Appendices

Image: Railway south of Moree, NSWa

Appendix A – Secretary's environmental assessment requirements and summary of agency requirements

Table A.1 General standard SEARs

Item	Requirement	EIS reference
1. Environmental Impact Assessment Process	1. The Environmental Impact Statement must be prepared in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation).	Appendix C
	2. The project will impact on matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed in accordance with the NSW Bilateral Agreement (2015). The Proponent must assess impacts to MNES protected under the EPBC Act. This assessment must be in accordance with the requirements listed in Attachment A.	Chapter 10 Technical Report 4 (refer Table A.3)
	3. The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	Chapter 3
2. Environmental Impact Statement	1. The EIS must include, but not necessarily be limited to, the following:	
	(a) executive summary	Executive summary
	(b) a description of the project, including all components and activities (including ancillary components and activities) required to construct and operate it	Chapters 7 and 8
	(c) statement of the objective(s) of the project	Section 1.3
	(d) a summary of the strategic need for the project with regard to its critical State significance and relevant State Government policy	Section 5.1, Appendix E
	(e) an analysis of any feasible alternatives to the project	Section 6.1
	(f) a description of feasible options within the project.	Section 6.2
	(g) a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative / option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to and options(s) within the project were selected	Sections 6.2 and 6.3
	(h) a concise description of the general biophysical and socio-economic environment that is likely to be impacted by the project (including offsite impacts). Elements of the environment that are not likely to be affected by the project do not need to be described	Chapter 2
	(i) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts	Section 7.1.2
	(j) the identification and assessment of key issues as provided in the 'Assessment of Key Issues' performance outcome	Chapters in Part C
	(k) a statement of the outcome(s) the proponent will achieve for each key issue	Section 27.4

Item	Requirement	EIS reference
2. Environmental Impact Statement	(l) measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact	Chapters in Part C
	(m) consideration of the interactions between measures proposed to avoid or minimise impact(s), between impacts themselves and between measures and impacts	Chapters in Part C
	(n) an assessment of the cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed	Chapter 26
	(o) statutory context of the project as a whole, including: ▸ how the project meets the provisions of the EP&A Act and EP&A Regulation ▸ a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out	Chapter 3
	(p) a chapter that synthesises the environmental impact assessment and provides: ▸ a succinct but full description of the project for which approval is sought ▸ a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project ▸ a compilation of the impacts of the project that have not been avoided ▸ a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts ▸ a compilation of the outcome(s) the proponent will achieve ▸ the reasons justifying carrying out the project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable development and cumulative impacts.	The synthesis is provided in the two chapters in Part D – Chapters 27 and 28
	(q) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software.	Throughout the EIS
	2. The EIS must only include data and analysis that is reasonably needed to make a decision on the proposal. Relevant information must be succinctly summarised in the EIS and included in full in appendices. Irrelevant, conflicting or duplicated information must be avoided.	Detailed findings are provided in appendices and technical reports

Item	Requirement	EIS reference
3. Assessment of key issues	1. The level of assessment of likely impacts must be proportionate to the significance of, or degree of impact on, the issue, within the context of the proposal location and the surrounding environment. The level of assessment must be commensurate to the degree of impact and sufficient to ensure that the Department and other government agencies are able to understand and assess impacts.	Part C
	2. For each key issue the Proponent must: (a) describe the biophysical and socio-economic environment, as far as it is relevant to that issue; (b) describe the legislative and policy context, as far as it is relevant to the issue; (c) identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts; (d) demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies); (e) detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant); and (f) detail how any residual impacts will be managed or offset, and the approach and effectiveness of these measures. Where multiple reasonable and feasible options to avoid or minimise impacts are available, they must be identified and considered and the proposed measure justified taking into account the public interest.	Refer individual chapters in Part C
4. Consultation	1. The project must be informed by consultation, including with relevant government agencies, infrastructure and service providers, special interest groups, affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines.	Chapter 4
	2. The Proponent must document the consultation process, and demonstrate how the project has responded to the inputs received.	Sections 4.1 to 4.3
	3. The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution.	Section 4.5

Table A.2 Key issue requirements

Key issue	Requirement	EIS reference
5. Air quality	1. The Proponent must undertake an air quality impact assessment (AQIA) for construction and operation of the project in accordance with the current guidelines	Chapter 13
	2. The Proponent must ensure the AQIA also includes the following: (a) demonstrated ability to comply with the relevant regulatory framework, specifically the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations (Clean Air) Regulation 2010*; and	Section 13.1.1
	(b) a cumulative local and regional air quality impact assessment.	Section 13.4
6. Biodiversity	1. The Proponent must assess biodiversity impacts in accordance with the current guidelines including the Framework for Biodiversity Assessment (FBA).	Chapter 10 Technical Report 2
	2. The Proponent must assess any impacts on biodiversity values not covered by the FBA as specified in s2.3.	Sections 10.3.2 to 10.3.4
	3. The Proponent must assess impacts on the EECs, threatened species and/or populations as listed in Attachment B and provide the information specified in s9.2 of the FBA.	Section 10.3.2
	4. The Proponent must identify whether the project as a whole, or any component of the project, would be classified as a Key Threatening Process in accordance with the listing in the *Threatened Species Conservation Action 1995* (TSC Act), *Fisheries Management Act 1994* (FM Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).	Chapter 10, Section 10.3.2
	5. The Proponent must assess impacts on MNES as outlined in Section 1.2 (*in Table A.1*).	Refer Table A.3 Technical Report 4
7. Climate Change Risk	1. The Proponent must assess the risk and vulnerability of the project to climate change in accordance with the current guidelines.	Chapter 23
	2. The Proponent must quantify specific climate change risks with reference to the NSW Government's climate projections at 10km resolution (or lesser resolution if 10km projections are not available) and incorporate specific adaptation actions in the design.	Section 23.2 Appendix J
8. Flooding	1. The Proponent must assess and model the impacts on flood behaviour during construction and operation for a full range of flood events up to the probable maximum flood (taking into account storm intensity due to climate change) including:	Chapter 15 Technical Report 6
	(a) any detrimental increases in the potential flood affectation of other properties, assets and infrastructure;	Sections 15.3.3 and 15.3.5
	(b) consistency (or inconsistency) with applicable Council floodplain risk management plans;	Section 15.3.5
	(c) compatibility with the flood hazard of the land;	Section 15.3.5
	(d) compatibility with the hydraulic functions of flow conveyance in flood ways and storage areas of the land;	Section 15.3.5

Key issue	Requirement	EIS reference
8. Flooding	(e) downstream velocity and scour potential;	Section 15.3.5
	(f) impacts the development may have upon existing community emergency management arrangements for flooding. These matters must be discussed with the State Emergency Services and Council; and	Section 15.3.5
	(g) any impacts the development may have on the social and economic costs to the community as consequence of flooding.	Section 15.3.5
9. Health and Safety	1. The Proponent must assess the likely risks of the project to public safety, paying particular attention to pedestrian safety, subsidence risks, bushfire risks and the handling and use of dangerous goods.	Chapter 25
10. Heritage	1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:	
	(a) Aboriginal places and objects, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines;	Sections 17.1.2, 17.2.2 and 17.3 Technical Report 8
	(b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	Section 17.2.2
	(c) environmental heritage, as defined under the *Heritage Act 1977*; and	Sections 18.2 and 18.3 Technical Report 9
	(d) items listed on the National and World Heritage lists.	Sections 18.2 and 18.3 Technical Report 9
	2. Where impacts to State or locally significant heritage items are identified, the assessment must:	
	(a) include a statement of heritage impact for all heritage items (including significance assessment);	Section 18.3 Technical Report 9, Section 5
	(b) consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant)	Section 18.3 Technical Report 9
	(c) outline measures to avoid and minimise those impacts in accordance with the current guidelines; and	Section 18.4
	(d) be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	Technical Report 9, Section 1.6.2

Key issue	Requirement	EIS reference
10. Heritage	3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010).	Chapter 17, Technical Report 8
	4. Where impacts to Aboriginal objects and/or places are proposed, consultation must be undertaken with Aboriginal people in accordance with the current guidelines.	Section 17.1.1 Technical Report 8
11. Noise and Vibration - Amenity	1. The Proponent must assess construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to sensitive receivers including small businesses, and include consideration of sleep disturbance and, as relevant, the characteristics of noise and vibration (for example, low frequency noise).	Chapter 11 Technical Report 5
	2. The Proponent must demonstrate that blast impacts are capable of complying with the current guidelines, if blasting is required.	No blasting required
12. Noise and Vibration - Structural	1. The Proponent must assess construction and operation noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage).	Chapter 12 Technical Report 5
	2. The Proponent must demonstrate that blast impacts are capable of complying with the current guidelines, if blasting is required.	No blasting required
13. Protected and Sensitive Lands	1. The Proponent must assess the impacts of the project on environmentally sensitive land and processes (and the impact of processes on the project) including, but not limited to:	Section 10.2.4 Technical Report 2
	(a) protected areas (including land and water) managed by OEH and/or DPI Fisheries under the National Parks and Wildlife Act 1974;	None would be impacted – refer Section 10.2.4
	(b) Key Fish Habitat as mapped and defined in accordance with the Fisheries Management Act 1994 (FM Act);	Sections 10.2.4 and 10.3.3
	(c) waterfront land as defined in the Water Management Act 2000;	Sections 15.3 and 16.3
	(d) land or waters identified as Critical Habitat under the TSC Act, FM Act or EPBC Act; and	None would be impacted – refer Section 10.2.4
	(e) biobank sites, private conservation lands and other lands identified as offsets.	None would be impacted – refer Section 10.2.4

Key issue	Requirement	EIS reference
14. Socio-economic, Land Use Property, Agriculture and Biosecurity	1. The Proponent must assess social and economic impacts in accordance with the current guidelines and consider the social and economic impacts of severance of communities.	Chapter 21 Technical Report 11
	2. The Proponent must assess agricultural land use impacts in accordance with the current guidelines	Chapter 20
	3. The Proponent must undertake an assessment of biosecurity risks and management measures relating to the potential for spread of pests, diseases or weeds along the length of the project alignment.	Sections 20.3 and 20.4
	4. The Proponent must assess impacts from construction and operation on potentially affected properties, businesses, recreational users and land and water users (for example, recreational and commercial fishers, oyster farmers), including property acquisitions/adjustments, access, amenity and relevant statutory rights.	Potential property impacts – Section 20.3. Potential business impacts – Section 21.3. The proposal would not impact on recreational or water uses.
	5. Where the project may impact on significant mineral resources, the proponent must assess the impact of the project on these resources, including: (a) any operating mines, extractive industries or known mineral or petroleum resources; (b) exploration activities in the vicinity of the proposed development; and (c) access for future exploration in the area and (d) consult with active Petroleum Extraction Licence holders in the vicinity of the proposal.	No impacts predicted – refer to Section 20.2.4
	6. The Proponent must identify encroachments into adjoining road reserves, and any Crown land affected by the proposal.	Sections 20.2.5 and 20.3
15. Soils	1. The Proponent must assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, the Proponent must document how the assessment and/or remediation would be undertaken in accordance with current guidelines.	Chapter 14
	2. The Proponent must assess whether salinity is likely to be an issue and if so, determine the presence, extent and severity of soil salinity within the project area.	Salinity is not expected to be an issue for the proposal site – refer to Sections 14.2.1 and 14.3.2

Key issue	Requirement	EIS reference
15. Soils	3. The Proponent must assess the impacts of the project on soil salinity and how it may affect groundwater resources and hydrology.	Section 14.3.2
	4. The Proponent must assess the impacts on soil and land resources (including erosion risk or hazard). Particular attention must be given to soil erosion and sediment transport consistent with the practices and principles in the current guidelines.	Sections 14.3 and 14.4
16. Sustainability	1. The Proponent must assess the sustainability of the project in accordance with the Infrastructure Sustainability Council of Australia (ISCA) *Infrastructure Sustainability Rating Tool* and recommend an appropriate target rating for the project.	Chapter 22 Appendix I
	2. The Proponent must assess the project against the current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport.	Chapter 22 Appendix I
17. Transport and Traffic	1. The Proponent must assess construction transport and traffic (vehicle, pedestrian, bus services, train operation and cyclists) impacts, including, but not necessarily limited to:	Chapter 9 Technical Report 1
	(a) a considered approach to route identification and scheduling of transport movements;	Sections 8.3 and 8.6 and Section 9.3.2
	(b) the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements and track machines);	Section 8.6.5 Section 9.3.2
	(c) construction worker parking;	Section 9.3.2
	(d) the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements) and assessment of traffic impacts on these routes including identifying traffic management measures to mitigate any issues;	Sections 9.2, 9.3.2 and 9.4
	(e) provisions proposed to ensure safe access and egress to/from the classified road network;	Sections 9.3.2 and 9.4
	(f) the nature of any train paths (types and number of movements) and potential impact to these train paths due to additional track possession requirements; and	Section 2.5 and Section 9.3.2
	(g) the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project.	Section 8.3 and Section 9.3.2
	2. The Proponent must assess (and model) the operational transport impacts of the project for both road and rail, including:	Chapter 9 Technical Report 1
	(a) existing and forecast travel demand and traffic volumes for the project (road and rail);	Section 7.6 and Section 9.3.3
	(b) travel time analysis (road and rail);	Section 9.3.3
	(c) performance of key interchanges and intersections by undertaking a level of service analysis at key locations	Section 9.3.3

Key issue	Requirement	EIS reference
17. Transport and Traffic	(d) assessment of impacts on the operation of bus services and public transport infrastructure;	Section 9.3.3
	(e) wider transport interactions (local and regional roads, cycling, public and freight transport and the broader NSW rail network); and	Section 9.3
	(f) identification of traffic and transport measures to mitigate any impacts.	Section 9.4
	3. The proponent must assess the feasibility of level crossings (existing and planned) and take into account: (a) safety assessments;	Section 6.3.4 Sections 9.2.3 and 9.3.3
	(b) consistency with any Interface Agreements and related Safety Management Plans, including draft Interface Agreements and draft Safety Management Plans; and	Section 6.3.4 Technical Report 1
	(c) operation of level crossings with regard to road and rail travel speeds, vehicle types, train lengths, train numbers, road and rail traffic volumes and sight distance.	Section 9.3.3 Technical Report 1
	4. The proponent must assess the likely risks of the project to public safety, paying particular attention to pedestrian safety	Sections 9.3.2 and 9.3.3 Section 25.3
18. Visual Amenity	1. The Proponent must assess the visual impact of the project and any ancillary infrastructure on:	Chapter 19 Technical Report 10
	(a) views and vistas;	Sections 19.2.2, 19.3.2 and 19.3.3
	(b) streetscapes, key sites and buildings;	Sections 19.2.1, 19.3.2 and 19.3.3
	(c) heritage items including Aboriginal places and environmental heritage; and	Sections 19.3.2 and 19.3.3 Technical Report 8 And 9
	(d) the local community.	Sections 19.2.2, 19.3.2 and 19.3.3
	2. The Proponent must provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.	Section 19.3.3
19. Waste	1. The Proponent must assess predicted waste generated from the project during construction and operation, including:	Chapter 24
	a) classification of the waste in accordance with the current guidelines;	Sections 24.2 and 24.3
	b) estimates / details of the quantity of each classification of waste to be generated during the construction of the project, including bulk earthworks and spoil balance;	Section 24.2.2
	c) handling of waste including measures to facilitate segregation and prevent cross contamination;	Section 24.3

Key issue	Requirement	EIS reference
19. Waste	d) management of waste including estimated location and volume of stockpiles;	Section 7.4.2 and Sections 24.2.2 and 20.3
	e) waste minimisation and reuse;	Sections 24.2 and 20.3
	f) lawful recycling or disposal locations for each type of waste; and	Section 24.2.2
	g) contingencies for the above, including managing unexpected waste volumes.	Section 24.3
	2. The Proponent must assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste particularly with relation to sediment/leachate control, noise and dust.	Section 24.2.2 Chapters 11, 13, 14 and 16
20. Water - Hydrology	1. The Proponent must describe (and map) the existing hydrological regime for any surface and groundwater resource (including reliance by users and for ecological purposes) likely to be impacted by the project, including stream orders, as per the FBA.	Section 15.2 Technical Report 6, Technical Report 3
	2. The Proponent must assess (and model if appropriate) the impact of the construction and operation of the project and any ancillary facilities (both built elements and discharges) on surface and groundwater hydrology in accordance with the current guidelines, including:	Sections 15.3.2 and 15.3.4 Technical Report 6
	(a) natural processes within rivers, wetlands, estuaries, marine waters and floodplains that affect the health of the fluvial, riparian, estuarine or marine system and landscape health (such as modified discharge volumes, durations and velocities), aquatic connectivity and access to habitat for spawning and refuge;	Sections 15.3.2 and 15.3.4
	(b) direct or indirect increases in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses;	Sections 15.3.2 and 15.3.4
	(c) minimising the effects of proposed stormwater and wastewater management during construction and operation on natural hydrological attributes (such as volumes, flow rates, management methods and re-use options) and on the conveyance capacity of existing stormwater systems where discharges are proposed through such systems; and	Sections 15.3.2 and 15.3.4 No discharges are proposed through existing stormwater systems
	(d) water take (direct or passive) from all surface and groundwater	Sections 15.3.2 and 15.3.4
	3. The Proponent must identify any requirements for baseline monitoring of hydrological attributes.	Section 16.4 Technical Report 6

Key issue	Requirement	EIS reference
21. Water - Quality	1. The Proponent must:	
	(a) state the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values;	Section 16.2.3 Technical Report 7, Section 2.6.1 (Table 2-2), Section 5.2.2
	(b) identify and estimate the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point and describe the nature and degree of impact that any discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment	Section 16.3.2
	(c) identify the rainfall event that the water quality protection measures will be designed to cope with	Section 16.4.1
	(d) assess the significance of any identified impacts including consideration of the relevant ambient water quality outcomes	Section 16.3 Technical Report 7, Section 2.6.1, Section 5
	(e) demonstrate how construction and operation of the project will, to the extent that the project can influence, ensure that: ▸ where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and ▸ where the NSW WQOs are not currently being met, activities will work toward their achievement over time	Sections 16.3.1, 16.3.2 and 16.4 Technical Report 6 – Table 2-2
	(f) justify, if required, why the WQOs cannot be maintained or achieved over time	Sections 16.2.3 and 16.3.2 Technical Report 7
	(g) demonstrate that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented	Sections 16.3.1 and 16.4
	(h) identify sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments; and	Sections 16.3.1 and 16.4 Technical reports 6 and 7
	(i) identify proposed monitoring locations, monitoring frequency and indicators of surface water quality.	Technical Report 7

Table A.3 Summary of EPBC Act assessment requirements (from Attachment A to the SEARs)

Requirement		EIS reference
General requirements	4. The title of the action, background to the development and current status.	Submission certificate and Chapter 5
Project description	5. The precise location and description of all works to be undertaken that may have impacts on matters of national environmental significance (MNES).	The location of the proposal site is described in Chapter 2. The proposal is described in Chapters 7 (proposal features) and 8 (construction). Refer also Figure 10.1.
	6. How the action relates to other actions that have been, or are being taken, in the region affected by the action.	Chapter 5
	7. How the works are to be undertaken and design parameters for those aspects that may have relevant impacts on MNES.	Chapter 8 (construction description) and Section 10.3.1
Impacts	8. The EIS must include an assessment of the relevant impacts of the action on threatened species and communities; including: ▸ a description and detailed assessment of the nature and extent of the likely impacts ▸ a statement whether any relevant impacts are likely to be known, unpredictable or irreversible ▸ analysis of the significance of the relevant impacts ▸ any technical data and other information used or needed to make a detailed assessment of the relevant impacts ▸ a comparative description of the impacts of alternatives, if any, on the threatened species and communities.	Chapter 10 Impacts on EPBC Act matters are considered in Technical Report 4, and summarised in Section 10.3.2
Avoidance, mitigation and offsetting	9. For each of the relevant matters protected that are likely to be impacted by the development, the EIS must provide information on proposed avoidance and mitigation measures to detail with the relevant impacts of the action, including: ▸ a description and an assessment of the expected or predicted effectiveness of the mitigation measures ▸ any statutory policy basis for the mitigation measures ▸ the cost of the mitigation measures ▸ a description of the outcomes that the avoidance and mitigation measures will achieve ▸ an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action ▸ a description of the offsets proposed to address the residual adverse significant impacts, and how these offsets will be established.	Section 10.4 Technical Report 4

Requirement		EIS reference
Avoidance, mitigation and offsetting	10. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Section 10.4.1 Appendix L
Key issues - biodiversity	11. The EIS must address the following issues in relation to biodiversity, including separate: ▸ identification of each EPBC Act listed threatened species and community likely to be impacted by the development ▸ any likely impacts must be described for each matter and, if there are impacts, how these impacts are avoided, mitigated and, if required, offset.	Technical Report 4, and summarised in Chapter 10
	12. For each of the relevant EPBC Act listed threatened species and communities likely to be impacted by the development, the EIS must provide a separate: ▸ description of the habitat and habits with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements ▸ details of the scope, timing and methodology of studies or surveys used, and how they are consistent with published Australian Government guidelines and policy statements ▸ description of the impacts of the action having regard to the full national extent of the species or community's range.	Technical Report 4, and summarised in Chapter 10
	13. For each of the relevant EPBC Act listed threatened species and communities likely to be impacted by the development, the EIS must provide a separate: ▸ identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account ▸ details of how the NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts ▸ details of the offset package to compensate for significant residual impacts, including details of the credit profiles required to offset the development	Technical Report 4, and summarised in Sections 10.3 and 10.4 Appendix L
	14. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the EPBC Act Environmental Offset Policy.	Section 10.4.1
	15. For each threatened species and community likely to be impacted by the development, the EIS must provide reference to, and consideration of, relevant approved conservation advice or recovery plan for the species or community.	Technical Report 4
Environmental record of person proposing to take the action	16. Information in relation to the environmental record of a person proposed to take action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations 2000.	Technical Report 4

Table A.4 Agency requirements

Agency	Issues raised	Where addressed in the EIS
Department of Planning and Environment	▸ Draft New England North West Regional Plan identifies the importance of the project ▸ Existing/proposed alignment traverses across various areas of land identified under the New England North West Strategic Regional Land Use Policy 2012	Chapter 21, Section 21.1.2 Technical Report 11, Section 2.2.3
Department of Primary Industries	▸ Consider the requirements of the Water Act 1912, Water Management Act 2000 and associated regulations and instruments	Chapters 15 and 16
	▸ Identification of an adequate and secure water supply for the life of the project	Chapter 8, Section 8.5.4
	▸ Assessment of impacts on surface and ground water sources	Chapters 15 and 16
	▸ Description of drainage lines and watercourses within the alignment	Chapter 15, Section 15.2
	▸ Proposed surface and groundwater monitoring activities	Chapter 15, Section 15.4 Technical Report 6, Section 7 Technical Report 7, Section 7
	▸ Assessment of any cumulative impacts on water resources and mitigation measures	Chapters 15 and 26
	▸ Assessment of impediment to surface or groundwater flow, and potential flood impacts	Chapter 15
	▸ Consideration of relevant policies and guidelines	Chapters 15 and 16
	▸ A statement of where each element of the SEARs is addressed in the EIS	Appendix A
	▸ Assessment of agricultural land use impacts in accordance with the current guidelines	Chapter 20
	▸ Assessment of impacts from construction and operation on potentially affected properties, businesses, recreational users and land and water users	Chapter 20, Section 20.3 Chapter 21, Section 21.3
	▸ The Environmental Assessment should specifically address the impacts on the aquatic ecology, waterway crossings and riparian buffer zones	Chapters 10, 15 and 16
	▸ Identify any Crown land affected by the proposal	Chapter 20, Section 20.2.5, Section 20.3.2
	▸ Assessment of biosecurity risks and associated mitigation measures	Chapter 20, Section 20.3, Section 20.4

Agency	Issues raised	Where addressed in the EIS
Department of Industry – Geological Survey of NSW	▸ Impacts on significant mineral resources including operating mines, extractive industries and current and future exploration activities ▸ Impacts on Petroleum Exploration Licences ▸ Retain access to Munros Pit (quarry)	Chapter 20
Office of Environment and Heritage	▸ Biodiversity impacts to be assessed in accordance with the Framework for Biodiversity Assessment	Chapter 10 Technical Report 2
	▸ Impacts on species and ecological communities specified by OEH require further consideration under the Framework for Biodiversity Assessment	Chapter 10 Technical Report 2
	▸ Detail the existing Aboriginal and cultural heritage values, consult with Aboriginal people must be undertaken when required and assess impacts	Chapter 17 Chapter 18 Technical Report 8 Technical Report 9
	▸ Impacts on Aboriginal cultural heritage values are to be assessed in the EIS. The EIS must demonstrate attempts to avoid impacts and identify any conservation outcomes	Chapter 17 Technical Report 8
	▸ Where impacts on Aboriginal heritage are unavoidable, outline mitigation measures..	Chapter 17 Technical Report 8
	▸ Any objects recorded as part of the assessment must be notified to OEH	Chapter 17 Technical Report 8
	▸ A historic heritage assessment must be undertaken as part of the EIS	Chapter 18 Technical Report 9
	▸ The historic heritage assessment must be undertaken by a qualified heritage consultant	Technical Report 9, Section 1.6.2
	▸ Provision of a statement of heritage impact for all heritage items	Chapter 18, Section 18.2.3, Section 18.3 Technical Report 9, Section 5
	▸ Consider all impacts (including vibration, demolition, archaeological disturbance, access, landscape and vistas and noise treatment) in an extensive manner	Chapters 9 to 26 Technical Reports 1 to 11
	▸ Develop an appropriate archaeological assessment methodology where potential archaeological impacts are identified	Chapter 17, Section 17.4.2 Technical Report 8, Section 1.5
	▸ Map features relevant to water and soils	Chapters 14, 15 and 16
	▸ Describe background conditions for any water resource likely to be affected by the proposal	Chapters 15 and 16 Technical Reports 6 and 7
	▸ Assess impacts on water quality	Chapter 16 Technical Report 7
	▸ Assess impacts on hydrology	Chapter 15 Technical Report 6
	▸ Map features relevant to flooding as described in the Floodplain Development Manual 2005	Chapter 15

Agency	Issues raised	Where addressed in the EIS
Office of Environment and Heritage	▸ Describe flood assessment and modelling undertaken in determining the design flood levels	Chapter 15 Technical Report 6
	▸ Model the effect of the proposal on the flood behaviour for current flood behaviour and the 1 in 200 and 1 in 500 year flood events due to an increase in rainfall intensity due to climate change	Chapter 15 Technical Report 6
	▸ Assess impacts of the proposal on flood behaviour and impacts of flooding on other development/land	Chapter 15
Transport for NSW	▸ Assessment of sustainability of the project in accordance with the Infrastructure Sustainability Council of Australia (ISCA) *Infrastructure Sustainability Rating Tool* and recommend an appropriate target rating for the project	Chapter 22
	▸ Assessment of the project against the current guidelines including targets to improved Government efficiency in the use of water, energy and transport.	Chapter 22
	▸ Assessment of construction transport and traffic on bus services and train operation	Chapter 9, Section 9.3.2
	▸ Assessment if traffic impacts on construction routes and identify mitigation measures	Chapter 9, Section 9.3.2
	▸ Impact on existing train paths due to additional track possession requirements	Chapter 9, Section 9.3.2
	▸ Identify measures to minimise delays and impacts	Chapter 9, Section 9.4
	▸ Assess and model operation impacts on road and rail, for existing and forecasted	Chapter 9, Section 9.3.3
	▸ Impacts on operation of bus services and public transport infrastructure	Chapter 9, Section 9.3.3
	▸ Assessment of existing and proposed level crossings	Chapter 9, Section 9.3.3
	▸ Wider transport interactions including walking and the broader NSW network	Chapter 9, Section 9.3
	▸ Identify mitigation measures	Chapter 9, Section 9.4
	▸ Details of property acquisition	Chapter 7, Section 7.5 Appendix G
	▸ Assess the visual impact of the proposal and any ancillary infrastructure	Chapter 19
	▸ Provide artist impressions and perspective drawings	Chapter 19, Section 19.3.3
	▸ Assess predicted waste generated from the proposal during construction and operation	Chapter 24

Agency	Issues raised	Where addressed in the EIS
Roads and Maritime	▸ Traffic report to be prepared in accordance with the RTA's Guide to Traffic Generating Developments 2002	Chapter 9 Technical Report 1
	▸ Details of intermodal hubs required for operation	Chapter 9, Section 9.3 Technical Report 1, Section 5.4.1
	▸ Details of access requirements and an analysis of intersections	Chapter 9, Section 9.3 Technical Report 1, Section 5.39, Section 5.4.4
	▸ Description of oversize vehicles and the materials to be transported	Chapter 9, Section 9.3 Technical Report 1, Section 5.3.12
	▸ Traffic impacts and mitigation measures during construction and operation	Chapter 9, Section 9.3, Section 9.4 Technical Report 1, Section 5, Section 6
	▸ Level crossing feasibility study is to include a safety assessment	Chapter 9, Section 9.4 Technical Report 1, Chapter 6, Section 6.3.4 Chapter 9, Section 9.4
	▸ Distances between rail lines and road intersections are to be measured to identify storage capacity and any shirt stacking risks for road traffic	Chapter 9, Section 9.3 Technical Report 1, Section 5.4.3
	▸ Vibration assessment must consider impact on nearby road infrastructure	Chapter 12 Technical Report 5
	▸ Proposed rail facilities are to be in accordance with Austroads Guide to Road Design	Technical Report 1, Section 4, Section 5.4.3, Section 6.2.2
	▸ Local climate that may affect safety of road vehicles during construction and operation	Technical Report 1, Section 6.2.2
	▸ A TMP is to be developed with the associated local councils and RMS prior to commencement of construction	Chapter 9, Section 9.4 Technical Report 1, Section 6.2.2
	▸ Detail rail encroachments on existing road reserves	Technical Report 1, Section 5.3.4
Environmental Planning Authority	▸ Construction activities are to be carried out in accordance with relevant EPA guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997*	Chapter 14 and Appendix K
	▸ Construction activities to address unexpected contaminated material finds	Chapter 14, Section 14.3.2, Section 14.4
	▸ Requirement for a contaminated land management plan	Chapter 14, Section 14.3.2, Section 14.4

Agency	Issues raised	Where addressed in the EIS
Environmental Planning Authority	▸ Requirement for a construction noise and vibration plan	Chapter 11, Section 11.4 Chapter 12, Section 12.4
	▸ Provision of specific requirements for assessment of water quality impacts	Chapter 16, Section 16.2.3 Technical Report 7, Section 2.6.1, Section 5.2.2
	▸ Requirement for an erosion and sediment control plan	Chapter 14, Section 14.4
	▸ Provision of specific requirements for assessment of air quality impacts	Chapter 13
	▸ Requirement for a construction waste management plan	Chapter 24, Section 24.3
	▸ SEARs should refer to the NSW Waste Avoidance and Resource Recovery Strategy 2014-21 and Waste Classification Guidelines – Part 1: Classification of Waste	Chapter 24, Section 21.1.4
Moree Plains Shire Council	▸ Consider an eastern deviation of the Moree urban area as an alternative	Chapter 6
	▸ Mitigation measures relating to social amenity, community access and public safety	Chapter 9, Section 9.4 Chapter 21, Section 21.4 Chapter 25, Section 25.4
	▸ Current alignment does not leverage the full economic benefits	Chapter 3
	▸ Project should maximise economic benefits, create new opportunities and improve the social amenity of the LGA	Chapter 3
	▸ Traffic accidents associated with the proposal's close proximity to the intersection of Newell Highway and Gwydir Highways in Moree	Chapter 9, Section 9.3
	▸ Areas to the west of the alignment may have issues accessing to amenities to the east of the alignment due to increase in length and frequency of trains	Chapter 9, Section 9.3
	▸ Emergency services located to the west of the alignment will result in reduced response times to emergencies in the east	Chapter 9, Section 9.3
	▸ A single train could take up to six minutes to clear a crossing point, impacting road freight efficiency	Chapter 9, Section 9.3
	▸ Noise and vibration impacts on residential areas	Chapter 11, Section 11.4
	▸ Noise and vibration impacts on the Moree Artesian Aquatic Centre	Chapter 11, Section 11.4
	▸ Scope for future logistics areas and rail support opportunities	Chapter 21, Section 21.3
	▸ Decrease in property values	Chapter 21, Section 21.3

Agency	Issues raised	Where addressed in the EIS
Moree Plains Shire Council	▸ Utilisation of current alignment to result in the full separation of passenger rail access from the corridor alignment	Chapter 8
	▸ Expansion of industrial lands and a consequent positive economic impact	Chapter 21, Section 21.3
	▸ Impacts to indigenous populations as a result of the division created by the alignment	Chapter 21, Section 21.3
	▸ Negative economic impacts due to delays for employee access, freight movement and commercial traffic	Chapter 21, Section 21.3
	▸ Operating speed through the township	Chapter 9, Section 9.3
Narrabri Shire Council	▸ Council had no contributions to the SEARs	n/a

Appendix B – Environmental risk assessment report

1. Overview

As part of the process of undertaking a detailed environmental impact statement (EIS) for the Narrabri to North Star section of Inland Rail, an environmental risk assessment has been undertaken. The purpose of undertaking the risk assessment process is to identify key issues to be incorporated into the impact assessment.

The environmental risk assessment has been carried out in the form of a preliminary, desktop level risk assessment, to broadly assess the potential environmental impacts and risks associated with construction and operation of the proposal. The environmental risk assessment identifies and ranks potential impacts with the aim of refining and prioritising the scope of the environmental assessment including the specialist studies which support this EIS.

The environmental impact assessment addresses the issues that have been confirmed as key issues through this environmental risk assessment process. Key issues are those issues that have high or very high impacts (actual or perceived) and require comprehensive assessment to determine the severity of potential effects and to identify appropriate management and mitigation measures.

2. Environmental risk assessment process

This environmental risk assessment process has included:

- impact screening which has resulted in the progressive identification and refinement of potential key issues
- an environmental risk analysis to confirm the significance of the environmental impacts/risks associated with the key issues and to identify any other potential environmental risks not incorporated into the Secretary's Environmental Assessment Requirements (SEARs) for the proposal.

These steps are discussed further in Sections 2.1 and 2.2.

2.1 Impact screening

An initial environmental risk assessment was undertaken as part of the State Significant Infrastructure Application Supporting Document (GHD, 2016) to help identify the key issues and inform the State significant infrastructure (SSI) application. Key issues were identified based on the findings of preliminary investigations undertaken for the proposal, and experience with other similar projects. An environmental risk workshop was held with key members of the project team, which assisted in the identification and prioritisation of issues. This initial risk assessment identified the following key issues associated with the proposal:

- air quality
- biodiversity
- hydrology and flooding
- heritage (Aboriginal and non-Aboriginal)
- noise and vibration
- land use, socio-economic and visual issues
- geology, soils and contamination
- traffic and transport
- water quality, watercourses and groundwater.

A number of other issues were identified as part of the initial environmental risk assessment, but were not categorised as key issues. These included:

- waste and resources
- hazard and risks
- sustainability
- utilities and services
- greenhouse gas and energy
- climate change
- cumulative impacts.

The key issues identified in the SEARs were generally consistent with the issues identified in the SSI application report but added a number of other potentially significant issues. The SEARs identified the following key issues to be assessed as part of the EIS for the proposal:

- air quality
- biodiversity
- climate change risk
- flooding
- health and safety
- heritage (Aboriginal and non-Aboriginal)
- noise and vibration (amenity and structural)
- protected and sensitive lands
- socio-economic, land use property, agriculture and biosecurity
- soils (including acid sulphate soils and site contamination)
- sustainability
- transport and traffic
- visual amenity
- waste
- water (hydrology and quality).

