extent of infestation represented by an estimate of cover in sample quadrats (e.g. 10 permanent quadrats per offset site of 10x10m with visual assessment of percentage density/cover or number of stems/area, as appropriate to the growth form)

Weed species that should be considered for targeting within the TEC area, if present and dependent on the extent and positioning of the infestation (based on potential weed threats in the TEC listing advice), include:

- Camphor laurel (*Cinnamomum camphora*)
- Cat's claw creeper (*Dolichandra unguis-cati*)
- Climbing asparagus (*Asparagus plumosus*)
- Lantana (*Lantana camara*)
- Madeira vine (*Anredera cordifolia*)
- Morning glory (*Ipomoea spp.*)
- Ochna (*Ochna serrulata*)
- Small-leaved privet (*Ligustrum sinense*).
- Wandering jew (*Tradescantia fluminensis*)
- Wild tobacco (*Solanum mauritianum*)

There are local environmental weeds that may be present at the offset sites, which may require targeting for weed management activities where they are present in high densities (i.e. abundant) and/or over large areas (i.e. widespread) and are considered to have the potential to impact the habitat quality at the sites (i.e. site condition factors and level of threats), either at the time of survey or for the future monitoring period. Such species may include *Passiflora spp.*, *Solanum spp.*, *Ageratum houstonianum*, *Paspalum spp.* and *Gomphocarpus physocarpus*.

These weed control areas should include the permanent biocondition plot areas in order to provide improvement of specific condition attributes that are below benchmark levels (refer to the method in Section 4.4.2) and therefore increase future habitat quality.

4.4.5 Vegetated buffer zone

Baseline surveys will include assessments within the vegetated buffer zones, for:

- Vegetation structure, estimated height and cover of each strata, species, landform and soils in accordance with quaternary level surveys from Neldner *et al.* (2019)
- Weed infestations to be targeted during weed control including invasive species present and estimated cover, location and/or extent of infestations (see above section on Weed Infestations survey methods)
- Potential locations and characteristics of disturbed areas to be targeted for revegetation activities, as well as additional representative plots of native species recruitment (e.g. all species <5cm DBH) in previously disturbed areas to be targeted for natural regeneration. Observations should include sufficient information to design planting and other management requirements, such as the type of disturbance present, location and size of the area available for replanting or regeneration, community structure (canopy, shrub and ground cover), existing species, any landscape features (e.g. waterway/gully or steep slope), and other factors to be managed, such as erosion or weeds present.

- Photographs and GPS locations of features to be managed and monitored

4.4.6 Additional baseline survey elements

In addition to the above, evidence of land use, degradation or access that is potentially damaging to the TEC (and the vegetated buffer areas) will also be recorded, such as:

- Cleared areas
- Logging
- Past fire
- Plant disease
- Erosion
- Human activities
- Stock grazing
- Domestic/pest animals
- Access tracks (both used and disused)
- Location and type of existing fences
- Fire breaks
- Natural disturbances such as tree falls, dieback due to drought, flood or other natural disaster
- Other relevant threats or degradation of the land and habitat
- Locations of permanent photo monitoring points (in TEC and vegetated buffer areas)

The above data (as well as the below monitoring survey elements) will then be collected/updated biennially (at years one, three and five) following the baseline survey, and then five-yearly for the term of the approval or until the completion criteria are demonstrated to be satisfied and confirmed as completed by DAWE.

4.4.7 Scheduled monitoring survey elements

The following aspects (in addition to the above elements) will be monitored biennially (at years one, three and five) to assess the offset areas progress towards the ecological outcomes (as set out in Section 5.1):

- Replanted areas: Representative sample sites will be assessed to provide general observations of plantings, where applicable, such as height ranges, condition/health, evidence of plant damage or mortality, evidence of reproduction (fruiting/seed dispersal) or seedling recruitment, evidence of pests or plant pathogens, weed introductions or spread, need for additional maintenance actions (e.g. increased watering, weeding, pesticide, mulch, tree guards), new threats or disturbances.
- Targeted naturally regenerating areas: Representative sample sites will be assessed for native species recruitment (presence and number of species from the ecologically dominant layer with individuals <5cm dbh), disturbances such as weeds introductions or spread.
- Targeted weed management areas: Representative sample sites will be assessed across the offset areas to estimate cover and extent for targeted weed infestations/species, observations of new weed species introductions, evidence of weed infestations along waterways or within flood plains, additional disturbances or land degradation, evidence of native or non-native recruitment where weeds have been removed, evidence of maintained

vine understorey habitat in areas subject to staged replacement of lantana with native understorey species within Woondum offset area, evidence of successful treatment methods, additional required maintenance of weed infestations.

- Land use and access: General area observations, potentially including evidence of public access by vehicles or on foot, evidence of rubbish, evidence of pest fauna or domestic/livestock animals (e.g. trampling, tracks, diggings), evidence of natural or non-natural disturbances, recovery of disturbed areas or effectiveness of remediation measures where applicable (e.g. erosion control), maintenance requirements for fences or access tracks.
- Capture of photographs at permanent monitoring points

The above elements can be captured in the form of a checklist/table for ease of use and repeatability.

After year 5, monitoring will then be undertaken on a five-yearly basis for the term of the approval, or as otherwise agreed with DAWE following satisfaction of the completion criteria.

4.5 Reporting

A baseline survey report will be prepared following baseline surveys, with monitoring reports to follow subsequent scheduled monitoring events.

Reporting of baseline/monitoring results (with comparisons to baseline and subsequent monitoring results) will include:

- Site condition field data, Benchmark (or reference site) data, site condition scores, site context scores and overall habitat quality scores for each site (as per template in Appendix B)
- Species richness across whole TEC patch (indicating number of species present from Appendix A of listing advice)
- Targeted weed infestation species and cover at representative sites
- Evidence of species recruitment (species, type, abundance) at representative sites
- Discussion of results for:
 - Habitat quality scores for each site and overall weighted average, with progress towards achieving an increase of at least 0.62 (as per predicted increase in the offset calculator)
 - Replanting and natural regeneration areas and progress towards species richness ecological outcome
 - Targeted weed management areas and progress towards weed reduction ecological outcome
 - Vegetated buffer zone management and progress towards ecological outcome
- Mapping showing:
 - Survey sites
 - Boundaries of Lowland rainforest TEC patch
 - Vegetated buffer zones by vegetation type
 - Extent of target weed infestations
 - Location of disturbances and clearings to be targeted for planting/regeneration
 - Infrastructure such as fences and tracks
 - Disturbances/threats to be managed or removed

- Locations of plots/survey sites and photo monitoring points
- Baseline/monitoring photographs from monitoring points

The results of baseline and monitoring surveys will be included in the annual compliance reports, as relevant to that year. Baseline data will be compared with monitoring data to measure changes in offset area habitat quality (based on the method in the Guide and using the template provided by DAWE (refer to Appendix B)) and for identifying progress of management actions towards the performance indicators and completion criteria. Remedial action or adaptive management will be provided based on monitoring results.

5. **Ecological outcomes and completion criteria**

5.1 Ecological outcomes

The ecological outcomes proposed to be achieved in order to improve the habitat quality of the TEC offset areas are:

1. Increase the species richness of the existing Lowland Rainforest of Subtropical Australia habitat
2. Reduce the extent of weed infestations within the existing Lowland Rainforest of Subtropical Australia habitat
3. Protect and rehabilitate the vegetated buffers zones around the existing Lowland Rainforest of Subtropical Australia habitat

5.2 Performance indicators and completion criteria

The Offset Strategy includes performance indicators and completion criteria that will be used to:

- Assess progress and completion of the offset in achieving the above ecological outcomes, compared to the baseline data
- Determine progress towards an overall habitat quality score increase of 0.62 (as predicted for the offset calculator in Section 3.2.3), in accordance with the *Modified QLD Habitat Quality spreadsheet – template* (provided December 2019, shown in Appendix B), compared to the baseline data

The success of ecological outcomes will be measured through species richness increased to >50 species from the Appendix A of the listing advice, reduced extent of targeted weed infestations, and the establishment of plantings or natural regeneration and weed control in vegetated buffer zones.

