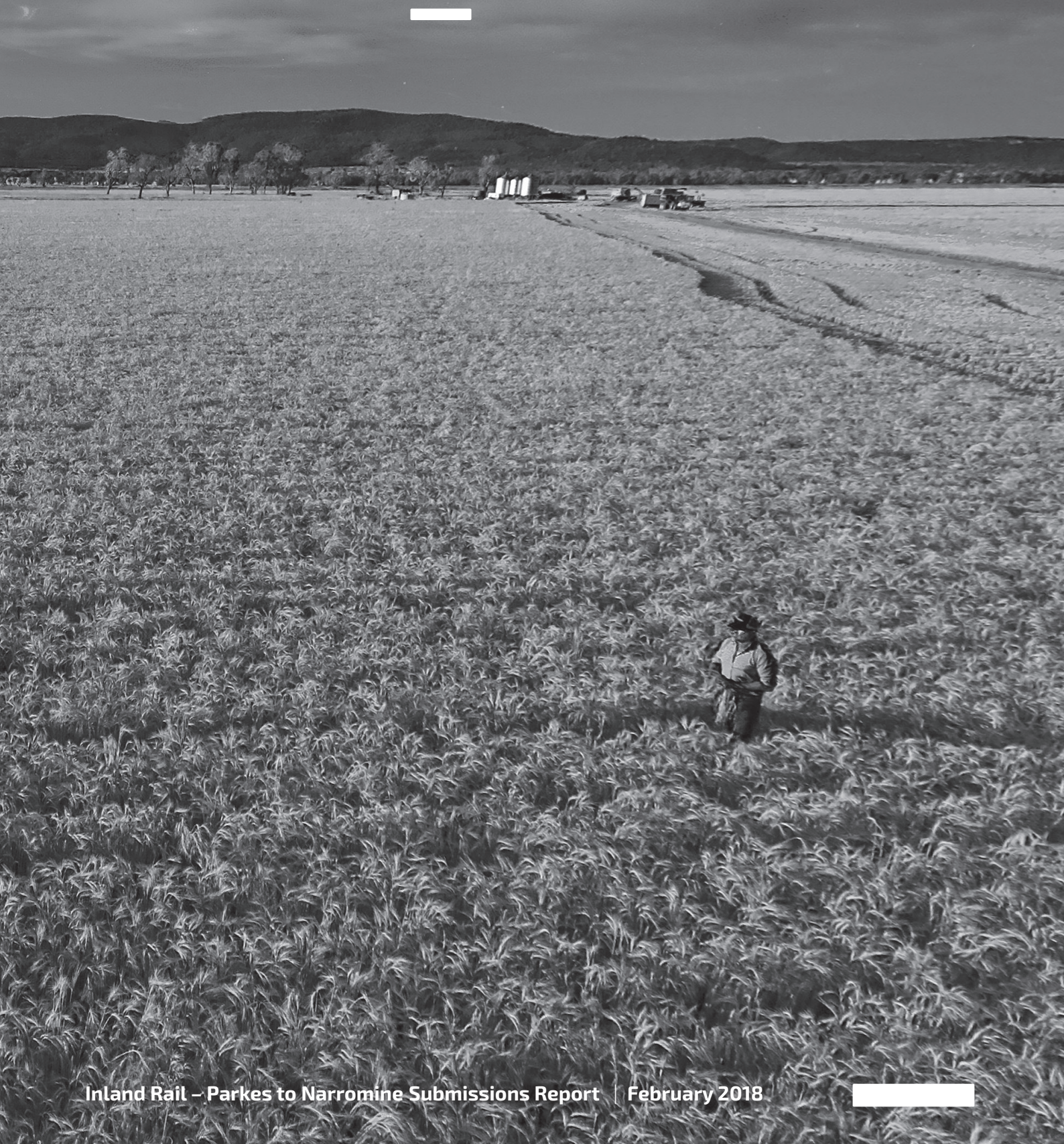


Public Level Crossing Treatment Methodology Appendix H



Public Level Crossing Treatment Methodology

Introduction

The key principles guiding the decision making process for determining treatments at public level crossings includes:

- Utilising a risk based decision making process focused on minimising risk so far as is reasonably practicable
- Consistency in the determination of level crossing treatments across the projects of the Inland Rail programme
- Consistent methodology used in the determination of whether the cost of the potential available treatment is grossly disproportionate to the level of risk to safety and the projected benefits
- Ensuring the feasibility of the Inland Rail Programme by proposing cost-effective solutions

An overview of the process followed in the assessment of level crossings across the Proposal site and the methodology followed in the development of level crossing treatments is outlined below.