The proposal either would result in impacts to these key issues, or would result in impacts from these key issues, depending on the issue. An impact can be considered as any change to the environment either wholly or partially resulting from activities associated with the proposal. Impacts may either be beneficial to the community and the environment, or may give rise to changes that are considered less than desirable. The events or activities that would lead to impacts that do not provide a benefit would require some level of monitoring, mitigation and/or management. The extent of monitoring or management required would depend on the level of risk that may be associated with the impact.

2.2 Risk analysis framework

The environmental risk analysis was undertaken in general accordance with the principles of the Australian/New Zealand Standard *AS/NZS ISO 31000:2009 Risk management – Principles and guidelines* (Australian/New Zealand Standard 2004). The risk analysis involved assessing the risk level of each identified potential impact by identifying the consequences of the impact and the likelihood that the impact can occur.

Definitions of the 'consequence' and 'likelihood' of the impacts are discussed in more detail in the following sections.

2.2.1 Evaluating consequence

Consequence is defined as the implication of an impact. The consequences of an impact require a degree of subjective assessment as the likely consequences of an impact may consist of several elements.

The elements that have been considered in this risk assessment are described in Table 2.1.

Table 2.1 Consequences of occurence

Consequence level	Description
Extreme	▸ Long-term (greater than 12 months) and irreversible large-scale environmental, social or economic impacts. ▸ May be local or wider spatial extent (including up to State-wide). ▸ One or more fatalities. ▸ Resulting in major prosecution under relevant environmental legislation. ▸ Extended substantial disruption and impacts to stakeholders or customers.
Major	▸ Medium to long-term (6 to 12 months) and potentially irreversible. ▸ May be local or wider spatial extent (no greater than nearby local government areas). ▸ Two to ten serious injuries. ▸ Extensive remediation required. ▸ Resulting in a fine or equivalent penalty under relevant environmental legislation. ▸ Severe disruptions or long-term impacts to stakeholders or customers.
Moderate	▸ Short to medium-term (1 to 6 months), reversible and/or well-contained impacts. ▸ May be local spatial extent (the site and nearby surrounds). ▸ One serious injury. ▸ Minor remedial actions. ▸ Moderate disruptions or impacts to stakeholders or customers.
Minor	▸ Short-term (less than 1 month), and reversible. ▸ May be localised spatial extent (within site boundaries). ▸ One or more minor injuries. ▸ Within environmental regulatory limits. ▸ Minor or short-term disruptions or impacts to stakeholders or customers.
Not significant	▸ Very short-term and readily reversible (not significant). ▸ No appreciable changes to environment. ▸ No injuries. ▸ Negligible impacts to environment, stakeholders or customers.

2.2.2 Evaluating likelihood

The likelihood of an impact occurring can be described in terms of probability. Overlaying this is the need to recognise the uncertainty that may be associated with the possible impacts, particularly during the initial risk assessment process. Where there is scientific uncertainty a cautious approach will identify a higher level of risk (worst-case scenario).

Each identifiable impact can be assigned likelihood between rare and almost certain (refer to Table 2.2). In simplifying the possible impacts for the purpose of a risk assessment, an element of subjectivity is introduced. The purpose of the risk assessment is not necessarily to agree on the probability of any particular impact, but to facilitate an understanding of the relative probability of different impacts.

Table 2.2 Likelihood and probability of occurrence

Likelihood	Description	Probability
Almost Certain	Expected to occur	>85%
Likely	Probably will occur	50-85%
Possible	May occur	21-49%
Unlikely	Not expected to occur in most circumstances	1-20%
Rare	May occur in exceptional circumstances	<1%

2.2.3 Environmental risk assessment matrix

Based on the assessment of likelihood and consequence any foreseeable impact can be assigned a risk level. This determines the significance of the environmental risk associated with a given impact. Table 2.3 is to be read as a matrix, with increasing consequence left to right and decreasing likelihood top to bottom.

Table 2.3 Environmental risk assessment matrix

	Consequence				
Likelihood	**Not significant**	**Minor**	**Moderate**	**Major**	**Extreme**
Almost Certain	Medium	Medium	High	Very high	Very high
Likely	Low	Medium	High	High	Very high
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

Very high impacts were considered the highest priority and were the focus of the concept design and environmental assessment. In general, the following was applied when scoping requirements for the environmental assessment.

- **Very high impacts** – Assessment and planning is necessary to avoid these impacts to the greatest extent possible.
- **High impacts** – Detailed specialist investigation and assessment is necessary to enable identification of appropriate management and mitigation options.
- **Medium impacts** –Further investigation as part of the environmental assessment is desirable, to address some uncertainties. Impacts could be mitigated through the application of relatively standard environmental mitigation measures.
- **Low impacts** – May not require specialist investigations, particularly where identifiable management/mitigation guidelines exist then potentially only broad or desktop investigation is necessary. Impacts could be mitigated through other working controls (such as detailed design requirements, normal working practice, safety and quality controls).

3. Environmental risk assessment

Using the risk framework discussed in Section 2.2 an environmental risk assessment was undertaken for the construction and operation of the proposal and is presented in Table 3.1. The environmental risk assessment included consideration of each of the key issues and their associated impacts. The assessment was based on evidence, previous experience and professional judgement of potential risks, and their consequence, likelihood and significance (without mitigation).

The preliminary risk assessment for the proposal involved:

- identifying potential key issues
- identifying potential key impacts/risks associated with each of these key issues
- evaluating the likelihood of occurrence and consequence in accordance with the definitions provided in Section 2.2
- assigning a risk ranking/priority using Table 2.3
- deciding on a response – it was determined that generally a specialist study would be undertaken for any key issues which included a risk ranking of very high or high.

Table 3.1 Environmental risk assessment

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Transport and traffic – Construction	Construction traffic impacts, including temporary delays to local and regional traffic.	Almost Certain	Moderate	High	The potential for very high impacts would be reduced through the effective implementation of management measures set out in the CEMP.	Likely	Minor	Medium
	Congestion in surrounding road networks due to diversion of road users during construction.	Unlikely	Minor	Low	However, based on the risk level for some traffic and transport impacts being assessed as high, traffic and transport risks have been assessed through preparation of a specialist study, which is provided in Technical Report 1. The results of the transport and traffic specialist study are summarised in Chapter 9.	Unlikely	Minor	Low
	Reduced pedestrian and road user access.	Unlikely	Minor	Low		Unlikely	Minor	Low
	Loss of parking spaces and loading zones in towns near construction areas.	Almost Certain	Minor	Medium		Likely	Minor	Medium
	Impacts to emergency services through delays in access due to works.	Unlikely	Major	Medium		Unlikely	Major	Medium
	Impacts on access to private properties.	Likely	Minor	Medium	This would only impact a small number of properties.	Likely	Minor	Medium
	Impacts to rural roads unsuitable for construction traffic.	Possible	Moderate	Medium		Possible	Moderate	Medium
Transport and traffic - Operation	Increase in travel times due to increase in level crossing waiting times associated with increasing length and frequency of trains.	Likely	Moderate	High	-	Likely	Moderate	High
	Reduction in road congestion and traffic due to reduction in heavy vehicles on road transporting freight.				Community and environmental benefit.			

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Biodiversity - Construction	Clearing of native vegetation resulting in loss of fauna habitat, habitat fragmentation and loss of connectivity.	Almost Certain	Moderate	High	The proposal route and construction width has been designed to minimise the amount of clearing required, with the majority of the proposal to be constructed within previously disturbed areas. However, some limited clearing will still be required. The potential significance of this impact needs to be assessed in the context of the amount and nature of the vegetation that would need to be cleared, and the resultant potential for impacts to threatened fauna and flora. The potential for impacts to threatened flora and fauna has been assessed through preparation of a biodiversity specialist study, which is provided in Technical Report 2. The results of the biodiversity specialist study are summarised in Chapter 10.	Almost Certain	Moderate	High
	Direct impacts on threatened species and endangered populations and communities (terrestrial) from clearing.	Likely	Moderate	High		Likely	Moderate	High
	Direct impacts on threatened species and endangered populations and communities (aquatic) from clearing.	Possible	Minor	Medium	Impacts reduced through the implementation of a CEMP.	Unlikely	Minor	Low
	Increased potential for pest plants and animals during construction from movement of vehicles, machinery and materials in and out of the site, particularly in greenfield sections such as the Camurra bypass.	Possible	Moderate	Medium	Impacts reduced through the implementation of a CEMP.	Unlikely	Minor	Low
	Impacts to groundwater dependant ecosystems as a result of groundwater drawdown.	Rare	Moderate	Low	Impacts reduced through the implementation of a CEMP.	Rare	Minor	Low
	Indirect impacts due to increased dust, sedimentation and erosion, noise, and light.	Likely	Minor	Medium	Impacts reduced through the implementation of a CEMP.	Possible	Minor	Medium

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Biodiversity - Construction	Disturbance to aquatic habitats and reduced water quality as a result of fugitive sediments and altered hydrology.	Almost Certain	Minor	Medium	The proposal would be specifically designed and operated to minimise the potential impacts to aquatic ecology within the proposal area. As a result, it is considered unlikely that the proposal would result in very high impacts on the ecology of watercourses in the proposal area.	Possible	Minor	Medium
	Alterations to surface water flow regimes and interruptions to fish passage.	Unlikely	Moderate	Medium	The design and construction of the proposal would incorporate the controls listed in Chapter 27 further reducing the potential significance of the impacts.	Rare	Minor	Low
	Native fauna mortality from vehicle strikes.	Almost Certain	Minor	Medium	The potential for impacts to aquatic ecology has been assessed through preparation of a biodiversity specialist study, which is provided as Technical Report 2. The results of the biodiversity specialist study are summarised in Chapter 10.	Almost Certain	Minor	Medium
	Domesticated animal mortality from vehicle strikes.	Possible	Moderate	Medium		Unlikely	Moderate	Medium
Biodiversity - Operation	Native fauna mortality from train strikes.	Possible	Minor	Low	See above cells regarding assessment of biodiversity impacts.	Possible	Minor	Low
	Domesticated animal mortality from train strikes.	Unlikely	Minor	Low		Unlikely	Minor	Low
	Native fauna mortality from maintenance vehicle strikes.	Unlikely	Minor	Low		Unlikely	Minor	Low
	Domesticated animal mortality from maintenance vehicle strikes.	Rare	Minor	Low		Rare	Minor	Low
	Impacts on fauna from noise and light during operation.	Unlikely	Minor	Low		Unlikely	Minor	Low
	Increased potential for pest plants and animals during maintenance from movement of vehicles, machinery and materials in and out of the rail corridor.	Possible	Moderate	Medium		Possible	Moderate	Medium

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Noise and vibration (amenity) - Construction	Noise impacts on local residents and sensitive receivers from construction activities including out of hours works.	Likely	Moderate	High	Construction and operation activities associated with the proposal would increase local noise levels. Any increases related to construction would be temporary. In some cases, the predicted noise levels during proposal operation would be likely to exceed the applicable noise criteria for residential receivers based on the existing land use. The potential significance of these impacts needs to be assessed in the context of the noise levels that construction and operation of the proposal will generate and the presence of sensitive receivers in proximity to the proposal. The potential for amenity and structural impacts from noise during construction and operation of the proposal has been assessed through preparation of a noise specialist study, which is provided in Technical Report 5. The results of the noise specialist study are summarised in Chapters 11 and 12.	Likely	Moderate	High
	Noise impacts on local residents and sensitive receivers from construction traffic.	Likely	Minor	Medium		Possible	Minor	Medium
Noise and vibration (amenity) - Operation	Noise impacts on local residents and sensitive receivers from the operation of trains.	Likely	Major	High		Possible	Moderate	Medium
Noise and vibration (structural) - Construction	Damage to structures including heritage structures from vibration caused by construction activities.	Possible	Moderate	Medium	Refer to heritage risks.	Unlikely	Minor	Low
Noise and vibration (structural) - Operation	Damage to structures including heritage structures from vibration caused by operation of trains.	Unlikely	Minor	Low	Refer to heritage risks.	Unlikely	Moderate	Medium
Air quality – Construction	Generation of dust during construction (from exposed soil/stockpiles, blasting, excavation and vehicle movements).	Almost Certain	Minor	Medium	The potential for air quality impacts during construction would be significantly reduced through the effective implementation of management measures set out in the CEMP. Although the risk level for potential air quality impacts did not exceed medium an air quality impact assessment has been conducted for the proposal in accordance with the SEARs and is incorporated into Chapter 13.	Possible	Not significant	Low
	Emissions from vehicles or plant during construction.	Likely	Minor	Medium		Likely	Not significant	Low
	Odours/emissions from disturbance of contaminated soils.	Unlikely	Minor	Low	-	Rare	Minor	Low

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Air quality - Operation	Generation of dust from transport of uncovered loads.	Unlikely	Minor	Low	-	Rare	Minor	Low
	Impacts on local air quality during operation from maintenance vehicle and train emissions.	Unlikely	Not significant	Low	-	Unlikely	Not significant	Low
Soils (including site contamination and saline soils) - Construction	Impacts associated with the disturbance of contaminated or soil salinity/saline soils during construction.	Possible	Minor	Medium	Previous contamination assessments (GHD, 2014) reported that all samples collected along the proposal route were below the health investigation and screening levels for the relevant land use. Targeted geotechnical investigations would be undertaken as part of the design development process. All construction works have the potential to generate erosion through the exposure of soils and excavation. However, the potential for impacts to soils and landforms would be significantly reduced through the effective implementation of management measures set out in the CEMP. The design and construction of the proposal would incorporate the mitigation measures listed in Chapter 26, further reducing the potential significance of these impacts. Although the risk level for potential soil impacts generally did not exceed medium, an assessment of soil impacts has been conducted for the proposal in accordance with the SEARs and is incorporated into Chapter 14.	Unlikely	Minor	Low
	Disturbance of soils and subsequent loss or degradation of soil quality during earthworks at construction compound sites.	Possible	Not significant	Low		Unlikely	Not significant	Low
	Disturbance of landforms during earthworks reducing the stability of landforms.	Possible	Not significant	Low		Unlikely	Not significant	Low
	Increased erosion and sedimentation due to excavation activities and vehicle movement.	Likely	Moderate	High		Unlikely	Minor	Medium
	Contamination of soils/ groundwater due to spills and leaks during construction.	Possible	Minor	Medium		Unlikely	Minor	Low
Soils (including site contamination and saline soils) - Operation	Changes to surface, including vegetation removal and creation of embankments, increasing potential for erosion in proposal area and sedimentation down-gradient.	Possible	Moderate	Medium	Refer to water quality risks	Possible	Minor	Medium

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Flooding - Construction	Impact of flooding on unprotected areas during construction resulting in wash-outs or erosion.	Possible	Moderate	Medium	The proposal would be specifically designed and operated to minimise the potential impacts of flooding on the proposal infrastructure, or to minimise impacts the proposal would have on flooding behaviour near the proposal.	Possible	Minor	Medium
	Temporary impact to the behaviour of local surface water systems during construction.	Possible	Minor	Medium	The potential for impacts to and from flooding has been assessed through preparation of a hydrology and flooding specialist study, which is provided in Technical Report 6. The results of the hydrology and flooding specialist study are summarised in Chapter 15.	Possible	Not significant	Low
Flooding - Operation	Presence of, or change to structures associated with the proposal could impact upstream and downstream local flood behaviour.	Likely	Moderate	High		Possible	Moderate	Medium
	Change to structures associated with the proposal and track height could impact upstream and downstream regional flood behaviour.	Likely	Moderate	High		Possible	Minor	Medium
Water (hydrology) - Construction	Changes to flow patterns and altered hydrology due to construction in watercourses.	Possible	Moderate	Medium	All construction works have the potential to generate erosion through the exposure of soils and excavation. Erosion of soil has the potential to impact on water quality and hydrology. Construction works across watercourses also have the potential to directly impact on these watercourses. However, the potential for these impacts would be significantly reduced through the construction planning process and the implementation of management measures set out in the CEMP. The design and construction of the proposal would incorporate the project controls listed in Chapter 27, further reducing the potential significance of these impacts. The potential for impacts to water hydrology and quality has been assessed through preparation of a hydrology and flooding specialist study, which is provided in Technical Report 6. The results of the hydrology and flooding specialist study are summarised in Chapter 15.	Unlikely	Minor	Low
	Blockages of flow paths affecting low flows through construction within watercourses and through erosion and sedimentation control structures.	Possible	Moderate	Medium		Possible	Minor	Medium
	Sedimentation and changes to geomorphology (aggradation in bed channels) in watercourses.	Possible	Major	High		Unlikely	Minor	Low

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Water (hydrology) - Operation	Impacts on upstream and downstream drainage due to the introduction of built structures such as embankments, culverts and bridges.	Possible	Major	High	-	Possible	Moderate	Medium
Water (water quality) - Construction	Reduced water quality (increased total suspended solids and turbidity) due to earthworks and erosion and sedimentation near watercourses.	Possible	Major	High	-	Possible	Minor	Medium
	Impacts on water quality from contamination from spills and leaks during construction.	Unlikely	Major	Medium	-	Unlikely	Minor	Low
	Impacts on groundwater quality and quantity during drawdown/extraction.	Possible	Major	High	-	Unlikely	Moderate	Medium
Water (water quality) – Operation	Potential for pollution of watercourses due to operation (freight materials, contaminants from train operation).	Rare	Minor	Low	-	Rare	Minor	Low
	Modification to existing drainage infrastructure resulting in water quality impacts.	Likely	Moderate	High	-	Possible	Minor	Medium
	Impacts on water quality from contamination from spills and leaks during operation.	Unlikely	Major	Medium	-	Unlikely	Minor	Low
	Impact to surface water quality and receiving environments due to increased runoff from increase in impervious surfaces.	Likely	Moderate	High	-	Rare	Not significant	Low

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Aboriginal heritage – Construction	Disturbance of known or unidentified items or places of Aboriginal heritage significance.	Possible	Major	High	The proposal route has been designed to minimise the amount of ground disturbance required, with the majority of the rail line using existing infrastructure. However, some disturbance will still be required. The potential significance of this risk needs to be assessed in the context of the amount of ground disturbance required and the presence of items or places of heritage significance in these areas. The potential for impacts to Aboriginal heritage has been assessed through preparation of an Aboriginal heritage specialist study, which is provided in Technical Report 8. The results of the Aboriginal heritage specialist study are summarised in Chapter 17.	Unlikely	Major	Medium
Non-Aboriginal – Construction	Design that detracts from the heritage significance of nearby items.	Unlikely	Moderate	Medium	The proposal route has been designed to minimise the amount of ground disturbance required, with the majority of the rail line using existing infrastructure. However, some disturbance will still be required. In addition, construction and operation activities have the potential to impact on heritage items in the proposal area due to demolition, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment. The potential significance of these risks needs to be assessed in the context of the amount of disturbance or potentially damaging activities required and the presence of items or places of heritage significance in these areas. The potential for impacts to non-Aboriginal heritage has been assessed through preparation of a non-Aboriginal heritage specialist study, which is provided in Technical Report 9. The results of the non-Aboriginal heritage specialist study are summarised in Chapter 18.	Unlikely	Minor	Low
	Impacts on listed heritage items or items with heritage values due to demolition, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment.	Possible	Moderate	Medium		Unlikely	Minor	Low
	Damage to heritage items from vibration during construction or operation.	Possible	Major	High		Unlikely	Moderate	Medium
	Disturbance of known or unidentified items or places of non-Aboriginal heritage significance.	Possible	Major	High		Possible	Moderate	Medium
Non-Aboriginal – Operation	Change to the values of a heritage conservation area.	Unlikely	Moderate	Medium	-	Rare	Moderate	Low

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Visual amenity - Construction	Impacts to nearby residents and business owners due to the presence of construction compounds and activities.	Likely	Minor	Low	Construction of the proposal has the potential to result in visual impacts along the construction route, as the construction works would be visible to some residents, businesses, road users and visitors. While some of these impacts have a risk level of high these impacts (construction related disturbance) would be short-term and would be reduced through the effective implementation of management measures set out in the CEMP. The proposal would also result in the introduction of new structures in the landscape. While visual amenity impacts during construction would be short-term and reduced through implementation of management measures, a separate visual amenity specialist study has been prepared and included as Technical Report 10 and summarised in Chapter 19.	Possible	Minor	Medium
	Light impacts from out-of-hours work during construction.	Possible	Minor	Medium		Unlikely	Minor	Low
	Adverse impacts on landscape character during construction, particularly in greenfield areas.	Possible	Moderate	Medium	Impacts may occur in the following locations: Camurra bypass, Newell Highway, Mehi River, Gwydir River and Croppa Creek bridges.	Possible	Minor	Medium
Visual amenity - Operation	Impacts on visual amenity due to the introduction of built elements, including noise walls and embankments, and the removal of vegetation in a rural environment.	Likely	Moderate	High	This may only occur in some sections of the proposal, it will not occur along the full length.	Possible	Moderate	Medium
	Visual impact of operational lighting.	Unlikely	Minor	Low	-	Unlikely	Minor	Low

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Protected and sensitive lands – Construction / operation	Direct and indirect impacts on protected areas managed by OEH and/or DPI Fisheries under the *National Parks and Wildlife Act 1974*.	Unlikely	Minor	Low	-	Rare	Not significant	Low
	Direct and indirect impacts on Key Fish Habitat as mapped and defined in accordance with the *Fisheries Management Act 1994* (FM Act).	Unlikely	Minor	Low		Rare	Not significant	Low
	Direct and indirect impacts on waterfront land as defined in the *Water Management Act 2000.*	Possible	Moderate	Medium		Unlikely	Minor	Low
	Direct and indirect impacts on land or waters identified as Critical Habitat under the T*hreatened Species Conservation Act 1995*, FM Act or EPBC Act.	Rare	Not significant	Low	-	Rare	Not significant	Low
	Direct and indirect impacts on biobank sites, private conservation lands and other lands identified as offsets of relevance.	Rare	Not significant	Low	-	Rare	Not significant	Low
Socio-economic, land use property – Construction	Temporary impacts on land use during construction including impacts to local businesses. Impacts include reduced access, reduced amenity, loss of privacy.	Likely	Moderate	High	Benefit to local businesses.	-	-	-
	Positive impacts due to job creation.	-	-		Benefit to community.	-	-	-

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Socio-economic, land use property – Construction	Impacts on services and utilities during construction resulting in a loss of services.	Likely	Not significant	Low	No substantial shift in the local demographics or population would be expected during construction and operation of the proposal. The economic benefits of the proposal would be mostly positive due to job creation and the benefits of improved freight transportation efficiency. The proposal route has been designed to minimise the amount of acquisition required, with the majority of the proposal to utilise existing infrastructure. Some changes to existing infrastructure will result in potential access issues for agricultural land users. Construction and operation of the proposal has the potential to result in the spread of invasive plants and diseases. Based on the risk level for some socio-economic impacts being assessed as high socio-economic risks has been assessed through preparation of a specialist study which is provided in Technical Report 11. The results of the socio-economic specialist study are summarised in Chapter 21. Risks to agricultural land uses have been summarised in Chapter 20. Biosecurity risks have been assessed as part of the biodiversity specialist study and are summarised in Chapter 10 and Chapter 20.	-	-	-
	Impacts on the use and functionality of community facilities.	Rare	Minor	Low	-	Rare	Minor	Low
	Impacts on agricultural land use from construction activities including impacts from reduced access, noise and air pollution.	Likely	Minor	Medium	-	Likely	Minor	Medium
	Impacts on land use as a result of property acquisition.	Likely	Moderate	Medium	-	Likely	Minor	Medium

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Socio-economic, land use property – Construction	Increased demand for accommodation driving up prices for local residents and potentially causing a shortage of emergency accommodation.	Possible	Moderate	Medium	Increase in demand will be short-term and likely to be less than 6 months. ARTC commits to removing workforce from a local area in the event of the requirement for emergency accommodation.	Possible	Minor	Medium
	Increased trade for food and accommodation during construction.	-	-	-	Economic benefit.	-	-	-
Socio-economic, land use property – Operation	Positive impacts due to job creation.	-	-	-	Benefit to community.	-	-	-
	Positive impacts due to enhanced efficiencies and capacity for transporting goods.	-	-	-	Economic benefit.	-	-	-
	Development stimulus during operation.	-	-	-	Economic benefit.	-	-	-
	Positive impacts resulting from reduction in heavy vehicles on road.	-	-	-	Community and environmental benefit.	-	-	-
	Impacts to local amenity due to increased frequency of trains.	Likely	Moderate	High	Mitigation measures would be adopted for aspects impacting local amenity such as noise and air quality.	Possible	Minor	Medium
	Severance of communities, including reduced access to community and recreational facilities.	Possible	Moderate	Medium	-	Possible	Moderate	Medium
	Impacts due to changes in infrastructure, including increased waiting times at level crossings and safe holding distances for large vehicles affecting agricultural land access.	Likely	Moderate	High	-	Likely	Moderate	High

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Socio-economic, land use property – Operation	Severance of properties resulting in smaller lot sizes that may impact on use.	Likely	Minor	Medium	This is only relevant to the Parkes north west connection.	Likely	Minor	Medium
Sustainability – Construction/ operation	Increased electricity and fuel use during construction and operation.	Almost Certain	Minor	Medium	The proposal would have some positive impacts on sustainability through the reduction in road congestion and use of heavy vehicles to transport freight. An Infrastructure Sustainability assessment has been conducted in accordance with the SEARs and the Infrastructure Sustainability Council of Australia (ISCA) and is provided in Appendix I.	Almost Certain	Minor	Medium
	Increased demand on local and regional resources during construction.	Almost Certain	Minor	Medium	-	Almost Certain	Minor	Medium
	Reduction in fuel consumption of heavy vehicles on road during operation.	-	-	-	Environmental benefit.	-	-	-
	Increase in efficiency of transportation of freight goods.	-	-	-	Economic benefit.	-	-	-
Climate change risk – Construction	Greenhouse gas emissions from combustion of fuels during plant/vehicle operation.	Almost Certain	Minor	Medium	Climate change impacts have been assessed in accordance with the SEARs as part of a chapter within the EIS (Chapter 23). The assessment of flooding risks has been considered as part of a separate specialist study for hydrology and flooding (Technical Report 6).	Almost Certain	Not significant	Medium
	Increased energy consumption associated with the operation of site compounds.	Almost Certain	Minor	Medium	-	Almost Certain	Not significant	Medium

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Climate change risk – Operation	Greenhouse gas emissions due to operation of the rail line, predominantly burning of diesel.	Likely	Minor	Medium	-	Likely	Minor	Medium
	Impacts to infrastructure due to increased heat and rainfall/ flooding.	Possible	Minor	Medium	-	Possible	Minor	Medium
	Reduction in emissions from freight vehicles due to reduction in amount of road freight vehicles.	-	-	-	Environmental benefit.	-	-	-
Waste - Construction	Inappropriate management of waste generated during construction resulting in excessive waste being directed to landfill.	Unlikely	Minor	Low	The potential for significant impacts would be reduced through the effective implementation of management measures set out in the CEMP, which would also include a spoil and waste management sub-plan. Although the risk level for potential waste management impacts did not exceed medium, a waste management impact assessment has been conducted for the proposal in accordance with the SEARs and is incorporated into Chapter 24.	Rare	Minor	Low
Waste - Operation	Increased littering from maintenance teams.	Rare	Not significant	Low	-	Rare	Not significant	Low
Health and safety - Construction	Impacts from transport, storage and use of hazardous substances and dangerous goods.	Possible	Minor	Medium	Contractors working on the proposal would be required to adopt strict on site health and safety practices in accordance with regulatory requirements (*Work Health and Safety Act 2011* and the *Work Health and Safety Regulation 2011*). Contractors working within or near to rail corridors would also be trained in accordance with Rail Industry Safety Induction requirements. An assessment of health and safety impacts has been conducted for the proposal in accordance with the SEARs and is incorporated into Chapter 25.	Unlikely	Minor	Low
	Reduced safety for road users and pedestrians during construction particularly in the vicinity of houses, businesses and townships.	Likely	Major	High	-	Possible	Minor	Medium

Key issue	Potential impact/risk	Initial risks			Comment/response	Post mitigation risks		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Health and safety - Construction	Adverse health from noise and air pollution during construction.	Possible	Minor	Medium	-	Unlikely	Minor	Low
	Potential for proposal to exacerbate bushfires (storage of dangerous goods, construction site issues such as smoking or hot works).	Rare	Minor	Low	-	Rare	Minor	Low
	Potential for environmental damage resulting from a bushfire passing through the site (e.g. explosion of fuel storages/tanks, vehicles and machinery).	Rare	Minor	Low	-	Rare	Minor	Low
Health and safety - Operation	Impact from spill or accident during the transport, storage and use of hazardous substances and dangerous goods.	Unlikely	Moderate	Medium	-	Rare	Moderate	Low
	Potential for train strike for pedestrians crossing line outside of crossings near houses, businesses and townships.	Possible	Extreme	High	-	Unlikely	Extreme	High
	Potential for train strike for pedestrians crossing line outside of crossings in rural areas.	Unlikely	Extreme	High	-	Unlikely	Extreme	High
	Adverse health from noise during operation.	Possible	Minor	Medium	-	Unlikely	Minor	Low

4. Summary of analysis and recommendations

The environmental risk analysis undertaken in this chapter has confirmed that there are no additional key issues to those key issues identified originally in the preliminary environmental assessment and provided in the SEARs.

The following key issues were confirmed as key considerations, which required further assessment in the form of specialist studies:

- biodiversity
- flooding and water (quality and hydrology)
- Aboriginal heritage
- non-Aboriginal heritage
- noise (structural and amenity)
- socio-economic
- traffic and transport
- visual amenity.

While the key issues of soil and health and safety also included impacts, which were assessed as high the impacts are considered to be well understood based on previous experience with similar projects and implementation of standard design and management measures, would minimise these risks. Therefore, these risks have been assessed within chapters of the EIS.

The environmental risk analysis undertaken as part of this report did not identify any impacts with a risk level of very high once mitigation measures are applied. This is because very high impacts would have been identified through the initial proposal planning stages and the proposal route and design modified to avoid very high impacts or mitigation measures identified. The EIS includes a discussion of the options, which were considered prior to selection of the current proposal.

Appendix C – Environmental Planning and Assessment Regulation 2000 checklist

Table C.1 Requirements of Schedule 2 (Part 3) of the Regulation

Requirement	EIS reference
6. Form of the environmental impact statement An environmental impact statement must contain the following information:	
(a) the name, address and professional qualifications of the person by whom the statement is prepared	Refer certification at the front of the EIS
(b) the name and address of the responsible person	
(c) the address of the land: (i) in respect of which the development application is to be made, or (ii) on which the activity or infrastructure to which the statement relates is to be carried out	
(d) a description of the development, activity or infrastructure to which the statement relates	
(e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule	
(f) a declaration by the person by whom the statement is prepared to the effect that: (i) the statement has been prepared in accordance with this Schedule, and (ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and (iii) that the information contained in the statement is neither false nor misleading.	
7. Content of environmental impact statement **(1) An environmental impact statement must also include each of the following:**	
(a) a summary of the environmental impact statement	Executive summary
(b) a statement of the objectives of the development, activity or infrastructure	Chapter 1
(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure	Chapter 6
(d) an analysis of the development, activity or infrastructure, including: (i) a full description of the development, activity or infrastructure, and (ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and (iii) the likely impact on the environment of the development, activity or infrastructure, and (iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment, and (v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out	Chapters 7 and 8 Chapter 2 and Part C Part C Part C Chapter 3
(e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv)	Chapter 27
(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).	Chapter 28

Appendix D – Narrabri to North Star Consultation Report

ARTC InlandRail

The Australian Government's priority freight rail project

PHASE 2
Inland Rail - Narrabri to North Star Consultation Report

2-2600-PCS-00-RP-0001

Document Control

Client:	Australian Rail Track Corporation
Project:	Inland Rail
Document title:	Inland Rail – Narrabri to North Star Consultation Report
Originator/Company:	Australian Rail Track Corporation
Purpose:	Report on the consultation activities and outcomes prior to and during the preparation of the EIS for Inland Rail Narrabri to North Star
Approved by:	Simon Eldridge
Issued to:	Alison Crocker
Date approved:	15.08.2017
File Name:	2-2600-PCS-00-RP-0001
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1. Introduction

1.1. Project background

The Australian Government has committed to building a significant new piece of national transport infrastructure by constructing Inland Rail between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. The Inland Rail project ('Inland Rail') is a major national programme that will complete the spine of Australia's existing national rail network and serve the interstate freight market.

The Inland Rail route, which is about 1,710 kilometres long, would involve:

- using the existing interstate rail line through Victoria and southern NSW
- upgrading about 1100 kilometres of existing track, mainly in NSW
- providing about 600 kilometres of new track in NSW and south-east Queensland.

Inland Rail has been divided into 13 projects, seven of which are located in NSW. Two priority construction projects have been identified for the Inland Rail program in NSW:

- Narrabri to North Star – consisting of about 183 kilometres of upgraded track and associated facilities
- Parkes to Narromine – consisting of about 106 kilometres of upgraded track and associated facilities.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Narrabri to North Star section of Inland Rail ('the proposal'). ARTC has identified this proposal as one of three priority projects for implementation of Inland Rail.

1.2. Purpose of this report

The purpose of this Consultation Report is to provide an overview of the communication and consultation approach and the activities carried out for this proposal prior to and during preparation of the EIS. This report also summarises the feedback received from stakeholders and the community during this period from early to mid-2015 until the end of June 2017.

2. Consultation objectives, strategy and approach

2.1. Consultation objectives and strategy

ARTC's values commit the organisation to active engagement with stakeholders and the community. For Inland Rail effective communication and stakeholder engagement are fundamental to reducing risk, optimising route alignment, minimising social and environmental impacts, securing statutory approval and gaining and maintaining the social licence to operate. ARTC believes that identifying, engaging and effectively communicating with stakeholders is critical to the successful delivery of Inland Rail.

The overarching objective for the communication and engagement for Inland Rail is to create goodwill among shareholders and stakeholders through responsive engagement, supporting responsible and efficient project delivery, sustainable operations and making rail the mode of choice for freight customers on this route.

ARTC's approach to consultation for Inland Rail is based around six strategic themes:

- building awareness, understanding and support for Inland Rail among customers, stakeholders and the community
- harnessing a sense of ownership through advocates of Inland Rail

- creating an active dialogue with customers, communities and other stakeholders
- identifying and managing issues and opportunities
- achieving a design that minimises the potential for environmental and community impacts
- actively seek opportunities to create beneficial outcomes for stakeholders, while not compromising the scope and budget of Inland Rail (for example, improving local rail and road interfaces where it benefits Inland Rail and improves community safety and amenity).

2.2. Consultation approach

The strategic approach to consultation applied to this proposal included:

- early and regular engagement
- inclusive – relevant stakeholders are consulted or involved during the planning and design of the proposal
- transparent – views and opinions captured from the public are reflected back during the engagement process and are available to participants
- equitable – relevant groups are included in the conversation with recognition, provisions are made for traditional owners, disabled, youth and the elderly to be included and gender equity occurs
- accessible – different socio-economic groups are able to participate
- iterative – how the engagement process has shaped the proposal is communicated prior to each phase of engagement and delivery.

ARTC's approach is based around the foundations of public participation developed by the International Association for Public Participation (IAP2). It also draws on the international standard for stakeholder engagement, the Accountability AA1000 Stakeholder Engagement Standard.

In early 2015, ARTC developed the *Inland Rail Strategic Stakeholder and Engagement Plan*. The aim of the plan was to inform early engagement with local councils, including those within which the proposal site is located, ahead of the commencement of formal consultation and fieldwork.

ARTC's approach to stakeholder engagement during this early stage was to:

- provide an update to key stakeholders
- revisit issues raised by councils and other local stakeholders during early consultation
- discuss any issues identified during technical studies
- seek input regarding key local stakeholder groups to be engaged through future consultation
- identify new opportunities and issues associated with delivery of Inland Rail at a local level.

This approach was welcomed by the local councils, who were actively seeking information and urging early engagement.

Later in 2015, ARTC developed the *Communication and Engagement Plan – Narrabri to North Star* to guide engagement with the local community. As defined by the plan, consultation has been and will continue to be undertaken over five phases:

- development of the business case

- planning, design and approvals (including preparation of the EIS)
- construction
- commissioning and handover
- operation.