These criteria relate to the condition thresholds in the listing advice for the TEC as well as overall protection of the TEC habitat, and can be compared with baseline data (yet to be obtained) spatially and temporally for each offset area.

The monitoring, management and reporting requirements included in the Offset Strategy are aimed towards providing the information needed to measure against these criteria. These measures are provided in Section 6 of this Offset Strategy, and will be updated following baseline surveys to incorporate site-specific details, and as part of the compliance reporting process.

The TEC offset areas will be measured against the performance indicators and completion criteria shown in Table 5-1. Criteria are relative to conditions as identified in baseline surveys (to be undertaken).

Table 5-1 Performance indicators and completion criteria for TEC offset areas

Ecological outcome	At 3 years	At 5 years	Completion criteria (5 years)
Increase the species richness of the existing Lowland Rainforest of Subtropical Australia habitat	<ul style="list-style-type: none"> Supplementary planting within the offset areas has been implemented so that >50 species present from Appendix A of the listing advice Evidence of natural recruitment of native species within disturbed areas 	<ul style="list-style-type: none"> Native species richness remains >50 species from Appendix A of the listing advice Replanted (or naturally regenerating) areas do not require further direct maintenance (i.e. they are self-sustaining) and/or evidence of growth of naturally regenerating native species within disturbed areas 	<ul style="list-style-type: none"> Native species richness is >50 species from Appendix A of the listing advice
Reduce the extent of weed infestations within the existing Lowland Rainforest of Subtropical Australia habitat	<ul style="list-style-type: none"> Weed infestations of target species have been identified and treated within the Lowland Rainforest habitat 	<ul style="list-style-type: none"> Targeted weed infestations have had follow-up inspection and treatment within the Lowland Rainforest habitat Additional identified weed infestations have been treated 	<ul style="list-style-type: none"> Targeted weed infestations have been reduced in extent within the Lowland Rainforest habitat
Protect and rehabilitate the vegetated buffers zones around the existing Lowland Rainforest of Subtropical Australia habitat	<ul style="list-style-type: none"> Disturbed areas have been replanted and/or show evidence of native species recruitment Weed infestations of target species have been identified and treated within the vegetated buffer zone 	<ul style="list-style-type: none"> Replanted or naturally regenerating areas do not require further maintenance (i.e. they are self-sustaining) Extent of weed infestations of target species have been reduced or removed completely from vegetated buffer zones (depending on species and severity of infestation) 	<ul style="list-style-type: none"> Disturbed areas have been revegetated or natural regeneration has occurred Weed infestations of target species have been reduced or removed completely within the vegetated buffer zones

6. Management and monitoring programs

The following sections outline the principal management and monitoring programs and triggers for remedial action identified for the TEC offset sites with the aim of achieving the ecological outcomes stated in Section 5, including revegetation and regeneration management, weed management, and land use and access management measures.

6.1 Offset management responsibility

The Woondum offset site will be managed by TMR.

The Kawana offset site will be managed by Sunshine Coast Council. An agreement will be in place between TMR and Council for the implementation of monitoring and management in accordance with the Offset Strategy.

The offset areas will be managed in accordance with the Offset Strategy, which details the management requirements of the offset area and includes actions, timing, reporting, remedial actions and responsibilities for the principal management activities.

Baseline surveys and scheduled monitoring will be undertaken by SQPs.

Site establishment, planting operations and maintenance will be undertaken by suitably qualified revegetation contractors or organisations.

Weed control programs will be undertaken by suitably qualified and experienced weed control operators.

6.2 Auditing and review

Following baseline surveys, management measures may be updated to include site-specific requirements, if relevant and appropriate (such as locations of weed infestations to be targeted for weed control, locations of existing infrastructure and proposed maintenance or removal, locations of areas to target for planting program and natural regeneration, locations of relevant disturbances and threats to be managed/removed, any updates to timing).

The Offset Strategy will be reviewed as part of the compliance reporting process following baseline surveys and after scheduled monitoring events.

Any relevant changes to the timeframes to achieve the performance or completion criteria will be formally submitted to DAWE for approval.

Independent audits will be undertaken upon request by DAWE in accordance with Conditions 23, 24 and 25 of the EPBC approval.

6.3 Compliance reporting

6.3.1 Annual compliance reporting

An Annual Compliance Report will be prepared that includes the TEC offset sites, as relevant to that year, in accordance with Condition 20 of the EPBC approval and the DAWE's *Annual Compliance Report Guidelines* (Commonwealth of Australia, 2014). The compliance report will include:

- Details of compliance, incidents and non-compliance
- Management actions undertaken within the offset areas and as part of control programs (with associated documentation attached)

- Remediation measures to be implemented where monitoring of the performance criteria indicates failure to achieve required outcomes
- Progress towards and achievement of the ecological outcomes and completion criteria outlined in Section 5

The results of baseline and monitoring surveys will be included in the annual compliance reports, as relevant to that year. Baseline data will be compared with monitoring data to demonstrate changes in offset area habitat quality scores and for identifying progress of management actions against the performance indicators and completion criteria. Remedial action or adaptive management will be provided based on monitoring results.

Results of the weed control program and planting/regeneration program will be included in the annual compliance report, as relevant, including inspections, control and maintenance activities undertaken on-site and follow-up treatments/monitoring conducted.

Following the five-year active management period, monitoring will be undertaken on a five-yearly basis for the term of the approval (or earlier if agreed to by DAWE), unless it is demonstrated that the completion criteria are no longer met and additional actions and/or monitoring is required.

6.3.2 Reporting non-compliance

Notification in writing to DAWE must be made for any incident, non-compliance with the conditions, or non-compliance with the commitments made in this Offset Strategy, in accordance with Conditions 21 and 22 of the EPBC approval.

Notification must be made as soon as possible and no later than 5 business days after becoming aware of the incident or non-compliance.

6.4 Revegetation and regeneration management

Supplementary planting will be undertaken for the habitat quality improvement of both offset areas and the rehabilitation of the vegetated buffer zones, as outlined in Table 6-1. Habitat quality improvement will be achieved through increasing native species richness (in combination with removal of weeds and other threatening processes) using site-specific and recognised revegetation methods, such as using framework species mixtures (from the listing advice) that allow for natural recruitment of existing rainforest species.

Revegetation and regeneration works should be undertaken with regard to the South East Queensland Ecological Restoration Framework (Chenoweth EPLA and Bushland Restoration Services, 2012) and the Subtropical Rainforest Restoration (Big Scrub Rainforest Landcare Group, 2019) as industry benchmark guidelines.

It is noted that the native species included in the Appendix A of the listing advice for the Lowland Rainforest TEC is largely derived from studies of the community in NSW, therefore some species listed are not locally endemic. Where species listed are not locally endemic, a substitute may be proposed to be planted that is consistent with the existing vegetation community (regional ecosystem description, benchmark or reference site) within the region and with the genera of the Appendix A of the listing advice.

By removal of weed infestations and other disturbances (e.g. dumped rubbish) or threats (e.g. unrestricted vehicle access), the TEC and buffer zones will also have the opportunity to naturally regenerate and increase species richness and habitat value through native species recruitment.