Process overview - determination of level crossing treatments

Identification of all level crossings within the project area

An important objective of level crossing investigations is the clear and accurate identification of all level crossings within the project area. The development of an initial level crossing listing encompasses a review of existing level crossing datasets including the Australian Level Crossing Assessment Model (ALCAM) database, ARTC's asset management database and any relevant property records. The list of level crossings is then provided to the relevant road manager for review in order to ensure that all level crossings and the associated road infrastructure managers have been correctly identified.

Level crossing closure review

Initial consideration will be given to the elimination of level crossing risks by assessing all level crossings for closure. This is in line with the TfNSW Level Crossing Closures Policy, which notes that *"in order to manage the risks to safety associated with road and rail interfaces, the closure of public and private level crossings in NSW is to be pursued, where it is practical and cost effective to do so"*,

In New South Wales, formal closure of any level crossing requires Ministerial approval and needs to be undertaken in accordance with the requirements of the *Transport Administration Act 1998*.

TfNSW reviews all applications for level crossing closures before they are submitted to the Minister to ensure that the relevant issues have been considered and adequate consultation has been undertaken with the land owner, the local council, Emergency Services, Roads and Maritime Services (if they are the road authority), and any other relevant parties.

Review whether the Level crossing meets the criteria for automatic grades separation?

ARTC's policy is that rail-road interfaces will be automatically grade separated in the following three instances:

1. rail-road crossings with four rail tracks (current)
2. rail-road crossings of freeways and highways of four or more lanes (current and committed future plans)
3. where grade separation is the logical option for topographical reasons.

All other crossings will be assessed using the Level Crossing Risk Tool.

Level Crossing Risk Tool

Where closure is not feasible a methodology has been developed to identify what risk treatments should be implemented at individual level crossings as part of the Inland Rail project

scope. This methodology is in the form of a formalised Level Crossing Risk Tool that identifies risk treatments and assists ARTC in being able to demonstrate that risks to safety would be managed So Far As Is Reasonably Practicable (SFAIRP) for both Brownfield and Greenfield interfaces. In line with Office of the National Rail Safety Regulator (ONRSR's) recommendation around the use of quantitative risk assessment techniques, a decision was made to develop a tool which moved from a "warrant" approach (e.g. decisions around control types based on basic metrics such as road type or traffic volumes) to a cost benefit analysis (CBA) approach for safety risk management. The approach utilises ALCAM as one of the main inputs into the decision process for the recommended level of control at Inland Rail level crossings.

The Australian Transport Council in May 2003 agreed to adopt the Australian Level Crossing Assessment Model (ALCAM) as the only comprehensive level crossing assessment model in Australia. ALCAM is an assessment tool used to identify key potential risks at level crossings and assess the overall effects of proposed treatments. It does not specify what treatment is warranted at level rail-road crossing sites nor attempt to define a 'safe' or acceptable level of risk. This is a decision for each Rail Infrastructure Manager.

Section 10 of ONRSR's Policy on Level Crossings (June 2016) provides support for the use of ALCAM as follows:

"ONRSR accepts the use of ALCAM as a tool to help prioritise investment (when used in conjunction with other relevant factors, such as recent occurrence history). This tool has been endorsed by state and territory ministers."

Consideration of factors other than ALCAM that may influence the recommended level of control are also taken into account where relevant on a case by case basis including:

- Collision and near-collision history;
- Engineering experience (both rail and road);
- Traffic and transport impacts; and
- Local knowledge of driver or pedestrian behaviour.

Level Crossing treatment (control) options considered as part of the process include:

- upgrade of passive (stop sign) level crossings to flashing lights and boom barriers
- upgrade of existing flashing light controlled level crossings to include boom barriers
- retain existing passive controls and renew the level crossing infrastructure including signage and road markings to ensure the crossing complies with the Australian Standard
- grade separation; and
- other treatments identified based on site specific risks.