Consultation activities undertaken for Inland Rail and the proposal have been guided by this plan and are detailed in Section 3.

2.3. Stakeholder identification

Understanding the local community and identifying stakeholders is critical to the success of this project. There are key stakeholders and stakeholder groups that have been and will continue to be engaged throughout the lifecycle of Inland Rail.

ARTC's definition of a stakeholder is a person, group or organisation that has an interest in Inland Rail and/or is directly or indirectly impacted by Inland Rail. In general terms the key stakeholders for Inland Rail are summarised in Table 1.

Table 1 - Key stakeholder identification

STAKEHOLDER GROUP	STAKEHOLDERS	
Government	Federal and State elected representatives	Relevant Australian and State, Ministers, MPs (including key parliamentary committees)
	Local Government	Local Government Councillors and executives
	Government agencies	Relevant Australian and State government departments, agencies and their officers Economic regulatory bodies Emergency services
	Projects	Neighbouring and related projects
Business and industry	Customers	Rail companies and their advisors Freight logistics executive and their advisors and relevant agencies Multimodal freight terminal operators and proponents
	Collaborators	Rail investors and their advisors
	Suppliers	Professional services and advisory firms (engineering, financial, environmental and legal) Construction, infrastructure and materials supply companies Real estate and rural estate agents

STAKEHOLDER GROUP	STAKEHOLDERS	
		Local/regional small to medium businesses and chambers of commerce
	Trade Unions	Rail Bus and Tram Union Transport Workers' Union
	Industry	Ports End users Peak industry groups such as the Australian Rail Association and the Australian Logistics Council Agricultural and Farming groups
Community		Local property owners Impacted landowners Community groups Traditional owners
Special Interest Groups		Peak environmental groups Local groups, coalitions or individuals Relevant university academics and researchers

3. Consultation activities undertaken prior to and during the preparation of the EIS

Stakeholder and community consultation for Inland Rail is an evolving process that commenced in 2010 and will continue on an ongoing basis.

3.1. Consultation tools and activities

A range of communication and consultation tools were utilised by the project team prior to and during the preparation of the EIS to raise awareness of the project and seek feedback from stakeholders and the community. Table 2 below outlines the communication and engagement tools used and the purpose and timing of each of these activities. Section 3.2, 3.3 and Section 3.4 provide more information on correspondence and consultation activities carried out with specific stakeholder groups and Section 4 summarises the key issues raised during consultation together with responses.

Table 2 - Communication and consultation tools and activities

COMMUNICATION AND CONSULTATION TOOL	PURPOSE	DATE
Toll free community information line (1800 732 761)	Obtain feedback & measure awareness of the Project	Established in January 2015 and continues to be managed
Project email (inlandrailenquires@artc.com.au)	Online communication channel where stakeholders can provide feedback or ask questions of the project team	Established in 2014 and continues to be managed
Inland Rail website (http://inlandrail.artc.com.au)	Raise awareness and understanding of the Project Provide information and promote channels through which stakeholders can communicate their views, issues and concerns	Established and updated regularly since 2014
Community baseline assessment – a written survey and face to face interviews conducted by the University of Melbourne	To seek feedback from the community	Commenced May 2016 and completed February 2017
Fact sheets / question and answers – provided in hard copy and available on the Inland Rail website	Raise awareness and understanding of the Project Provide information on land access guidelines and procedures	First edition of fact sheets made available in October 2015 and updated on an as needs basis
Project information packs – including fact sheets, maps and technical information	Provided to stakeholders to increase understanding of the Project	Ongoing since 2015 Project information packs handed out at each face to face meeting with landholders, businesses, community members etc.
Supplier eNewsletter	Provide a physical update on the status of the project and ways to get involved	Ongoing since November 2015
Community information sessions	Provide information on the project to the local community and seek local input to inform the design process and development of the EIS	Moree 24 May 2016 Narrabri 25 May 2016 and 14 November 2016 North Star 29 June 2016 and 24 October 2016
Workshops	Opportunity to discuss the project and address specific questions and concerns in person	Commenced in April 2015 and have been held on a regular basis with different stakeholder groups

COMMUNICATION AND CONSULTATION TOOL	PURPOSE	DATE
	Provide an opportunity for stakeholder input to inform the design process and development of the EIS	
Landowner face to face meetings	Raise awareness of the project and the potential impacts on landowners. Provide an opportunity for landowners to ask questions and have input into the design and EIS process	Commenced in March 2016 and will be ongoing
Stakeholder meetings and briefings	Opportunity to address specific questions and issues in person Build relationships and trust. Provide an opportunity for stakeholder input to inform the design process and development of the EIS	Commenced in 2014 and are ongoing.
Submissions	Submissions from local councils and businesses have been invited to provide an opportunity for local knowledge and views to be shared with the project team regarding Inland Rail Public submissions to the Inland Rail Implementation Group (2015) were also invited prior to the preparation of the EIS	Early 2015
Attendance and presentations at industry forums	Raise awareness and understanding of the Project Provide an opportunity for stakeholders to ask questions and understand the opportunities to be involved in Inland Rail	Commenced in 2014 and are ongoing
Letter mail outs to property owners identified along the rail corridor	Raise awareness and understanding of inland Rail and the proposal Provide updates on the proposal's progress. Provide details for how the project team can be contacted for further information and details for providing feedback	Provided on an ongoing basis at regular intervals since May/June 2016
Briefing papers	To provide government with information on key issues and strategies and information on project milestones	Provided on an ongoing basis as required
Advertisements and proactive media articles	Raise awareness and understanding of Inland	Ongoing. Specific advertisements

COMMUNICATION AND CONSULTATION TOOL	PURPOSE	DATE
	Rail and the proposal Provide information and promote channels through which stakeholders can communicate their views, issues and concerns Celebrate project milestones publicly	were placed in local newspapers, The Australian and the Koori News in December 2015 to January 2016 requesting contact with cultural heritage knowledge holders.
Media releases	Raise awareness and understanding of inland Rail and the proposal Provide information and promote channels through which stakeholders can communicate their views, issues and concerns Celebrate project milestones publicly	Regular media releases published since 2014 and are ongoing (available via Inland Rail website)
Project database	Record all correspondence relating to the Project, including feedback, concerns, supportive comments so that they are contained in a central location and can be considered by the project team in during the design development and EIS process	Established in 2014

3.2. Consultation with government departments and agencies

The primary mechanism for consultation with relevant State governments prior to the preparation of the EIS was through the Inland Rail Implementation Group. In late 2013, the then Deputy Prime Minister, the Hon Warren Truss MP, established an Inland Rail Implementation Group to develop a delivery programme for the implementation of Inland Rail. The Implementation Group was chaired by former Deputy Prime Minister, the Hon John Anderson AO, with senior representatives from the Australian, New South Wales, Queensland and Victorian governments and ARTC.

To support the Inland Rail Implementation Group's investigations, ARTC was tasked with developing an Inland Rail Programme Business Case, to include a 10-year delivery schedule, cost estimate, development strategy and a detailed analysis of the economic benefits of Inland Rail. The Inland Rail Implementation Group took a consultative approach, engaging with a broad range of stakeholders including potential future users as well as individuals, communities and others who would live and work along the alignment to understand the breadth of issues associated with Inland Rail, and to inform the report to the Australian Government.

The Inland Rail Implementation Group delivered its Report to the Australian Government in August 2015, supported by the Inland Rail Programme Business Case.

Further to the early consultation carried out by the Inland Rail Implementation Group, Table 3 provides an overview of consultation activities carried out with key government groups prior to and during the preparation of the EIS.

Table 3 - Consultation activities with government

STAKEHOLDER	ACTIVITY	DATE
Narrabri Shire Council	Invitation to Inland Rail Forum	6 June 2014
	Request from Council for copy of the Service Offering and map to assist with Regional Snap Shot submission	16 March 2015
	First draft of Regional Snap Shot Submission received	27 March 2015
	Introduction of project team and meeting for following week	14 August 2015
	Technical workshop	17 August 2015
	E-news correspondence and update on Inland Rail Business Case	14 September 2015
	E-news update on tender for Technical Advisory services for Inland Rail	4 November 2015
	Email to Council with update regarding launch of Suppliers e-newsletter	5 November 2015
	Provision of preferred suppliers list for future reference	13 November 2015
	Email correspondence received from Council with provision of list of cultural knowledge holders	15 December 2015
	Email correspondence received from Council with additional list of cultural knowledge holders	17 December 2015
	Face to face meeting regarding general project update	9 February 2016
	Presentation to Council on Inland Rail Programme and NSW project update	1 March 2016
	Email received acknowledging ongoing budget commitment to Inland Rail	4 May 2016
	Email correspondence regarding community	16 May 2016

STAKEHOLDER	ACTIVITY	DATE
	information sessions	
	Face to face project update meeting	23 May 2016
	Phone call to provide update on outcomes from information sessions	9 June 2016
	Meeting to discuss social impact assessment	27 June 2016
	Email correspondence to Council regarding participation in community baseline assessment survey	15 July 2016
	Email correspondence to Council regarding community baseline assessment survey	23 August 2016
	Enews update to all Councils on NSW projects including Narrabri to North Star project	21 September 2016
	Phone call regarding upcoming project meetings	26 September 2016
	Meeting with Council to provide update on Narrabri to North Star and Narromine to Narrabri projects	10 October 2016
	Provision of traffic count data and flood modelling map	12 October 2016
	Provision of contact details for organisation currently completing flood studies within Narrabri	13 October 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	21 October 2016
	Email received including media article on Narromine to Narrabri project	11 November 2016
	Meeting to provide information on project activities and time frames	23 November 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	19 December 2017

STAKEHOLDER	ACTIVITY	DATE
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	2 February 2017
	Meeting with Councillors and Staff regarding connectivity of Inland Rail	22 June 2017
Moree Plains Shire Council	Project update to MPSC plus introduction of new Community Engagement Manager	14 August 2015
	Technical workshop	18 August 2015
	Contact requesting information regarding proposed route	18 August 2015
	Meeting to discuss project and potential early works	24 September 2015
	Workshop held with MPSC and local NSW Farmers group to discuss impacts of Inland Rail	30 September 2015
	Submission on proposed alignment via Moree	29 October 2015
	Email correspondence and update on Inland Rail Business Case	14 September 2015
	Correspondence between ARTC and MPSC regarding follow up from farmer's workshop	Throughout the month of November 2015
	Email update on tender for Technical Advisory services for Inland Rail	4 November 2015
	Email update regarding launch of Suppliers e-newsletter	5 November 2015
	Request from MPSC for presentation material for Regional Council's meeting	23 November 2015
	Request for and provision of assistance with identifying cultural knowledge holders relevant to the NNS project	24 November 2015
	Media release received from MPSC in support of Inland Rail	26 November 2015

STAKEHOLDER	ACTIVITY	DATE
	Provision of project update slide kit for Regional Council update	30 November 2015
	Update provided to MPSC on cultural heritage assessment and notification advertising	10 December 2015
	Social profile of Moree shared by MPSC	18 December 2015
	Update provided regarding flood modelling tender to MPSC	2 February 2016
	Correspondence from MPSC regarding the potential closure of a road that may impact inland Rail	18 February 2016
	Project update to MPSC regarding field studies, including noise monitoring	9 March 2016
	Signed access agreement received from MP:SC for noise logging field studies	15 March 2016
	Media release received from MPSC	16 March 2016
	Correspondence from MPSC regarding local newspaper article	24 March 2016
	Meeting with MPSC discussing property access for field studies on various Council owned property	7 April 2016
	Email providing information regarding traffic count data	14 April 2016
	Correspondence between ARTC and MPSC regarding traffic counts – request for information and provision of data	19 April 2016 to July 2016
	Media release received from MPSC and MBIRA supporting the ongoing budget commitment to Inland Rail	4 May 2016
	Meeting with MPSC project update and discussion of Moree bypass studies	25 May 2016
	Meeting request sent to MPSC to hold meeting	30 May 2016

STAKEHOLDER	ACTIVITY	DATE
	with ARTC and emergency services on 6 June, draft agenda provided	
	Correspondence provided to MPSC and emergency services requesting a response regarding the proposed inland Rail project and corridor for NNS.	10 June 2016
	Meeting with MPSC and emergency services	17 June 2016
	Email to MPSC requesting meeting to understand socio economic impacts and discuss these further	22 June 2016
	Teleconference with MPSC on social impacts associated with Inland Rail	27 June 2016
	Teleconference with MPSC regarding cultural heritage	13 July 2016
	Email regarding participation in community baseline assessment survey	15 July 2016
	Teleconference meeting with MPSC providing update on NNS and NS2Y projects	21 July 2016
	Presentation pack provided to MPSC for update to Regional Council meeting on Inland Rail and discussion on programme and project status	4 August 2016
	Email regarding community baseline assessment survey	23 August 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	21 September 2016
	Information package provided to MPSC on structures under review including the Mehi, Gwydir, Croppa Creek bridges	14 October 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	21 October 2016
	Workshop with MPSC and ARTC, including presentation from ARTC commercial team representative	24 November 2016

STAKEHOLDER	ACTIVITY	DATE
	Notification provide to MPSC of sewer and water utility investigation occurring	6 December 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	19 December 2016
	Eastern option sketch provided by MPSC to ARTC	19 December 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	2 February 2017
	Teleconference update provided to members of MBIRA on status of NSW projects.	13 February 2017
	Workshop with MPSC and LALC and elders to discuss pedestrian crossing of the rail line and identify potential solutions	15 February 2017
Gwydir Shire Council	Correspondence and phone calls regarding Regional Snap Shot invitation	Throughout the month of March 2015
	Technical workshop	29 October 2015
	Discussion with Council regarding social impact assessment	27 June 2016
	Email regarding community baseline assessment survey	21 September 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	21 September 2016
	Briefing with Council in Warialda	11 October 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	21 October 2016
	Discussion with Council regarding upcoming level crossing consultation	2 November 2016
	Request made to Council for road and traffic count data	2 November 2016
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	19 December 2016

STAKEHOLDER	ACTIVITY	DATE
	E-news update to all Councils on NSW Projects including Narrabri to North Star project	2 February 2017
	Meeting at Warialda office updating on NNS timelines	4 April 2017
Narrabri, Moree and Gwydir Council	Discussions and collaborative planning with councils regarding survey	Throughout the month of March 2017

3.3. Consultation with industry

Consultation activities have occurred with key business and industry stakeholders relevant to the Narrabri to North Star project as identified in Table 4.

Table 4 - Consultation activities with industry

STAKEHOLDER	ACTIVITY	DATE
Inland Rail Stakeholder Forum 1 (with Freight & Logistics Industry stakeholders)	Presentations / workshop	16 May 2014
Inland Rail Regional Stakeholder Forum – Ipswich	Presentations / Q&A	2 June 2014
Inland Rail Regional Stakeholder Forum – Toowoomba	Presentations / Q&A	2 June 2014
Inland Rail Regional Stakeholder Forum – Narrabri	Presentations / Q&A	4 June 2014
Inland Rail Regional Stakeholder Forum – Dubbo	Presentations / Q&A	5 June 2014
Inland Rail Regional Stakeholder Forum – Parkes	Presentations / Q&A	6 June 2014
Transport for NSW	Briefing	29 July 2014
National Farmers Federation Agriculture Infrastructure and Logistics Forum	Presentation	18 August 2014
Heavy Haul Rail	Presentation	27-28 August 2014
CEDA Newcastle and Hunter Region Economic Development	Presentation	4 September 2014

STAKEHOLDER	ACTIVITY	DATE
AusIntermodal	Presentation	10 September 2014
Inland Rail Industry Information Session - Sydney	Presentations / Q&A	17 September 2014
Inland Rail Industry Information Session - Brisbane	Presentations / Q&A	26 September 2014
Rail Freight Futures Australia	Presentation	10 October 2014
CEDA Australia's Infrastructure Future	Presentation	16 October 2014
Inland Rail Stakeholder Forum 2 (with Freight & Logistics Industry stakeholders)	Presentations / workshop	17 October 2014
PWI convention	Presentation	31 October 2014
Aus Rail	Presentation	11-12 November 2014
Inland Rail Regional Stakeholder Forum – Wagga Wagga	Presentations / Q&A	4 February 2015
Inland Rail Regional Stakeholder Forum – Wodonga	Presentations / Q&A	5 February 2015
CEDA Trustee	Presentation including Q and A	4 March 2015
Australian Logistics Council Forum 2015	Presentation	10-12 March 2015
Regional Development Australia	Presentation	12 March 2015
Freight Outlook Conference	Presentation	17 March 2015
Australian Property Institute (Dubbo)	Presentation including Q and A	18 March 2015
QLD Infrastructure Conference 2015	Presentation	5 May 2015
Australian Property Institute NSW 2015 Country Conference	Presentation	8 May 2015
Women in Project Management Leadership Summit	Presentation	20 May 2015
Heavy Haul Rail Conference	Presentation	May – June 2015
7th Annual Victorian Transport Infrastructure Conference	Presentation	23-24 June 2015
Transport and Logistics Symposium	Presentation	4-5 August 2015

STAKEHOLDER	ACTIVITY	DATE
Ports and Rail Forum	Presentation	14 August 2015
Integrated Logistics Hub Conference	Presentation	26-27 August 2015
Public Sector Infrastructure Summit	Presentation	27-18 October 2015
AusIntermodal 2015 Conference	Presentation	20 November 2015
NSW Major Projects Conference	Key note presentation	25 November 2015
Ausrail Plus	Presentation plus CEO Forum	25-26 November 2015
Australian Logistics Council Forum 2016	Presentation	2-3 March 2016
2016 Australian Property Institute Rural QLD Conference	Presentation	18-19 March 2016
7th Annual QLD Transport Infrastructure Conference 2016	Presentation	10-11 May 2016
8th Annual Victorian Transport Infrastructure Conference 2016	Presentation	15-16 June 2016
NSW Farmers and ARTC Conference	Presentation	19 July 2016
2nd Annual Logistics Hub Conference	Presentation	17-18 August 2016
2016 RTSA Annual Group Meeting, Dinner and Trivia	Presentation	24 August 2016
ARA Heavy Haul Conference	Presentation	24 -25 August 2016
Consult Australia	Presentation	7 September 2016
ARA AusIntermodal Conference	Presentation	9 September 2016
3rd Annual NSW Transport Infrastructure 2016 Summit	Presentation	27-28 September 2016
Operator's Forum	Presentation	28 September 2016
IAQ Breakfast	Presentation	7 October 2016
CMIC Conference	Presentation	27 October 2016
Queensland Major Contractors Association Members Breakfast	Presentation	18 November 2016
Ipswich City Council Economic Development, Tourism and Digital City	Presentation	29 November 2016

STAKEHOLDER	ACTIVITY	DATE
Committee		

Consultation and correspondence with utility and other service providers within the project corridor has also been carried out with:

- AARNet
- Essential Energy
- APA Group
- Jemena
- Soul Australia Communication – Pipe Network Pty Ltd
- Nextgen Group Holdings
- Telstra
- TPG
- Santos

3.4. Consultation with potentially affected landowners, special interest groups and community members

Consultation activities have occurred with relevant community stakeholders for the Narrabri to North Star project as identified in Table 5.

Table 5 - Consultation activities with potentially affected landowners, special interest groups and community

STAKEHOLDER	ACTIVITY	DATE
Moree Farmers Meeting in collaboration with Moree Plains Council and NSW Farmers Federation	Workshop attended by 26 stakeholders	17 December 2015
Moree Local Aboriginal Land Council	Meeting with CEO and Deputy CEO	December 2015
Cultural knowledge holders	Advertisement Correspondence	December 2015 / January 2016 February 2016 ongoing
Western Zone Aboriginal Land Council Director	Face to Face meeting	10 February 2016
Landowner feedback	Face to face meetings with identified landowners along the alignment for property access to enable field studies and other investigations	1 March 2016 and ongoing
Narrabri Registered Aboriginal Parties	Workshop	10 May 2016

STAKEHOLDER	ACTIVITY	DATE
Moree Registered Aboriginal Parties	Workshop	10 May 2016
Impacted landowners within 1km from the alignment	Mail out providing an overview of the project and proposed activities sent to over 390 landowners	25 May 2016
Moree Community	Drop in information session attended by approximately 10 community members	24 May 2016
Narrabri Community	Drop in information session attended by approximately 180 stakeholders	25 May 2016
Narrabri farmers in collaboration with NSW Farmers Federation	Workshop attended by 8 landowners	25 May 2016
North Star community	Drop in information session with approximately 20 attendees	29 June 2016
Emergency services Moree in collaboration with Moree Plains Council	Introductory meeting with LEMC	17 June 2016
Landowner consultation	Face to face meetings to support cultural heritage and geo-tech field studies with 45 landowners	July – August 2016
Heavy Vehicle Moree Workshop	ARTC participant only	18 August 2016
Water-flow and flood modelling consultation undertaken	Face to face meetings with approximately 30 landowners	October 2016
Broadbent Grain farmers presentation	Attendee at community presentation	11 October 2016
Emergency services Moree region	Workshop to discuss severance and accessibility and pedestrian safety with representatives from Police and Ambulance services in attendance	11 October 2016
Stakeholder update (Councils and MPs)	e-news project update to Councils and MPs	21 October 2016
North Star community	Drop in information session with approximately 11 attendees	24 October 2016
Narrabri community	Drop in information session with approximately 110 attendees	14 November 2016
Landowner consultation	Face to face meetings with 31 landowners with private level crossings	November – December 2016

STAKEHOLDER	ACTIVITY	DATE
Narrabri Business Chamber	Presentation	14 February 2017
Moree Local Aboriginal Land Council and elders	Workshop with 7 attendees	15 February 2017
Landowner consultation	Face to face meetings with 2 landowners regarding potential quarry sites and geotechnical activities	March 2017
Landowner engagement	Engagement with four private landholders to request access for LiDAR surveyors	March – April 2017
Broad community	Advertising in Moree and Narrabri newspapers advising the community of LiDAR survey activities	March 2017
Landowner notification	Written notification provided to 74 landowners advising of LiDAR survey activities	March 2017
Private Landowner consultation along with Crown Lands, Local Land Services, Councils, RMS, Telstra and Essential Energy	Face to face meetings with 110 private and public landowners along the alignment updating access agreements and providing information on the project (post Budget)	April, May, June 2017
Interested community members	Calls to 1800 number	Ongoing

4. Feedback received prior to and during the preparation of the EIS

4.1. Summary of feedback received

The results of consultation for Inland Rail prior to the preparation of the EIS indicated sustained positive interest in Inland Rail from all key stakeholder groups. Customer's descriptions of Inland Rail included Inland Rail being:

- a vital piece of infrastructure that will reduce freight transit times and reduce congestion
- the best response to the freight challenge
- essential infrastructure.

Local councils and regional businesses highlighted the strong regional development potential and enhanced connectivity that Inland Rail would facilitate. Farming and mining exporters commented that Inland Rail would create competition in the logistics supply chain, driving down costs and making them more competitive in world markets.

Motoring organisations and councils identified the potential to reduce the burden on regional road networks and improve road safety outcomes.

Overwhelmingly, stakeholder sentiment toward Inland Rail is strongly supportive and positive.

Table 6 provides an overview of the proposal's key issues as identified in the consultation process undertaken to date and how these issues will be addressed.

Table 6 - Feedback received prior to and during the preparation of the EIS

ISSUE CATEGORY	KEY ISSUES	RESPONSE
Consultation	• Partnership opportunities with Councils • Request for discussions to be held with individual landowners regarding private level crossing requirements and any proposed changes to level crossings • Request for landowners to be consulted about construction and culvert replacement as surface water is a major concern and cost for farmers • Continue consultation with local commercial grain terminals and handlers especially retaining access	• Further consultation to be undertaken during detailed design in accordance with the Inland Rail Level Crossing Strategy • Further consultation to occur as part of additional drainage assessment undertaken during detailed design • Ongoing consultation to be undertaken during detailed design and construction
Design	• Consider any impacts to private and public level crossings • Ensure design of culverts is effective during times of flood • Fencing needs to allow for large heavy vehicle access between the road and the rail line • Consideration of pedestrian safety at crossings in Moree • Consideration of illegal corridor access around rail line in Moree • Suggestion to review recent RMS consultation in Moree associated with the bypass • Allow for livestock and large machinery movements across the alignment • Consider bypassing the township of Moree with the proposed Inland Rail corridor further to the East • Consider accessibility for existing terminals • Consider the need for road and rail grade separation • Consideration of overpass at Jones Avenue Moree to provide emergency access at all times	• Inland Rail Level Crossing Strategy to progress during detailed design • See EIS for current hydrology modelling results - additional drainage assessment to be undertaken during detailed design • Ongoing consultation to be undertaken during detailed design and construction • Detailed design to take into consideration, where relevant for proposal

ISSUE CATEGORY	KEY ISSUES	RESPONSE
	• Impacts of noise and vibration on those living close to the rail line • Consider establishing a GPS freight tracking data centre when the project is in operation • Consider the impact of flooding on construction and operation • Farmers have developed contour banks in some area and these are costly and would be directly impacted by the design and flooding mitigation measures	
Economic	• Potential opportunities to establish intermodal terminals or logistics hubs in region • Consider potential impacts of the project on heavy vehicle movements particularly during peak harvest times • Supplier and employment opportunities including Indigenous employment policies • Consider the issue around preclusion of further development in Narrabri due to a new level crossing • Potential sites for intermodal activity • Benefit of rail connections to Queensland particularly seen as a local 'fit' • Consider the impact of Inland Rail on property values and resale	• Ongoing consultation to be undertaken during detailed design and construction • Acquisition to be undertaken in accordance with legislative requirements
Environment	• Consider impact of weeds adjacent to the alignment and management strategies to prevent spread to neighbouring agricultural operations • Consider impact on TSRs and TSR usage • Concern regarding impacts of noise and vibration to communities along the existing line • Consideration of bushfire mitigation and spark reduction • Management of protected flora and fauna	• See EIS • Ongoing consultation to be undertaken during detailed design and construction

ISSUE CATEGORY	KEY ISSUES	RESPONSE
Social	• Concern about the potential impacts on residential properties in close proximity to the alignment concern about perception of a divided community in Moree • Concern from Moree Council that trains through the town could create a severance issue • Previous history with ARTC and issues with maintenance of track, flooding, weed control, maintaining access roads, fence and property damage not made good	• Ongoing consultation to be undertaken during detailed design and construction
Planning of route and infrastructure	• Closure of Crown roads by the State Government which may limit access • Importance of access to Inland Rail with established infrastructure e.g. grain handling facilities	• Further consultation to be undertaken during detailed design

5. Next steps

The proposal EIS will be placed on public exhibition for a minimum of 30 days. During that time, the communication and consultation methodologies adopted during preparation of the EIS will continue to be used, to enable landowners, community members and other stakeholders to ask questions and to provide feedback to ARTC project team members. Consultation tools used during this period will include:

- mail out to affected and adjoining landowners
- community information sessions and briefings
- updates to ARTC Inland Rail website at key milestones, i.e. announcing public exhibition of EIS and outlining location details for drop-in information days
- project newsletter distributed to stakeholders
- Frequently Asked Questions and other website based information updated to include EIS information, i.e. details on how to make a submission
- advertisements in the local newspapers giving information regarding the proposal and display of the EIS.

The EIS will be available for viewing at the following locations:

- Moree Plains Shire Council Administration Centre, Level 2 30 Heber Street Moree
- Narrabri Shire Council Administration Centre, 46 – 48 Maitland Street Narrabri
- Gwydir Council Administration Warialda, 52 Hope Street Warialda

The EIS will also be made available for viewing and in web audio on the Department of Planning and Environment and Inland Rail websites.

The public will be able to review the EIS and send submissions to the Department of Planning and Environment for consideration.

At the completion of the display period the Department will provide ARTC with a copy of all public and government submission. ARTC will manage submissions received in accordance with the *Environmental Planning and Assessment Regulation 2000*. While all submissions received will be posted on the Department of Planning and Environment website, if requested the privacy of submitters will be protected by removing names from submissions. If changes to the proposal need to be made, a preferred project report would be prepared. ARTC will continue to liaise directly with key stakeholders regarding the proposal's progress.

Appendix E – Consistency with relevant strategic plans

Strategic planning context for the proposal

A summary of the reports and strategies that are relevant to the need for, and development of, the proposal is provided below.

National planning

Australian Infrastructure Plan

The Australian Infrastructure Plan (Infrastructure Australia, 2016a) sets out the infrastructure challenges and opportunities that Australia faces over the next 15 years and the solutions required. The plan was informed by the Northern Australia Audit and the Australian Infrastructure Audit, which provide a comprehensive review of existing and required infrastructure over the coming decades.

The plan has four main themes:

- productive cities, productive regions
- efficient infrastructure markets
- sustainable and equitable infrastructure
- better decisions and better delivery.

Inland Rail is referenced in relation to the first theme. The plan states that 'the efficient movement of freight into, out of, and across Australia is critical to the nation's ongoing productivity growth and competitiveness.' It recognises that the Melbourne to Brisbane corridor is one of the most important and busiest freight routes in Australia, supporting key population, production, and employment precincts. The Plan states that Inland Rail would improve the efficiency of freight moving between Melbourne and Brisbane, as it would bypass the Sydney metropolitan area.

As part of the *Australian Infrastructure Plan*, the *Infrastructure Priority List* (Infrastructure Australia, 2016b) is designed to give guidance to decision makers, visibility to industry, and transparency for the community. It is a 'rolling' list which will be updated periodically as proposals move through stages of development and delivery, and to respond to emerging challenges and opportunities. Inland Rail is included as a priority initiative on the *Infrastructure Priority List* in the 'national connectivity' category. It is identified for longer-term planning and business case development to address 'freight connectivity Melbourne-Brisbane'.

State of Australia's Cities 2014-2015

The State of Australian Cities reports bring together current research and data to present a comprehensive picture of how Australia's cities are evolving, to strengthen the knowledge base used to develop policy. The 2014-2015 report (Department of Infrastructure and Regional Development, 2015) observed that there is more demand for transport in Australia, including freight, than ever before.

Further growth in population, transport passengers, and freight demands is forecast. Recognised key challenges for policy makers include the potential conflicts between the usability of cities with the utility and long-term capacity of freight hubs, ports, airports, and the movement of goods and people in cities. The interstate freight task is forecast to grow significantly in the coming decades, with resultant pressure on to transport infrastructure. The report notes that the issues associated with this will be particularly felt in the cities where many freight movements originate and terminate, as there are already capacity constraints experienced when the movement of freight conflicts with the transport of people on roads and rail.

The report notes that all levels of government and industry have agreed on the need to apply a national focus and effort to deliver a streamlined, integrated and multimodal transport and logistics system, capable of efficiently moving freight throughout Australia.

Inland Rail provides a response to some of the issues raised in this report, as it aims to:

- Provide a step-change improvement in rail service quality in the Melbourne to Brisbane corridor to deliver a freight rail service on the east coast that is competitive with road.
- Improve road safety, ease congestion and reduce environmental impacts by moving freight from road to rail.
- Bypass bottlenecks on the congested metropolitan rail networks on the east coast, and free up train paths for other services on the coastal route.

Urban Transport Strategy

The *Urban Transport Strategy* (Infrastructure Australia, 2013), *National Land Freight Strategy* (Standing Council on Transport and Infrastructure, 2012), and the *National Ports Strategy* (Infrastructure Australia, 2011) form the key components of strategic planning for transport in Australia.

Relevant to Inland Rail, the *Urban Transport Strategy* recognises that some of Australia's public transport sub-systems influence the performance of urban roads and the national freight systems. The strategy notes that as Australia is highly urbanised, and that urban transport strongly affects national productivity, with road congestion impacting on national productivity and economic activity.

One of the aims of the strategy is to promote the best use of capacity on high use roads. This can be achieved in a number of ways, including by removing freight from urban roads, and prioritising freight on the national freight network.

Inland Rail is consistent with this strategy, as it aims to:

- improve road safety, ease congestion and reduce environmental impacts by moving freight from road to rail
- bypass bottlenecks on congested metropolitan rail networks on the east coast, and free up train paths for other services on the coastal route.

National Land Freight Strategy

The *National Land Freight Strategy* (Standing Council on Transport and Infrastructure, 2012) is a partnership between Commonwealth, State, Territory and local governments and industry to deliver a streamlined, integrated and multimodal freight transport and logistics system, capable of efficiently moving freight throughout Australia. The strategy recognises that 'the efficient movement of land freight is crucial for Australia's productivity and competitiveness, and affects the lives of every Australian' and that 'continued growth in freight volumes is giving rise to a range of increasingly complex challenges for governments, industry and the community.'

The strategy seeks to direct the efforts of all governments and industry towards the long-term vision, objectives and outcomes for freight in Australia. Identifying the current and future places for freight movement is a core element of the strategy. Inland Rail is included on the map of key freight routes developed by the strategy, based on the route provided in the *National Land Freight Strategy Update Paper* (Infrastructure Australia, 2012). The map shows a single new national network to reflect the emphasis on potential future freight flows, freight (vehicle) connectivity, ports, and settlements.

The background paper for the strategy, the *National Land Freight Strategy Discussion Paper* (Infrastructure Australia, 2011) provides a case and priorities for a national land freight network strategy, and an indicative list of projects and programs that Infrastructure Australia has already flagged for inclusion in a long-term national land freight network plan. This includes Inland Rail.

National Ports Strategy

The Council of Australian Governments (COAG) endorsed the *National Ports Strategy* (Infrastructure Australia, 2011) in July 2012 as part of a collaborative approach to the future development and planning of Australia's port and freight infrastructure. The strategy was jointly authored by Infrastructure Australia and the National Transport Commission following extensive consultation and engagement with stakeholders.

The *National Ports Strategy* covers both bulk commodity ports and container ports, identifying:

- the most effective regulatory and governance frameworks
- ways to improve land planning and corridor preservation
- the future infrastructure requirements of Australia's ports, including road and rail links.

The strategy notes that there are major efficiency implications for Australia if significant improvements are not made to ports and related landside road and rail systems over the coming decades.

Inland Rail would connect key production areas in Queensland, NSW and Victoria with export ports in Brisbane and Melbourne. As a result, it is consistent with the *National Ports Strategy*.

NSW planning

State Priorities: NSW Making it Happen

On 14 September 2015 the NSW Premier announced 30 priorities for the state, to grow the economy, deliver infrastructure, protect the vulnerable, and improve health, education and public services across NSW. These consist of 12 'Premier's Priorities' and 18 'State Priorities'. Collectively, these replace NSW 2021 as the new state plan. The transport priority relevant to the proposal is 'improving road travel reliability'.

Newell Highway Corridor Strategy

The *Newell Highway Corridor Strategy* (NSW Government, 2015) sets out the objectives, current performance, and issues in managing the Newell Highway corridor over the long-term. It details a series of safety, asset and traffic actions to meet the current and future issues along the highway. The strategy notes that:

- The Newell Highway currently provides the major freight route between Queensland and Victoria, and connects numerous regional centres and communities along its 1,060 kilometre length.
- The Newell Highway serves as a key economic link to domestic and export markets for agricultural products from the Central West, and interstate road freight between Queensland and Victoria.
- Traffic volumes along the Newell Highway vary significantly, from around 1,200 to 4,000 vehicles per day in rural areas. Traffic volumes along the Newell Highway increase substantially within the urban areas (such as Parkes, Dubbo, Narrabri and Moree). In urban areas, average daily traffic volumes can exceed 20,000 vehicles a day.
- The Newell Highway experiences high levels of heavy vehicle use, with around 26 to 52 per cent of daily traffic made up of heavy vehicles, depending on the location. Relative use of heavy vehicles is highest to the north between Narrabri and Boggabilla, with up to 1,500 heavy vehicles per day near the Queensland border, and rural sections around Narrandera.
- A number of significant intermodal freight hubs are located along and around the Newell Highway, including major hubs at Tocumwal, Forbes, Parkes, Dubbo, Narrabri, and Moree. The NSW government aims to support these hubs by improving inland rail access, and supporting the road connections.

Relevant to the proposal, the strategy notes the issues associated with moving significant volumes of freight along the road corridor.