Table 6-1 Revegetation and regeneration management

Revegetation and regeneration management
Ecological outcomes
<ul style="list-style-type: none"> - Increase the species richness of the existing Lowland Rainforest of Subtropical Australia habitat - Protect and rehabilitate the vegetated buffers zones around the existing Lowland Rainforest of Subtropical Australia habitat
Management actions
<ul style="list-style-type: none"> - A planting program will be developed by an experienced and qualified revegetation specialist contractor that uses site-specific information from baseline surveys to locate planting areas, select species, describe site establishment and planting methods, an inspection and maintenance schedule for watering, weeding and stock replacement, if necessary. The planting program must consider potential inundation areas in the planting locations and species selection. - Results of baseline surveys to be used to design planting areas where there are opportunities within the TEC offset areas and in the vegetated buffer zones (locations of clearings, weed infestations, other disturbances such as tree fall canopy gaps and along the edges of vegetated areas where appropriate and within the legally secured offset area). Areas to be planted should be located in relatively accessible locations or close to existing access tracks to enable maintenance activities to be undertaken. Opportunities for natural regeneration of disturbed areas or habitat edges will also be identified. - Where weed infestations or other disturbances occur, treatment or removal of the disturbance will commence within one year of legally securing the offset area in order to allow for immediate replanting or natural regeneration of these areas with native species, as appropriate. Refer to Weed Management section. - Selection of species for plantings will be derived from presence and absence of species from Appendix A of the listing advice (resulting from baseline surveys), and will be dependent on localised community, landscape and habitat features, focussing on framework species that will establish rapidly from tubestock. Species for replanting must result in the native species richness consisting of >50 species from Appendix A of the listing advice. This may require an additional 10 species to be established, depending on baseline survey results, with allowance for adequate stock replacement if >20% mortality occurs. Where species listed in Appendix A of the listing advice are not locally endemic (e.g. NSW species), a substitute may be proposed that is endemic to SEQ, consistent with the existing vegetation community, and consistent with the genera provided in the Appendix A list of species. - Planting program to describe spacing/density for different strata/species and overall numbers of each species, consistent with the existing vegetation community and local environment. - Tubestock shall be from locally sourced seeds, wherever possible, with no evidence of poor condition, growth or root systems. - Planting will be scheduled within one year of legally securing the offset area (or staged where weed treatment still ongoing), with an inspection and maintenance schedule implemented immediately to provide adequate watering, weed control and replacement of stock, as necessary.

Revegetation and regeneration management

- Staged removal of lantana infestations within the Woondum offset area will be undertaken with staged replacement with native vine understorey species to maintain habitat values for the black-breasted button-quail. A method for this staged replacement will be included in the planting program and weed control program.
- Site planting and maintenance activities will be done manually wherever possible to minimise disturbance to surrounding vegetation.
- Tubestock and planting holes to be watered prior to and immediately after planting, with ongoing watering maintenance to be scheduled in the planting program.
- Access to planting areas to follow existing walking or vehicle tracks wherever possible, with no new vehicle access tracks to be constructed within the TEC habitat or vegetated buffer zones.
- The following watering program is to be implemented, with consideration of prevalent conditions and recent or forecast rainfall:
 - o Watering immediately prior to and post planting (as specified above)
 - o Once per week up to three months (i.e. two months if wet conditions; three months if dry conditions)
 - o Increased frequency or total duration may be required if heatwave or prolonged dry conditions experienced.
- Mulch and/or tree guards to be installed as appropriate to the species, location and required protection, to be specified in the planting program. Tree guards to be removed after plants established.
- Inspections and maintenance to be scheduled (at a minimum):
 - o Monthly for the first six months after planting
 - o Every three months between six and 12 months after planting
 - o Every six months in the second and third year after planting
- Inspections and maintenance will include assessment of survival with adequate plant replacement to occur where >20% mortality experienced to achieve >50 species from Appendix A of the listing advice. Species selection is to be reviewed/modified if continued failure is observed in one or more species. Survival rate will be monitored at the following frequencies (can be undertaken in conjunction with scheduled inspections):
 - o Every six months in the three years after planting
- Inspection and maintenance activities (or other works) shall be recorded on a checklist, including details of replacement of plants. Photographs and GPS data to be captured.
- Minor clearing or disturbance of native vegetation within or adjacent to the TEC offset area may be required to enable access to planting areas, for site establishment or to maintain fences, firebreaks, access tracks or infrastructure such as constructed drains. Minor works are to be recorded in the inspection and maintenance checklist.
- Notification to TMR/SCC of any major works (e.g. clearing for new infrastructure or tracks) prior to undertaking.
- Notification to TMR immediately if any incident (that does or has the potential to impact on the TEC), or non-compliance (of management actions or conditions of approval) occurs.

Revegetation and regeneration management

Monitoring

Monitoring aspect	Monitoring Frequency	Trigger for remedial activities	Potential Remedial activities
Baseline survey event	Prior to or within six months of legally securing	Additional site-specific information	Update of Offset Strategy with site-specific information
Survival rate	Every six months for three years after planting	>20% loss of plantings	Replacement of plants in same manner as initial plantings and maintenance Species selection to be reviewed/modified if continued failure is observed in one or more species
Inspections and maintenance of plantings will be recorded (checklist), including plant health and growth, weed introduction or spread, seedling recruitment, evidence of insect damage or plant pathogens, evidence of additional disturbance, threats or land degradation, general site observations, weather records	Monthly for the first six months after planting Then every three months up to one year after planting Then every six months in the second and third year after planting	Reduced condition or health of plantings Weed introduction or spread Evidence of pests or plant pathogens on new plantings Additional disturbances	Potential to increase frequency of inspections and maintenance for a period of one year Conduct weed treatment, as appropriate Apply treatment as appropriate to pest/pathogen, having regard to sensitive environment of TEC habitat Take action to remove additional disturbance and prevent further disturbances, as appropriate
Scheduled monitoring event (in accordance with baseline and monitoring survey program)	Years 1, 3 and 5 after baseline survey Then five-yearly for the term of the approval, or until the completion criteria are met and as agreed to by DAWE	No evidence of increase in species richness No reduction in weed infestations	Review results of planting program, weed management and land management and amend Offset Strategy as required Undertake additional active management beyond initial five years if required to meet or maintain completion criteria Review/increase frequency of monitoring events if progress towards performance or completion criteria is not demonstrated

Revegetation and regeneration management

Performance and completion criteria

Criteria	Reporting	Compliance	Potential Remedial activities
At three years, supplementary planting within the offset areas has been implemented so that >50 species present from Appendix A of the listing advice, surviving independently	Monitoring report to compare against baseline data and determine progress against criteria Report on TEC habitat quality	At the three-year milestone if at least 50 species from Appendix A established/ surviving independently, project can progress as scheduled.	If plantings are not surviving or in poor condition, review planting program and maintenance schedule. Establish additional plantings if required.
At three years, disturbed areas (within TEC or vegetated buffer zone) have been replanted or show evidence of natural recruitment of native species as relevant	Monitoring report to compare against baseline data and determine progress against criteria Report on TEC habitat quality	At the three-year milestone if disturbed areas replanted or evidence of native species recruitment present (as relevant), project can progress as scheduled.	If plantings not established/surviving independently or negligible native species recruitment observed in disturbed areas, take additional action to remove disturbing factors and consider supplementary plantings.
At five years, species richness remains >50 species from Appendix A of the listing advice	Monitoring report to compare against baseline data and determine progress against completion criteria Report on TEC habitat quality	At the five-year milestone, if species richness >50 native species from Appendix A of the listing advice, completion criteria has been achieved. No further requirements.	If species richness >50 has not been achieved, assess reasons and review and amend Offset Strategy accordingly. Additional maintenance and inspections may be required. DAWE is to be notified.
At five years, replanted (or naturally regenerating) areas do not require further direct maintenance (i.e. they are established/ surviving independently)	Monitoring report to compare against baseline data and determine progress against completion criteria Report on TEC habitat quality	At the five-year milestone, if no further planting maintenance needed and evidence of native species recruitment present, completion criteria has been achieved. No further requirements.	If maintenance of plantings still required or negligible evidence of native species recruitment in disturbed areas, assess causes and review and amend Offset Strategy accordingly. Additional maintenance and inspections may be required. DAWE is to be notified.