In accordance with the TfNSW position, any upgrades from passive/stop sign controls to active controls will include boom barriers. Active controls are where a device such as flashing lights or boom barriers are activated prior to and during the passage of a train through the level crossing.

Cost Benefit Analysis (CBA)

Part of the test as to whether risks have been managed SFAIRP is to determine whether the cost of the additional control is grossly disproportionate to the benefit gained via a Cost Benefit Analysis (CBA). From a financial perspective to do the CBA, 3 key inputs are required. The basis for these inputs is detailed below:

1. *The avoided cost if an additional risk control is implemented* - The risk tool relies on ALCAM which provides a quantitative measure of risk also enables the modelling of

risk reduction generated by changing the controls at the level crossing. Risk reduction (benefits) can be calculated by comparing two risk scores for two scenarios – for example one Proposal with stop signs and one with flashing lights and boom barriers.

2. *The cost of implementing the additional risk control* - This is a combination of the capital cost of the additional control and the annual maintenance and repair cost over the life of the additional control
3. *What would be considered grossly disproportionate* - From a legal perspective the ONRSR *Meaning of Duty to Ensure Safety So Far As Is Reasonably Practicable Guideline* provides some guidance on what would be considered grossly disproportionate in other words guidance on a “Grossly Disproportionate Factor” or GDF. The guideline suggests that the GDF may be dependent on the likelihood and consequence with low risks having a factor of 2 and high risk having a factor of 10.

The use of ALCAM assessments in the determination of level crossing treatments

ALCAM assessments have been undertaken for all public road level crossings in the proposal site thus providing a baseline risk score. The proposal functionality in the ALCAM system is used to model what the ALCAM risk score would be assuming the introduction of Inland rail. This incorporates forecast changes to train speeds, volumes and train lengths. Updated road traffic counts including a breakdown between light and heavy vehicles are also collected for all public roads and included in this analysis.

If a crossing is assessed as being non-compliant for the existing control, the next level of control will be applied. For example if based on the updated train speeds, sufficient sighting distance for a stop sign crossing as per Australian Standard 1742.7-2016 (Manual of uniform traffic control devices Part 7: Railway crossings) cannot be achieved, then the minimum control will be flashing lights and boom barriers. Even when a crossing is compliant for the current control, the next level of control is modelled in ALCAM and a cost benefit/grossly disproportionate analysis is undertaken and additional levels of control are modelled and a cost-benefit/gross disproportionate analysis is carried out until the risk factor is reduced and a cost-effective level of crossing protection is established. In parallel, ARTC review the ONRSR incident data to determine if there have been any road rail collisions at the respective level crossings.

Preliminary Design

A preliminary level of design is first undertaken to confirm that a level crossing with the proposed control, which complies with the relevant standards can be constructed onsite. This design incorporates any road design standards which have been provided by the relevant road infrastructure manager.