Consistent with the strategy, Inland Rail supports north–south freight movement between the communities of the Central West, along with interstate movements between Victoria, NSW and Queensland.

Rebuilding NSW - State Infrastructure Strategy

Rebuilding NSW - State Infrastructure Strategy (NSW Government, 2014) was prepared following consideration of the recommendations provided by Infrastructure NSW in the *State Infrastructure Strategy Update 2014* report (Infrastructure NSW, 2014). The strategy sets out the infrastructure projects and initiatives that the NSW Government will prioritise over the short, medium and long-term. The strategy highlights the importance of sustaining productivity growth in our major centres and our regional communities, and recognises the need for investment in road and rail projects.

Although the proposal is not included in the strategy, it is considered to be consistent with the strategy. The strategy notes that the transport freight industry is critical to the NSW economy, and that by 2031, the amount of freight travelling in NSW will nearly double. It also notes that there are too many constraints on the rail network, reducing the efficiency of freight connections between regional NSW and key markets.

In particular, the *State Infrastructure Strategy Update 2014* report notes that road and rail freight within the metropolitan area operate largely on networks that are shared with passenger vehicles and public transport. Many of these journeys occur at similar times of day, resulting in highly variable travel speeds and journey times. The report recognises that a key challenge in the modal shift from road to rail is the regular disruption to freight trains running on the shared Metropolitan Rail Network, as passenger train services are increasing and are given priority across the day, meaning that the efficiency of freight trains will gradually decline. The update report notes that:

- In 2013, the NSW rail network carried 157 million tonnes of freight (33 per cent of the total State freight task). Coal made up most of NSW's rail freight task, with significant grain and cotton movements drawn from across western NSW.

- The regional freight network in NSW plays a critical role in supporting the national freight task, with 75 per cent of interstate truck freight in Australia using the NSW road network for some part of its journey.
- By 2031, the freight task in NSW will nearly double to 794 million tonnes, with significant growth in major regional exports, in particular mining production, and meat and livestock.
- The main transport challenge for regional NSW is to manage this growth efficiently by improving road productivity, enhancing local freight connectivity across the regions, and developing a sustainable and viable regional rail freight network.
- A viable regional rail freight network – one with the capacity to carry a greater share of the total freight task – is critical to the productivity and competitiveness of regional businesses, as well as the broader NSW economy.

NSW Freight and Ports Strategy

The *NSW Freight and Ports Strategy* (NSW Government, 2013) aims to create a transport network where goods move efficiently to their markets. The strategy responds to Infrastructure Australia's National Port Strategy (Infrastructure Australia, 2011) and the *National Land Freight Strategy* (Standing Council on Transport and Infrastructure, 2012), and is consistent with the objectives of the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012).

Freight and logistics are an indispensable component of economic activity. The strategy notes that in 2013, congestion and inefficiencies are evident in all network modes. Providing a network that eliminates or at least minimises congestion will support economic growth and productivity and encourage regional development.

The strategy identifies the following issues relevant to the movement of rail freight:

- NSW has experienced under investment in freight infrastructure, particularly rail. While a number of rail infrastructure projects have been undertaken in the last 10 years, the focus has been on coal and passenger transport.
- The transport of freight via the shared metropolitan rail network is limited by the needs of passenger transport, particularly during morning and afternoon passenger peaks.
- Projected growth in freight demand is increasing the pressure on the existing rail network. By 2031, all key corridors will struggle to meet demand unless action is taken.

Inland Rail is relevant to the following key actions included in the strategy

- improve productivity of the rail freight network
- identify and protect strategic freight corridors (including Inland Rail).
- develop and maintain projects to support network capacity
- develop and maintain capacity for freight on the rail network
- foster intermodal terminal network development
- coordinate regional infrastructure and service provision
- prioritise safety of freight transport.

NSW Road Safety Strategy 2012-2021

The *NSW Road Safety Strategy 2012-2021* (Transport for NSW, 2012) sets the direction for road safety in NSW for the next seven years. The NSW Government is committed to reducing road fatalities to at least 4.3 per 100,000 people by 2016, together with at least a 30 per cent reduction in fatalities and serious injuries by 2021.

The strategy notes that heavy trucks are often involved in serious road accidents in NSW. While they represent only 2.2 per cent of registered motor vehicles and seven per cent of all motor vehicle travel, heavy trucks were involved in 17 per cent of fatalities on NSW roads. Nearly 30 per cent of fatal heavy vehicle crashes involved heavy vehicles from interstate.

The proposal contributes to the strategy as it aims to improve road safety by moving freight from road to rail.

NSW Long Term Transport Master Plan

The NSW Long Term Transport Master Plan (Transport for NSW, 2012) provides a framework for addressing transport challenges across NSW over the next 20 years. The master plan is designed to guide the allocation of available funds to deliver maximum benefits to the people of NSW. It integrates transport with wider land use planning.

The plan recognises the rapid growth in freight demand across NSW, and that the NSW freight network is a critical part of the national freight network. It notes issues associated with sharing infrastructure between freight and passenger journeys, and the negative impacts associated with moving ever-increasing volumes of freight around NSW:

- increased traffic congestion
- displaced local economic activities
- impacts on communities from higher numbers of trucks moving through urban areas.

The plan notes that allowing the efficient flow of goods to the market has inherent benefits for the environment and community. It includes the following actions that are relevant to the proposal:

- protect strategic rail freight corridors (including Inland Rail)
- continue to work with the Australian Government to develop the Inland Rail
- improve road safety.

Regional and local planning

New England North West Regional Plan 2036

The *New England North West Regional Plan 2036* (NSW Government, 2017) has been prepared to guide the NSW Government's land use planning priorities and decisions for the region for the next 20 years. It provides an overarching framework to guide subsequent and more detailed land use plans, development proposals, and infrastructure funding decisions.

The plan recognises that:

- the region is strategically located between Sydney and Brisbane, and that high-quality transport networks to Newcastle, Sydney and South East Queensland will provide ready access to domestic and international markets and services.
- upgrades to transport infrastructure, including the development of the Melbourne-Brisbane Inland Rail and intermodal freight terminals, are making it easier for goods, services and people to move across the region and beyond
- Moree is one of the top agricultural producing areas in Australia and is one of the key locations for Inland Rail.

Relevant goals, directions and actions include:

- strong infrastructure and transport networks for a connected future
- expand emerging industries through freight and logistics connectivity
- work with the Australian Government and councils as the Melbourne to Brisbane Inland Rail Corridor project progresses.

Economic Development Strategy for Regional NSW

The E*conomic Development Strategy for Regional NSW* (DTIRIS, 2015), provides the framework for driving economic growth in regional NSW.

Inland Rail is relevant to the following goals included in the strategy:

- drive regional employment and regional business growth
- invest in economic infrastructure and connectivity.

The strategy notes that greater physical and virtual connectivity between regional centres, major ports, Sydney, neighbouring states and the broader region can increase prosperity in Regional NSW.

Relevant actions include improvements in regional transport through the Regional Transport Plans and NSW Freight and Ports Strategy.

A Plan for Growing Sydney (the Sydney Metropolitan Strategy)

A *Plan for Growing Sydney*, released in December 2014, is the NSW Government's 20-year plan for the Sydney metropolitan area. It provides direction for Sydney's productivity, environmental management, and liveability, and for the location of housing, employment, infrastructure and open space.

The proposal is not mentioned in the strategy. However, it is considered to be consistent with key directions of the strategy, including direction 1.5 – 'enhance capacity at Sydney's gateways and freight networks'. This direction recognises the existing land use conflicts between residential areas and the freight transport network, and the strategy notes that curfews on freight operations mean that freight movements are often forced into peak periods when there is greater pressure on the roads. This adds to the economic costs of freight movements, and the economic, social and environmental costs of traffic congestion.

Inland Rail provides a response to some of the issues raised in the strategy, as it aims to:

- improve road safety, ease congestion and reduce environmental impacts by moving freight from road to rail
- bypass bottlenecks within the congested Sydney rail networks, freeing up train paths for other services.

Regional Transport Plans

The regional transport plans, which include the *Central West Regional Transport Plan* and the *New England North West Transport Plan* (NSW Government, 2013), support the *NSW Long Term Transport Master Plan* and outline specific actions and priorities for each region.

The Central West Regional Transport Plan includes the following actions that are relevant to the proposal:

- invest in rail freight facilities (including the Parkes National Logistics Hub and Inland Rail)
- improve road safety.

The *New England North West Regional Transport Plan* includes the following actions that are relevant to the proposal:

- investigate opportunities for an inland rail freight line
- improve road safety.

Central West Freight Study

The *Central West Freight Study (*Regional Development Australia Central West, 2013) documents the freight task in the Central West region, in terms of net tonnes transported via road, rail and air. It highlights constraints and opportunities, considers possible network improvements, and provides guidance on the benefits to the region of these improvements.

Relevant to the proposal, the study notes that Inland Rail is strongly supported, and that it meets the strategic merit test applied by the study. The study notes that Inland Rail would:

- provide an opportunity for regional businesses to access Melbourne and Brisbane markets and export ports, as well as other regional nodes
- provide a viable alternative for freight travelling along the Newell Highway
- unlock significant value in the supply chain, open up new markets to freight users across the region, and provide significant economic benefits to the region and the broader NSW economy.

Regional Plan 2011-2015: Northern Inland NSW

The *Regional Plan 2011-2015: Northern Inland NSW* (Regional Development Australia, 2013) is a regional plan for NSW's Northern Inland region supported by the Federal and NSW governments. This region includes the LGAs of Moree Plains, Gwydir and Narrabri in its north-westernmost corner. The plan aims to articulate a regional economic, environmental and social vision and direction and has identified six priorities for the region to work towards. These priorities are:

- Regional community regeneration and sustainable population growth.
- Industry diversification, business growth and job creation.
- Integrated and improved health care.
- Investment in regional infrastructure and education.
- Social inclusion and engaging aboriginal communities.
- Environmental achievement.

New England North West Strategic Regional Land Use Plan

The *New England North West Strategic Regional Land Use Plan* (Department of Planning and Infrastructure, 2012) represents one component of the Government's broader Strategic Regional Land Use Policy. The policy comprises multiple initiatives to address land use conflict in regional areas, particularly focused on managing coal and coal seam gas issues. The plan provides a strategic framework for the New England North West region, delivering the necessary context for Government investment priorities, servicing strategies and local environmental plan making.

Key infrastructure issues are identified, particularly those relating to the growth of the mining industry. These issues include road and rail capacity and increased demand for health and social services. The plan recognises that the provision of infrastructure is vital in supporting economic growth and development while also maintaining liveability.

Appendix F – Air quality data

This appendix provides background data and analysis used to undertake the air quality impact assessment. The results of the assessment are summarised in Chapter 13.

Dust emission inventory

The potential impacts of construction were assessed based on a 30 m wide corridor undergoing earthworks with earth movements related to cut and fill activities typical of road and rail construction. Dust emissions for each construction area have been calculated using generic emission factors based on a range of typical construction activities. The derived emission rates were characterised using generic emission factors published in the *Western Regional Air Partnership Fugitive Dust Handbook* (Countess Environmental, 2006).

Particulate emissions were calculated using generic emission factors based on typical construction activities including:

- general construction with minimal/no earthworks – relevant to site compounds and spoil sites
- construction activities with minor earth movements – relevant to general track construction works along the proposal site
- construction activities with significant earth movements - relevant to bridge construction works.

Emissions for concrete batching were estimated using *AP42 Compilation of Air Pollutant Emission Factors Section 11.12 Concrete Batching* (USEPA, February 2011).

The dust emissions inventory is provided in Table F.1.

Table F.1 Dust emissions inventory

Particle size	Emission factor	Units	Notes
General construction with minor earth excavation			
Total suspended particles (TSP)	1.90E-05	g/m^2/s	TSP/PM_{10} ratio assumed to be a factor of 2
PM_{10}	0.11	tons PM_{10}/ acre/month	WRAP handbook - General construction using Best Available Control Measures (BACM) with minimal earth movement, i.e. cut and fill
	9.51E-06	g/m^2/s	
$PM_{2.5}$	9.51E-07	g/m^2/s	$PM_{2.5}$/PM_{10} ratio assumed to be 0.1
Construction with excavation, cut and fill			
TSP	7.26E-05	g/m^2/s	TSP/PM_{10} ratio assumed to be a factor of 2
PM_{10}	0.42	tons PM_{10}/ acre/month	WRAP handbook - Road construction using Best Available Control Measures (BACM) with significant earth movement, i.e. cut and fill, typical of road construction
	3.63E-05	g/m^2/s	
$PM_{2.5}$	3.63E-06	g/m^2/s	$PM_{2.5}$/PM_{10} ratio assumed to be 0.1
Concrete batching plant with emission controls			
TSP	0.016	g/s	TSP/PM_{10} ratio assumed to be a factor of 2
PM_{10}	0.008	g/s	Average dust emissions based on 5000 m^3 annual throughput, typical concrete source levels[1] and densities[2], AP42 Section 11 emission factors with typical emission controls, and 20 m of unpaved roads truck access into site.
$PM_{2.5}$	0.0008	g/s	$PM_{2.5}$/PM_{10} ratio assumed to be 0.1

Notes 1: http://www.cement.org/cement-concrete-basics/how-concrete-is-made
2: http://www.engineeringtoolbox.com/density-materials-d_1652.html

Dust dispersion modelling

A screening level assessment was undertaken with consideration of the A*pproved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005). The predicted worst-case 24 hour PM_{10} concentrations are presented Figures F.1 – F.4 as concentration versus distance graphs for the following scenarios:

- **scenario 1** – construction works outside the rail corridor, including the Jones Avenue overbridge, the Newell Highway overbridge, the Camurra bypass, and new bridges over Mehi River, Gwydir River and Croppa Creek
- **scenario 2** – construction within the proposal site where the track is being upgraded, significant earthworks are not expected and the potential for dust impacts is lower than for scenario 1
- **scenario 3** – establishment of site compounds
- **scenario 4** – operation of the concrete batching plant during construction.

The calculations consider a background dust level of 19.1 µg/m^3 and are worst case predictions, which would depend on background dust levels and local meteorology on any given day.

Derivation of ambient air quality

Table F.1 summarises Tamworth's PM_{10} average and 70th percentile values for the last five years. The highest 70th percentile concentration of PM_{10} was used in the cumulative impact assessment, in line with the Victorian government guidance document (EPAV, 2007). This document prescribes the use of the 70th percentile concentration of PM_{10} to be assessed in aggregate with the predicted maximum concentration from the proposal as an alternative to the Approved Methods approach where a contemporaneous hourly background concentration is added to predictions based on representative local measurements. This is considered appropriate for use in this desktop level 1 dust assessment. To be conservative, the highest 70th percentile annual PM_{10} level at Tamworth was used.

Table F.1 Annual average and 70th percentile PM_{10} levels at Tamworth

Year	Average PM_{10} (µg/m^3)	70th percentile PM_{10} (µg/m^3)
2011	13.9	15.3
2012	15.9	18.3
2013	16.6	19.1
2014	15.8	18.1
2015	14.1	16.2
Used background level	**-**	**19.1**

Figure F.1 Daily PM_{10} concentration versus distance relationship from the boundary of the proposal site (Scenario 1)

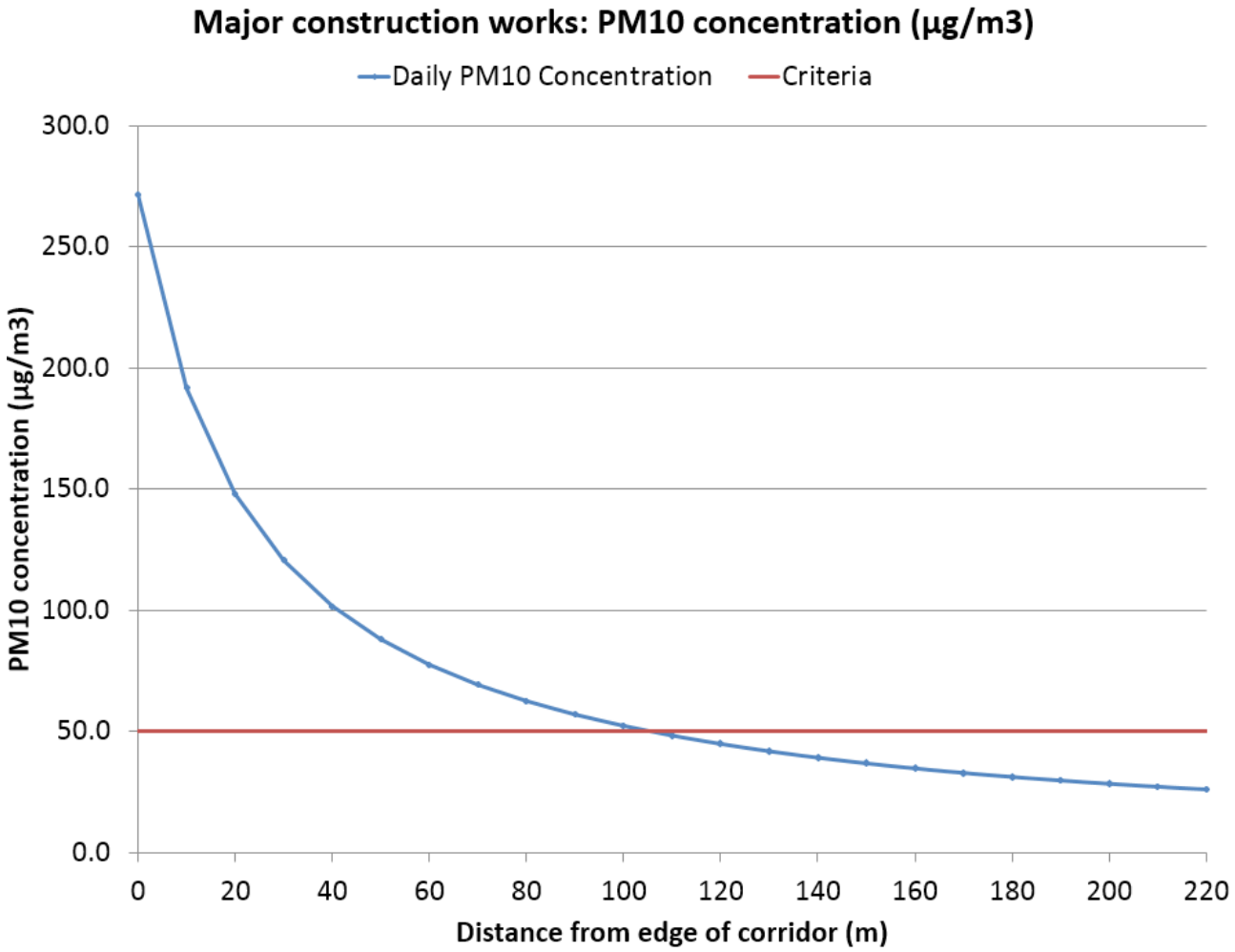


Figure F.2 Daily PM_{10} concentration versus distance relationship from the boundary of the proposal site (Scenario 2)

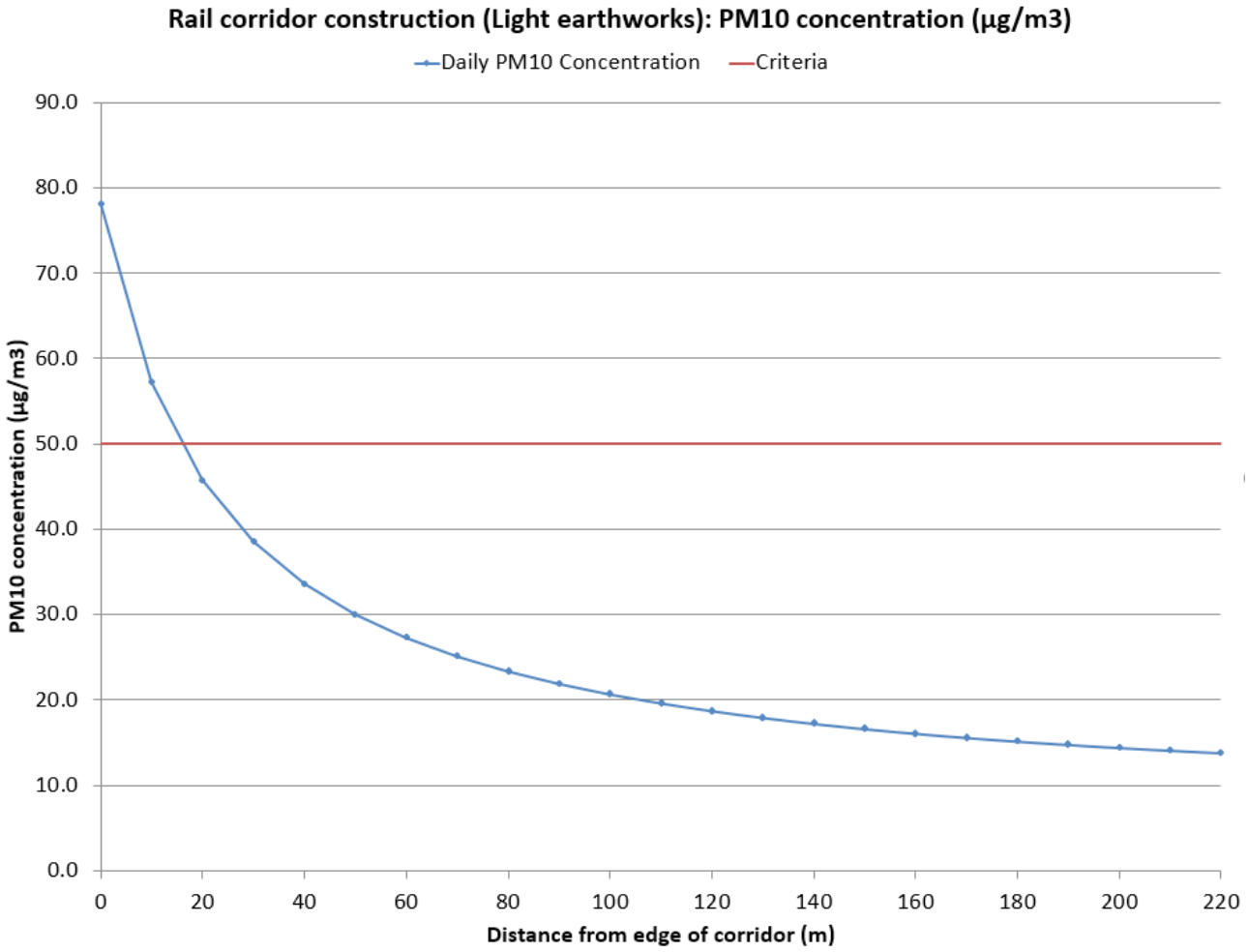


Figure F.3 Daily PM_{10} concentration versus distance relationship from the boundary of the compound site during establishment (Scenario 3)

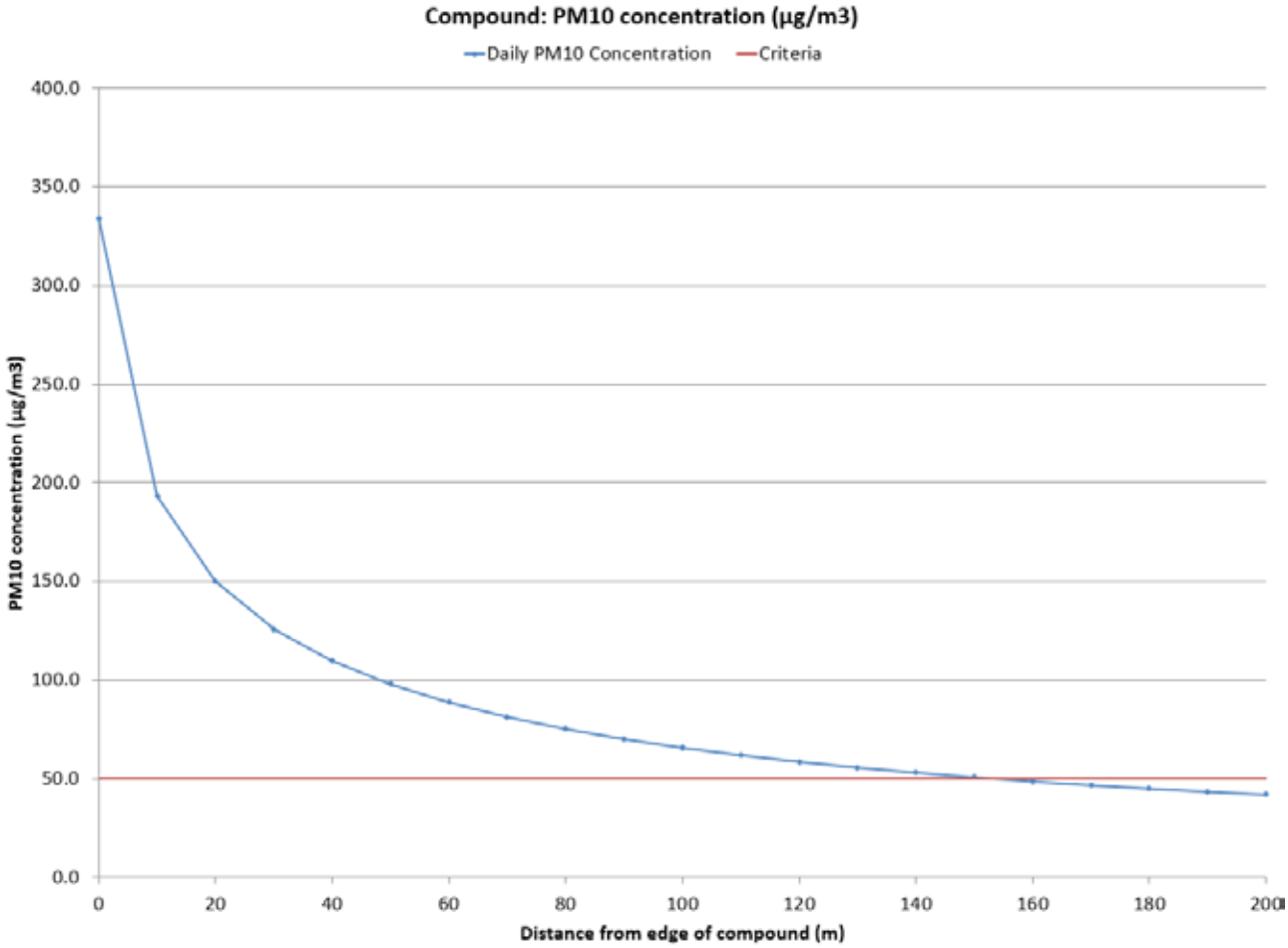
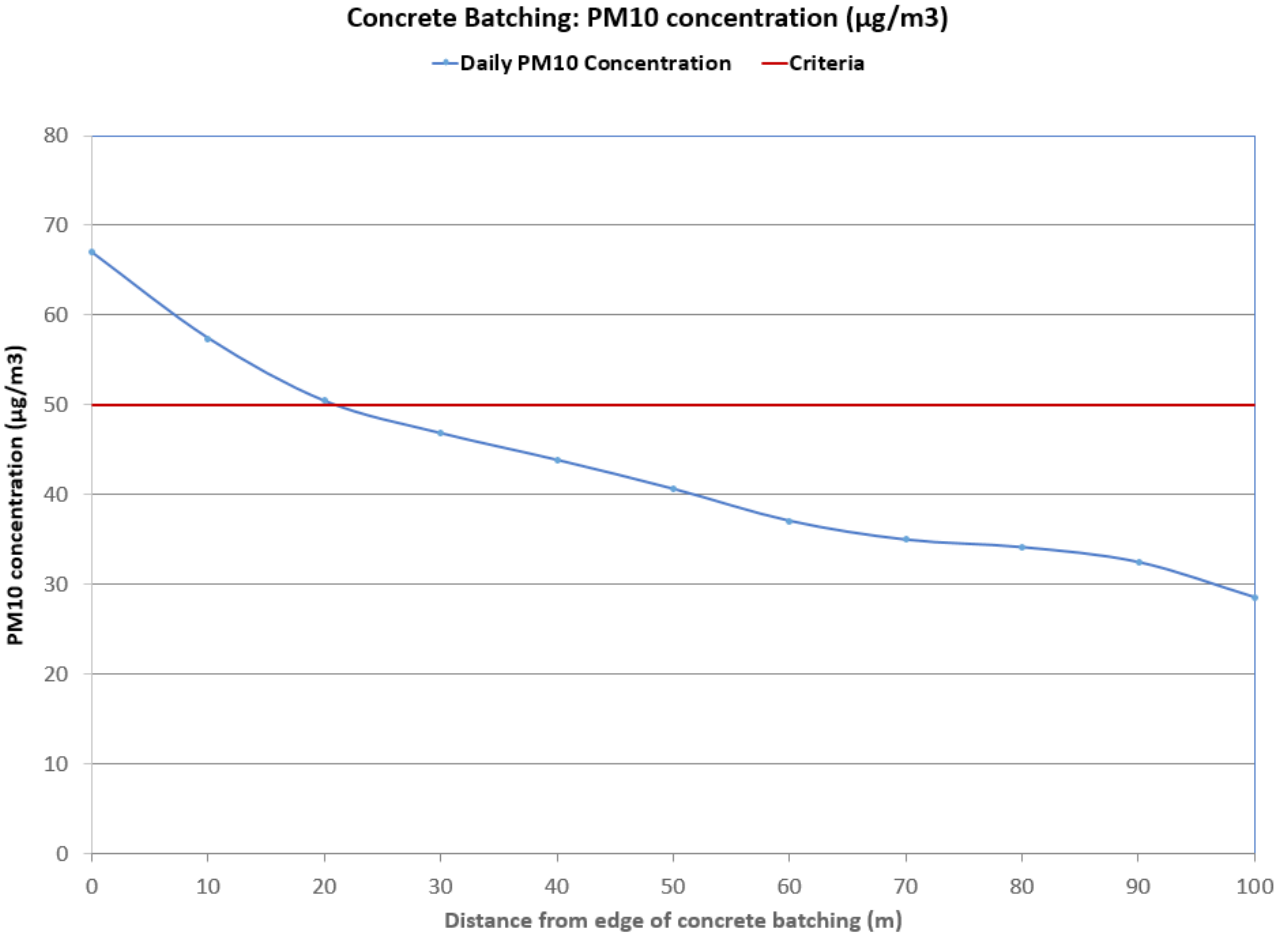


Figure F.4 Daily PM_{10} concentration versus distance relationship from the boundary of the concrete batching plant (Scenario 4)



Appendix G – Preliminary land acquisition details

Table G.1 Land acquisition – preliminary (all partial acquisitions)

Property details				Acquisition details		
Location	**Descriptor**	**Ownership**	**LEP zoning**	**Type**	**Area (m²)[1]**	**Proposed future use**
Narrabri LGA						
17140 Newell Hwy, Bellata	Lot 7002 DP1029062, 17140 Newell Highway	Crown land – Travelling Stock Reserve	Narrabri Newel Highway runs through part of the lot RU1-Primary Production	Partial	46,838	Newell Highway overbridge
Moree LGA						
73 Morton St, Moree	Lot 14 DP1092132,	Private	RU1	Partial	1,145	Camurra bypass
16833 Newell Highway, Bellata	Lot 48 DP753964, Rockdale, 16833 Newell Highway, Bellata	Private	RU1	Partial	3,845	Newell Highway overbridge
Newell Highway, Moree	Lot 7007 DP1061128, Newell Highway, Moree	Crown land – Travelling Stock Reserve	Mosquito Creek Road transects the southern end of the site RU1	Partial	24,072	Camurra bypass
Mosquito Creek Road, Moree	Lot 7019 DP1061126, Mosquito Creek Road, Moree	Crown land – Travelling Stock Reserve	RU1	Partial	12,048	Camurra bypass
45 Tycannah Street, Moree	Lot 257 DP751780, 45 Tycannah Street, Moree	Private	IN2-Light Industrial	Partial	10,250	Jones Avenue
	Lot 7052 DP1073870,	Crown land	IN2	Partial	5,797	Jones Avenue overbridge
Gosport Street, Moree	Lot 39 DP1121103, Gosport Street, Moree	Roads And Traffic Authority of NSW	SP2 – Rail infrastructure	Partial	770	Jones Avenue overbridge
	Lot 2 DP612417,	Unknown	SP2	Partial	727	Jones Avenue overbridge

Note: Area of potential acquisition – estimate only (not based on survey data). Estimates to be finalised at the detailed design stage.

Appendix H – Inland Rail NSW Construction Noise and Vibration Management Framework

ARTC InlandRail

The Australian Government's priority freight rail project

NSW Construction Noise and Vibration Management Framework

0-9000-ENV-00-RP-0001

Document Control

Client:	Australian Rail Track Corporation
Project:	Inland Rail Programme
Document title:	NSW Construction Noise and Vibration Management Framework
Date issued:	16/06/2017
Originator/Company:	ARTC
Purpose:	To provide consistent approach to NSW construction noise/vibration assessments and selection of feasible and reasonable controls during construction.
Endorsed by:	Stuart Ross
Approved by:	Sarah Connelly
Date approved:	19/06/2017
Status	Issued for Release

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TABLES

1. INTRODUCTION

The Australian Government has committed to delivering the Inland Rail Programme (Inland Rail), which is a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales and Toowoomba in Queensland.

Inland Rail is a major nation-building programme of works that will enhance Australia's existing national rail network and serve the interstate freight market.

The Inland Rail route, which is about 1,700 kilometres long, involves:

- Using the existing interstate rail line through Victoria and southern NSW
- Upgrading about 400 kilometres of existing track, mainly in western NSW
- Providing about 600 kilometres of new track, mainly in northern NSW and south-east Queensland.

The Inland Rail consists of 13 proposals, seven of which are located within NSW. Each of these proposals (and, in some cases as appropriate, separate work sites within a proposal) will be subject to an assessment and, if required, approval under the statutory requirements of the relevant jurisdiction/s.

The NSW Inland Rail Construction Noise and Vibration Management Framework (the Framework) outlines the approach that ARTC will take to assessing and managing noise and vibration arising from the construction of the NSW components of Inland Rail. The Framework is identified in the Inland Rail Noise and Vibration Strategy (01-9000-PE-P11-ST-0003) and provides the necessary detail to allow practical application of relevant guidelines and standards at all project stages.

Terms and acronyms used in this Framework are defined in Table 1.

Table 1 Definitions

Term or Acronym	Definition
AA	Alternate accommodation – Refer to additional mitigation measures
ARTC	Australian Rail Track Corporation. Australian Government-owned corporation tasked with developing a 10 year program to implement Inland Rail
CO	Communication– Refer to additional mitigation measures
CNVIS	Construction Noise and Vibration Impact Statement. Informs the development of the CNVMP (see Table 2)
CO1	Category 1: Personalised communication (doorknock, meeting, telephone call) – Refer to additional mitigation measures
CO2	Category 2: Communication to inform (newsletter, email, letterbox drop, advertisements, website and media) – Refer to additional mitigation measures

Term or Acronym	Definition
CNVMP	Construction Noise and Vibration Management Plan. Details how construction noise and vibration impacts will be minimised and managed. The CNVMP is based on the Project Environmental Management Plan.
DECC	The former Department of Environment and Climate Change
EIS	An Environmental Impact Statement is a document prepared to describe the effect of proposed activities on the environment. An EIS is determined by NSW Planning and Environment, and is developed in response to the Secretary's Environmental Assessment Requirements (SEARs).
Enhancement Works	Enhancement works involve bridge works, and/ or track lowering, and may also include ancillary works such as gantry works, signalling and communications.
Environmental impact assessment	A broad term that covers a range of assessments required under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and any related amendments to the Act.
Feasible	Relates to engineering considerations, what can practically be built (e.g. safety, access, and site constraints).
Greenfield	This involves construction within an entirely new corridor.
ICNG	Interim Construction Noise Guideline (DECC 2009)
Inland Rail Programme (Inland Rail)	The Inland Rail programme encompasses the design and construction of a new inland rail connection between Melbourne and Brisbane, via Wagga Wagga, Parkes, Moree, and Toowoomba. The route for Inland Rail is about 1,700 km in length. Inland Rail will involve a combination of track upgrades, enhancement of existing rail track and the provision of new track in greenfield areas.
Inland Rail Proposal	Specific works subject to an environmental impact assessment and confined to a particular geographic area within the Programme alignment, for example Parkes to Narromine.
NML	Noise Management Levels
OOHW	Out of hours work. Works conducted outside of the Standard Programme Construction Hours.
Preconstruction Activities	This includes enabling works such as geotechnical investigations, the movement of machinery, and other activities that may be undertaken prior to formal commencement of project construction.
Project Environmental Management Plan	Prepared by ARTC to guide the construction contractor in environmental management. This document will form the basis of the contractor's CNVMP.