Revegetation and regeneration management

Reporting

Report type	Report details	Frequency
Baseline survey report	Site-specific information for offset areas and buffer zones, to be used to update Offset Strategy as relevant and summarised in annual compliance report.	Post-baseline survey
Site works shall be recorded, such as site establishment works or other necessary infrastructure works	Activities to be summarised in compliance reporting	Following baseline survey or as otherwise relevant
Planting program	Design and implementation schedule of planting areas within the TEC offset areas and buffer zones.	Following baseline survey
Planting inspections and maintenance records	Checklist of inspection events and maintenance undertaken on site. Activities to be summarised in compliance report.	Following each planting inspection
Monitoring report	Reporting will summarise methods, field data, comparison against baseline and previous years and progress towards the performance or completion criteria and TEC habitat quality. Report to include maps, photographs and all relevant data. Results to be summarised or included in compliance report.	Years 1, 3 and 5 Then five-yearly for the term of the approval, or until the completion criteria are met and as agreed to by DAWE

6.5 Weed management

Weed management will be undertaken for the habitat quality improvement and maintenance of extent of both offset areas and the rehabilitation of the vegetated buffer zones, as outlined in Table 6-2. Habitat quality improvement will be achieved through controlling targeted weed infestations within the offset areas and reducing target weed species in adjoining buffer zones (in association with undertaking supplementary planting and managing other threatening processes).

A diversity of introduced species were observed within and surrounding the proposed offset sites, including restricted invasive species under the *Biosecurity Act 2014* and Weeds of National Significance (WONS) such as:

- *Dolichandra unguis-cati* (cat's claw creeper) (WONS) – Woondum site (further described below)
- *Lantana camara* (lantana) (WONS) – both sites (further described below)
- *Schinus terebinthifolius* (broadleaf pepper tree) – Kawana site
- *Sporobolus sp* (giant rat's tail grass) – unconfirmed in cleared area adjacent Kawana site

Lantana is a Weed of National Significance and a restricted invasive species in Queensland. Lantana forms dense thickets that are typically to 4m but can be up to 15m tall. It is known to suppress native vegetation and seedlings through shading, nutrient competition, smothering and chemical suppression of germination or growth of other plants. It can become the dominant understorey species in open forests and woodlands, and can readily invade disturbed sites and communities, including edges, disturbed areas and canopy breaks in dense forests. It is long-lived, can produce up to 12,000 fruit each year, can have seed viability for up to 2 years, is dispersed readily by fruit-eating birds, and can resprout from the stem-base and by layering (developing roots from stems in contact with soil). It is a threat to lowland rainforest ecosystems and to a number of threatened flora and fauna species (OEH, 2017). Lantana present in the rainforest ecosystems will serve to increase the fuel load therefore increase the risk and intensity of fires. If fire occurs within or adjacent the rainforest ecosystem, the composition of the vegetation community will change and weeds like lantana will be more prevalent, thereby further increasing future fire risk (Berry *et al.*, 2011).

Cat's claw creeper is a Weed of National Significance and a restricted invasive species in Queensland. This vine spreads rapidly through high seed production, multiple seedlings sometimes produced from one seed, and dispersal through water and wind. Established plants can reproduce vegetatively from tubers (which can be 40cm long and produce multiple stems) and creeping stems, and detached tubers and cuttings can resprout. Young plants can be shade tolerant. It can smother native vegetation through a dense ground covering mat layer and can overtop and kill mature trees (DPI, 2018).

Baseline surveys will further determine the identity and location of weeds of potential significance to the quality and extent of the Lowland Rainforest community, including those occurring within the vegetated buffer zones.

Methods for weed control will be site-specific and appropriate to each species, with regard to best practice and relevant guidelines, such as:

- South East Queensland Ecological Restoration Framework (Chenoweth EPLA and Bushland Restoration Services, 2012)
- Subtropical Rainforest Restoration (Big Scrub Rainforest Landcare Group, 2019)
- Local government biosecurity plans

- Biosecurity Queensland fact sheets

Methods may involve a combination of physical, chemical and/or biological methods, depending on the species and extent of infestations. Some species may require subsequent treatments due to viability of seed banks for longer periods. Appropriate minor use permits from the Commonwealth Australian Pesticides and Veterinary Medicines Authority may apply.

The Woondum offset area is also providing habitat as an offset for the black-breasted button-quail, therefore a program of gradual, staged replacement of lantana thicket with native vine understorey will be implemented at this site (rather than immediately treating all lantana infestations) in order to maintain habitat for this fauna species. In some circumstances (i.e. where evidence of black-breasted button-quail activity occurs within lantana patches), the weeds may be treated and left in situ to retain the vegetation structure of value to the species (with follow-up treatments required to ensure all plants are killed and to remove seedlings growing from the soil seed bank).

Table 6-2 Weed management

Weed management
Ecological outcomes
<ul style="list-style-type: none"> - Reduce the extent of weed infestations within the existing Lowland Rainforest of Subtropical Australia habitat - Protect and rehabilitate the vegetated buffers zones around the existing Lowland Rainforest of Subtropical Australia habitat
Management actions
<ul style="list-style-type: none"> - A weed control program will be developed by an experienced and qualified weed control specialist contractor that uses site-specific information from baseline surveys to target weed infestations, describe methods of treatment and an inspection and maintenance schedule. TMR to be advised of commencement of initial treatment. - Where weed infestations occur, treatment or removal of the disturbance will commence within one year of legally securing the offset area in order to allow for immediate replanting or natural regeneration of these areas with native species, as appropriate. - Initial treatment of infestations will target key species (e.g. lantana and cat's claw creeper), focussing on higher value areas first and working out towards the edge of buffer zones. Where possible commence control in areas of light infestations and work towards dense infestations using a mix of controls, as appropriate to the species and landscape. - Staged removal of lantana infestations within the Woondum offset area will be undertaken with staged replacement using appropriate native vine understorey species to maintain habitat values for the black-breasted button-quail. A method for this staged replacement will be included in the planting program. Where there is evidence of active black-breasted button-quail foraging or other activity, treat lantana in-situ by cutting the stems and painting with herbicide to leave the structure of the lantana thicket. - Lantana control methods to be adopted may include the following: <ul style="list-style-type: none"> o Physical control by hand cutting or slashing, or selective clearing using remote control slasher/mulcher (with follow-up spot spray for regenerating stumps or seedlings as seeds can remain viable for four years, with seedlings maturing after one year) o Herbicide control: <ul style="list-style-type: none"> ▪ Recommended herbicide agents are provided in the Queensland Government Biosecurity Fact Sheet for Lantana. ▪ Basal bark spraying and cut stump methods are appropriate for single stemmed lantana. ▪ Foliar spraying is not recommended within sensitive environments, such as the TEC habitat. o Biological agents have been used to treat lantana infestations and are listed in the Queensland Government Biosecurity Fact Sheet for Lantana. - Control of cat's claw creeper can be undertaken in a number of different ways depending on the nature and extent of the infestation and the time of year. A combination of methods can be adopted. Methods include: <ul style="list-style-type: none"> o Physical control methods – cut all stems/ leaders