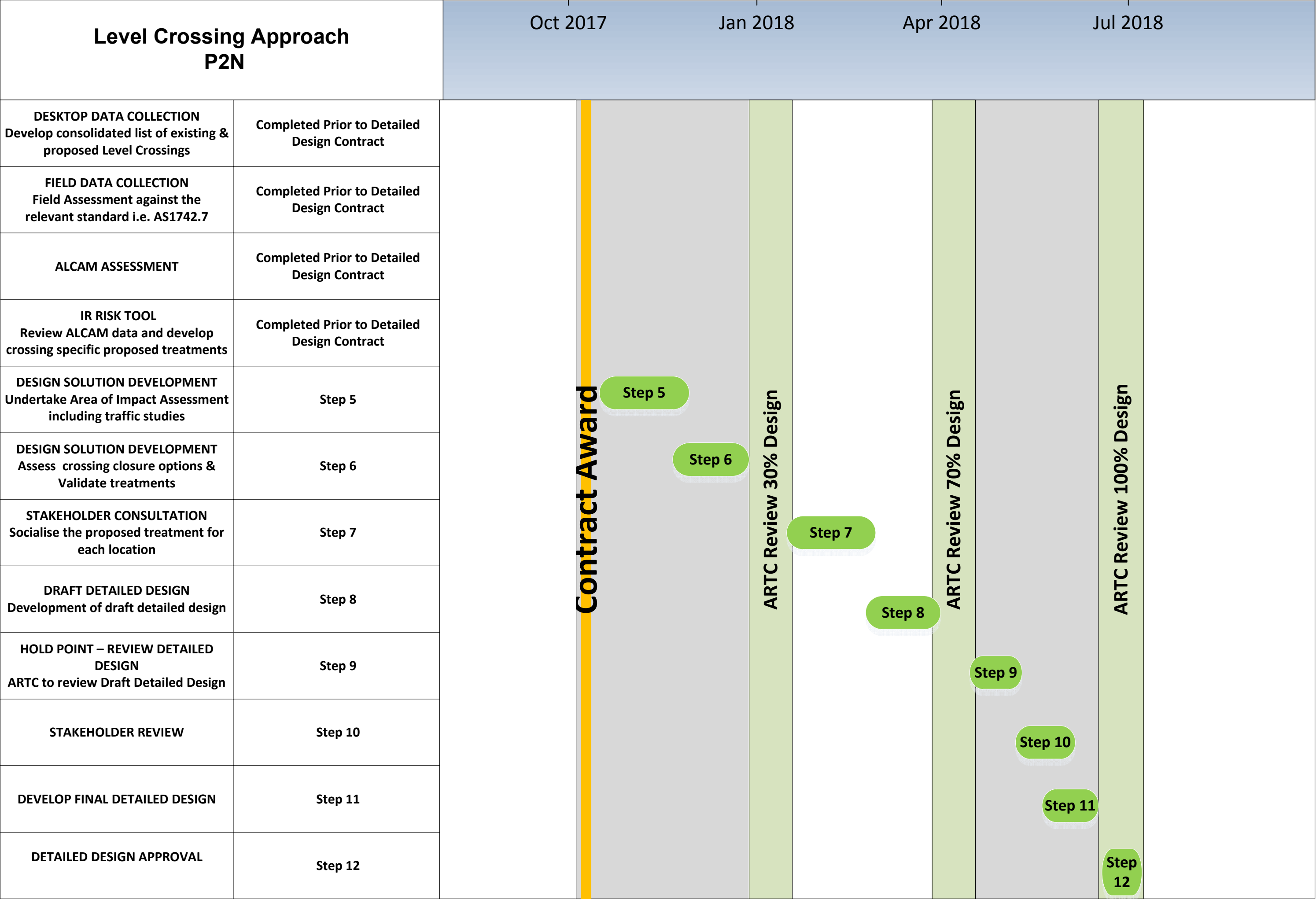
Site specific level crossing treatments are then reviewed with the respective road infrastructure managers as the project progresses through detailed design. An overview of the detailed design timelines is included in attachment A.

Interface Agreements

In accordance with National and State Rail Safety Law requirements, all current and proposed public road crossings will be subject to an Interface Agreement