Term or Acronym	Definition
Reasonable	Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh adverse social, economic and environmental effects including the cost of the measure. Further advice on determining reasonable measures can be found in the Interim Construction Noise Guideline.
Receiver	A premises that is subject to construction noise or vibration. - Noise sensitive receivers are properties where the occupants can be adversely impacted by noise or vibration including dwellings, hospitals, places of worship, childcare centres etc.. - Impacted receivers are those exposed to noise and vibration above the relevant management levels. - Residential receivers are properties where people reside on a permanent basis.
REF	Review of Environmental Factors is a document prepared to describe the effect of proposed activities on the environment. A REF will be prepared for projects where an EIS is not triggered. A REF is determined by ARTC.
RO	Respite Offer
SEARs	Secretary's Environmental Assessment Requirements are the requirements that must be addressed as part of the EIS.
SSI	State Significant Infrastructure
Standard Programme Construction Hours	Hours of work for construction activities undertaken as part of the Inland Rail Programme: 6am – 6pm Monday – Sunday (including public holidays)
Upgrade works	Can involve any or all of the following: upgrading the track, formation, culverts, curve easings, construction of passing loops and/ or ancillary works to level crossings, signalling and communications, signage, fencing, services and utilities.

1.1. Aim and Scope

The Framework is applicable to all NSW Inland Rail proposals and fulfils the recommendation in the *Interim Construction Noise Guideline, DECC 2009* (ICNG) for organisations to detail best practice, project-specific approaches to minimise noise impacts from pre-construction activities and construction and provide the public with transparency. The Framework also establishes the requirement for the management of construction vibration.

The Framework applies to all project stages, from the environmental impact assessment through to construction and is most relevant to:

- Project managers
- Acoustic consultants

- Environmental officers
- Construction contractors.

This Framework does not take precedence over proposal specific approval or licence conditions. The Framework will be reviewed as the Inland Rail Programme progresses to incorporate learning from Inland Rail proposals and in response to release or update of relevant guidelines, standards and policies.

Any reference to 'construction noise' in this Framework should also be taken to include noise generated by 'pre-construction activities'. Similarly a reference to vibration also includes vibration generated as part of pre-construction activities. Within NSW there are seven Inland Rail proposals, these are described in Table 2.

Table 2 NSW Inland Rail Proposals

PROPOSAL	DESCRIPTION	PROJECT TYPE	ASSESSMENT TYPE
Albury to Illabo	Providing double-stack capability for 185km of existing track.	Enhancement	REF
Illabo to Stockinbingal	New 37km standard gauge rail line that eliminates a twisty section of track known as the Bethungra Spiral.	Greenfield	SSI EIS
Stockinbingal to Parkes	Providing double-stack capability and passing loops on 173km of existing track.	Enhancement	REF
Parkes to Narromine	Upgrade of the existing 107km section of track, with passing loops, ancillary works and new 5.3km connection to the Broken Hill line.	Upgrade	SSI EIS underway
Narromine to Narrabri	307km of new track constructed between Narromine and Narrabri.	Greenfield	SSI EIS
Narrabri to North Star	188km of existing track upgraded to take heavier axle loads and double stacked trains	Upgrade	SSI EIS underway
North Star to NSW/Qld border	52 km of new track.	Greenfield	SSI EIS

1.2. Objectives

The objectives of this Framework are to:

- Ensure neighbours and people living in close proximity to places where work is being undertaken are not unduly affected and also address the requirements of relevant NSW guidelines, standards and policies

- Provide a consistent approach to the evaluation, selection and delivery of feasible and reasonable noise and vibration controls during construction
- Balance the needs of adjacent communities, rail commuters and train operators by facilitating efficient project delivery.

2. CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

The level of detail available on the construction methodology and project design increases as the planning and approval process progresses. Noise and vibration assessments are undertaken to quantify the impact of construction activities on receivers. The results of the assessment are then used to develop management measures to mitigate the impact of construction activities on receivers. Assessments should:

- Be based on the best information available at the time
- Assess a realistic, worst-case scenario
- Provide sufficient detail to identify project specific noise and vibration mitigation measures.

Assessments and plans incorporating different levels of detail will be required pre and post project approval. Table 3 identifies the document and information required at each stage.

Each aspect of construction noise and vibration is to be assessed in accordance with NSW state guidelines, Australian or international standards (Table 4), and the SEARs and relevant conditions of approval. Assessments should be quantitative and where possible estimate the duration of impact on receivers, noting that works will move along the alignment and are unlikely to affect a single receiver for the entire project construction period.

Table 3 Construction Noise and Vibration Assessment Documents

Project Stage	Document	Description	Content
Pre-approval	Environmental impact assessment (EIS or REF) – Noise and Vibration Study	Describes all noise and vibration effects of the project on the environment and advises how best to manage the impacts.	• Description of works, duration and working hours and noise management levels • Identification of noise sensitive receivers including impacted commercial receivers • Identification of vibration sensitive structures including heritage buildings, and other vibration sensitive receivers (including sensitive scientific and medical equipment) • Assessment of likely noise impacts, including sleep disturbance • Assessment of construction methods with the potential to cause discomfort, cosmetic or structural damage • Conceptual description of feasible and reasonable work practices to minimise

Project Stage	Document	Description	Content
			noise and vibration impacts • Changes made to the proposal in response to submissions
Post-approval	Construction Environmental Management Plan – Noise and Vibration	Prepared by ARTC to collate the environmental management requirements for each proposal and guide the development of the contractor's CNVMP. Based on detailed design incorporating a Construction Noise and Vibration Impact Statement (CNVIS).	• Description of works, duration, working hours and noise management levels • Assessment of likely noise impacts, including sleep disturbance based on detailed design • Assessment of construction methods with the potential to cause discomfort, cosmetic or structural damage, based on detailed design • Defines the requirements for pre-construction dilapidation surveys • Approval and licence conditions • Feasible and reasonable work practices • Monitoring, training and auditing requirements
	Construction Noise and Vibration Management Plan (CNVMP)	Details how construction noise and vibration impacts will be minimised and managed. Incorporates project specific approval or licence conditions. Prepared prior to the commencement of construction, usually by the construction contractor.	• Description of works, duration and working hours and noise management levels • Identification of noise sensitive receivers including impacted commercial receivers • Identification of vibration sensitive structures and receivers, and requirements for dilapidation surveys and/ or monitoring during construction • Details of construction including and indicative schedule for key construction scenarios • Feasible and reasonable work practices to minimise noise and vibration impacts • Monitoring and auditing procedures • Blast Management Plan (if applicable) considering methods contained in AS2187.2-2006

Table 4 Construction Noise and Vibration Guidelines and Standards

Aspect	Description	Framework
Airborne noise	Construction noise	Interim Construction Noise Guideline (Department of Environment and Climate Change, NSW, 2009)
	Construction traffic noise	NSW Road Noise Policy (NSW EPA, 2011)
	Sleep disturbance (for works extending over more than two consecutive nights)	Interim Construction Noise Guideline (Department of Environment and Climate Change, NSW, 2009) NSW Road Noise Policy (NSW EPA, 2011)
Ground-borne noise	Sound transmitted through the ground into a structure, for example by underground works such as tunnelling.	Interim Construction Noise Guideline (Department of Environment and Climate Change, NSW, 2009)
Vibration	Human responses to vibration.	Assessing Vibration: a technical guideline (Department of Environment and Conservation, NSW, 2006)
	Effect of vibration on structures (cosmetic and/ or structural damage)	German Standard DIN 4150-3: Structural Vibration – effects of vibration on structures.
Blasting	Overpressure and vibration from blasting, potential to cause annoyance/ discomfort, cosmetic or structural damage	Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC 1990) or other limit set by conditions of consent[1] AS 2187: Part 2-2006 'Explosives - Storage and Use - Part 2: Use of Explosives'

2.1. Standard Programme Construction Hours

Assessment of noise and vibration should be undertaken with reference to the Standard Programme Construction Hours:

- 6am – 6pm Monday – Sunday

These working hours will apply to locations where there are impacted receivers. Extended working hours outside of the Standard Programme Construction Hours are permissible where impacts to receivers can be appropriately managed. Any changes to working hours must be supported by the results of a noise and vibration assessment (e.g. EIS or CNVIS).

The Standard Programme Construction Hours have been developed to:

[1] Recent NSW infrastructure project approvals have recognised that levels presented in Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration are restrictive and have applied these upper limits: vibration (PPV): 25mm/s, overpressure: 125dBL at the nearest receiver. More conservative limits apply to heritage structures and buildings.

- Accommodate the remote location of worksites and the efficient use of the workforce
- Reduce the duration of impact on individual receivers and minimise disruption to commuters and freight operators using existing operational rail lines
- Minimise the potential to cause sleep disturbance.

2.1.1. Standard Programme Blasting Hours

The Standard Programme Blasting Hours are below. These are consistent with the ICNG.

- Monday – Friday 9am – 5pm
- Saturday 9am -1pm
- No blasting on Sundays or public holidays.

2.2. Works outside of Standard Programme Construction Hours

Works may be conducted outside of the Standard Programme Construction Hours if one or more of the following applies:

- The delivery of oversized plant or structures that police or other authorities have determined requires special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Works that do not exceed the noise management level adopted in the Construction Noise and Vibration Management Plan (CNVMP) at the nearest receiver
- Works that do not exceed the 'preferred' human exposure vibration level adopted in the Construction Noise and Vibration Management Plan (CNVMP) at the nearest receiver
- Where agreement is reached between ARTC and potentially affected sensitive receivers. Agreements must be made in writing (refer to Section 7.2.2 of the ICNG for further guidance)
- Works to ensure construction personnel, road user or public safety
- Works that cannot be undertaken during the day due to ambient daytime temperatures that may be carried out during the night
- Rail tamping where the stress free temperature of the rail cannot be achieved during the Standard Programme Working Hours
- Works required to be conducted during a track possession.

2.3. Track Possessions

Track possessions will be required to undertake construction work on operational rail lines as part of the Inland Rail Programme. Track possessions are undertaken when safety or construction requirements mean that construction cannot be completed during Standard Programme Construction Hours.

Noise and vibration impacts from track possessions should be assessed in the environmental impact assessment, noting that the number of possessions required by a proposal or the scale of the possession may not be defined. A further detailed assessment should be undertaken as part of the CNVIS to inform site specific mitigation measures.

3. MANAGEMENT MEASURES

3.1. Standard Management Measures

The measures below will be applied to all works conducted during Standard Programme Construction Hours in order to minimise potential noise and vibration impacts at surrounding noise sensitive receivers. It is considered that the measures in Table 5 are feasible and reasonable for all Inland Rail projects in most circumstances.

Table 5 Standard Management Measures

Standard Management Measures
Site inductions for all employees and contractors will address: • Environmental aspects and impacts • Proposal specific and standard noise management measures • Licence and approval conditions • Hours of work • Environmental incident reporting and management procedures • Complaint management
Daily site specific briefings for all employees and contractors will include: • Site specific noise management measures • Location of nearest noise sensitive receivers • Construction employee parking areas • Behavioural practices (e.g. avoid swearing, shouting, dropping materials from heights) • Designated loading/unloading areas and procedures
Work compounds, storage areas, parking areas, unloading/loading areas and other semi-permanent construction sites should be located away from noise sensitive receivers. Where this is not possible, the orientation and layout of the work site will consider noise impacts, and opportunities to shield receivers from noise through the use of site buildings and stockpiles should be considered.
When working adjacent to schools, medical centres, childcare centres or places of worship, particularly noisy activities will be scheduled outside of operating or service hours where possible.
Equipment that is used intermittently is to be shut down when not in use.
The off-set distance between noisy plant and noise sensitive receivers will be maximised.
The number of vehicle trips to and from site will be optimised.
Regularly inspect and maintain equipment to ensure it is operating correctly.
Avoid the simultaneous operation of noisy plant within discernible range of noise sensitive receivers where possible.

Standard Management Measures
Use of non-tonal reversing alarms for all permanent mobile plant[2].
Where available, equipment selection will favour the use of quieter and less vibration emitting construction methods.
A telephone, email and web based community information service will be established to allow the community to obtain additional information on construction activities, provide feedback or make a complaint.
Regular communications on the activities and progress of the proposal will be provided to the community (e.g. via newsletter, email and/or website).
Noise or vibration monitoring in response to complaints will be undertaken where the results or the process assist in resolving or understanding the receiver's issue.
Where vibration levels are predicted to approach the criteria for cosmetic building damage or limits for critical or sensitive areas, attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration limits are within the acceptable range.
Where vibration and overpressure from blasting or construction activities are predicted to approach the relevant limits, dilapidation surveys on potentially affected buildings will be undertaken.

3.2. Additional Management Measures

Where works conducted outside of Standard Programme Construction Hours result in exceedance of noise or vibration management levels, the proposal will implement the measures described above as well as additional measures based on impact that are described below. Due to the number of proposals and variety of locations that make up the Inland Rail Programme in NSW, these measures may need to be adapted to suit individual proposals and community expectations.

3.2.1. Communication (CO)

The level of noise and vibration impact and duration will guide communication with receivers. Accurate and timely communication is essential to manage and understand community expectations for out of hours works (OOHW).

Two categories of communication have been developed commensurate with the scale of the impact. The purpose of the communication is described below, but the method of communication will be at the discretion of the proposal and detailed in the Proposal's Community Engagement Plan.

- Category 1 CO1: Communication should be personalised (e.g. door knock, meeting, telephone call). Contact with these residents should commence early to enable feedback to be considered by the proposal.
- Category 2 CO2: Communication to provide information on the proposal via letter box drop, email, newsletter, media advertisements and/or website a minimum of 5 days prior to the works commencing.

At minimum the information provided to stakeholders (CO1 or CO2) will include:

- The reason the work is required to be undertaken outside of the Standard Programme Construction Hours

[2] Excludes light vehicles

- A diagram that identifies the location of the proposed works in relation to nearby cross streets and local landmarks
- The nature, scope and duration of the works, including start and finish times
- The expected noise impacts on receivers
- Information on how to obtain further information or make a complaint, including an after-hours number and Programme website.

3.2.2. Respite Offer (RO)

Residential receivers subject to lengthy periods of noise or vibration may be eligible for a respite offer in accordance with Tables 6, 7 and 8. The purpose of such an offer is to provide residents with respite from an ongoing impact and may comprise of pre-purchased movie tickets, dinner vouchers or similar.

Respite offers are not applicable to non-residential receivers.

3.2.3. Alternate Accommodation (AA)

Alternate accommodation options (i.e. accommodation in motels away from the worksite) may be provided for residents living in close proximity to construction sites in accordance with Tables 6 - 8.

Acceptable accommodation measures will be developed with the affected community and project team.

3.2.4. Assigning Additional Management Measures

Tables 6-8 identify appropriate additional management measures for noise sensitive receivers by matching the predicted exceedance of the relevant management level to the appropriate management measures which serve to counter or mitigate that exceedance. The management levels are derived from the assessment process outlined in the relevant guideline or standard (Table 4).

OOHW has been divided into two periods (rest and sleep) in Tables 6-8 to recognise the different impact that works can have at those times.

Management measures for works within the Standard Programme Construction Hours are listed in Table 5, and therefore only works outside of this period are considered in Tables 6-8.

Table 6 Additional Management Measures – Airborne Noise

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
OOHW Rest Period Evenings	Monday – Sunday 6pm – 10pm (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15-25	Moderately intrusive	Any	CO1, CO2

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
		>25	Highly intrusive	Any	CO1, CO2
				>2 consecutive rest periods	CO1, CO2,RO
OOHW Sleep Period Night	Monday – Sunday 10pm – 6am (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15	Moderately intrusive	Any	CO1, CO2
				>2 consecutive sleep periods	CO1, CO2, RO
		>25	Highly intrusive	Any	CO1, CO2, RO
				>2 consecutive sleep periods	CO1, CO2, RO, AA

Table 7 relates to exceedances of ground-borne construction noise at noise sensitive receivers.

Table 7 Additional Management Measures – Ground- borne Noise

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
OOHW Rest Period Evenings	Monday – Sunday 6pm – 10pm (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15-25	Moderately intrusive	Any	CO1, CO2
		>25	Highly intrusive	Any	CO1, CO2
				>2 consecutive	CO1, CO2,RO

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
				rest periods	
OOHW Sleep Period Night	Monday – Sunday 10pm – 6am (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15	Moderately intrusive	Any	CO1, CO2
				>2 consecutive sleep periods	CO1, CO2, RO, AA
		>25	Highly intrusive	Any	CO1, CO2, RO
				>2 consecutive sleep periods	CO1, CO2, RO, AA

Table 8 relates to exceedances of the human comfort vibration values for continuous, impulsive and intermittent vibration at noise sensitive receivers. Potential exceedances of the cosmetic or structural damage criteria are to be addressed via the Standard Management Measures in Table 5.

Table 8 Additional Management Measures – Vibration

Time Period		Duration	Exceedence of 'preferred' value	Exceedence of 'maximum' value
OOHW Rest Period Evenings	Monday – Sunday 6pm – 10pm (including public holidays)	Any	CO1, CO2	CO1, CO2, RO
OOHW Sleep Period Night	Monday – Sunday 10pm-6am (including public holidays)	Any	CO1, CO2, RO	CO1, CO2, RO, AA

4. COMPLAINT HANDLING AND COMMUNITY ENGAGEMENT

Complaints will be handled in accordance with Inland Rail's complaints management system. Community engagement plans will be developed for each proposal incorporating the requirements of this Framework.

5. MONITORING AND AUDITING

5.1. Noise and Vibration Monitoring

Compliance noise and vibration monitoring will be undertaken as specified in this Framework, with the methodology and results documented. Noise measurements shall be undertaken consistent *AS1055.1-1997 Acoustics – Description and Measurement of Environmental Noise – General Procedures*. Vibration measurements shall be undertaken in accordance with *Assessing Vibration: a technical guideline* and *BS7385 Part 2-1993 Evaluation and measurement of vibration in buildings*, as recommended in *AS 2187: Part 2-2006 'Explosives - Storage and Use - Part 2: Use of Explosives'*.

5.1.1. Track Possession Monitoring Programme

If there is the potential to impact sensitive receivers, during a track possession, a monitoring programme should be initiated to confirm predicted noise and vibration levels and identify any additional feasible and reasonable measures to reduce impact on receivers. The monitoring programme (for either noise, vibration or both) should be risk based, and would not need to occur if there are no impacted receivers within the vicinity of the work. Design of the monitoring programme will be included in the proposal CNVMP.

5.1.2. Dilapidation Surveys

If construction activities have potential to cause cosmetic or structural damage through vibration or overpressure to public utilities, structures, buildings or their contents an existing condition report of buildings and structures will be undertaken in accordance with *AS 4349.0 Inspection of buildings – General requirements*. Where a heritage structure is assessed as potentially susceptible to vibration damage, a more conservative cosmetic damage criterion should be adopted.

5.2. Auditing

Periodic audits will be undertaken of proposal construction activities and the implementation of the CNVMP to ensure that noise and vibration predictions are accurate and the required management measures are in place. The Proposal Environmental Management Plan and CNVMP will prescribe the auditing regime for each proposal.

Appendix I – Sustainability assessment results

Assessment using the infrastructure sustainability ratings tool

Purpose of the assessment

The purpose of the assessment was to:

- Determine the likely infrastructure sustainability (IS) ratings that would apply to the proposals under a business as usual (BAU) approach.
- Identify IS credits that would provide additional value to the proposal, such as cost reductions, improved environmental outcomes and improved stakeholder relationships, and outline the cost implications for each activity.
- Determine the resultant IS rating and potential impacts on the proposal with the revised approach.

Approach

The assessment process involved:

- A workshop with ARTC and GHD team members was held on 13 April 2016 to discuss the IS rating scheme, and its application to the proposal. Each credit was applied over the proposal and reviewed.
- Following the workshop:
  - the applicable IS rating scheme credits for the proposal were determined
  - the value or improvements the IS framework will apply to the proposal were determined
  - the appropriate staging of actions to address issues was identified
  - additional time and resources for implementation were evaluated
  - key issues or concerns that may need to be addressed were identified.
- The findings of the assessment were documented in an amended IS rating calculation spreadsheet.

The assessment undertaken using the IS rating tool was based a design rating only, and includes design elements and construction requirements for sustainability. An 'as-built' assessment may be undertaken using the tool following practical completion. This would be based on sustainability performance measured during construction.

Assessment outcomes

The indicative IS rating that applies to proposal is listed in Table I.1. The preferred approach incorporates additional sustainability activities and initiatives.

It should be noted that Level 1 was achieved for the Stakeholder Participation credits for both the BAU and alternative ratings. GHD understands that stakeholder participation will be undertaken by Inland Rail and was uncertain on the activities were proposed for the proposal. Stakeholder participation initiatives implemented by ARTC would likely increase both the BAU and preferred approach rating scores.

Table I.1 IS ratings for a business as usual and alternative approach for proposal implementation

Approach	Score	Rating
Business as usual	33.6	Commended
Preferred approach	50.4	Excellent

The major differences between the BAU and the preferred approach are listed in Table I.2. The level and score for each credit is provided along with the value to the proposal for the preferred approach. Opportunities to improve the sustainability outcomes of the proposal are listed in Table I.2.

It is noted that not many infrastructure projects have achieved ISCA IS ratings to date. However, for comparison purposes, projects registered for ratings in urban areas are aiming to achieve scores in the 50 to 65 range. Some higher profile projects such as North West Metro and Melbourne Metro are targeting scores of 65 or higher. Other projects (mostly road projects) are targeting scores in the 35-50 range.

Achieving an 'excellent' rating via the IS rating tool would provide proposal specific sustainability outcomes in terms of:

- reduction in transport via waste and material efficiency
- reduction in waste disposal and waste transport
- reduction in power and water use
- long-term operation and maintenance savings
- improved project timelines and stakeholder engagement
- reduction in overall proposal carbon emissions and fewer tonnes of carbon compared to transport by road vehicle.

Through achievement of an 'excellent' rating with the ISCA rating tool, the proposal would also be consistent with the principles of ESD, and would align with relevant sustainability policies and guidelines.

One of the benefits of the application of the IS rating scheme for Inland Rail will be to apply consistency in approach across proposal stages and packages. The IS rating scheme enables objectives and targets to be achieved in a flexible manner across design phases, EIS, construction phase and flowing through to operation. The proposal aligns well with the scheme and there is the potential for efficiency and improved proposal wide outcomes by applying a standard sustainability framework across all Inland Rail packages, in particular, a process to share knowledge and innovative approaches across proposals.

The flexibility of the tool should allow contractors the ability to apply innovation to achieve positive proposal outcomes whilst maintaining a focus on budget outcomes and delivery time efficiency.

Table I.2 Opportunities to improve the sustainability outcomes of the proposal

Credit	Description	BAU[1] level	Alternative level	Score increase	Cost and implementation	Value to proposal
Management and Governance						
Man-1	Sustainability leadership and commitment	1/3	2/3	0.36	ARTC time to develop a sustainability policy and integratein proposal contracts.	Provides overarching intent to all stakeholders in proposal delivery. Committed targets and objects to ensure outcomes are achieved and not motherhood statements
Man-2	Management system accreditation	1/1	1/1	0.00	No additional cost - ARTC specify in contracts Head Contractor to hold appropriate accreditation	Accreditation will reduce proposal risk and improve standards.
Man-3	Risk and opportunity management	1/2	2/2	0.43	Minor cost for contractors in improved process. To be integrated through design and construction stages.	Plays a significant role in both reducing proposal risks and improving innovation and opportunities. This can lead to significant cost savings or beneficial outcomes.
Man-4	Organisational structure, roles and responsibilities	1/3	2/3	0.36	Achieving a Level 2 credit should not impose any additional cost on the proposal however to achieve Level 3 engaging an independent sustainability professional on a quarterly in bi-annual basis will put an additional but not significant cost on the proposal. ARTC should specify Level 1 requirements in contracts.	Having appropriate lines of responsibility should enhance proposal outcomes, reduce risk and improve efficiency and proposal delivery
Man-5	Inspection and auditing	1/2	1/2	0.00	BAU no additional cost to the proposal. Requirement of contractor.	Inspections and audits will enhance performance and identify any problems at an early stage.
Man-6	Reporting and review	1/3	1/3	0.00	BAU no additional cost. ARTC should specify any reporting requirements.	Value in accountability and communication to proposal stakeholders.
Man-7	Knowledge sharing	1/3	3/3	1.43	No additional cost. ARTC best to coordinate through measures such as a monthly committee meeting. This will grow expertise, innovation and learning across the packages/proposal. Alternative transport infrastructure proposals with multiple packages have achieved great benefits by applying knowledge sharing across delivery teams.	Shared learning and value across proposal stages which if done correctly can result in efficiency and improved outcomes across proposals.
Man-8	Decision-making	1/3	2/3	1.07	No additional cost to proposal. Responsibility of contractor.	If implemented correctly MAN-8 can assist better decision making and in some cases reduce cost - for example if an environmental initiative will have a negative social or economic impacts, it may be best to avoid this. It is only by considered decision-making processes that more common sense outcomes can be achieved.

Credit	Description	BAU[1] level	Alternative level	Score increase	Cost and implementation	Value to proposal
Procurement & Purchasing						
Pro-1	Commitment to sustainable procurement	1/3	2/3	0.83	No additional cost. Responsibility of contractor	Improved proposal wide sustainability outcomes and improved stakeholder relations.
Pro-2	Identification of suppliers	1/3	2/3	0.83	Small addition time commitment in procurement process.	Innovation and cost savings with forward procurement
Pro-3	Supplier evaluation and contract award	0/3	0/3	0.0	-	-
Pro-4	Managing supplier performance	0/3	0/3	0.0	-	-
Climate Change Adaptation						
Cli-1	Climate change risk assessment	1/3	2/3	0.83	If a climate risk workshop is undertaken at an early stage with the design team the cost will be minimal to implement. It is not likely to be feasible for adaptation options to be implemented for all medium climate risks identified.	Risk mitigation in design. Improves durability of asset and potential significant costs later on through maintenance and repair and outages. Improves reliability of service to clients.
Cli-2	Adaptation options	0/3	1/3	0.83	A climate risk assessment should be undertaken as early as possible to inform design. The cost of mitigating risks increases for the proposal the further back this task takes place.	Risk mitigation in design. Improves durability of asset and potential significant costs later on through maintenance and repair and outages. Improves reliability of service to clients.
Energy and Carbon						
Ene-1	Energy and carbon monitoring and reduction	1/3	1/3	1.56	Monitoring and modelling of energy and greenhouse gas emissions is a standard process that will incorporate a minor additional cost to the proposal. This is required for a range of credits covering energy, greenhouse, water and materials. Further monitoring and modelling should be undertaken by the design and construction contractor.	Significant savings can be achieved by using modelling to influence design and construction stage. This can result in major reductions in concrete, steel, and haulage. Typically significant savings have been achieved by ISCA rated proposals to date through this credit.
Ene-2	Energy and carbon reduction opportunities	0/3	1/3	0.0	Monitoring and modelling of energy and greenhouse gas emissions is a standard process that will incorporate a minor additional cost to the proposal. This is required for a range of credits covering energy, greenhouse, water and materials. Further monitoring and modelling should be undertaken by the design and construction contractor.	Significant savings can be achieved by using modelling to influence design and construction stage. This can result in major reductions in concrete, steel, and haulage. Typically significant savings have been achieved by ISCA rated proposals to date through this credit.
Ene-3	Renewable energy	0/3	0/3	0.0	-	-

Credit	Description	BAU[1] level	Alternative level	Score increase	Cost and implementation	Value to proposal
Water						
Wat-1	Water use monitoring and reduction	1/3	1/3		Can be implemented at minimal cost during construction phase.	Provide a positive initiative to communicate to stakeholders in drought prone region.
Wat-2	Water saving opportunities	1/3	1/3		Review of options to reduce water use can be undertaken by construction contractor at negligible cost.	-
Wat-3	Replace potable water	0/3	1/3		The cost of using non-potable water may be negligible depending on location and circumstance.	Potential minor savings by sourcing non-potable water. It may have important impacts on select communities/ business along the corridor.
Materials						
Mat-1	Materials footprint measurement and reduction	1/3	2/3	2.33	Minimal cost to apply the ISCA materials calculator. To be undertaken with bill of quantities prior to detailed design to assist in base case and estimated savings.	Reducing material quantities will result in cost savings and reduced greenhouse gas outcomes on the proposal.
Mat-2	Environmentally labelled products and supply chains	0/3	0/3	0.0	-	-
Discharge						
Dis-1	Receiving water quality	1/3	1/3	0.0	BAU requirement during construction.	No risk or harm to surrounding area/waterways.
Dis-2	Noise	1/3	3/3	1.56	Rail Infrastructure Noise Guidelines (RING) will specify noise goals that must be achieved during operations. Level 3 may be achieved as business as usual depending on the extent of monitoring and modelling undertaken.	Improved stakeholder relationships - avoided future costs.
Dis-3	Vibration	1/3	3/3	1.56	Similar to noise, specific goals will need to be met - Level 3 could potentially be achieved as business as usual.	Meet compliance requirements.
Dis-4	Air quality	1/3	1/3	0.0	BAU cost to proposal.	Meet compliance requirements.
Dis-5	Light pollution	1/1	1/1	0.0	BAU cost to proposal.	Meet compliance requirements.

Credit	Description	BAU[1] level	Alternative level	Score increase	Cost and implementation	Value to proposal
Land						
Lan-1	Previous land use	0/3	0/3	0.0	No cost. No points achievable for this credit due to predominantly agricultural land existing which is excluded from being classified as previously disturbed.	Credits for rating.
Lan-2	Conservation of onsite resources	1/3	2/3	0.17	No cost. Potential to achieve Level 2.	Reduces the need to source and transport materials from outside of the proposal boundary, which can then reduce proposal cost and emissions associated with material transport.
Lan-3	Contamination and remediation	1/3	2/3	0.83	BAU cost to proposal.	Reduced risk and improved environmental outcomes.
Lan-4	Flooding design	1/2	1/2	0.0	Flood design will be a central component and cost in the design process. Whilst the design will alter the existing landscape, the target will be for altered flood levels to be no worse than existing. A Level 1 may be achievable if the design does not increase existing flood risk.	Reduce impacts on line outages and costs regarding impacts to adjacent properties.
Waste						
Was-1	Waste management	1/3	1/2	0.00	BAU cost to proposal - possible additional costs for tracking and auditing if seeking a Level 2 credit.	Smart waste management can save significant cost and improve the proposals sustainability outcomes.
Was-2	Diversion from landfill	0/3	0/3	0.00	-	-
Was-3	Deconstruction/ Disassembly/ Adaptability	0/3	3/3	2.33	Minor cost to develop a deconstruction plan. Can be developed as part of detailed design.	Reduces future maintenance costs, repairs or future line upgrades.
Ecology						
Eco-1	Ecologically sensitive sites	1/1	1/1	0.0	BAU cost to proposal.	Environmental performance.
Eco-2	Ecological value	0/3	0/3	0.0	Whilst applicable, this credit may be difficult to achieve due to placement along an existing alignment. Potential costs to enhance ecological value. To achieve Level 1 negligible costs may be involved.	Enhance environmental outcomes and improve stakeholder/community relations.
Eco-3	Biodiversity enhancement	1/3	1/3	0.0	Costs for offsetting but may be a proposal BAU requirement.	Enhance environmental outcomes and improve stakeholder/community relations.
Eco-4	Habitat connectivity	1/3	2/3	1.0	Cost may be a BAU compliance requirement. Costs for offsetting but may be a proposal BAU requirement as part of biodiversity enhancement.	Enhance environmental outcomes and improve stakeholder/community relations.

Credit	Description	BAU[1] level	Alternative level	Score increase	Cost and implementation	Value to proposal
Community health, well-being and safety						
Hea-1	Community health and well-being	0/3	1/3	0.50	BAU cost to proposal.	Minimise disruption to the proposal - cost and timelines. To be further investigated as proposal progresses.
Hea-2	Crime prevention	1/2	1/2	0.0	Contractors likely to implement measures to reduce the likelihood of crime during construction.	Reduced the cost of maintenance
Hea-3	Community and user safety	1/2	1/2	0.0	Minor additional cost to achieve Level 2 credit. Level 2 to be further considered as proposal progresses.	Reduced cost of future safety incidents. Community and stakeholder benefits.
Heritage						
Her-1	Heritage assessment and management	1/3	1/3	0.0	BAU for EIS. Level 2 potential could occur, some additional cost for none compulsory items.	Improved stakeholder relationship.
Her-2	Monitoring and management of heritage	0/3	0/3	0.0	-	-
Stakeholder participation						
Sta-1	Stakeholder engagement strategy	1/3	1/3	0.0	BAU cost to proposal.	Improved stakeholder management reduces time and cost on the proposal.
Sta-2	Level of engagement	1/3	1/3	0.0	Inland Rail to comment on stakeholder engagement plan	Inland Rail to comment on stakeholder engagement plan.
Sta-3	Effective communication	1/3	1/3	0.0	Inland Rail to comment on stakeholder engagement plan	Inland Rail to comment on stakeholder engagement plan.
Sta-4	Addressing community concerns	1/3	1/3	0.0	Inland Rail to comment on stakeholder engagement plan	Inland Rail to comment on stakeholder engagement plan.
Urban and landscape design						
Urb-1	Site and context analysis	1/1	1/1	0.0	-	-
Urb-2	Site planning	0/3	0/3	0.0	-	-
Urb-3	Urban design	0/3	0/3	0.0	-	-
Urb-4	Implementation	0/3	0/3	0.0	-	-

Note 1: Business as usual

Appendix J – Climate change risk assessment

Climate change risk assessment

The climate change risk assessment identifies risks and risk mitigation measures associated with the predicted impacts of climate change on the design, construction, and operation of the proposal. The objectives of this assessment are to:

- identify significant potential impacts of climate change on the proposal's infrastructure and service delivery
- assess the level of associated risks.

This assessment considers the impact of climate change on the proposal rather than the impact of the proposal on future climate change. The climate change risk assessment was undertaken in general accordance with the following standards and guidelines:

- *AS/NZS ISO 31000:2009 Risk management – Principles and guidelines*
- *AS 5334:2013 Climate change adaptation for settlements and infrastructure – a risk based approach*
- *Climate Change Impacts and Risk Management – A Guide for Business and Government* (Australian Greenhous Office, 2006).

The risk assessment involved assessing the risk level of each identified potential impact by identifying the consequences of the impact and the likelihood that the impact can occur.

Definitions of the 'consequence' and 'likelihood' of the impacts are discussed in more detail in the following section.

Methodology

The climate change risk assessment involved the following main tasks:

Review of climate data and the existing climate environment

Data on climatic conditions and climate change projections for the study area was reviewed, based on available data from the Australian Bureau of Meteorology (BoM) and the *Climate Change in Australia* web-based data portal (maintained by CSIRO and BoM). Due to the long design life of the proposal and potential exposure to flooding impacts (described in Chapter 15), it was determined that an assessment of the impact from climate change was appropriate for the proposal. The climate change risk assessment considers a number of climate variables and extreme weather events that have the potential to impact infrastructure associated with the proposal.

The climatic environment is relatively consistent along the length of the proposal site. There is minimal change in climatic conditions or variability and as such, three reference points in the study area were selected to best represent the climatic environment in the vicinity of the proposal site. Historic weather records were analysed from three BoM weather stations.

Climate projections

To determine the potential implications of climate change for the design and operation of the proposal, and assess the risk and vulnerability of the proposal to climate change, it is necessary to develop projections of the future climate in the study area (that is, the area in which the proposal site is located). The principal means of developing projections of the future climate is to use global climate models.