Weed management

- Herbicide control – treated with spray applied in a cut stump method. Refer to Queensland Government Biosecurity Fact Sheet for Cats Claw Creeper for chemical types, rates and application method. Foliar spraying not recommended in sensitive environments such as the TEC habitat.
- Biological control – release of tingid bug *Carvalhotingis visenda*, the moth *Hypocosmia pyrochroma* or the leaf-mining jewel beetle *Hylaeogena jureceki*
- Inspections and maintenance will be undertaken that includes observations on success of previous treatments in terms of extent, abundance and any regrowth of weed infestations, new weed introductions or spread, additional disturbances, follow-up treatment such as spot-spray of new shoots and removal of seedlings. Inspection and maintenance activities (or other works) shall be recorded on a checklist to be provided to TMR. The following inspection and maintenance program is to be implemented, with consideration of prevalent conditions and recent rainfall:
 - Initial treatment of targeted weed infestations within six months of baseline surveys
 - Inspection of targeted areas and follow-up treatment every three months in the first year after initial treatment
 - Scheduled inspection and follow-up treatments once in years 4 and 5 after initial treatment
 - Additional monitoring for new introductions or spread during scheduled monitoring surveys, with TMR to be notified of additional treatment to occur
- Photographs and GPS data to be captured during control works
- Access to weed management areas to follow existing walking or vehicle tracks wherever possible, with no new vehicle access tracks to be constructed within the TEC habitat or vegetated buffer zones
- Minor clearing or disturbance of native vegetation within or adjacent to the TEC offset area may be required to enable access to weed management areas or to maintain fences, firebreaks, access tracks or infrastructure such as constructed drains. Minor works are to be recorded in the inspection and maintenance checklist.
- Notification to TMR/SCC of any major works (e.g. clearing of an area of native vegetation for weed management purposes) prior to undertaking
- Notification to TMR immediately if any incident (that does or has the potential to impact on the TEC), or non-compliance (of management actions or conditions of approval) occurs

Monitoring

Monitoring aspect	Monitoring Frequency	Trigger for remedial activities	Potential Remedial activities
Baseline survey event	Prior to or within six months of legally securing	Additional site-specific information	Update of Offset Strategy with site-specific information

Weed management			
Inspections and maintenance of targeted weed infestations, including success of treatment methods, observations of new introductions or spread, additional disturbance or land degradation to be remediated	<p>Every three months for the first year after initial treatment</p> <p>Then every six months in years 2 and 3 after initial treatment</p> <p>Scheduled inspection and follow-up treatments once in years 4 and 5 after initial treatment</p>	<p>New weed infestations or spread of existing infestations</p> <p>Additional disturbance that might lead to new infestations</p>	<p>Update of control program methods and locations</p> <p>Conduct weed treatment, as appropriate</p> <p>Increase frequency of inspections and maintenance if new weed infestations require treatment</p> <p>Remediation of additional disturbances and prevention of further disturbance</p>
Scheduled monitoring event (in accordance with baseline and monitoring survey program)	<p>Years 1, 3 and 5 after baseline survey</p> <p>Then five-yearly for the term of the approval, or until the completion criteria are met and as agreed to by DAWE</p>	<p>Increased extent of weed infestation in targeted areas (species density/cover)</p>	<p>Review results of weed control program, and amend Offset Strategy as required</p> <p>Undertake additional active management beyond initial five years if required to meet or maintain completion criteria</p> <p>Review/increase frequency of monitoring events if progress towards performance or completion criteria is not demonstrated</p>

Performance and completion criteria			
Criteria	Reporting	Compliance	Potential Remedial activities
At three years, weed infestations of invasive species have been identified and treated within the Lowland Rainforest habitat and buffer zone	<p>Monitoring report to compare against baseline data and determine progress against criteria</p> <p>Report on TEC habitat quality increase</p>	<p>At the three-year milestone if weed infestations have been identified and treated, with follow up treatments occurring, project can progress as scheduled.</p>	<p>If initial weed treatment has not been successful, or evidence of new invasive species or spread to new areas, review methods in weed control program and undertake an additional round of weed control of the same areas, potentially using different methods as appropriate. Increase inspection and treatment frequency if necessary to achieve criteria.</p>
At five years, extent of targeted weed infestations has been reduced within the Lowland Rainforest habitat	<p>Monitoring report to compare against baseline data and determine progress against completion criteria</p> <p>Report on TEC habitat quality increase</p>	<p>At the five-year milestone if extent of weed infestations have been reduced as targeted, completion criteria has been achieved. No further requirements.</p>	<p>If extent of weed infestations has increased or spread to new areas, review methods in weed control program and undertake additional treatment. Increase inspection and follow-up treatment frequency.</p>

Weed management			
			If monitoring identifies additional potentially impacting species, review potential impacts to TEC and determine control requirements accordingly. DAWE is to be notified.
At five years, weed infestations have been reduced or removed completely within the vegetated buffer zones	Monitoring report to compare against baseline data and determine progress against completion criteria	At the five-year milestone, if targeted weed infestations have been reduced or removed completely within the vegetated buffer zones, completion criteria has been achieved. No further requirements.	If additional treatment within buffer zones required, review methods, apply treatment and increase frequency of inspections and maintenance. DAWE is to be notified.
Reporting			
Report type	Report details	Frequency	
Baseline survey report	Site-specific information for offset areas and buffer zone, to be used to update Offset Strategy as relevant and summarised in annual compliance report.	Post-baseline survey	
Weed control program	Design and implementation schedule for control of targeted weed infestation areas within the TEC offset areas and buffer zones.	Following baseline survey	
Weed management inspections and maintenance records	Checklist of inspection events and maintenance undertaken on site. Activities to be summarised in compliance report.	Following each scheduled inspection	
Monitoring report	Reporting will summarise methods, field data, comparison against baseline and previous years and progress towards the performance or completion criteria and TEC habitat quality. Report to include maps, photographs and all relevant data. Results to be summarised or included in compliance report.	Years 1, 3 and 5 Then five-yearly for the term of the approval, or until the completion criteria are met and as agreed to by DAWE	

6.6 Land use and access management

Management of land use and access at the offset sites will be undertaken for the protection and rehabilitation of TEC and vegetated buffer zones, as outlined in Table 6-3.

Following baseline surveys, a program of site maintenance will be prepared to be undertaken within the following six months that limits access and land uses to those appropriate to the protection of the sites. The offset areas will be restricted from potentially impacting activities such as stock grazing and public access for the life of the offset. Other evidence of land degradation, such as rubbish disposal or erosion, will be managed as appropriate.

There is a residence adjacent to the Woondum TEC offset area, which may have tenants present that will be restricted from undertaking any land use beyond their immediate cleared yard area.

Vegetation clearing activities that may be required to carry out land use and access management includes clearing for access tracks, clearing to reduce hazardous fuel loads and to establish fire breaks, and maintenance of fences, roads, water facilities and constructed drains.

Table 6-3 Land use and access management

Land use and access management
Ecological outcomes
<ul style="list-style-type: none"> - Increase the species richness of the existing Lowland Rainforest of Subtropical Australia habitat - Reduce the extent of weed infestations within the existing Lowland Rainforest of Subtropical Australia habitat - Protect and rehabilitate the vegetated buffers zones around the existing Lowland Rainforest of Subtropical Australia habitat
Management actions
<ul style="list-style-type: none"> - Following baseline surveys, the Offset Strategy will be updated to include site-specific land management actions and locations of existing and proposed infrastructure, signage, and maintenance requirements. Significant land management actions will be undertaken within six months of the baseline surveys. - Restriction of vehicles to established access routes or defined access points. Access tracks needed for site management activities to be restricted to site personnel with a locked gate/barrier. Any unneeded access tracks to be permanently closed and identified for rehabilitation, if appropriate. - Exclusion of domestic/livestock animals from the offset area and vegetated buffer zones will be established through installation or repair (and maintenance) of fencing bordering residences, access points, and/or adjoining paddocks, as appropriate. Any fences erected or replaced will be native fauna friendly to allow for fauna movements into and through habitat areas. - Fencing will be maintained as needed, or as appropriate given site conditions or weather events. - Where fencing is deemed to not be appropriate, signs will be erected that prohibit public access into the TEC areas and, in particular, the active weed management, natural regeneration and planting areas. - All rubbish will be removed from the offset areas and buffer zones and disposed of off-site. - Existing external fire breaks will be maintained. - Erosion control will be installed if evidence of soil loss or sedimentation of downstream waterways is identified. Any installed erosion control measures will be maintained as needed. - Inspections of land use and access management issues will be undertaken biennially with scheduled monitoring events. Locations to be inspected will be based on previously identified infrastructure, disturbance and maintenance areas. - Photographs and GPS data to be captured during control works. - Access to land use management areas to follow existing walking or vehicle tracks wherever possible, with no new vehicle access tracks to be constructed within the TEC habitat or vegetated buffer zones. - Minor clearing or disturbance of native vegetation within or adjacent to the TEC offset area may be required to enable access to land management areas or to maintain fences, firebreaks, access tracks, erosion control or infrastructure such as constructed drains. Minor works are to be recorded in the inspection and maintenance checklist.