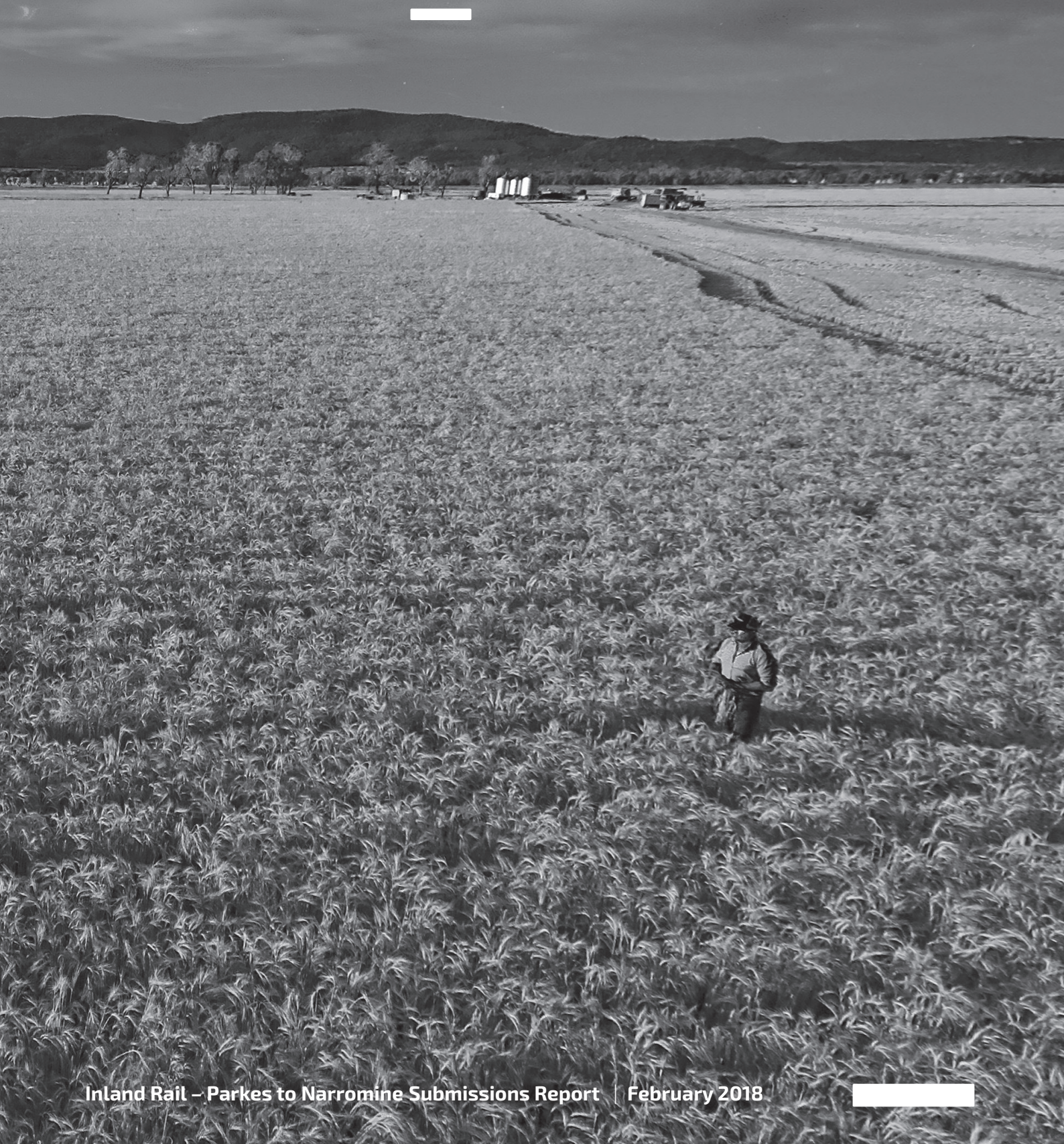
Conclusion

The objective is to develop a consistent methodology in the selection of level crossing treatments which is acceptable to key stakeholders and minimises risk so far as is reasonably practicable.



Biodiversity Offsets Preliminary Site Assessment Results

Appendix I



P2N Shortlisted Offset Sites (State offset obligations)

Property	P2N Offset Credit Requirements (estimated offset area needed)										Comments
	PCT26 (14.6ha)	PCT36 (5.4ha)	PCT55 (34.2ha)	PCT70 (3.8ha)	PCT76 (102.9ha)	PCT201 (7ha)	PCT244 (11.4ha)	PCT267 (18.5ha)	PCT276 (58.5ha)	Koala Habitat (70ha)	
1						PCT266 Confirmed 72ha estimated		PCT267 Confirmed 35ha estimated	PCT266 Confirmed 72ha estimated	Koala habitat present >100ha estimated	We believe this property is compliant with NSW Major Project Offset Policy to deliver three impact PCT credit requirements and koala habitat credits for the proposal. Based on preliminary inspections we have confirmed the property contains areas of PCT267 and PCT266 which are suitable to offset PCTs 201, 267 and 276. There is also potential for additional areas of Western Grey Box (PCT76) to be present. This will be subject to further assessments.
2											At this time this property is not recommended to be progressed as an offset due to existing legal agreements.