The Intergovernmental Panel on Climate Change (IPCC) has developed four scenarios for global climate change that relate to how the world may respond to the challenge of a changing climate, the need to continue to produce and use energy and resources, and the global greenhouse gas emissions that may occur. These scenarios incorporate diverging tendencies based on alternative economic, globalisation, and environmental pathways. These have been modified through subsequent reports and renamed as representative concentration pathways (RCPs) in the IPCC's Fifth Assessment Report.

CSIRO and BoM's *Climate Change in Australia* technical reports and Climate Futures Exploration Tool link strongly to the findings of the latest IPCC Fifth Assessment Report, and update the projections previously outlined in the 2007 Technical Report. The 2015 Technical Report released by CSIRO and BoM uses over 40 global climate models to produce climate change projections as they relate to IPCC RCP scenarios. These RCPs include:

- RCP2.6 requiring very strong emission reductions from a peak at around 2020 to reach a CO_2 concentration at about 420 parts per million (ppm) by 2100
- RCP4.5 with slower emission reductions that stabilise the CO_2 concentration at about 540 ppm by 2100
- RCP6.0 with some mitigation strategies and technologies, reaching a CO_2 concentration at about 660 ppm by 2100 and total radiative forcing stabilising shortly after 2100
- RCP8.5 which assumes little curbing of emissions and increases leading to a CO_2 concentration of about 940 ppm by 2100.

To develop projections for the study area, the RCP scenarios were adopted for two timeframes. A moderate RCP (RCP6.0) was used for a 2030 near-term scenario, and an extreme RCP (RCP8.5) was used for a 2070 long-term scenario, to reflect the more pronounced level of uncertainty as the timescale of the projection is extended. The climate projection scenarios adopted for the proposal are listed in Table J.1.

Generally, under any scenario, the extent of climate change is projected to increase over time, and the changes are more uncertain for longer term projections. Given the anticipated design life of track formation/concrete sleepers and structures (50 years and 100 years respectively), both scenarios are considered appropriate for the assessment.

The CSIRO and BoM reports and Climate Futures Exploration Tool do not provide projections at a 10 kilometre resolution (as requested by the SEARS), however projections from the tool are spatially focussed around natural resource management regions, where data and reports are available. While the projections remain at a cluster level, these are supported by global and regional climate models as well as statistically downscaled results. Importantly, the data within the tool is underpinned by extensive, independently peer-reviewed climate model evaluation (CSIRO and BoM, 2015).

Table J.1 Adopted climate projection scenarios for the assessment

Scenario	Year	IPCC scenario	Scenario description	Rationale
Near-term moderate change scenario	2030	RCP6.0	An intermediate emissions scenario with balance on all energy sources.	This represents a more likely near-term climate scenario for the assessment.
Long-term extreme change scenario	2070	RCP8.5	A high emission scenario representing a future with little curbing of emissions which have both stabilised by 2100.	This represents an extreme or near worst-case climate scenario, and is useful to highlight the long-term challenges and monitoring that may be required for adaptation for the proposal.

Risk assessment

A high-level risk assessment was undertaken to determine how changing patterns of rainfall, hydrology, and extreme weather may impact on the future resilience of the proposal. Through discussions with the design team, review of design drawings and documents, publications, case studies, and work completed on similar projects, potential risks to the construction and operation of the proposal were identified. Extreme weather events and climate change impacts on existing rail infrastructure across the Australian network were also considered as part of the risk assessment, to determine relevance and ascertain appropriate mitigation measures and adaptation options applicable to the proposal.

The risk matrix adopted for this assessment is based on the risk management matrix within AS 5334-2013, which in turn is based on the approach within AS/NZS 31000:2009, and is used to guide:

- the allocation of consequences against service reliability, financial, environmental, safety, and governance objectives
- the determination of likelihood that a described event may arise
- the relative level of risk associated with that event, that can then be used to prioritise its management.

The proposal's potential vulnerability to these risks was considered, along with currently proposed control measures. Appropriate high level adaptation options and approaches were identified to address the potential risks.

Tables J.2 and J.3 provide the likelihood and consequence criteria used for the climate change risk assessment. The criteria are adapted from those provided in AS 5334:2013 for infrastructure. The consequence rating considers the potential consequence of climate change on the proposal in terms of the physical asset of Inland Rail (damages) and in terms of service provision (loss).

The likelihood of a given climate change impact occurring is described in terms of probability. Consideration has also been given to whether climate change impacts and extreme weather events have occurred on existing rail infrastructure across the Australian network. Overlaying this is the need to recognise the uncertainty that may be associated with the possible impacts. Where there is scientific uncertainty a cautious approach will identify a higher level of risk (worst-case scenario).

Table J.2 Consequences of occurrence

Consequence level	Description
Extreme	Significant permanent damage and/or complete loss of the infrastructure and the infrastructure service. Loss of infrastructure support and translocation of service to other sites. Early renewal of infrastructure by > 90%.
Major	Extensive infrastructure damage requiring major repair. Major loss of infrastructure service. Early renewal of infrastructure by 50 – 90%.
Moderate	Limited infrastructure damage and loss of service. Damage recoverable by maintenance and minor repair. Early renewal of infrastructure by 20 – 50%.
Minor	Localised infrastructure service disruption. No permanent damage. Some minor restoration work required. Early renewal of infrastructure by 10 – 20%. Need for new/modified ancillary equipment.
Not significant	No infrastructure damage, little change to service.

Table J.3 Likelihood and probability of occurrence

Likelihood	Description	Recurrent or event risks	Long-term risks
Almost certain	Could occur several times per year.	Has happened several times in the past year and in each of the previous 5 years *or* Could occur several times per year.	Has a greater than 90% chance of occurring in the identified time period if the risk is not mitigated.
Likely	May arise about once per year.	Has happened at least once in the past year and in each of the previous 5 years *or* May arise about once per year.	Has a 60 – 90% chance of occurring in the identified time period if the risk is not mitigated.
Possible	May occur a couple of times in a generation.	Has happened during the past 5 years but not in every year *or* May arise once in 25 years.	Has a 40 – 60% chance of occurring in the identified time period if the risk is not mitigated.
Unlikely	May occur once in a generation.	May have occurred once in the last 5 years *or* May arise once in 25 to 50 years.	Has a 10 – 30% chance of occurring in the future if the risk is not mitigated.
Rare	May occur once in a lifetime.	Has not occurred in the past 5 years *or* Unlikely during the next 50 years.	May occur in exceptional circumstances, that is less than 10% chance of occurring in the identified time period if the risk is not mitigated.

Based on the assessment of likelihood and consequence, any foreseeable climate change impact can be assigned a risk level. This determines the significance of the environmental risk associated with a given impact. The risk assessment matrix is provided as Table J.4.

Table J.4 Risk assessment matrix

	Consequences				
Likelihood	**Not significant**	**Minor**	**Moderate**	**Major**	**Extreme**
Almost certain	Medium	Medium	High	Very high	Very high
Likely	Low	Medium	High	High	Very high
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

The initial risk ratings are conservative based on initial design information. A conservative approach allows for potential adaptation measures to be identified and considered during the design process. The potential adaptation measures identified were general measures to be considered and refined during the design, as it was not possible to outline specific measures during the concept design stages. It is likely some potential measures will be incorporated as business as usual, in line with relevant Australian standards and building codes. Specific measures would be incorporated as the design progresses, allowing for the risk ratings to be re-evaluated at final design.

As a guide, Australian Greenhouse Office (2006) suggests that the management priority levels for risks of various magnitudes can be interpreted as follows:

- 'Very high' priority risks demand urgent attention at the most senior level and cannot be simply accepted as a part of routine operations without executive sanction
- 'High' priority risks are the most severe that can be accepted as a part of routine operations without executive sanction but they will be the responsibility of the most senior operational management
- 'Medium' priority risks can be expected to form part of routine operations but they will be explicitly assigned to relevant managers for action and maintained under review
- 'Low' priority risk will be maintained under review but it is expected that existing controls will be sufficient.

Identify climate change adaptation measures

Based on the identified risks and potential impacts, appropriate adaptation measures and/or design strategies are recommended. Adaptation responses can be grouped according to the type of treatment.

Depending on the level, type and certainty of specific climate risks, adaptation can be either reactionary or precautionary. Development of adaptation responses should be both relevant and targeted. In some cases, excessive adaptation measures can be unsustainable. For example, designing oversized drainage for a one in 50-year flood event (that is, a flood with a two per cent AEP) may be excessive, if diversion to overland flows could achieve a similar outcome, with resultant savings in concrete and the carbon footprint. In other circumstances, simple measures, such as regular or increased monitoring during maintenance inspections, can be adequate to mitigate a risk that may have a high uncertainty level.

Examples of commonly identified treatments, which may be applicable to the proposal, include:

- **Policy** - changes to policies, standards and guidelines, such as developing new or updating existing and internal standards to better consider climate change.
- **Behavioural** - adjustments to existing processes, operational systems and procedures, such as conducting more frequent inspections for maintenance and monitoring.
- **Physical** - engineered solutions or relocation of assets such as the use of larger drains to account for more frequent rainfall events.
- **Investigations** - specialist assessments and explorations of each site, their assets, specific issues, and solutions, such as detailed flood modelling assessment of the project area to determine future flood extents due to climate change.

Assumptions

The following assumptions were made for the climate change risk assessment:

- climate change scenarios were based on publicly available projections
- the assessment of risks was qualitative not quantitative
- climate change projections were regional rather than localised
- the consequences and risks for infrastructure and service delivery were based on consideration of the proposal only, not the wider Inland Rail programme.

Assessment results

Existing environment

Climate

The existing climatic environment is described with reference to data from available weather stations operated by BoM in the study area. The overall climate of the study area is characterised by hot summers. The long-term monthly mean temperatures observed across the three reference points show that 9:00 am temperatures range from 8.3 to 26.4 degrees Celsius across the study area, and 3:00 pm temperatures range from 17.1 to 32.7 degrees Celsius. Temperatures vary between -5.6 and 47.3 degrees Celsius.

The highest recorded rainfall occurs during November and January. Relative humidity is highest in the mornings and lowest in the afternoons. The climatic environment remains relatively consistent across the study area. There is minimal change in climatic conditions or variability in the type of climate experienced.

The historic climate conditions for the study area are listed in Table J.5.

Table J.5 Historic climatic condition

Station location	Data range (years)	Temp range (avg. max. (OC)	Extreme heat – mean no. days >350C	Mean rainfall (mm/ year)	Mean wind speed 3 pm (km/h)	Mean relative humidity 9 am (%)	Solar radiation (MJ/m²)
Narrabri West Post Office (site 053030)/ Narrabri Airport (site 054038)[1]	1962-2016	26.6	43	611	17.7	68	19.3
Moree comparison (site 053048)/ Moree Aero (site 053115)[2]	1964-2016	26.4	35	586	13.7	62	19.6
Goondiwindi Post Office (site 041038)/ Goondiwindi Airport (site 041521)[3]	1891-2015	26.9	41	620	9.9	62	19.9

Notes 1: Narrabri West Post Office weather station site ceased operation in 2001. Narrabri Airport meteorology station, approximately 7.7 kilometres from the Narrabri West Post Office weather station was established in 2001 and was used for more recent weather data up to current. The average of both weather station data has been used.
2: Moree comparison weather station was used for data from 1964-1998, after which Moree Aero, located 1.6 kilometres away was used for data commencing 1995-20163:
3: Goondiwindi Post Office weather station was used for data from 1891-1991, after which Goondiwindi Airport, located 3.5 kilometres away was used for data commencing 1991-2015.

Bushfires

Information on bushfire risk and associated vegetation and topography is provided in Chapter 25. The fire season in the study area generally runs from October through to March. According to the *Bushfire Risk Management Plan* (Narrabri/Moree Bushfire Management Committee, 2010), the area has an average of 230 bushfires per year, of which 10 on average can be considered to be major fires. The *Bushfire Risk Management Plan* (Gwydir Bushfire Management Committee, 2010) states an average of 70 bushfires xper year of which 5 are usually major fires.

Climate change risk assessment results

The climate change risk assessment results are provided in Table J.6.

Table J.6 Climate change risk assessment

Climate variable	Historic trend	Climate change projections (2030)[1]	Climate change projections (2070)	Potential risk	Initial risk rating	Potential avoidance / adaptation measures	Final risk rating (residual risk) after adaptation measures	Implications for proposal
Max. daily temperature (mean) (°C)	Narrabri: 26.6°C Moree: 26.4 °C Goondiwindi: 26.9 °C	Warmer: +0.5 to 1.5 °C Narrabri: 28.1 °C Moree: 27.9 °C Goondiwindi: 28.4 °C	Much hotter: >3 °C Narrabri: 29.6 °C Moree: 29.4 °C Goondiwindi: 29.9 °C	Increases in average temperature will likely increase the probability (and therefore expected frequency) of severe storms, leading to disruption of services and damage to infrastructure.	Medium	Ensure no significant vegetation cover placing infrastructure at high risk during high wind conditions Structures designed for high wind loading to withstand wind speed effects, with reference to relevant standards.	Medium	The frequency of infrastructure damage and disruption on services can be decreased with appropriate adaptation measures, but still may arise periodically.
				Increases in average temperature will likely increase the probability (and therefore expected frequency) of extreme weather events such as bushfires.	High	Ensuring fire safety standards are adhered to. Ensure appropriate fire breaks along rail corridor to reduce risk of possible impact from bushfires.	Medium	Likely to impact upon operations in instances of extreme weather. Site proximity to bushland high, but buffered by main roads and local properties. Damage from bushfire could be reduced with adaptation measures.
				Increases in average temperature will likely increase the probability (and therefore expected frequency) of extreme weather events, including extreme rainfall leading to flooding.	High	Investigate the hydrologic and hydraulic effect of break-outs from the major river systems. Track drainage designed and built to meet expected conditions. Flood protection incorporated into track infrastructure. Site electrical/critical infrastructure adequately covered to withstand extreme rainfall/inundation.	Medium	With adequate drainage and flood mitigation factored into design, risks from extreme rainfall events can be managed appropriately.

Climate variable	Historic trend	Climate change projections (2030)[1]	Climate change projections (2070)	Potential risk	Initial risk rating	Potential avoidance / adaptation measures	Final risk rating (residual risk) after adaptation measures	Implications for proposal
Extreme heat (projected number of days above 35 °C (annual mean))	Narrabri: 43 days Moree: 35 days Goondiwindi: 41 days	Data not available	Narrabri: 85 days Moree: 102 days Goondiwindi: 100 days	Any increase in temperatures may lead to an increase in malfunction of communication and signalling equipment.	Medium	Backup power for critical infrastructure. Outdoor equipment designed to operate in extreme heat conditions.	Low	Unlikely to impact the proposal.
				Increased potential of track buckling if prolonged heat above stress free temperature.	Medium	Track design to consider greater level of heat tolerance and make allowance for increased frequency of heat events at stress points. Undertake adequate preventative maintenance of the track and infrastructure as part of standard procedures. Reduce train operating speeds in line with speed restrictions to minimise risk of incident.	Low	Unlikely to impact the proposal.
				Increased severity and frequency of extreme heat days can lead to more frequent interruptions of mains power supply.	Medium	Maintenance inspection cycle would identify equipment which is not performing efficiently or is becoming degraded.	Low	Unlikely to impact the proposal.

Climate variable	Historic trend	Climate change projections (2030)[1]	Climate change projections (2070)	Potential risk	Initial risk rating	Potential avoidance / adaptation measures	Final risk rating (residual risk) after adaptation measures	Implications for proposal
Annual rainfall (mm)	Narrabri: 611 mm Moree: 586 mm Goondiwindi: 620 mm	Wetter: 5 to 15% Narrabri: 703 mm Moree: 674 mm Goondiwindi: 713 mm	Little change: -5 to 5% Narrabri: 642 mm Moree: 615 mm Goondiwindi: 651 mm	Reductions in average annual rainfall leading to changes in soil profile and potential failure of embankments. Sub-surface soil stability for prolonged periods of heating and drying.	Medium	Potential risks of seasonal variations may require remedial measures at some locations. Scheduled maintenance checks to track and embankments.	Low	Unlikely to impact the proposal.
				Potential increased risk of flooding or inundation of track and associated infrastructure resulting from increasing summer rains and thunderstorms.	High	Drainage diversions and lines to direct and accommodate flows to be considered in design. Flood protection incorporated into track infrastructure. Site electrical/critical infrastructure adequately covered to withstand extreme rainfall/inundation. Monitor track and equipment conditions following heavy or prolonger rainfall events. Drainage structures are designed with sufficient hydraulic capacity to accommodate high flows	Medium	With adequate drainage and design, increase in rainfall and associated potential flood risk can be appropriately managed for the proposal.

Climate variable	Historic trend	Climate change projections (2030)[1]	Climate change projections (2070)	Potential risk	Initial risk rating	Potential avoidance / adaptation measures	Final risk rating (residual risk) after adaptation measures	Implications for proposal
Wind speed at 9 am (km/h)	Narrabri: 17.7 km/h Moree: 13.7 km/h Goondiwindi: 9.7 km/h	Small decrease: -3.09 to -1% Narrabri: 17.2 km/h Moree: 13.3 km/h Goondiwindi: 9.4 km/h	Large Increase: >3.09% Narrabri: 18.2 km/h Moree: 14.1 km/h Goondiwindi: 10 km/h	Damage to rail infrastructure from falling debris, trees, and branches.	Medium	Ensure no significant vegetation cover placing infrastructure at high risk. Structures designed for high wind loading to withstand wind speed effects, with reference to relevant Australian wind standards.	Low	Projected wind speed increase unlikely to impact the proposal.
				Changes to track speed affecting train operations and scheduling.	Medium	Design to consider potential impacts of increased long-term wind speed on train operations and make allowance for changes to train speed where applicable.	Low	With adequate design consideration for changing wind speed, potential risk associated with track speed can be appropriately managed for the proposal.
				Damage to rail infrastructure and derailment of double stacked trains from increased wind.	Medium	Structures designed for high wind loading to withstand wind speed effects, with reference to relevant Australian wind standards.	Low	With adequate design consideration for changing wind speed, potential risk associated with derailment can be appropriately managed for the proposal.
Humidity (%)	Narrabri: 68% Moree: 62% Goondiwindi: 62%	Small decrease: -10% to -1% Narrabri: 61.2% Moree: 55.8% Goondiwindi: 55.8%	Small decrease: -10% to -1% Narrabri: 74.8% Moree: 68.2% Goondiwindi: 68.2%	Decrease in humidity may potentially lead to changes in other hazards, such as increase bushfire risk.	Low	Ensure appropriate buffers along rail corridor to reduce risk of impact from possible bushfire.	Low	Impacts of humidity changes are unlikely to have any significant impact on the proposal.
Time in drought	NA	Large increase: >30%	Large increase: >30%	Sub-surface soil stability for prolonged periods of heating and drying.	Low	Potential risks of seasonal variations may require remedial measures at some locations. Appropriate design for long-term dry spells.	Low	Unlikely to impact the proposal.

Climate variable	Historic trend	Climate change projections (2030)[1]	Climate change projections (2070)	Potential risk	Initial risk rating	Potential avoidance / adaptation measures	Final risk rating (residual risk) after adaptation measures	Implications for proposal
Solar radiation (annual mean) (MJ/m^2)	Narrabri: 19.3 MJ/m^2 Moree: 19.6 MJ/m^2 Goondiwindi: 19.9 MJ/m^2	No change	Large increase: >1.08% Narrabri: 19.5 (MJ/m^2) Moree: 19.8 (MJ/m^2) Goondiwindi: 20.1 (MJ/m^2)	Increase in solar radiation, resulting from decrease in cloud cover may result in potential increase in periods of direct sunshine - potential glare issues during rail operation. Potential impacts to electrical cables and signalling equipment through prolonged direct exposure to sunlight.	Low	Continued monitoring and maintenance of cables and signalling equipment.	Low	Unlikely to impact the proposal.
Bushfires (risk days)	Regional	Likely increase due to change in combined climate variables conducive for bushfire conditions.	Bushfires in vicinity of the rail corridor could damage fencing, utilities and signals causing potential operational safety hazards and impacting rail operations.	Medium	Ensure appropriate vegetation buffers along rail corridor to reduce risk of possible impact from bushfires. Communications with rural fire services along the route.	Low	With appropriate vegetation buffer around asset, and management measures to prepare for high risk periods, potential impacts of bushfire can be appropriately managed for the proposal.	

Notes 1: Where a range of values has been indicated in the CSIRO projection models, the higher value has been adopted for increased values to represent a worst-case scenario.
2: Projections of the number of days above 35 °C were obtained using the Climate Thresholds Calculator available from http://www.climatechangeinaustralia.gov.au/en/climate-projections/explore-data/threshold-calculator/#. The results are for the 2070 scenario and are an average of the eight available models. Projections were not available for the 2030 scenario.

Appendix K – CEMP outline

Table K.1 CEMP outline

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
1. General	The CEMP would outline the construction conditions and temporary environmental protection measures to manage the impact of construction activities. It would be consistent with the mitigation and management measures documented in this EIS, conditions of the approval, the conditions of any licences or permits issued by government authorities, and ARTC's environmental management system.	Site induction	▸ All employees, contractors and subcontractors would receive an environmental induction which would include: • all proposal specific and standard noise and vibration mitigation measures • relevant conditions of licences/approvals/determinations etc • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • heritage requirements • construction employee areas • designated loading/unloading areas and procedures • construction traffic routes • site opening/closing times (including deliveries) • environmental incident procedures.
		Roles and responsibilities	▸ The CEMP would identify all members of the Inland Rail and construction team, including roles and responsibilities relevant to implementation of the CEMP. ▸ Contact details would be provided, including contacts in the case of emergencies or incidents as well as out-of-hours contacts.
		Reporting and communication	▸ The CEMP would outline reporting requirements for different levels of environment incidents, as well as the required procedure for emergency and incident management, non-compliance management and corrective and preventative actions. ▸ Any additional training requirements would be identified (in addition to the site induction). ▸ Reporting requirements would be included, including for the control of environmental records.
		Monitoring and auditing	▸ The CEMP would identify monitoring, auditing and inspection requirements, and determine the framework for the management of key environmental issues for construction.
		Environmental control maps	▸ The location of sensitive areas (for example heritage items and trees/vegetation to be retained) would be clearly identified on environmental control maps, which would be supplied to construction managers and workers.
		Working hours and out of recommended standard working hours protocol	▸ Permissible working hours and activities would be defined. ▸ A protocol for works undertaken outside recommended standard construction working hours (as per Department of Environment and Climate Change, 2009) would be prepared in accordance with the conditions of approval.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
2. Soil and water	The soil and water management sub-plan would detail how potential impacts on soils, erosion, sedimentation, watercourses and water quality (surface and groundwater) would be mitigated and managed during construction. The plan would consider site-specific conditions including dispersive soils and potential treatment options during construction. The plan would provide for incident management in relation to potential water quality contamination incidents. It would include procedures to manage the impact of the proposal on flooding, and would take into account the requirements of relevant guidelines, including: ▸ *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) ▸ *Managing Urban Stormwater: Soils and Construction Volume 2A: Installation of Services* (DECC, 2008) ▸ *Managing Urban Stormwater: Soils and Construction Volume 2C: Unsealed roads* (DECC, 2008) ▸ Erosion and sediment control on unsealed roads (OEH, 2012) ▸ Technical Guideline: Temporary stormwater drainage for road construction (RMS, 2011) ▸ Waste Classification Guidelines (EPA, 2014).	Erosion of exposed soils and sediment management	▸ Sediment and erosion control devices would be installed to minimise mobilisation and transport of sediment in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). ▸ Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and any subsequent records retained. Sediment would be cleared from behind barriers/sand bags on a regular basis as required and all controls would be managed to ensure they work effectively at all times. ▸ The area of exposed surfaces would be minimised. Disturbed areas would be stabilised progressively to ensure that no areas remain unstable for any extended length of time. ▸ Soil and sediment that accumulates in erosion and sediment control structures would be reused where practicable during site reinstatement, unless it is contaminated or otherwise inappropriate for reuse. ▸ Work would cease where practicable during heavy rainfall events when there is a risk of sediment loss off site or ground disturbance due to waterlogged conditions. ▸ Equipment, plant and materials would be placed in designated lay-down areas where they are least likely to cause erosion. ▸ Erosion control devices would be removed as part of the final site clean-up. This would include removing any sediment in drainage lines that has been trapped by erosion control devices, and restoring disturbed areas. ▸ Exposed surfaces would be stabilised, and final landscaping implemented, as soon as practicable.
		Stockpile management	▸ Stockpiles would be managed by implementing sediment and erosion control devices in accordance with *Managing Urban Stormwater, Soils and Construction* (Landcom, 2004). ▸ No stockpiles of materials or storage of fuels or chemicals would be located within high/medium flood risk areas or flow paths.
		Spill/incident management	▸ Spill kits would be maintained on-site at all times. ▸ Machinery would be checked daily to ensure that no oil, fuel or other liquids are leaking. ▸ Refuelling of plant and equipment would be undertaken within designated areas with appropriate controls. ▸ Visual monitoring of local water quality (such as turbidity, hydrocarbon spills/slicks) would be undertaken on a regular basis to identify any potential spills. ▸ Vehicle wash down and/or cement truck washout would occur in a designated bunded area or off-site.
		Groundwater	▸ Any groundwater encountered during construction would be managed and disposed of in accordance with the *Waste Classification Guidelines* (EPA, 2014b). Groundwater would be managed to ensure it does not cause pollution of waters in accordance with section 120 of the POEO Act. ▸ If dewatering is required during construction, the water would be tested, and treated if necessary, prior to re-use, discharge or disposal in accordance with the testing results.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
3. Contamination and hazardous materials	A contamination and hazardous materials sub-plan would detail how potential and actual contaminated soils and materials would be managed during construction to minimise the potential for significant on and off-site impacts. It would include the listed management measures. Construction hazard and risk issues associated with the use and storage of hazardous materials would be addressed through risk management measures developed in accordance with relevant Department of Planning and Environment guidelines, Australian and ISO standards. The plan would take into account the requirements of relevant legislation and guidelines, including: ▸ POEO Act and the *Waste Avoidance and Resource Recovery Act 2001* ▸ Waste Classification Guidelines (EPA, 2014b) ▸ National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM) (National Environment Protection Council, 2013) ▸ WorkCover NSW ▸ *AS 1940: The Storage and Handling of Flammable and Combustible Liquids.* ▸ *AS 3780-2008: The Storage and Handling of Corrosive Substances.* ▸ *Dangerous Goods (Storage and Handling) Regulations 2012.*	Hazardous materials	▸ Any hazardous materials that are to remain on site would be surveyed and recorded on a hazardous building material register. A risk assessment would be undertaken and a management plan implemented, including any remediation measures. The register and management plan would be maintained and updated in accordance with the relevant WorkCover codes of practice. ▸ Where required, any materials classified as Hazardous Waste would be treated, or an immobilisation approval obtained, in accordance with Part 10 of the *Protection of the Environment Operations (Waste) Regulation 2014* prior to off-site disposal. ▸ In the event synthetic material fibres are found on site, they would be handled and disposed of in accordance with the National Code of Practice for the Safe Use of Synthetic Mineral Fibres. ▸ The storage of hazardous materials, and refuelling/maintenance of construction plant and equipment, would be undertaken in clearly marked designated areas that are designed to contain spills and leaks. ▸ The storage of hazardous materials and dangerous goods would be undertaken in accordance with all relevant Australian Standards and regulatory requirements. ▸ Fuels, chemicals and liquids would be appropriately stored, in accordance with the following requirements. • Would be stored on an impervious base that must be able to withstand fuel or chemical spills without degradation. • The fuels and chemicals stored must be compatible (i.e. will not react with each other). The safety data sheets would be consulted in this regard. • For liquids, a minimum bund volume requirement of 110 per cent of the volume of the largest single stored volume, within the bund. • The storage facility would be undercover. • All containers would be labelled with the details of the contents. • Safety data sheets would be available at the site. • The storage facility would be inspected for compliance to the above requirements. ▸ Spill kits would be kept at fuel, oil and chemical storage locations. ▸ The removal, handling and disposal of any asbestos containing materials would be undertaken by an appropriately licensed contractor, and in accordance with: ▸ *Code of Practice for the Safe Removal of Asbestos 2005* ▸ *Code of Practice for the Management and Control of Asbestos in Workplaces 2005.*
		Incident management	▸ Spill kits, appropriate for the type and volume of hazardous materials stored or in use, would be readily available and accessible to construction workers. ▸ All hazardous materials, spills and leaks would be reported to site managers, and actions would be immediately taken to remedy spills and leaks. ▸ Training in the use of spill kits would be given to all personnel involved in the storage, distribution or use of hazardous materials. ▸ Incidents would be managed in accordance with the conditions of approval for the proposal.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
3. Contamination and hazardous materials	A contamination and hazardous materials sub-plan would detail how potential and actual contaminated soils and materials would be managed during construction to minimise the potential for significant on and off-site impacts. It would include the listed management measures. Construction hazard and risk issues associated with the use and storage of hazardous materials would be addressed through risk management measures developed in accordance with relevant Department of Planning and Environment guidelines, Australian and ISO standards. The plan would take into account the requirements of relevant legislation and guidelines, including: ▸ POEO Act and the *Waste Avoidance and Resource Recovery Act 2001* ▸ Waste Classification Guidelines (EPA, 2014b) ▸ National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM) (National Environment Protection Council, 2013) ▸ WorkCover NSW ▸ *AS 1940: The Storage and Handling of Flammable and Combustible Liquids.* ▸ *AS 3780-2008: The Storage and Handling of Corrosive Substances.* ▸ *Dangerous Goods (Storage and Handling) Regulations 2012.*	Unexpected finds	▸ An 'unexpected finds protocol' would be prepared and included in the CEMP to assist with the identification, reporting, assessment, management, health and safety implications, remediation, and/or disposal (at an appropriately licensed facility) of any potentially contaminated soil and/or water. This would include specifying appropriate reporting requirements in accordance with the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015a). ▸ In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the affected area would cease immediately, and the procedures detailed in the unexpected finds protocol would be implemented. Unexpected soil contamination could include: • unexpected staining or odours • potential asbestos containing materials • underground storage tanks, buried drums or machinery, etc. ▸ The unexpected finds protocol would include the following general approach: • site workers would make the area safe, stop work, and notify the construction supervisor, who would quarantine/fence the area, notify staff on-site and the project manager • the project manager or their representative would notify an appropriately qualified environmental consultant who would carry out an assessment of the nature and extent of the unexpected contamination • remediation would be undertaken as required and as advised by the environmental consultant • works may only recommence at the site after approval has been obtained by the environmental consultant and the project manager. • validation of the remediation would be carried out to assess the success of the remediation works. ▸ Awareness training would be provided for all on-site staff to assist in the identification of potentially contaminated material.
		General contamination management	▸ Machinery would be checked daily to ensure that no oil, fuel or other liquids are leaking. ▸ Refuelling of plant and equipment would be undertaken within a designated refuelling point.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
4. Traffic, transport and access	The traffic, transport, and access management sub-plan would detail how traffic, public transport and access would be managed during construction to minimise the potential for significant impacts. It would include measures relating to construction vehicle and traffic movements, parking and access requirements for construction personnel, safety signage, and training of personnel in traffic management. It would cover all construction zones and worksites, including the construction compounds.	Construction site traffic	▸ Traffic and access would be managed in accordance with *Traffic Control at Work Sites* (Road and Traffic Authority, 2010) and in consultation with Roads and Maritime, and local councils. ▸ Adequate road signage would be provided to inform drivers of the work, timing and alternative access arrangements. ▸ Measures to manage traffic flows around the area affected by construction would be provided, including required regulatory and directional signposting, line marking, variable message signs, and all other necessary traffic control devices. ▸ The plan would specify routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and the local community. ▸ Construction vehicles would park within the construction compound where practicable. ▸ The timing of deliveries accessing the site would be programmed to ensure there is sufficient space within the proposal site to accommodate deliveries. ▸ The queuing and idling of construction vehicles would be minimised. ▸ Designated queuing and idling areas would be determined near the work site to minimise disruption to the local community. ▸ Adequate sight lines would be provided to allow for safe entry and exit from the construction sites. ▸ Access to all private properties adjacent to the proposal site would be maintained during construction, unless otherwise agreed with relevant property owners. ▸ Councils, Roads and Maritime Services, and emergency services would be liaised with at an early stage to establish requirements and measures to be adopted to maintain emergency vehicle movements ▸ Contractors, including transport/deliveries contractors, would be provided with a copy of the traffic, transport and access management sub-plan to ensure disruptions to the local community are minimised.
		Pedestrian and cyclists	▸ The plan would include measures to maximise safety and access for pedestrians and cyclists, including details of alternative access arrangements. ▸ Adequate road signage would be provided to inform pedestrians of the work, and ensure that the risk of accidents and disruption to surrounding land uses is minimised. ▸ Adequate road signage would be provided to inform pedestrians and cyclists of the work, timing and alternative access arrangements. ▸ Appropriate controls would be established where vehicles are required to cross footpaths to access construction sites. This may include manual supervision, physical barriers or temporary traffic signals as required.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
5. Noise and vibration	The noise and vibration management sub-plan would detail how potential noise and vibration impacts would be mitigated and managed during construction. The plan would include the listed management measures. Where the noise and vibration levels are predicted to exceed the criteria after implementation of the general work practices, the additional mitigation measures detailed in the *Construction Noise Strategy* would be implemented. The requirements of relevant standards and guidelines, including AS 2436-2010 and the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) would be addressed. The plan would also include reference the working hours protocol (item 1) and the complaints management procedures specified in the communication and complaints management plan (refer to item 8).	Notification and behaviour	▸ Notification undertaken during construction would inform relevant stakeholders of the work locations and timing, and the potential for noise impacts. ▸ Construction sites and compounds located within 200 metres of sensitive receivers would be managed to minimise noise generating activities, including unnecessary shouting, loud stereos/radios, dropping of materials from height, throwing of metal items, and slamming of doors, particularly at the start and finish of shifts.
		Construction hours and scheduling	▸ The relevant noise and vibration criteria would be defined. ▸ For work undertaken in the vicinity of receivers where 'highly noise affected' impacts are predicted: • High noise and vibration generating activities would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. • No more than four consecutive nights of high noise and/or vibration generating work would be undertaken over any seven day period, unless otherwise approved by ARTC.
		Equipment and plant	▸ Quieter and less vibration emitting construction methods would be used where reasonable and feasible. ▸ The noise levels of plant and equipment would have operating sound power or sound pressure levels that comply with the required criteria. ▸ Simultaneous operation of noisy plant within range of sensitive receivers would be avoided. ▸ The offset distance between noisy plant and adjacent sensitive receivers would be maximised. ▸ Plant used intermittently would be throttled down or shut down. ▸ Noise-emitting plant would be directed away from sensitive receivers. ▸ Stationary noise sources (such as pumps, compressors, fans etc) would be enclosed or shielded whilst ensuring that the health and safety of workers is maintained. ▸ Consider site topography when situating plant and use structures (such as site shed placement, earth bunds, fencing, noise barriers) to shield receivers from noise.
		Traffic flow and deliveries	▸ For construction sites located near sensitive receivers, plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. ▸ Loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers, and preferably during standard construction hours. ▸ Site access points and roads would be selected to minimise impacts on sensitive receivers. ▸ Where practicable, delivery vehicles would be fitted with straps rather than chains for unloading.
		Measuring and monitoring	▸ Attended vibration measurements would be undertaken at the commencement of vibration generating activities located in close proximity to sensitive receptors to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. ▸ Additional vibration and noise monitoring may be required in response to complaints.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
5. Noise and vibration	The noise and vibration management sub-plan would detail how potential noise and vibration impacts would be mitigated and managed during construction. The plan would include the listed management measures. Where the noise and vibration levels are predicted to exceed the criteria after implementation of the general work practices, the additional mitigation measures detailed in the *Construction Noise Strategy* would be implemented. The requirements of relevant standards and guidelines, including AS 2436-2010 and the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) would be addressed. The plan would also include reference the working hours protocol (item 1) and the complaints management procedures specified in the communication and complaints management plan (refer to item 8).	Vibration	▸ Where construction is required within the safe working buffer distance, alternative work methods would be considered, such as the use of smaller equipment. If no alternative work method is feasible or reasonable, then compliance vibration monitoring would be undertaken. ▸ Trial vibration testing would be undertaken as required, prior to undertaking any high vibration activities. Trials would be undertaken in non-sensitive areas and at a range of distances from the source. The results of the trial monitoring would be compared against predicted vibration levels and the potential for impact refined, if deemed appropriate. ▸ The trial period may also be used to determine the effectiveness of source-based mitigation measures, such as changing the operating speed of the vibratory roller to generate a higher frequency of vibration, which may allow for a higher vibration threshold at the structure. ▸ For identified properties within buffer distances, or where pre-construction monitoring indicates that vibration levels from construction activities would exceed the target levels, a dilapidation survey of potentially affected structures would be undertaken to enable post-construction verification.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
6. Heritage (Aboriginal and non-Aboriginal)	The heritage management sub-plan would detail how potential impacts on heritage would be mitigated and managed during construction. The plan would be prepared in consultation with relevant agencies and Aboriginal groups for management of Aboriginal heritage, listed non-Aboriginal heritage items and archaeological areas, and any previously unidentified items/areas of potential heritage significance identified during construction. It would incorporate the results of archaeological subsurface testing and an unexpected finds procedure. The unexpected finds procedure would define requirements relating to potential human skeletal remains, in accordance with relevant guidelines, including: ▸ *Policy Directive: Exhumation of Human Remains* (NSW Health, 2013) ▸ *Manual for the identification of Aboriginal remains* (DEC, 2006) ▸ *Skeletal Remains: Guidelines for Management of Human Skeletal Remains* (NSW Heritage Office, 1998). It would incorporate the results of archaeological subsurface testing and an unexpected finds procedure.	General – built and non-Aboriginal heritage	▸ All identified items within and in the immediate vicinity of the proposal site would be marked on the environmental control maps, site plans, fenced off where appropriate, and avoided. ▸ The detailed construction methodologies would take into account mapped heritage items. ▸ Heritage requirements would be included in the site induction.
		Aboriginal heritage	▸ The plan would be prepared in consultation with registered Aboriginal parties, incorporate the recommendations of the Aboriginal Cultural Heritage Assessment of the proposal, the mitigation measures provided in Chapter 17, and the outcomes of any further investigations following detailed design.
		Unexpected finds	▸ An unexpected finds procedure would be developed and included in the CEMP to provide a consistent method for managing any unexpected heritage items (both Aboriginal and non-Aboriginal) discovered during construction, including potential heritage items or objects, and human skeletal remains. ▸ The procedure would define responsibilities, tasks, reporting requirements, and relevant guidelines and requirements. It would include the following: • If previously unidentified Aboriginal or non-Aboriginal heritage/archaeological items, relics, burial sites or potential human skeletal remains are uncovered during construction works, all works in the vicinity of the find shall cease and ARTC would be notified. • An appropriate buffer area would be established around the find. • Appropriate advice would be sought from a suitably qualified heritage consultant/archaeologist (and in consultation with the relevant division of the Department of Planning and Environment, as required). • Works in the vicinity of the find would not re-commence until clearance has been received from the heritage consultant/archaeologist and ARTC. ▸ Procedures and notification requirements for potential human remains in accordance with relevant guidelines.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
7. Visual amenity	The visual amenity sub-plan would provide measures to minimise the potential impacts of the proposal during construction.	General worksite management	▸ Work sites would be maintained in a clean and tidy condition at all times. ▸ Temporary hoardings, barriers, traffic management and signage would be removed when required. ▸ On completion of construction, all work sites and other land occupied temporarily would be rehabilitated in accordance with the rehabilitation strategy.
		Lighting	▸ Directional lighting would be mounted to avoid light spill into adjoining residences. ▸ Lighting would be installed and maintained in accordance with Australian Standard (AS) 4282 *Control of the Obtrusive Effects of Outdoor Lighting*.
8. Communication management plan	The communication management sub-plan would provide guidance for the management of communication and consultation during the construction period, including objectives of consultation, stakeholders, contact mechanisms, and protocols. It would be consistent with the consultation plan developed by ARTC, as described in Chapter 4. The plan would also include implementation and maintenance of a complaints register and complaints handling and escalation procedures, consistent with ARTC requirements.	Communication and complaints	▸ Contact details for a 24-hour project response line and email address would be provided for ongoing stakeholder contact throughout the construction period. ▸ Provision of accurate public information signs while work is in progress. ▸ Staging of works would be undertaken to minimise disruption, in consultation with relevant stakeholder groups, to minimise impacts to community activities and functions. ▸ Relevant stakeholders would be notified regarding service disruptions in accordance with the communication management sub-plan. ▸ Complaints would be managed according to the following procedure: • Details of all complaints received will be recorded. • A detailed written response will be provided to the complainant within 14 calendar days.
9. Biodiversity management	The biodiversity management sub-plan would detail how construction impacts on aquatic and terrestrial flora and fauna would be mitigated, managed and monitored.	Vegetation management	▸ Employee education and training including inductions for staff, contractors and visitors to the site would include the biodiversity issues present at the site and so they know their role and responsibilities in relation to the protection and/or minimisation of impacts to native biodiversity. ▸ The CEMP and construction plans would clearly document the location and full extent of clearing required.
		Management of trees to be retained	▸ The management of trees in the vicinity of the construction zone would be consistent with the AS 4970-2009 *Protection of trees on development sites* (incorporating Amendment No. 1 (March 2010)).
		Pre-clearance surveys – woody native vegetation	▸ Pre-clearance surveys would be implemented within areas of woody native vegetation that are to be cleared. Pre-clearance surveys will be undertaken by suitably qualified and experienced ecologists and involve the following: • The demarcation of areas approved for clearing to reduce risk of accidental clearing/ disturbance of surrounding native vegetation. • The likely habitat resources and habitat trees would be identified and marked. Habitat trees are those containing hollows, cracks or fissures and spouts, active nests, dreys or other signs of recent fauna usage. Other habitat features to be identified include fallen timber/hollow logs and burrows. • The potential presence of threatened flora and fauna species, endangered populations and TECs would be identified. • The identification of species or habitat features that are suitable for translocation or salvage. • In areas of koala habitat, visual inspection of trees for koalas prior to clearing.