Land use and access management

- Notification to TMR/SCC of any major works (e.g. clearing of an area of native vegetation for land use or access purposes) prior to undertaking.
- Notification to TMR immediately if any incident (that does or has the potential to impact on the TEC), or non-compliance (of management actions or conditions of approval) occurs.

Monitoring

Monitoring aspect	Monitoring Frequency	Trigger for remedial activities	Potential Remedial activities
Baseline survey event	Prior to or within six months of legally securing	Additional site-specific information for land use and access management and site maintenance	Update of Offset Strategy with site-specific information. Prepare schedule of land management and maintenance requirements. Undertake required land management activities within six months of baseline survey event, such as removal, replacement, maintenance or additional infrastructure requirements, signage, access restriction etc.
Maintenance and any follow-up inspection of land use and access management areas, including observations of rubbish, public access, pest animals, damage to infrastructure, firebreak or other infrastructure maintenance requirements, effectiveness of existing remediation, or additional threats, disturbance or land degradation to be remediated	Follow-up inspection of management activities (inspection can be part of scheduled monitoring events)	Additional disturbance or threat that might lead to land degradation. Maintenance requirements on existing infrastructure.	Assess damage or maintenance requirements. Undertake additional or ongoing maintenance or repair to infrastructure or management actions. Increase frequency of inspections and maintenance if new threats identified requiring additional management. Remediation of additional disturbances and prevention of further disturbance.
Scheduled monitoring event (in accordance with baseline and monitoring survey program)	Years 1, 3 and 5 after baseline survey Then five-yearly for the term of the approval, or until the completion	Additional disturbance or threat that might lead to land degradation	Undertake required land management activities within six months of baseline survey event, such as removal, replacement, maintenance or

Land use and access management		
	criteria are met and as agreed to by DAWE	<p>Maintenance requirements on existing infrastructure</p> <p>additional infrastructure requirements, signage, access restriction etc.</p> <p>Increase frequency of inspections and maintenance if new threats identified requiring additional management.</p> <p>Remediation of additional disturbances and prevention of further disturbance</p>
Reporting		
Report type	Report details	Frequency
Baseline survey report	Site-specific information for offset areas and buffer zones, to be used to update Offset Strategy and summarised in annual compliance report.	Post-baseline survey
Schedule of maintenance works	Implementation schedule for land use and access management actions, including fencing, access restrictions, signage, fire risk management, erosion control within the TEC offset areas and buffer zones.	Following baseline survey
Land management inspections and maintenance records	Checklist of follow-up inspection events and maintenance required and/or undertaken on site. Activities to be summarised in compliance report.	Following each scheduled inspection (can be included in scheduled monitoring event)
Monitoring report	Reporting will summarise methods, field data, comparison against baseline and previous years and progress towards the performance or completion criteria and TEC habitat quality. Report to include maps, photographs and all relevant data. Results to be summarised or included in compliance report.	Years 1, 3 and 5 Then five-yearly for the term of the approval, or until the completion criteria are met and as agreed to by DAWE

6.7 Other management actions

6.7.1 Bushfire management

The areas immediately north and east of the Woondum offset area are heavily wooded, with Woondum State Forest adjoining the north-east corner of the lot.

The Kawana offset area adjoins forested areas to the east and south, adjacent to urban areas, and some vegetated and cleared areas to the north and west bordered by the Mooloolah River.

Bushfires can impact the success of the TEC offset as the rainforest is not adapted to fire (Floyd 1990a cited in TSSC, 2011) and rainforest species are only likely to survive to maturity if fire is excluded until the rainforest species have formed a closed community (Bowman, 2000, cited in TSSC, 2011). Weeds can also substantially change fuel characteristics at rainforest boundaries (Bowman, 2000, cited in TSSC, 2011). Therefore, fire can limit rainforest boundaries and rainforest remnants with a high woody weed component or surrounded by land with a high woody weed component are more susceptible to the impacts of fire. Additionally, climate change predictions for south-east Queensland indicate a shift to more extreme fire event days (DECC, 2009 cited in TSSC, 2011).

The offset sites will be managed to reduce the risk of impacts from bushfire, through a targeted weed management program and maintenance of existing external fire breaks.

SCC currently manages fire breaks along the cleared edges of the vegetated buffer zone to the north and west of the TEC offset area, which are slashed approximately four times per year.

Vegetation clearing activities that may be required to reduce the impact risk of bushfires include establishment of fire breaks, clearing native vegetation to control weeds, and maintaining fences, roads, tracks, and water facilities. The following activities may be undertaken at or adjacent the Kawana TEC offset sites:

- Clearing for the purpose of establishing a fire break up to 10 m wide in areas adjoining the TEC and/or during an imminent bushfire emergency
- Clearing to reduce weed infestations with high fuel loads in surrounding areas
- Clearing for reducing hazardous fuel loads in areas adjoining the TEC
- Clearing that is necessary for maintaining existing infrastructure including fences, roads, vehicular tracks, water facilities and constructed drains

6.7.2 Flood management

The offset site at Lot 802 on SP244924 may be subject to occasional inundation during periods of high rainfall, as it occurs on a broad flood plain.

Baseline surveys will seek to identify areas showing evidence of inundation, through damage or changes in species or structure present.

Revegetation, regeneration, weed management and land use and access management actions will consider the impact of periodic inundation on the activities to be undertaken in such areas, and their likely effectiveness, as well as the timing of such activities.

Should management be impacted by inundation, the Offset Strategy will be reviewed and modifications to management activities and locations will be undertaken accordingly.

7. Risk framework

An ecological risk assessment was undertaken for each of the identified threats/risks, where each threat/risk was evaluated in terms of the likelihood of occurrence and the potential consequences. The likelihood of occurrence table (Table 7-1) is used to identify the most credible likelihood of an event occurring, while the level of consequence (Table 7-2) is an assessment of what the anticipated impact of the threat/risk would be, either directly or indirectly, to the offset sites. By combining the likelihood of occurrence and consequence, an overall risk rating can be applied to each threat/risk (refer to Table 7-3).

Table 7-1 Likelihood of occurrence

Likelihood	Definition
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Table 7-2 Level of consequence

Consequence	Definition
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

Table 7-3 Risk matrix

Likelihood ^α	Consequence ^α				
	Minor ^α	Moderate ^α	High ^α	Major ^α	Critical ^α
Highly likely ^α	Medium ^α	High ^α	High ^α	Severe ^α	Severe ^α
Likely ^α	Low ^α	Medium ^α	High ^α	High ^α	Severe ^α
Possible ^α	Low ^α	Medium ^α	Medium ^α	High ^α	Severe ^α
Unlikely ^α	Low ^α	Low ^α	Medium ^α	High ^α	High ^α
Rare ^α	Low ^α	Low ^α	Low ^α	Medium ^α	High ^α

The risk assessment in Table 7-4 identifies the current threats/risks to achieving the management intent and outcomes. An initial risk rating is given for the threat in the absence of management measures, with a residual risk rating applied after management measures have been implemented.