3	PCT26 Confirmed 140ha estimated									Koala habitat present. Associated with River Red Gum along riparian areas.	We believe this property is compliant with NSW Major Project Offset Policy to deliver at least one impact PCT credit requirements and koala habitat credits for the proposal.
4											This property will be retained on our register. It can be used as a secondary option to fill any remaining gaps once Property 3 offsets areas are finalised.
5											This property will be retained on our register. It can be used as a secondary option for Weeping Myall should there be any remaining Weeping Myall requirements once Property 3 offset areas are finalised.
6											We will continue to try and contact landholder.

7		River Red Gum communities are present		<p>PCT70 5ha mapped</p> <p>PCT80 22ha mapped</p> <p>PCT237 0.3ha mapped</p> <p>PCT76 0.5ha mapped</p>						<p>Koala habitat confirmed Associated with River Red Gum</p>	<p>The property has the potential to meet two impact PCT offset requirements (PCT36, PCT70) but further evaluation is needed to confirm PCTs on the property and ability to trade at the Class/Formation level. Property also contains koala habitat. The next step will be to confirm PCTs and offset requirements they can meet.</p>
8			<p>PCT39 17ha mapped</p> <p>PCT55 61ha mapped</p>	<p>PCT56 14ha mapped</p>						<p>Potential koala habitat associated with Coolabah</p>	<p>We recommend a site inspection is conducted in early 2018 to validate PCTs, the extent available, estimated credits, and overall suitability as an offset site for the proposal.</p>

9		PCT9 15ha & PCT5 35ha ground- truthed		PCT76 20ha ground- truthed			PCT76 20ha ground- truthed				This property will be retained on our register. It can be used as a secondary option for these impact PCTs should gaps remain post finalising the preferred offset sites.
10											We recommend continuing consultation with the landowner late January 2018 to determine what vegetation is available for offsets.
11								PCT267 White Box Yellow Box grassy woodland TEC confirmed	PCT267 White Box Yellow Box grassy woodland TEC confirmed	Koala habitat is likely present associated with eucalyptus woodlands	The property will be retained on the offset register as another option to meet EPBC requirements for White Box-Yellow Box TEC. The property contains >250ha of the TEC but due to an existing agreement 'additionality' would need to be demonstrated.

P2N Shortlisted Offset Sites – (Commonwealth offset obligations)

P2N Offset Credit Requirement (estimated offset area needed)					
Property	Weeping Myall TEC (14ha)	Grey Box Grassy Woodland TEC (105ha)	White Box – Yellow Box TEC (80ha)	Koala Habitat (70ha)	Comments
1			Confirmed 100ha estimated	Confirmed >100ha estimated	We believe this property is compliant with NSW Major Project Offsets Policy and EPBC Act Offsets Policy for delivering the White Box-Yellow Box-Blakely's Red Gum TEC and koala habitat offset requirements for P2N. More detailed field surveys will be undertaken at a later date post further offset negotiations with the landowner to complete offset credit assessments and confirm total area required.
3	Confirmed >140ha estimated			Confirmed. Associated with River Red Gum	We believe this property is compliant with NSW Major Project Offset Policy and EPBC Act Offsets Policy for delivering the Weeping Myall TEC and koala habitat offset requirements for P2N. More detailed field surveys will be undertaken at a later date post further offset negotiations with the landowner to complete offset credit assessments and confirm total area required.
9	Confirmed PCT26 3.5ha estimated	Confirmed PCT76 20ha estimated			The property and landholder are within our existing networks, and an initial ground-truthing survey has been undertaken. As the property has been confirmed to contain two TECs that partially acquit P2N requirements it will be retained on our offset register as a secondary offset option.

10	Confirmed PCT27 >100ha estimated				<p>The landowner has advised his property contains:</p> <ul style="list-style-type: none"> • Weeping myall • Native grasslands (Bluegrass/Mitchell grass) • Poplar box woodlands • Coolabah on watercourse • Closed Belah forests • Brigalow woodlands. <p>We recommend continuing engagement with the landowner late January 2018 to determine if it is known what vegetation is available for offsets. We can then make a further evaluation if it is worth exploring.</p>
11			Confirmed >250ha	Confirmed koala habitat present associated with eucalyptus woodlands	<p>The property will be retained on the offset register as another option to meet EPBC requirements for White Box-Yellow Box TEC. The property contains >250ha of the TEC but due to an existing agreement 'additionality' would need to be demonstrated.</p>