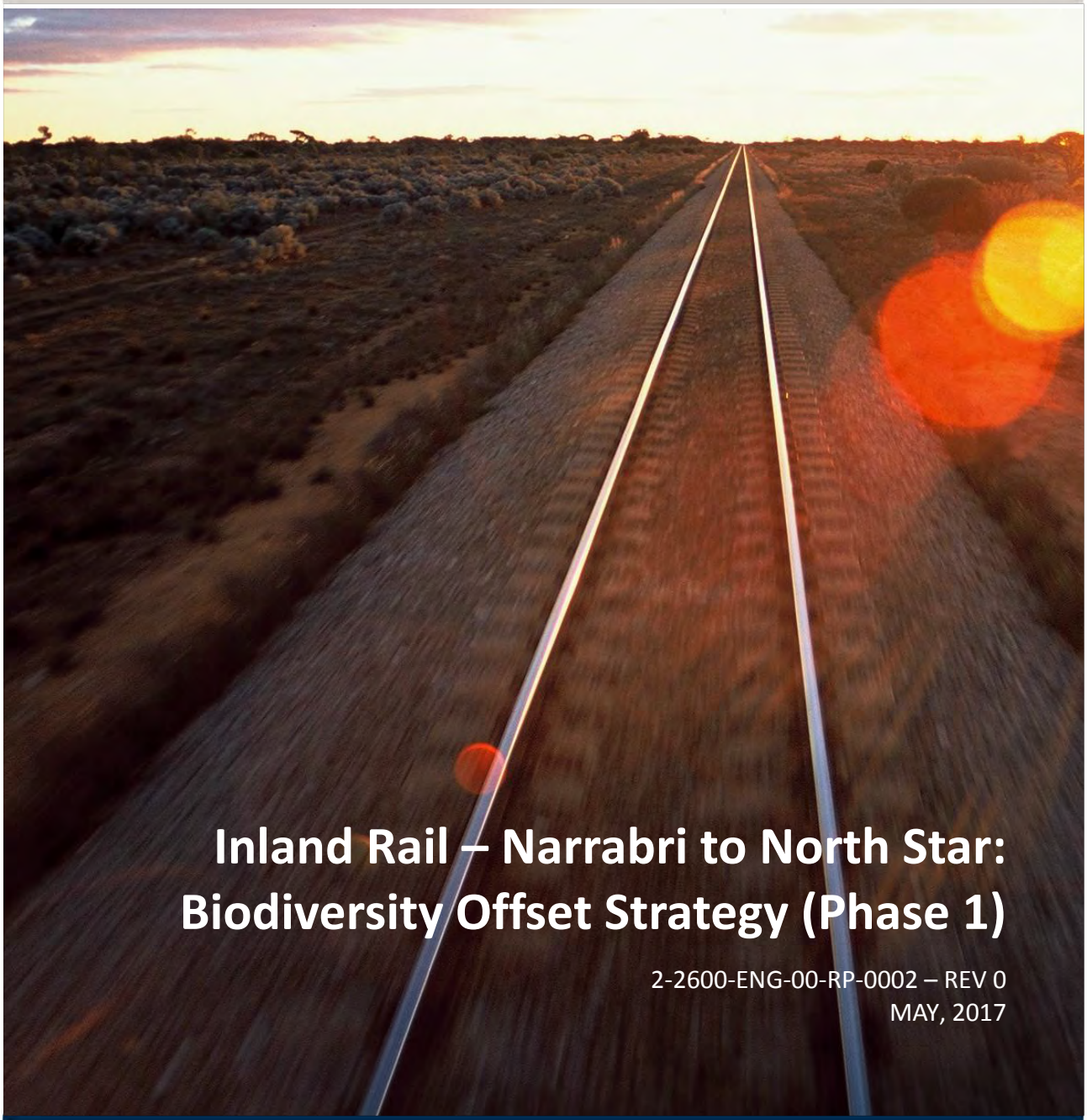
Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
9. Biodiversity management	The biodiversity management sub-plan would detail how construction impacts on aquatic and terrestrial flora and fauna would be mitigated, managed and monitored.	Pre-clearance surveys – bridges and culverts (micro-bats)	▸ Pre-clearance surveys would be implemented on the day prior to the disturbance of culverts with the potential to provide roosting habitat for micro-bats, and would involve: • Recording: – roosting species (if identifiable) – count/estimate of the number of roosting individuals – location and time of relocation (if applicable) or other actions taken to discourage the roosting of micro-bats. • If roosting bats are identified, the bats would be left undisturbed until dusk. At dusk, roosting bats can be captured and released at a location to be agreed during pre-clearance surveys. • Following removal or departure of all roosting bats, crevices would be removed or blocked off (for example, by covering the entrance with shade cloth).
		Tree-felling	▸ Tree clearing would be completed as close to the completion of pre-clearance surveys as practicable and would include: • All habitat trees would be vigorously shaken with heavy machinery the day prior to clearing. • On the day of habitat tree felling, the following would be undertaken: – all habitat trees would be subject to a visual inspection for threatened species – all reasonable attempts would be made to reduce the impact of felling on all fauna species – he lowering of hollow-bearing trees would be done as gently as possible with heavy machinery – if a native fauna species is identified in a habitat tree on the day of felling, the supervising ecologist or appropriately qualified fauna handler would advise the most appropriate method to minimise potential harm – uninjured animals would be released on the day of capture into nearby suitable secure habitat and would not be held for extended periods of time – injured animals would be taken to the nearest veterinary clinic or wildlife carer as soon as possible for assessment and treatment. • Following felling, habitat trees would be inspected for remaining or injured fauna species and to ensure that no hollows are blocked against the ground. This may require the tree to be rolled to ensure adequate access. • All felled habitat trees would remain in place for a least one night to allow any fauna still present to move on.
		Aquatic ecology	▸ Works within the riparian zone would maximise, where practicable, the preservation of any existing vegetation and minimise disturbance. ▸ Designs for works within or near watercourses would provide for the retention of natural functions and maintenance of fish passage in accordance with *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge, 2003). ▸ Management of sediment that has accumulated upstream to avoid sediment mobilisation. ▸ Any large woody debris in the development footprint would be relocated upstream or downstream in consultation with an appropriately qualified specialist.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
9. Biodiversity management	The biodiversity management sub-plan would detail how construction impacts on aquatic and terrestrial flora and fauna would be mitigated, managed and monitored.	Dewatering of pools	▸ A dewatering procedure would be included, detailing methods for collection and relocation of protected fish and euthanasia of pest species. ▸ Any pools in watercourses that would be impacted by construction would be dewatered according to the dewatering procedure.
		Weed management	▸ Weeds would be managed and disposed of in accordance with the requirements of the *Noxious Weeds Act 1993* and/or the *Weeds of National Significance Weed Management Guide.* ▸ Weed control mitigation and management strategies would be documented and implemented as follows: • vehicles or equipment being brought onto the proposal site and/or travelling around the site must be inspected and cleaned prior to commencing work to limit the spread of seeds and plant material • regular inspections to monitor the spread of weed species • training of environmental personnel on the identification of target weed species. ▸ Any outbreak of noxious weeds will be controlled and eradicated as required under the *Noxious Weeds Act 1993*, and as required by the Local Land Services and other relevant authorities. Weed control and eradication techniques may include: • spraying with herbicides • physical removal for example chipping, and/or • minimisation of area available for weed infestation, through prompt revegetation of bare areas.
10. Air quality and dust	The air quality and dust management sub-plan would detail how potential impacts on air quality would be mitigated and managed during construction.	Dust suppression – construction works	▸ Shade cloth would be fastened to the perimeter fence on the proposal site where construction is being undertaken within 100 metres of sensitive receptors to minimise dust transported from the site during construction. ▸ Dust generation would be monitored visually, and where required, dust control measures such as water spraying would be implemented to control the generation of dust. ▸ Dust suppressants would be applied to stockpiled dirt if the pile is inactive for extended periods. ▸ Access points would be inspected to determine whether sediment is being transferred to the surrounding road network. If required, sediment would be promptly removed from roads to minimise dust generation. ▸ Works (including the spraying of paint and other materials) would be suspended during strong winds or in weather conditions where high levels of dust or airborne particulates are likely. ▸ Any exposed surfaces would be stabilised as soon as practicable. ▸ In locations where nearby sensitive receivers may be affected, adopt a site 'shut down and cover up' policy during periods of extreme weather conditions, for example high winds.
		Dust suppression – vehicle movements	▸ Vehicle movements would be limited to designated entries and exits, haulage routes, and parking areas. ▸ Materials transported to and from the site would be covered to reduce dust generation in transit.

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
10. Air quality and dust	The air quality and dust management sub-plan would detail how potential impacts on air quality would be mitigated and managed during construction.	Vehicle emissions	▸ All plant and machinery would be fitted with emission control devices complying with relevant Australian Standards. ▸ Machinery would be turned off when not in use and not left to idle for prolonged periods. ▸ Surveillance would be undertaken to identify any vehicle, plant or equipment that is causing visible emissions. If any defective vehicles, plant or equipment are identified, operation of this machinery would cease and service/maintenance would be undertaken.
		Communication	▸ Advance warning would be provided to sensitive receivers in relation any significant dust generating activities undertaken in close proximity to sensitive receptors, including stock.
11. Spoil and waste	The spoil and waste management sub-plan would detail how waste would be managed during construction to minimise the potential for significant impacts. It would include disposal requirements, measures to measures to reduce, re-use or recycle wastes where possible. It would set targets for waste diversion, demonstrate how targets can be achieved, and outline how waste diversion would be tracked and reported. The plan would be prepared in accordance with the *Waste Classification Guidelines* (EPA, 2014).	Waste management	▸ Resource management hierarchy principles would be followed: • avoid unnecessary resource consumption as a priority • avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • disposal is undertaken as a last resort. ▸ Waste material, including soil and spoil to be taken off site, would be classified and managed in accordance with the *Waste Classification Guidelines* (EPA, 2014b) and would be disposed of in accordance with the POEO Act. ▸ All waste documentation would be collated and maintained on file in accordance with these guidelines. ▸ Waste material would not to be left on site once the works have been completed. ▸ Working areas would be maintained, kept free of rubbish, and cleaned up at the end of each working day. ▸ Any waste material identified as being contaminated would be managed in accordance with the *Contaminated Land Management Act 1997* and other relevant legislation and guidelines. ▸ The removal, handling and disposal of any asbestos containing materials would be undertaken by an appropriately licensed contractor, and in accordance with: • *Code of Practice for the Safe Removal of Asbestos 2005* • *Code of Practice for the Management and Control of Asbestos in Workplaces 2005.*
12. Hazards, risk and contingency management	The hazards, risk and contingency management sub-plan would be aligned to ISO 4260 and AS/NZS *4360:2004 Risk Management*, and would provide a systematic pro-active approach of ongoing risk identification and contingency planning. It would identify hazards and risks, and measures to minimise risks and respond to incidents during construction.		▸ Hazards and risks associated with construction activities would be identified prior to construction. ▸ A process for regularly reviewing work practices/procedures would be implemented throughout construction to identify, report, and respond to any new environmental hazards/risks. ▸ Site-specific work health and safety management plans and safe work method statements would be developed and implemented in accordance with work health and safety requirements. ▸ The plan would support the contamination and hazardous materials sub-plan developed as per item 3.
13. Emergency response	An emergency response sub-plan would be prepared to address protocols and procedures to be followed during emergency situations (including bushfires, fires, explosions, flooding and inundation).	Emergency response	The plan would include: ▸ Details of traffic management measures to be implemented during emergencies. ▸ Design and management measures to address the potential environmental impacts of an emergency situation. ▸ Training programs to ensure that all staff are familiar with the plan.

Appendix L – Inland Rail – Narrabri to North Star: Biodiversity Offset Strategy (Phase 1)

The Australian Government's priority freight rail project



Inland Rail – Narrabri to North Star: Biodiversity Offset Strategy (Phase 1)

2-2600-ENG-00-RP-0002 – REV 0

MAY, 2017

Document Control

Client:	Australian Rail Track Corporation
Project:	Inland Rail – Narrabri to North Star
Document title:	Inland Rail – Narrabri to North Star Biodiversity Offset Strategy (Phase 1)
Date issued:	16.05.2017
Revision:	0
Prepared by:	Amec Foster Wheeler
Purpose:	To assess the biodiversity offset requirements for the Narrabri to North Star proposal under the *NSW Biodiversity Offsets Policy for Major Projects* and demonstrate that appropriate offsets are available and can be delivered.
Endorsed by:	Berlinda Ezzy
Approved by:	Jeromy Claridge
Date approved:	
Issued to:	Benjamin Wells, ARTC
Filename:	652520-ENV-RPT-002
Status	Issued for use
Further work	

Revision history

REVISION	DATE ISSUED	TO	DESCRIPTION
0	16/05/2017	Benjamin Wells	Issued for use.

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FIGURES

APPENDICES

EXECUTIVE SUMMARY

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. The Inland Rail programme (Inland Rail) involves the design and construction of a new inland rail connection, about 1,700 kilometres long, between Melbourne and Brisbane.

Inland Rail has been divided into 13 projects, seven of which are located in New South Wales (NSW). One of these is the **Narrabri to North Star** (proposal), consisting of approximately 183 kilometres of upgraded track, replacement of culverts and bridges, five new passing loops and other associated infrastructure and facilities.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the proposal. The proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). ARTC are required to prepare an environmental impact statement (EIS) for the proposal that meets the Secretary's Environmental Assessment Requirements (SEARs). The EIS will be assessed by the NSW Department of Planning & Environment (DPE) under the Bilateral agreement made between the Commonwealth and NSW governments.

ARTC have completed the preparation of a Biodiversity Assessment Report (BAR) (Umwelt, 2017a) as part of the EIS, and this biodiversity offsets strategy has been prepared to support the BAR. The BAR describes the ecological values that occur within the *proposal site and additional assessment area*[1] including threatened flora and fauna species and ecological communities that have the potential to be impacted, assesses the potential for significant impacts, and calculates the offset requirements in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* (Major Projects Offsets Policy). The BAR identifies nine Plant Community Types (PCTs), three flora species (finger panic grass (*Digitaria porrecta*), creeping tick-trefoil (*Desmodium campylocaulon*), Belson's panic (*Homopholis belsonii*)) and one fauna species (koala (*Phascolarctos cinereus*)) as requiring biodiversity offsets under Major Projects Offsets Policy. A total of 18,826 ecosystem credits and 6,501 species credits need to be retired. Further details are provided in Table 4-2.

Based on the offset credits required, a desktop assessment was undertaken to identify the potential for suitable land based offset sites to be located and secured. The principles established under the Framework for Biodiversity Assessment (FBA) which underpins the Major Projects Offsets Policy was used to guide which PCTs and areas could be used for the proposal. A range of sources were investigated including the NSW Office of Environment and Heritage (OEH) biodiversity credits register, expressions of interest (EOI) register and desktop spatial analysis using available PCT mapping.

The assessment identified there are no existing registered suitable ecosystem credits or flora species credits occurring in the impact subregions of Northern Basalts, Northern Outwash or Castlereagh-Barwon, or the adjacent subregions. Two EOIs are located in impact subregions that may contain areas of impact PCT71 and PCT78. For koala species credits there are three existing credit registered offset areas, and 14 EOIs within NSW.

[1] Defined as the construction footprint, including provision for ancillary facilities, for the total 183 kilometres of the rail line; resulting in a total proposal site area of approximately 1,563 hectares the (Umwelt, 2017a). NOTE: *The proposal site and additional assessment area* referenced within this report refers to the "Proposal Site" and the "Additional Assessment Area" terminology used within the EIS, and the "Development Site" terminology used in the BAR assessment.

The majority of the registered offset areas are located in eastern and coastal areas of NSW and it is likely there would be adequate koala credits available to meet the proposal's requirements. Under the FBA proponents are permitted to offset for a threatened species within other subregions that are within the known geographic distribution of the threatened species impacted.

Desktop analysis found that for the majority of impact PCTs there are adequate areas mapped within the impact subregions and adjoining subregions to meet the proposal's offset requirements. For impact PCT52 - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains and PCT135 - Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion it is likely offset areas may be limited within the impact and adjoining subregions. Therefore, offsets for these PCTs may require the use of alternate PCTs. The extent of area available for each PCT is summarised in Table 5-7 and 5-8. Figures illustrating the distribution for each impact and alternate PCT are provided in Appendix A.

Due to a lack of suitable registered offsets for ecosystem and flora species credits ARTC will need to investigate sourcing their own offset sites and register BioBanking agreements with landowners. A preference will be for land-based offsets that are strategically located in the impact or adjacent subregions, where a number of PCTs and suitable habitat for those species required to be offset can be co-located, and 'like for like' conservation outcomes are achieved.

GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviation	Description
BAR	Biodiversity Assessment Report
BBAM	BioBanking Assessment Methodology
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
CMA	Catchment Management Authority
DPE	NSW Department of Planning and Environment
DoEE	Commonwealth Department of the Environment and Energy
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FBA	Framework for Biodiversity Assessment
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEARS	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

Abbreviation	Description
VIS	Vegetation Information System

1. INTRODUCTION

1.1. Background

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. The Inland Rail programme (Inland Rail) involves the design and construction of a new inland rail connection, about 1,700 kilometres long, between Melbourne and Brisbane. Inland Rail is a transformational rail infrastructure initiative that will enhance Australia's existing national rail network and serve the interstate freight market.

Inland Rail has been divided into 13 projects, seven of which are located in New South Wales (NSW). One of these is the **Narrabri to North Star** (proposal), consisting of about 183 kilometres of new and upgraded track and associated infrastructure and facilities.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') has sought approval to construct and operate the proposal. The proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposal was referred to the Commonwealth Department of Environment and Energy (DoEE) in June 2016. A notice was issued on 20 September 2016 by DoEE the proposal will be a controlled action for listed species and communities, and the assessment approach is through the bilateral agreement with New South Wales.

ARTC is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the proposal under the *NSW Biodiversity Offsets Policy for Major Projects* (Major Projects Offsets Policy).

1.2. Purpose

The Narrabri to North Star Biodiversity Offset Strategy (BOS) (Phase 1) has been developed in accordance with the Narrabri to North Star Biodiversity Assessment Report (BAR) and supports the overall Environmental Impact Statement (EIS) process. The purpose of this report is to:

- Summarise the proposal's biodiversity offset requirements (both State and Commonwealth) which have been determined through environmental impact assessments as part of finalising the BAR and EPBC Act referral
- Identify requirements for delivering a suitable offset under the Major Projects Offsets Policy and delivery options available for the proposal
- Assess the availability of suitable offset sites
- Outline a preferred offset delivery approach
- Identify future steps to secure the biodiversity offset requirements and associated timeframes.

This report forms the first of three phases of the BOS.

Phase 2 of this BOS will be prepared post detailed design and prior to the commencement of construction activities for the proposal. The BOS Phase 2 report will provide confirmation of offset values and credits required, identification of proposed offset site options, summary of preliminary field inspections, confirmation of initial landholder interest and assessment of existing condition, key threats and likely management actions on the offset site.

Phase 3 of this BOS will be prepared and submitted for approval within 12 months post commencement. Phase 3 of the BOS report will provide in detail the final offset sites proposed, ground-truthed confirmation of PCTs and species credits generated at the offset site/s, completed biodiversity credit calculator output and report and a detailed offset site management plan. It is then proposed the endorsed offset site/s are legally secured within 2 years post commencement.

2. NARRABRI TO NORTH STAR PROJECT DESCRIPTION

2.1.1. Location and Area

The proposal is generally located in the existing rail corridor between the towns of Narrabri to North Star in north-western NSW, and will involve upgrading the existing line (approximately 183 kilometres) (Figure 2-1). The proposal is located within three predominantly rural local government areas (LGAs) including Narrabri LGA for the southern section of the proposal, Moree Plains LGA for the middle section of the proposal, and Gwydir LGA for the northern section of the proposal.

The rail corridor is generally defined by fences located approximately 20 metres either side of the rail line, however in some sections where fences are not present the rail corridor may be wider, extending out to about 30 to 40 metres from the rail line or wider where site compounds are proposed. The proposal site varies along the length of the proposal depending on the construction activities that are to take place in any given area (Umwelt, 2017a).

The proposal site and additional assessment area includes the construction footprint and provision for ancillary facilities, for the total 183 kilometres of the rail line; resulting in a total proposal site area of approximately 1,563 hectares (Umwelt, 2017a).Offset requirements have been calculated based on the proposal site and additional assessment area.

2.1.2. Key Features

Key features of the proposal involve:

- Upgrading the track, track formation, culverts and bridges within the existing rail corridor for a distance of 183 kilometres between Narrabri to North Star
- Realigning the track where required within the existing rail corridor to minimise/ease tight curves, including construction of a deviation at Camurra to eliminate the existing hairpin curve
- Providing five new passing loops within the existing rail corridor, at Bobbiwaa, Penny's Road, Moree, Coolleearllee and Croppa Creek.

Ancillary work would include works to level crossings, flood immunity works, stormwater drainage works, upgrading signalling and communications, establishing or upgrading existing fencing of the rail corridor and relocation of some services and utilities within the proposal site.

Inland Rail (through-connection) would be operational in 2025.

ARTC - 652520 - NSW Offset Advice

LEGEND

LOCATION DIAGRAM

Figure 2-1
Proposal Site

Proposal Site

WORK REQUEST NUMBER: 652520

DATA SOURCES:
Base Map - OEH NSW
World Base Map Copyright © 2015 DeLorme

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

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3. NARRABRI TO NORTH STAR OFFSET LEGISLATIVE REQUIREMENTS

The proposal will be assessed and approved under both State and Commonwealth legislation including:

- Sections 130(1) and 133 of the Commonwealth EPBC Act
- Part 5.1 of NSW EP&A Act as State Significant Infrastructure (SSI) with assessment via an EIS.

Based on the approval and legislative requirements the following sections provide an overview of the State and Commonwealth biodiversity offset frameworks that will apply to the proposal, and requirements for the provision of biodiversity offsets.

3.1. Commonwealth

The proposal was referred to the Commonwealth DoEE in June 2016. A notice was issued on 20 September 2016 that the proposal will be a controlled action for listed species and communities, and the assessment approach is through the bilateral agreement with New South Wales.

ARTC is required to assess potential for the proposal to have significant impacts on matters of national environmental significance (MNES) in accordance with the issued Secretary's Environmental Assessment Requirements (SEARs). Where a significant impact has been identified, a biodiversity offset is required to compensate for this loss. An offset framework is established under the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) that provides guidance on what constitutes an acceptable offset. However, the EPBC Act Environmental Offsets Policy is not applicable to the proposal as the NSW Major Projects Offsets Policy is accredited under the NSW Bilateral Agreement. As the proposal has been declared a major project, offsets for impacts on MNES can be delivered in accordance with the NSW Major Projects Offsets Policy (as set out in Chapter 3.2 below).

An Assessment of Significance has been undertaken in accordance with the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance (DoEE, 2013) for those MNES identified in the referral as known or likely to occur in the proposal site. Results of this assessment are outlined in the BAR (Umwelt, 2017a) and the Assessment of Commonwealth Matters Report (Umwelt, 2017b) which will be appended to the BAR. The MNES assessed and findings are summarised in Chapter 4.4.

3.2. New South Wales

3.2.1. New South Wales Biodiversity Offset Strategy for Major Projects

The NSW *Biodiversity Offsets Policy for Major Projects 2014* (OEH, 2014a) (Offsets Policy for Major Projects) establishes a set of offsetting principles for major projects, outlines an assessment methodology to quantify and describes the offsets required as well as detailing a range of options that can be used to provide offsets. The policy provides a standard method for assessing impacts and the quantum of biodiversity credits (species credits and ecosystem credits) required for projects declared as State Significant Development (SSD) or SSI under the EP&A Act. This includes impacts on:

- Species credit species – threatened species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or EPBC Act that are identified by the OEH Threatened Species Profile Database as not being able to reliably be predicted to occur on a development site based on Plant Community Types (PCT), distribution and habitat criteria

- Ecosystem credit species – threatened species listed under the TSC Act and/or EPBC Act that are identified by the OEH Threatened Species Profile Database as being able to be predicted to occur on a development site based on the presence of habitat surrogates, including the confirmed presence of PCT
- Critically endangered ecological communities (CEECs) and endangered ecological communities (EECs) listed under the TSC Act
- Migratory species and Threatened Ecological Communities (TECs) listed under the EPBC Act.

Under the policy offset credit requirements can be satisfied through one or a combination of options which include:

- Land based offsets through the purchase and retirement of biodiversity credits from the biodiversity credit register
- Making payments into an offset fund (this option is not currently available)
- Supplementary measures (these are measures other than protection and management of land, and can include funding of actions identified in species recovery plans, threat abatement programs or research), or
- A combination of the above.

Supplementary measures may only be considered if appropriate offset sites cannot be found. Proponents need to demonstrate reasonable steps have been undertaken to locate appropriate like-for-like offset sites before supplementary measures can be proposed. Reasonable steps are defined in Appendix A of the Major Projects Offsets Policy.

Where there are insufficient credits available from the register to acquit a project's offset requirements, proponents can seek to identify and establish a biobank site by entering into a BioBanking agreement with an interested landholder.

Proponents are generally required to secure offsets before development commences. If they wish to secure the offset after development commences, they must enter into a voluntary planning agreement prior to the granting of project approval, requiring the offset requirement to be carried out.

3.2.2. Framework for Biodiversity Assessment

As a requirement under the EP&A Act the proposal has been provided with SEARs that require ARTC to prepare a Biodiversity Assessment Report (BAR) and apply the Framework for Biodiversity Assessment (FBA) to assess impacts on biodiversity. The FBA underpins the Major Projects Offsets Policy.

The FBA sets out the process for assessing impacts on threatened species, CEECs, EECs and TECs and determining the biodiversity offset requirements for those impacts. It provides a method for calculating an offset quantum in the form of biodiversity credits (species credits and ecosystem credits) based on landscape analysis and detailed field assessments including ground truthing of mapped vegetation communities and threatened species surveys.

The results of the application of the FBA are documented by accredited assessors in a BAR. ARTC have completed the preparation of a BAR for the proposal which identifies the potential impacts to species and ecological communities and biodiversity offset credits required (Umwelt, 2017a). The findings of the BAR in terms of offset credit requirements are summarised in Chapter 4.1 – 4.3.

3.2.3. BioBanking

BioBanking was established by the former NSW Department of Environment, Climate Change and Water (DECCW) (now the OEH) as a method to address the loss of biodiversity and threatened species. The scheme attempts to create a market framework for the conservation of biodiversity values and the offsetting of development impacts.

BioBanking is established under Part 7A of the TSC Act. The *Threatened Species Conservation (Biodiversity Banking) Regulation 2008* provides additional rules for specific aspects of the scheme that are important for its operation. The BioBanking Assessment Methodology 2014 (BBAM) sets out how biodiversity values will be assessed, establishes rules for calculating the number and class of biodiversity credits, and determines the trading rules that will apply (OEH, 2014a).

To support proponents and offset providers OEH have established the BioBanking Public Registers. They consist of:

- BioBanking agreements register – identifies locations of approved biobank sites, number and type of credits generated and a copy of BioBanking agreement
- BioBanking statements register – provides the location of where BioBanking statements apply, the number and type of credits required, a copy of the BioBanking statement and credits retired to satisfy conditions of statement requirements
- Biodiversity credits register – provides ownership information in relation to each credit, including its status. The credit register can be used to find buyers and sellers
- Biodiversity credit transactions and sales register – information on credit transactions including the price and date of transactions
- Expressions of Interest (EOI) register – landowners who are interested in establishing biobank sites, but have not entered into a formal agreement
- Credits wanted register – proponents who are seeking biodiversity credits.

A search of the above public registers has been undertaken to identify offset credit availability in this strategy.

4. NARRABRI TO NORTH STAR OFFSET REQUIREMENTS

The BAR (Umwelt, 2017a) has assessed the biodiversity values that are known and likely to occur in the proposal site and additional assessment area. An assessment has been undertaken to determine the residual impacts requiring an offset through the application of the FBA. The number of biodiversity offset credits (both ecosystem and species credits) has been estimated and further supporting information is provided in the BAR (Umwelt, 2017a).

All information presented in this chapter has been summarised from the BAR (Umwelt, 2017a).

4.1. Threatened Species Requiring Offset

A total of 32 ecosystem-credit fauna species have been identified as required to be assessed to calculate the total ecosystem credits required for the proposal. These are summarised in Table 5.1 of the BAR. The species with the highest multiplier was used to determine credit requirements for the vegetation zones they are predicted to occur in. Five ecosystem-credit fauna species were recorded during targeted field surveys. These fauna species and their applicable species multipliers are listed in Table 4-1. Offset sites will incorporate habitat for these fauna species through associated PCTs.

Table 4-1 Ecosystem-credit species requiring offset as a result of the proposal

Common Name	Species Name	Threatened Species Offset Multiplier
grey-crowned babbler	*Pomatostomus temporalis* subsp. *temporalis*	1.3
varied sittella	*Daphoenositta chrysoptera*	1.3
eastern bentwing-bat	*Miniopterus schreibersii oceanensis*	Not predicted in the BioBanking Credit Calculator
little pied bat	*Chalinolobus picatus*	2.1
yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*	2.2

The BAR identified five species-credit species as being recorded in the proposal site being; finger panic grass (*Digitaria porrecta*), creeping tick-trefoil (*Desmodium campylocaulon*), Belson's panic (*Homopholis belsonii*), koala (*Phascolarctos cinereus*)) and grey-headed flying fox (*Pteropus poliocephalus*). The grey-headed flying fox only generates species-credits for impacts on breeding habitat. No camp sites were recorded within the proposal site therefore no species credits are generated. Details are summarised in Table 4-2.