Table 7-4 Current risks to achieving management outcomes

Risk name	Risk description	L	C	Risk rating in absence of management	Management measures	L	C	Residual risk rating
Weed infestation	Invasive weed species outcompeting TEC habitat or plantings	Highly likely	Minor	Medium	Undertake weed control, maintenance, monitoring, reporting and remedial actions as detailed in Section 6.5	Possible	Minor	Low
Insect outbreak/ infestation	A localised insect outbreak in the offset area has the potential to reduce plant growth and/or cause plant mortality via complete or partial plant defoliation or plant stress. Insect outbreaks could alter the species composition of the area ultimately leading to a change in the vegetation community or increasing the time to offset realisation.	Unlikely	Moderate	Low	Regular inspections of plants for symptoms of major insect attack (e.g. plant stress, leaf predation). Upon identification of major insect attack, remedial action should be undertaken at a scale appropriate to the size, extent and intensity of the disturbance.	Rare	Moderate	Low
Disease outbreak/ infestation	The health of the proposed offset area may be influenced by various phytopathogens (such as myrtle rust) which could cause reduced growth, plant stress, and/or plant mortality on an individual or community level. A disease outbreak could alter the species composition of the area	Possible	Moderate	Medium	Ensure disease free planting stock is used. Limit site access and perform regular inspection of plants for symptoms of disease (e.g. plant stress, leaf discolouration). Upon identification of disease or following an outbreak, remedial action should be undertaken at a scale	Unlikely	Moderate	Low

Risk name	Risk description	L	C	Risk rating in absence of management	Management measures	L	C	Residual risk rating
	and ultimately lead to a change in the vegetation community or increase the time to offset realisation.				appropriate to the size, extent and intensity of the disturbance.			
Vegetation management	Inappropriate site preparation and/or weed control leading to unsuccessful establishment of TEC plantings	Possible	Moderate	Medium	A planting program will be developed following baseline surveys, as will a weed control program. The preferred TEC offset planting sites will be located in existing disturbance areas of the TEC that have resulted in canopy gaps or sparseness. Targeted weed control will be undertaken followed by planting in these sites, as considered necessary to improve habitat quality. Refer to Section 6.5 for site preparation and planting methods.	Rare	Moderate	Low
Edge effects and habitat fragmentation	Areas with small habitat fragments may experience an increase in edge effects, where changes in population or community structures occur on the edges of habitats	Possible	Major	High	Consideration of fragmentation of habitat will be included in selection of planting sites, natural regeneration sites, targeted weed infestations and other land management activities. Connection of these patches will increase the extent of the current habitat and provide protection to	Possible	Minor	Low

Risk name	Risk description	L	C	Risk rating in absence of management	Management measures	L	C	Residual risk rating
					the existing fragments through the reduction in edge effects.			
Adjacent land uses	Impacts may occur from adjacent land uses such as logging, railway lines and roads.	Unlikely	Minor	Low	Management of adjacent land uses such as large infrastructure projects has been considered when selecting offset sites. The location of plantings will be in areas that are not already selected for future development. Inspection and management of disturbances and land use impacts will be undertaken. Refer to Section 6.6 for land use and management actions.	Unlikely	Minor	Low
Human trespass	Risk of humans traversing the site, particularly in areas where there are existing tracks, causing disturbance.	Possible	Minor	Low	If unauthorised access to the sites is recorded and considered to be having a negative impact, additional measures for restricting access (e.g. exclusion fencing, signage) will be installed to prohibit public access to the offset sites. Refer to Section 6.6 for land use and management actions.	Unlikely	Minor	Low
Flooding	A major flood event has the potential to severely disturb the offset site and cause individual	Possible	Major	High	Limit revegetation activities where terraced banks or gullies may be subject to flooding. Species	Unlikely	Major	High

Risk name	Risk description	L	C	Risk rating in absence of management	Management measures	L	C	Residual risk rating
	or vegetation community mortality as well as significantly affecting vegetation community integrity. A flood event has the potential to remove existing vegetation, potentially altering the species composition of an area and ultimately leading to a change in community composition and /or increasing the time to offset realisation.				selection and placement will consider flood impact on particular species during the planting stage. This may be in conjunction with a tree guard that will be removed when the plant has become established. Following a flood event, remedial action may be required at a scale appropriate to the size, extent and intensity of the disturbance. Refer to Section 6.7 for guidance on flood management.			
Land degradation from significant rainfall event	Erosion of topsoil from overland sheet flow or gully erosion on steep slopes occurring during significant rainfall events.	Likely	Moderate	Medium	Baseline surveys to identify areas of existing erosion or unstable soils. Access to sites for maintenance or monitoring may be limited during high rainfall events. Timing of activities in relation to wet weather should be considered when attempting access. Alternate access arrangements such as on foot rather than vehicle may be required. Where areas are identified as sloping, land stability should be considered for planting suitability in the event of significant	Unlikely	Minor	Low

Risk name	Risk description	L	C	Risk rating in absence of management	Management measures	L	C	Residual risk rating
					rainfall events. Low lying areas that will remain water logged may only be suitable for select species and should be positioned within the landscape based on their tolerance for soils that are not free draining. Refer to Section 6.6 for land use and management actions.			
Bushfire	Fire has the potential to severely disturb offset sites and cause individual tree or vegetation community mortality as well as affect vegetation community integrity. Species composition of the offset may be altered which could lead to a change in the vegetation community composition. Fire also has the potential to increase the time to offset realisation.	Possible	Major	High	Baseline surveys will include the identification of existing firebreaks and locations where firebreaks require maintenance. Fire breaks may be implemented where a considerable risk to offset area is identified. Fire breaks will be located outside of TEC habitat areas. Restriction of access to offset sites will assist in reducing fire ignition risks. If monitoring identifies an extreme risk of fire to the site that is not able to be mitigated in other ways, investigation into hazardous fuel load reduction through the surrounding areas with local councils or state government may	High	Possible	Medium

Risk name	Risk description	L	C	Risk rating in absence of management	Management measures	L	C	Residual risk rating
					be considered. Refer to Section 6.7 for guidance on bushfire management.			
Grazing	Stock on adjacent properties and herbivorous fauna entering the offset sites and grazing on vegetation (including newly planted or regenerating plants).	Possible	Minor	Low	Maintain perimeter fences to exclude stock access. Use tree guards on planted stock to reducing grazing impacts if observed.	Unlikely	Minor	Low
Prolonged drought	Prolonged periods without rainfall have the potential to cause plant stress and/or death and increase the time to offset realisation.	Possible	Moderate	Medium	The use of watering during the early establishment as outlined in Section 6.4 will assist the survival of the plants. Planting will be undertaken at a suitable time of year when there is a greater chance of rain occurring within the first six months of establishment. Monitoring will be used to determine the impacts of prolonged drought. Additional watering events may need to be applied if there is a risk of the planted stock dying.	Possible	Moderate	Medium

8. Compliance with EMP Guidelines

The proposed offsets have been developed in accordance with the overarching principles and aims of the EPBC Act and EPBC Act Environmental Management Plan Guidelines (Commonwealth of Australia, 2014), as outlined in Table 8-1.

Table 8-1 Lowland Rainforest Offset Compliance with EMP Guidelines

Relevant EMP Guideline section	Compliance
2.1 Key principles	<p>This Offset Strategy meets the key principles of an EMP, as relevant, including:</p> <ul style="list-style-type: none"> • Being balanced, objective and concise • Stating the purpose of the use of the document and any assumptions made • Identifying gaps in information requiring further detail (such as information to be updated following baseline surveys or monitoring events) • Using adaptive management strategies • Being clearly presented and written, and • Identifying roles and responsibilities for the commitments made
2.2 Including commitments in management plans	<p>Commitments in the Offset Strategy are specific and measurable with clear timeframes. The Offset Strategy will be incorporated into and appended to the Offset Management Plan, which will be submitted to DNRME as part of the VDec legally securing process.</p>
3. Content of the EMP	<p>The Offset Strategy is structured appropriately for its purpose as a guide to the delivery of the offsets. This includes:</p> <ul style="list-style-type: none"> • An introduction with project description, approval condition reference table, purpose of the strategy, roles and responsibilities, report structure and assumptions sections • Reporting of baseline surveys, monitoring surveys and other management requirements • Environmental management measures are included that describe the activities and control programs to be designed and undertaken at the offset sites, including timeframes and measurable performance indicators and completions criteria. Site maps are included. Monitoring programs are described, including triggers for remedial actions and reporting processes. • Audit and review processes
4. Evaluating risk	<p>A risk assessment is included in the Offset Strategy with regard to the EMP Guidelines risk assessment method (Section 7).</p>

9. Compliance with Offsets Policy

The proposed offsets have been developed in accordance with the overarching principles and aims of the EPBC Act and EPBC Act Environmental Offsets Policy (Commonwealth of Australia, 2012), as outlined in Table 9-1.

Table 9-1 Lowland Rainforest Offset Compliance with Environmental Offsets Policy

Offset Principles	Compliance
Suitable offsets must:	
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 proposed offset sites will be legally secured and contain suitable habitat for the Lowland Rainforest TEC that will be maintained and improved through removal of major threats (i.e. clearing disturbances, weed infestations, public access and activities, grazing livestock) and supplementary planting and maintenance and monitoring.
2. be built around direct offsets but may include other compensatory measures	The proposed offset sites achieve over 100% of the direct offset requirements for the Lowland Rainforest TEC. Additional compensatory measures are being undertaken alongside the direct offset provisions, such as weed control within TEC habitat in the Woondum local area.
3. be in proportion to the level of statutory protection that applies to the protected matter	The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide, and therefore is considered consistent with the statutory protection that applies to the Lowland Rainforest TEC.
4. be of a size and scale proportionate to the residual impacts on the protected matter	The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide, and therefore is considered to be of a size and scale proportionate to the residual impacts on the Lowland Rainforest TEC. Additional indirect offset measures being undertaken will ensure that the offsets provided are effective and are a greater compensation than that required.
5. effectively account for and manage the risks of the offset not succeeding	The offset sites contain suitable habitat for the Lowland Rainforest TEC, are currently either owned by TMR, or are owned and will be managed by SCC under an agreement with TMR, and will be legally secured prior to the impacts occurring or at least within four months following commencement, through Voluntary Declaration process and protected from clearing or other disturbances, therefore there is a low risk of the offset not succeeding. The Offset Strategy details management actions to be implemented with timeframes and performance indicators and outcomes. Management measures will include restriction of access, weed control, supplementary planting and identification of threats, and monitoring and maintenance as appropriate.
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 Woondum offset site is not otherwise protected or conserved. The Kawana offset site is located on reserve tenured land managed by SCC, but will be further protected through the Voluntary Declaration process to become a Category A area regulated under the VM Act. The Queensland Environmental Offsets Policy recognises that requirements for offsets for MNES under the EPBC Act do not need to be duplicated where the same impact and prescribed matter have been subject to assessment under the EPBC Act as a controlled action.

Offset Principles	Compliance
7. be efficient, effective, timely, transparent, scientifically robust and reasonable	<p>The proposed delivery of the Lowland Rainforest TEC offsets have used established and scientifically robust methods and will be implemented prior to the impacts occurring to the MNES.</p> <p>Assessments and monitoring and management programs proposed are based on documented management strategies and land management techniques that have been adapted to the locations and site characteristics, with reference to priority management actions and species profile information, recovery plans and threat abatement plans.</p>
8. have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	<p>The Offset Strategy includes responsible parties, management actions, timeframes, baseline survey and monitoring programs, review and audit processes, reporting, and remedial action triggers and measures. Compliance reporting, non-compliance reporting and requirements for notification to DAWE is described.</p>

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In effect under the EPBC Act from 25-Nov-2011 .

Appendices

Appendix A – Offset Assessment Guide Lowland Rainforest TEC

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	Lowland Rainforest of subtropical
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	6.8%

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
<i>Ecological communities</i>						
Area of community	Yes		Area	2	Hectares	
			Quality	7	Scale 0-10	
			Total quantum of impact	1.40	Adjusted hectares	
<i>Threatened species habitat</i>						
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					
<i>Threatened species</i>						
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			
<i>Ecological Communities</i>																			
Area of community	Yes	1.40	Adjusted hectares	TMR land adjacent to impact sites	Risk-related time horizon (max. 20 years)	20	Start area (hectares)	18.2	Risk of loss (%) without offset	0%	Risk of loss (%) with offset	0%	0.00	80%	0.00	0.00	1.51	107.73%	Yes
					Future area without offset (adjusted hectares)	18.2	Future area with offset (adjusted hectares)	18.2	Raw gain	2.00	Confidence in result (%)	80%	Adjusted gain	1.60	Net present value (adjusted hectares)	0.83			
					Time until ecological benefit	10	Start quality (scale of 0-10)	7	Future quality without offset (scale of 0-10)	6	Future quality with offset (scale of 0-10)	8							
<i>Threatened species habitat</i>																			
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	Raw gain		Confidence in result (%)		Adjusted gain		Net present value				
					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																		
<i>Threatened species</i>																			
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	1.4	1.51	107.73%	Yes	\$0.00	N/A	\$0.00
					\$0.00	\$0.00	\$0.00

Appendix B – Modified QLD Habitat Quality template

Provided by DAWE (December 2019)

OFFSET - Threatened Ecological Community (meets TEC listing thresholds)

Assessment Unit - Regional Ecosystem	Eg. AU 1 - RE 11.5.3 regrowth														Total average % benchmark	Total average score								
	Benchmark 11.5.3	Eg. Site 1		Average %		Average Score		Benchmark 11.5.9	Raw Data		% Benchmark		Score				Benchmark 11.4.2	Raw Data		% Benchmark		Score		
Site Condition																								
Recruitment of woody perennial species in EDL																								
Native plant species richness - trees																								
Native plant species richness - shrubs																								
Native plant species richness - grasses																								
Native plant species richness - forbs																								
Tree canopy height (average of emergent, canopy and sub-canopy)																								
Tree canopy cover (average of emergent, canopy and sub-canopy)																								
Shrub canopy cover																								
Native grass cover																								
Organic litter																								
Large trees (euc plus non-euc)																								
Coarse woody debris																								
Non-native plant cover																								
Site Condition Score				80			80					80											80	
MAX Site Condition Score																								80
Site Condition Score - out of 7																								0.00
Site Context																								
Size of patch																								
Connectedness																								
Context																								
Ecological Corridors																								
Role of site location to TEC overall population in the state																								
Threats to the species																								
Site Context Score				46			46					46											46	
MAX Site Context Score																								46
Site Context Score - out of 3																								0.00

Final habitat quality score (weighted)	AU1	AU2	AU3	Average/Final
Site Condition score (out of 7)				
Site Context score (out of 3)				
Habitat Quality score (out of 10)	0	0	0	0.00
Assessment Unit area (ha)				
Total offset area (ha) for this MNES				
Size Weighting				
Weighted Habitat Quality Score	0.00	0.00	0.00	0.00

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