4.2. Biodiversity Offset Credit Summary

There are nine PCTs within ten condition classes, three flora species and one fauna species requiring biodiversity offsets. A summary of ecosystem and species credits that require offsetting under the FBA is provided in Table 4-2 below. A total of 18,826 ecosystem credits and 6,501 species credits are required to offset the direct impacts of the proposal. Maps of these PCTs within the proposal site and the full Credit Calculator reports are provided as Appendices to the BAR.

Table 4-2 Ecosystem and species credits generated by the proposal

Name	Credits Required
Ecosystem Credits	
PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	254
PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion	250
PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	63
PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	11,046
PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	3,386
PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good – Derived Native Grasslands*	2,917
PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion	2
PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	675
PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion	133
PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	100
Total Ecosystem Credits	**18,826**
Species Credits	
finger panic grass (*Digitaria porrecta*)	364
creeping tick-trefoil (*Desmodium campylocaulon*)	2,607

Name	Credits Required
Belson's panic (*Homopholis belsonii*)	1,898
koala (*Phascolarctos cinereus*)	1,632
Total Species Credits	**6,501**

4.3. Matters of National Environmental Significance

ARTC have completed assessments of significance for MNES applying the *Significant Impact Guidelines 1.1* (DoEE, 2013). Assessments of significance concluded the proposal was likely to result in a significant impact on the CEEC Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland. No other MNES was identified to be significantly impacted by the proposal (Umwelt, 2017b). Further detail on the MNES assessed are summarised below and provided in the BAR.

4.3.1. Threatened Ecological Communities

Assessments of Significance following Significant Impact Criteria in the Significant Impact Guidelines (DoEE, 2013) for EPBC Act TECs have been undertaken as part of the BAR. The TECs include:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (EEC under EPBC Act)
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (EEC under the EPBC Act)
- Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD (CEEC under the EPBC Act)
- Weeping Myall Woodlands (EEC under the EPBC Act).

Assessments of Significance concluded that only one TEC (Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD CEEC) is likely to be significantly impacted by the proposed action with impacts on up to 268 ha of the CEEC and as such, offsets are required for this TEC.

Each of the above TECs is equivalent to a NSW PCT impacted by the proposal and requires offsetting as detailed in Table 4-3 below. As such, offsets for the ecosystem credits calculated from project impacts to these PCTs will also offset impacts to all four TECs under the NSW Bilateral Agreement. Table 4-3 also identifies the extent of clearing for each TEC and the corresponding PCT.

Table 4-3 NSW Plant Community Types impacted by the proposal and equivalent Commonwealth Threatened Ecological Communities impacted

NSW PCT	Equivalent TEC	PCT area to be Impacted (ha)	TEC area to be impacted (ha)
PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	Weeping Myall Woodland	5.05	1.99 meets the Listing Advice for Weeping Myall Woodland TEC
PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion *Moderate to Good*	Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions	3.54	3.54
PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion *Moderate to Good*	Coolibah - Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions	1.19	1.19
PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion *Moderate to Good Natural Grassland*	Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD	237.41	237.41
PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	Nil	55.07	N/A
PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good – Derived Native Grassland*	Nil	87.87	N/A

NSW PCT	Equivalent TEC	PCT area to be Impacted (ha)	TEC area to be impacted (ha)
PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion *Moderate to Good*	Nil	0.04	N/A
PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	Nil	14.59	N/A
PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion *Moderate to Good*	Nil	3.57	N/A
PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion *Moderate to Good*	N/A	2.29	N/A
Total clearing (ha)		**410.62**	**244.13**

4.3.2. Threatened Species

Assessments of Significance following Significant Impact Criteria in the Significant Impact Guidelines (DoEE, 2013) were completed for a number of EPBC Act threatened fauna species as part of the BAR. These species were listed in the controlled action notification and included:

- Regent honeyeater (*Anthochaera phrygia*) - critically endangered under the EPBC Act
- Swift parrot (*Lathamus discolor*) - critically endangered under the EPBC Act
- Bluegrass (*Dichanthium setosum*) – vulnerable under the EPBC Act
- Belson's panic (*Homopholis belsonii*) – vulnerable under the EPBC Act
- *Tylophora linearis* – endangered under the EPBC Act
- Murray cod (*Maccullochella peelii*) – vulnerable under the EPBC Act
- Five-clawed worm skink (*Anomalopus mackayi*) - vulnerable under the EPBC Act
- Pink-tailed worm-lizard (*Aprasia parapulchella*) - vulnerable under the EPBC Act
- Border thick-tailed gecko (*Uvidicolus sphyrurus*) - vulnerable under the EPBC Act
- Squatter pigeon (*Geophaps scripta scripta*) - vulnerable under the EPBC Act
- Painted honeyeater (*Grantiella picta*) - vulnerable under the EPBC Act
- Large-eared pied bat (*Chalinolobus dwyeri*) - vulnerable under the EPBC Act
- Pilliga mouse (*Pseudomys pilligaensis*) - vulnerable under the EPBC Act
- Koala (*Phascolarctos cinereus*) combined populations of Qld, NSW and the ACT – vulnerable under the EPBC Act
- Grey-headed flying-fox (*Pteropus poliocephalus*) – vulnerable under the EPBC Act
- South-eastern long-eared bat (*Nyctophilus corbeni*) – vulnerable under the EPBC Act.

Assessments of Significance concluded that all of these species are unlikely to be significantly impacted by the proposed action. The assessment of significance for the koala concluded that the proposal is unlikely to result in a significant impact on an important population of the koala, however the DoEE has determined that the proposal is likely to result in a significant impact on the koala, and residual impacts will be offset (Umwelt, 2017b).

5. OFFSET INVESTIGATIONS

5.1. Requirements under the Major Projects Offsets Policy and Framework for Biodiversity Assessment

As identified in Chapter 3.2 the FBA provides guidance and criteria to assist proponents in determining offset sites that will satisfy the Major Projects Offsets Policy requirements. The objective is to ensure that the biodiversity values, such as PCTs and threatened species, being lost at an impact site are offset by improvements on land with the same or similar biodiversity values (i.e. like for like offsets). A summary of the FBA offset criteria that have supported the assessment of offset availability for the proposal are summarised in Table 5-1.

Table 5-1 Criteria used to identify potential like for like offsets

Offset Attribute	Offset Criteria (OEH, 2014b)
PCT	PCTs that meet the following criteria may be used for offsetting: 1. The same PCT for which the ecosystem credit is required (i.e. the impact PCT). 2. Any PCT of the same vegetation class as the impact PCT that has: • A percent cleared value that is equal to, or greater than the percent cleared of the impact PCT OR • A percent cleared value up to 10% lower than the impact PCT if the percent cleared of the impact PCT is less than or equal to 70%.
Interim Biogeographic Regionalisation for Australia (IBRA) Subregions	IBRA subregions that meet the following criteria can be used for offsetting purposes. 1. The IBRA subregion in which the impact will occur (i.e. the impact subregion) 2. The adjoining IBRA subregions within the same IBRA bioregion as the impact PCT 3. Any other IBRA subregions that immediately adjoin the impact subregion 4. Any other IBRA subregions that have the same geographic distribution of the threatened species assessed for ecosystem credits or species credits.
Species Credits	A required species credit must be offset with a species credit created for the same species, determined in accordance with the BBAM.

The offset criteria outlined in Table 5-1 have been used to assess offset availability for the proposal, and results are outlined in Chapter 5.3.

An analysis of the IBRA subregions that satisfy the FBA (being the impact IBRA subregions and adjacent subregions) has been undertaken and results are presented in Table 5-2. The proposal occurs within three IBRA subregions, namely Northern Basalts, Northern Outwash and Castlereagh-Barwon. These will be given priority for locating potential offset sites. There are a total of nine adjoining IBRA subregions that can also be considered when assessing potential offset availability (Table 5-2). The location of the proposal in relation to the location of impact and adjacent subregions is illustrated in Figure 5-1.

Table 5-2 IBRA subregions that satisfy the FBA offset rules

IBRA Bioregion	Impact IBRA Subregion/s	Adjoining IBRA Subregion/s
Brigalow Belt South	Northern Basalts	Nandewar Northern Complex Inverell Basalts Peel Kaputar Liverpool Plains
Brigalow Belt South	Northern Outwash	Liverpool Plains
Darling Riverine Plains	Castlereagh-Barwon	Pilliga Outwash Pilliga Bogan-Macquarie Moonie-Barwon Interfluve

A range of alternative PCTs to the impact PCTs that may also be considered for offsets are presented in Table 5-3. These PCTs meet the FBA offset rules presented in Table 5-1 in that:

- They are of the same vegetation class as the impact PCT
- They occur in the impact subregions or adjoining subregions identified in Table 5-2
- They have a percent clearing value that is equal to, or greater than the percent clearing for the impact PCT in the major catchment area (consistent with criteria outlined in Appendix A of the NSW Biodiversity Offsets Policy for Major Projects for achieving 'like for like' offset outcomes).

Roma
Kingaroy
Toowoomba
Stanthorpe
Moree
Inverell
Armidale
Tamworth
Dubbo
Nyngan
Cobar
Coonamble
Narrabri
Gunnedah
Muswellbrook
Newcastle
Sydney
Wollongong
Goulburn
Nowra
Canberra
Young
Griffith
Wagga Wagga
Parkes
Orange
Katoomba
Barringun
Thallon
Cunnamulla
Charleville
Augathella
Mitchell
Roma
Miles
Dalby
Chinchilla
Tara
Goondiwindi
Warialda
Glen Innes
Tenterfield
Walgett
Lightning Ridge
Bourke
Brewarrina
Collarenebri
Boggabilla
Mungindi
Coonabarabran
Gilgandra
Dunedoo
Mudgee
Scone
Singleton
Cessnock
Maitland
Newcastle
Gosford
Wyong
Katoomba
Blue Mountains National Park
Nattai National Park
Wollemi National Park
Yengo National Park
Parr Conservation Park
Putty State Forest
Barrington Tops National Park
Morton National Park
Monga National Park
Bondo State Forest
Kosciuszko National Park
Goobang National Park
Willandra National Park
Yathong Nature Reserve
Pilliga Nature Reserve
Goonoo State Forest
Bebo State Forest
Torrington Conservation Park
Culgoa Floodplain National Park
Culgoa National Park
Paroo River
Warrego River
Culgoa River
Balonne River
Maranoa River
Condamine River
Weir River
Macintyre River
Gwydir River
Moomin Creek
Namoi River
Castlereagh River
Macquarie River
Bogan River
Barwon River
Birrie River
Bokhara River
Lachlan River
Murrumbidgee River
Hunter River
Darling River
Billabong Creek
Mirrool Creek
Bland Creek
Lake George
Shoalhaven River
Cudgegong River
Yowah Creek
Nooroma Creek
Padua Park
284 m
217 m
250 m
306 m
198 m
1164 m
1342 m
1511 m
517 m
1502 m
1182 m
513 m
518 m
134 m
1232 m
1592 m
1595 m
1392 m
1915 m
NEW SOUTH WALES
Louth Plains
Boorindal Plains
Nebine Plains
Culgoa-Bokhara
Narrandool
Warrambool-Moonie
Moonie-Barwon Interfluve
Brewarrina
Castlereagh-Barwon
Northern Outwash
Northern Basalts
Nandewar Northern Complex
Inverell Basalts
Kaputar
Pilliga Outwash
Peel
Liverpool Plains
Pilliga
Bogan-Macquarie

Figure 5-1
IBRA Subregions for Offset Purposes

ARTC - 652520 - NSW Offset Advice

LEGEND

- Proposal Site
- Impacted Sub-Regions
- Neighbouring Sub-Regions

LOCATION DIAGRAM

amec foster wheeler

0 25 50
Kilometers

1:3,000,000

(A3) GCS GDA 1994

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
World Base Map Copyright © 2015 DeLorme

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

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Table 5-3 Impact and Alternative PCTs that may be considered for offsets

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
Semi-arid woodland (Grassy sub-formation)	Riverine Plain Woodlands	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	PCT26 (BR233, CW204, NA219, WE97) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
	Brigalow Clay Plain Woodlands	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion	PCT101 (BR189, NA185) Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion
	North-west Floodplain Woodlands	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	PCT37 (BR105, CW106, NA105, WE73) Black Box woodland wetland on NSW central and northern floodplains including the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
			PCT40 (BR131, CW126, NA130, WE76) Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains
			PCT55 (BR102, CW104, NA102, WE66) Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
			PCT87 (BR187, CW168, NA183, WE78) Poplar Box - Coolabah floodplain woodland on light clay soil mainly in the Darling Riverine Plains Bioregion
	North-west Alluvial Sand Woodlands	PCT71 (BR127, NA126, WE128) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian	PCT206 (BR138, CW132, NA136) Dirty Gum - White Cypress Pine tall woodland of alluvial sand (sand monkeys) in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
		soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion	PCT227 (BR208, CW189, NA203) Silver-leaved Ironbark - White Cypress Pine - Rough-barked Apple woodland on alluvial terraces in central-north NSW
			PCT428 (BR281, NA267) Carbeen - White Cypress Pine - Curracabah - White Box tall woodland on sand in the Narrabri - Warialda region of the Brigalow Belt South Bioregion
	Western Peneplain Woodlands	PCT135 (BR284, CW246, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion.	PCT72 (LA221, WE95) White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion
			PCT98 (BR188, CW170, LA250, NA184, WE137) Poplar Box - White Cypress Pine - Wilga - Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
			PCT103 (CW169, LA176, MR675, WE91) Poplar Box - Gum Coolabah - White Cypress Pine shrubby woodland mainly in the Cobar Peneplain Bioregion
			PCT105 (CW171, LA177, WE92) Poplar Box grassy woodland on flats mainly in the Cobar Peneplain Bioregion and Murray Darling Depression Bioregion
			PCT109 (CW173, WE93) Poplar Box - Mulga - Ironwood woodland on red loam soils on plains in the Cobar Peneplain Bioregion and north-eastern Mulga Lands Bioregion

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
			PCT145 (BR249, CW222, NA235, WE150) Western Rosewood - Wilga - Wild Orange - Belah low woodland of the Brigalow Belt South Bioregion and eastern Darling Riverine Plains Bioregion
Grasslands	Semi-arid Floodplain Grasslands	PCT52 (BR191, NA187, WE7) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	PCT43 (BR157, CW151, NA155, WE6) Mitchell Grass grassland - chenopod low open shrubland on floodplains in the semi-arid (hot) and arid zones
			PCT49 (BR251, CW223, NA236) Partly derived Windmill Grass - copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
			PCT50 (BR133, CW128, LA134, LM119, MR545, MU537, NA132, WE130) Couch Grass grassland wetland on river banks and floodplains of inland river systems
			PCT242 (BR192, CW174, LA179, LM141, MR590, MU565, NA188, WE139) Rats Tail Couch sod grassland wetland of inland floodplains
			PCT214 (BR167; CW161; NA168; WE134) Native Millet - Cup Grass grassland of the Darling Riverine Plains Bioregion
Grassy Woodlands	Floodplain Transition Woodlands	PCT56 (BR186, CW167, LA175, NA182, WE136) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	PCT70 (BR247, CW220, LA223, NA233, WE148) White Cypress Pine woodland on sandy loams in central NSW wheatbelt
			PCT76 (CW145, LA154, MR566, MU555) Western Grey Box tall grassy woodland on alluvial loam and clay soils

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
			in the NSW South Western Slopes and Riverina Bioregions
			PCT80 (LA153, MR565, MU554) Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
			PCT82 (CW144, LA152, MR564, WE96) Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
			PCT244 (BR190, CW172, LA178, NA186, WE138) Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)
			PCT248 (CW152, LA162) Mixed box eucalypt woodland on low sandy-loam rises on alluvial plains in central western NSW
			PCT628 (BR282; NA268) Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion
Forested Wetlands	Inland Riverine Forests	PCT78 (BR196, CW184, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	PCT36 (BR195, CW183, LA193, NA192, WE100) River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
			PCT112 (BR119, CW237, NA253) Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland of rich soil depressions in the Brigalow Belt South Bioregion
Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	PCT228 (BR257; CW232; NA242) Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW
			PCT318 (LA249; MR579; MU559) Mugga Ironbark - Tumbledown Red Gum - Red Box - Black Cypress Pine open forest on shallow stony soils on hills in the NSW South Western Slopes Bioregion
			PCT385 (CW314; NA382) Warrumbungle trachyte hillcrest Tumbledown Red Gum - Black Cypress Pine - White Bloodwood shrubby woodland
			PCT412 (CW319; NA392) White Box - Black Cypress Pine shrubby hill woodland in the east Pilliga - Mendooran - Gulgong regions, mainly Brigalow Belt South Bioregion
			PCT413 (BR346; NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
			PCT429 (BR393; NA407) White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion
			PCT435 (BR239; CW321; NA397) White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion
			PCT453 (BR373) Granite gorge Tumbledown Red Gum - White Cypress Pine - Oleander Wattle low open woodland in the Warialda region
			PCT527 (BR310) Mugga Ironbark - Black Cypress Pine shrubby open forest mainly in the Nandewar Bioregion and northern Brigalow Belt South Bioregion
			PCT549 (BR343) Silver-leaved Ironbark - Black Cypress Pine +/- White Box shrubby open forest mainly in the northern Nandewar Bioregion
			PCT564 (BR394, NA408) White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion
			PCT591 (BR392, NA401) White Box shrubby open forest on hills mainly in the Nandewar Bioregion

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
			PCT594 (BR349, NA349) Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
			PCT595 (BR347) Silver-leaved Ironbark - White Cypress Pine - tea tree shrubby woodland mainly in the northern Nandewar Bioregion
			PCT596 (BR374) Tumbledown Red Gum - White Cypress Pine - Silver-leaved Ironbark shrubby woodland mainly in the northern Nandewar Bioregion
			PCT597 (BR385, NA396) White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion
			PCT598 (BR345, NA347) Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion

5.2. Methodology Used to Identify Suitable Offset Sites

In accordance with the Major Projects Offsets Policy, the options presently available for the proposal to fulfil its offset requirements are:

- Retiring biodiversity credits – like for like offsets are secured and credits retired
- Contributing to supplementary measures, or
- Combination of the above.

Biodiversity credits are generated when a landholder agrees to enter a BioBanking agreement. BioBanking agreements provide security and certainty for offsets, as adequate funding for offset site management forms part of the agreements as well as stringent monitoring and reporting requirements to OEH.

The following steps were undertaken in order to find biodiversity credits for the PCTs and species requiring offsets for the proposal (refer Chapter 4).

Table 5-4 Process used to identify offset credits and like for like offsets for the proposal

Step	Actions
1. Check for available credits	The OEH biodiversity credits register was checked on 21 March 2017 to determine if ecosystem credits matching the proposal offset requirements have been issued and are available.
2. Check for expressions of interest	The OEH Biobank site expression of interest (EOI) register was checked on 21 March 2017 to determine if a landholder may have credits matching the proposal offset requirements, but have not yet issued those credits.
3. Identify potential like for like offset sites	A desktop analysis has been completed using the offset rules specified in Table 5-1 to identify potential like for like offset sites. Desktop analysis occurred during January 2017.
4. Put a request on the credits wanted list	A 'credits wanted' request will be prepared and submitted on the OEH credits wanted register for the approximate number and type of credits required for the proposal once these are confirmed with assessing agencies.
5. Test landholder interest	Post approval of the proposal contact will be made with shortlisted landholders to determine interest in entering into a BioBanking agreement and selling credits to ARTC.
6. Validate offset credits	Based on landholder interest ground-truth the potential offset site to validate the presence of ecosystem and/or species credit requirements and assess overall suitability as an offset. Shortlist preferred offset properties that will then be taken to the next level of assessment.

7. Investigate options for supplementary measures and estimate costs	The indicative cost of supplementary measures is estimated with similar credits already sold as part of the BioBanking scheme acting as a guide to pricing. Estimated offset delivery costs for the proposal are summarised in Chapter 5.3.4.

5.3. Biodiversity Offset Availability

The availability of ecosystem credits and potential like for like offset sites as identified by undertaking the actions described in Table 5-2 is discussed in the following sections.

5.3.1. Offset Register Availability

The BioBanking public register is established under section 127ZZ of the TSC Act. The public register covers:

- BioBanking agreements register
- Biobank site expressions of interest (EOI) register
- BioBanking statements register
- Biodiversity credits register
- Biodiversity credit transactions and sales register.

The biodiversity credits register was searched on 21 March 2017 for credits available for purchase that satisfy the proposal offset requirements. At present, there are no suitable ecosystem credits in the impact subregions or adjoining subregions (Table 5-2) available on the BioBanking credit register (Table 5-5). There are three registered koala credits that could meet most of the proposal's species credit requirements, but an additional area would need to be found.

Table 5-5 Results of Biobank credit register searches

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
Ecosystem Credits – Priority PCTs			
PCT27	BR233, NA219	No available credits in impact subregions.	No available credits state-wide.
PCT35	BR120, NA117	No available credits in impact subregions.	No available credits state-wide.
PCT39	BR130, NA129	No available credits in impact subregions.	No available credits state-wide.
PCT52	BR191, NA187	No available credits in impact subregions.	No available credits state-wide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
PCT56	BR186, NA182	No available credits in impact subregions.	No available credits state-wide.
PCT71	BR127, NA126	No available credits in impact subregions.	No available credits state-wide.
PCT78	BR196, NA193	No available credits in impact subregions.	No available credits state-wide.
PCT135	BR284, NA271	No available credits in impact subregions.	No available credits state-wide.
PCT413	BR346, NA348	No available credits in impact subregions.	No available credits state-wide.
Ecosystem credits – Alternative PCTs [Corresponding Impact PCT]			
PCT26 [PCT27]	BR233, CW204, NA219, WE97	No available credits in alternative subregions.	No available credits state-wide.
PCT101 [PCT35]	BR189, NA185	No available credits in alternative subregions.	No available credits state-wide.
PCT37 [PCT39]	BR105, CW106, NA105, WE73	No available credits in alternative subregions.	No available credits state-wide.
PCT40 [PCT39]	BR131, CW126, NA130, WE76	No available credits in alternative subregions.	No available credits state-wide.
PCT55 [PCT39]	BR102, CW104, NA102, WE66	No available credits in alternative subregions.	No available credits state-wide.
PCT87 [PCT39]	BR187, CW168, NA183, WE78	No available credits in alternative subregions.	No available credits state-wide.
PCT43 [PCT52]	BR157, CW151, NA155, WE6	No available credits in alternative subregions.	No available credits state-wide.
PCT49 [PCT52]	BR251, CW223, NA236	No available credits in alternative subregions.	No available credits state-wide.
PCT50 [PCT52]	BR133, CW128, LA134, LM119, MR545, MU537, NA132, WE130	No available credits in alternative subregions.	No available credits state-wide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
PCT242 [PCT52]	BR192, CW174, LA179, LM141, MR590, MU565, NA188, WE139	No available credits in alternative subregions.	No available credits state-wide.
PCT70 [PCT56]	BR247, CW220, LA223, NA233, WE148	No available credits in alternative subregions.	No available credits state-wide.
PCT76 [PCT56]	CW145, LA154, MR566, MU555	No available credits in alternative subregions.	No available credits state-wide.
PCT80 [PCT56]	LA153, MR565, MU554	No available credits in alternative subregions.	No available credits statewide.
PCT82 [PCT56]	CW144, LA152, MR564, WE96	No available credits in alternative subregions.	No available credits statewide.
PCT244 [PCT56]	BR190, CW172, LA178, NA186, WE138	No available credits in alternative subregions.	No available credits statewide.
PCT248 [PCT56]	CW152, LA162	No available credits in alternative subregions.	No available credits statewide.
PCT628 [PCT56]	BR282; NA268	No available credits in alternative subregions.	No available credits statewide.
PCT206 [PCT71]	BR138, CW132, NA136	No available credits in alternative subregions.	No available credits statewide.
PCT227 [PCT71]	BR208, CW189, NA203	No available credits in alternative subregions.	No available credits statewide.
PCT428 [PCT71]	BR281, NA267	No available credits in alternative subregions.	No available credits statewide.
PCT36 [PCT78]	BR195, CW183, LA193, NA192, WE100	No available credits in alternative subregions.	No available credits statewide.
PCT112 [PCT78]	BR119, CW237, NA253	No available credits in alternative subregions.	No available credits statewide.
PCT72 [PCT135]	LA221, WE95	No available credits in alternative subregions.	No available credits statewide.
PCT98 [PCT135]	BR188, CW170, LA250, NA184, WE137	No available credits in alternative subregions.	No available credits statewide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
PCT103 [PCT135]	CW169, LA176, MR675, WE91	No available credits in alternative subregions.	No available credits statewide.
PCT105 [PCT135]	CW171, LA177, WE92	No available credits in alternative subregions.	No available credits statewide.
PCT109 [PCT135]	CW173, WE93	No available credits in alternative subregions.	No available credits state-wide.
PCT145 [PCT135]	BR249, CW222, NA235, WE150	No available credits in alternative subregions.	No available credits state-wide.
PCT429 [PCT413]	BR393, NA407	No available credits in alternative subregions.	No available credits state-wide.
PCT435 [PCT413]	BR239, CW321, NA397	No available credits in alternative subregions.	No available credits state-wide.
PCT453 [PCT413]	BR373	No available credits in alternative subregions.	No available credits state-wide.
PCT527 [PCT413]	BR310	No available credits in alternative subregions.	No available credits state-wide.
PCT549 [PCT413]	BR343	No available credits in alternative subregions.	No available credits state-wide.
PCT564 [PCT413]	BR394, NA408	No available credits in alternative subregions.	No available credits state-wide.
PCT591 [PCT413]	BR392, NA401	No available credits in alternative subregions.	No available credits state-wide.
PCT594 [PCT413]	BR349, NA349	No available credits in alternative subregions.	No available credits state-wide.
PCT595 [PCT413]	BR347	No available credits in alternative subregions.	No available credits state-wide.
PCT596 [PCT413]	BR374	No available credits in alternative subregions.	No available credits state-wide.
PCT597 [PCT413]	BR385, NA396	No available credits in alternative subregions.	No available credits state-wide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
PCT598 [PCT413]	BR345, NA347	No available credits in alternative subregions.	No available credits state-wide.
Species Credits			
koala (*Phascolarctos cinereus*)	N/A	There are no species credits for the koala available in the impact subregions	There are no species credits for the koala available in any adjoining subregions. There are three credit registered areas for koalas state-wide available for use. All are classified with a credit status of "Issued" and have a combined credit number of 1,391. One is located within the Macleay Hastings - Northern Rivers subregion of Kempsey Shire LGA with 965 credits available for use. The second is located in the Cumberland – Hawkes Karuah Manning subregion of Great Lakes LGA with 109 credits available. The third is located in Cumberland - Hawkesbury/Nepean subregion of Wollondilly Shire LGA with 317 credits available. 1,632 koala credits are needed for the proposal. Therefore, there would still be a deficit of 241 credits.
finger panic grass (*Digitaria porrecta*)	N/A	There are no species credits for finger panic grass available in the impact subregions.	There are no species credits for finger panic grass available statewide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
creeping tick-trefoil (*Desmodium campylocaulon*)	N/A	There are no species credits for creeping tick-trefoil available in the impact subregions.	There are no species credits for creeping tick-trefoil available statewide.
Belson's panic (*Homopholis belsonii*)	N/A	There are no species credits for Belson's panic available in the impact subregions.	There are no species credits for Belson's panic available statewide.

5.3.2. Expressions of Interest

The Biobank EOI register provides details of potential Biobank sites that could generate biodiversity credits in the future. The EOI register was searched on 22 March 2017 for potential sites with ecosystem credits that would satisfy the proposal offset requirements (Table 5-6). Two EOI's have the potential to be located in an impact subregion which may contain areas of PCT71 and PCT78.

Table 5-6 Results of Biobank Credit Expressions of Interest Searches

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
Ecosystem credits – Impact/priority PCTs			
PCT27	BR233, NA219	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT35	BR120, NA117	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT39	BR130, NA129	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT52	BR191, NA187	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT56	BR186, NA182	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT71	BR127, NA126	There is currently one EOI for BR127* (Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt	There are currently no EOIs in adjoining subregions

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
		South Bioregion and Darling Riverine Plains Bioregion) within the Inverell Shire Council, Northeast Basalts IBRA sub-region. The total patch size comprises 25-100ha of potential ecosystem credits. Further information on the EOI site will need to be sought.	
PCT78	BR196, NA193	There is currently one EOI for NA193* (River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion) within the Narrabri Shire Council, Pilliga Outwash IBRA sub-region. The total site area comprises 2570 ha of potential ecosystem credits. Further information on the EOI site will need to be sought.	There are currently no EOIs in adjoining subregions
PCT135	BR284, NA271	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT413	BR346, NA348	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
Ecosystem credits – Alternative PCTs [Corresponding Impact PCT]			
PCT26 [PCT27]	BR233, CW204, NA219, WE97	There are currently no EOIs for the impact subregions.	There are currently no EOIs in adjoining subregions
PCT101 [PCT35]	BR189, NA185	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT37 [PCT39]	BR105, CW106, NA105, WE73	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT40 [PCT39]	BR131, CW126, NA130, WE76	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
PCT55 [PCT39]	BR102, CW104, NA102, WE66	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT87 [PCT39]	BR187, CW168, NA183, WE78	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT43 [PCT52]	BR157, CW151, NA155, WE6	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT49 [PCT52]	BR251, CW223, NA236	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT50 [PCT52]	BR133, CW128, LA134, LM119, MR545, MU537, NA132, WE130	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT242 [PCT52]	BR192, CW174, LA179, LM141, MR590, MU565, NA188, WE139	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT70 [PCT56]	BR247, CW220, LA223, NA233, WE148	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT76 [PCT56]	CW145, LA154, MR566, MU555	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT80 [PCT56]	LA153, MR565, MU554	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT82 [PCT56]	CW144, LA152, MR564, WE96	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT244 [PCT56]	BR190, CW172, LA178, NA186, WE138	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT248 [PCT56]	CW152, LA162	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
PCT628 [PCT56]	BR282, NA268	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT206 [PCT71]	BR138, CW132, NA136	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT227 [PCT71]	BR208, CW189, NA203	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT428 [PCT71]	BR281, NA267	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT36 [PCT78]	BR195, CW183, LA193, NA192, WE100	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT112 [PCT78]	BR119, CW237, NA253	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT72 [PCT135]	LA221, WE95	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT98 [PCT135]	BR188, CW170, LA250, NA184, WE137	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT103 [PCT135]	CW169, LA176, MR675, WE91	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT105 [PCT135]	CW171, LA177, WE92	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT109 [PCT135]	CW173, WE93	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT145 [PCT135]	BR249, CW222, NA235, WE150	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT429 [PCT413]	BR393, NA407	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT435 [PCT413]	BR239, CW321, NA397	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
PCT453 [PCT413]	BR373	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT527 [PCT413]	BR310	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT549 [PCT413]	BR343	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT564 [PCT413]	BR394, NA408	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT591 [PCT413]	BR392, NA401	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT594 [PCT413]	BR349, NA349	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT595 [PCT413]	BR347	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT596 [PCT413]	BR374	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT597 [PCT413]	BR385, NA396	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
PCT598 [PCT413]	BR345, NA347	There are currently no EOIs for the alternative subregions.	There are currently no EOIs in adjoining subregions
Species credits			
koala	N/A	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions. However, under FBA an offset site can be used in a different subregion if it occurs in the species known distribution. There are currently 14 EOIs for the koala statewide located within Burragorang (Part A), Coffs Coast & Escarpment, Cumberland – Hawkesbury/Nepean,

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
			Illawarra, Karuah Manning, Macleay Hastings – Northern Rivers, Peel – Namoi, Richmond-Tweed (Part B), Sydney Cataract – Sydney Metro and Upper Hunter IBRA sub-regions, providing 4,116.2 ha of potential ecosystem credits.
finger panic grass	N/A	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
creeping tick-trefoil	N/A	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
Belson's panic	N/A	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.

5.3.3. Desktop Analysis

To assess availability of potential offset sites (other than those registered through OEH databases) a spatial analysis of OEH's Vegetation Information System (VIS) database and mapping was undertaken. Based on the latest PCT mapping available for the impact and adjacent subregions, spatial analysis identified the extent of each impact PCT or suitable alternative PCT. It should be noted there are some limitations with the spatial analysis; PCT mapping was unavailable for a number of adjacent subregions in the north-west, there may also be a level of inaccuracy in the PCT mapping therefore future steps will include field validation and an evaluation of landholder interest.

The spatial extent of each impact PCT and alternative PCTs is presented in figures in Appendix A.

The results of the spatial analysis using NSW State Type Vegetation Mapping (STVM) indicate that there are mapped areas of each impact PCT (except for PCT52) within at least one of the impact subregions (Table 5-7; Appendix A). Based on the results of desktop analysis there are sufficient areas of impact or alternative PCTs that could be used for offsets within impact and/or adjoining subregions. PCT135 was found to be restricted in its availability, with only 1ha mapped in the impact subregion of Northern Basalts and 36ha mapped in adjoining subregions. PCT52 did not have any mapped areas occurring in any impact or adjoining subregions. Throughout most of NSW native grasslands have been extensively cleared or modified, and now mainly occur as small remnants, thereby making them difficult to map. In 2010 a study was commissioned to map areas of native grassland in the Namoi Catchment that are likely to be remnants of the EPBC-listed grassland (associated with PCT52) using a combination of extensive field validation, existing vegetation mapping, historic information from Parish and Portion plans, and various spatial layers. It was found that about 8,900 hectares remain out of a probable pre-European extent of about 183,000 hectares in the Namoi Catchment. This mapping will be used to support offset identification in the next phase.

As a priority offsets should be located within the impact subregions as far as practical. Should this not be possible, the adjoining subregions with the greatest mapped areas and ability to co-locate PCTs should be considered as a priority, given their proximity to the proposal site and associated impacts.

Table 5-7 Area (ha) of Impact PCTs in each impact subregion and adjoining subregion.

Impact PCT	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT27	5,038	8,631	43,623	36,991	166	16	1,833	99	938	108	-	-
PCT35	5,735	4,521	564	-	-	-	25	-	16	10,770	-	-
PCT39	63	7,395	169,884	9,294	-	-	73	-	-	650	-	-
PCT52	-	-	-	-	-	-	-	-	-	-	-	-
PCT56	1,988	8,677	80,704	16,508	-	-	7	3	520	2,066	-	-
PCT71	1	1	1,862	-	-	-	-	-	-	-	-	-
PCT78	2,772	252	719	32	5	334	6,651	3,838	4,261	1,404	-	2,368
PCT135	1	-	-	34	-	-	-	-	2	-	-	-
PCT413	3,310	8	-	-	-	-	-	336	-	-	-	-

Table 5-8 Area (ha) of Alternative PCTs in each impact subregion and adjoining subregion

Alternative PCT [Associated Impact PCT]	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT26 [PCT27]	-	-	-	17	-	-	-	-	-	-	-	-
PCT101 [PCT35]	5	-	1	-	-	-	16,372	723	7	2,472	-	-
PCT37 [PCT39]	-	-	167,808	114,494	-	-	-	-	-	1,080	-	-
PCT40 [PCT39]	-	484	216,325	32,854	-	-	-	-	-	48	-	-
PCT55 [PCT39]	4,650	29,123	40,507	5,645	-	13	313	5	1,330	3,755	-	-
PCT87 [PCT39]	-	112	5,953	76	-	-	-	-	-	17	-	-
PCT43 [PCT52]	-	9	4,862	2,941	-	-	7	-	-	-	-	-
PCT49 [PCT52]	-	-	287,854	266,569	-	-	-	-	17,123	69	-	-

PCT242 [PCT52]	-	-	6,667	7,017	-	-	-	-	-	-	-	-
PCT70 [PCT56]	-	-	18,643	11,621	-	-	-	-	2,305	20	-	-
PCT76 [PCT56]	-	-	253	3,168	-	-	-	-	513	-	-	-
PCT80 [PCT56]	-	-	-	286	-	-	-	-	97	-	-	-
PCT82 [PCT56]	-	-	-	9,059	-	-	-	-	1,379	-	-	-
PCT244 [PCT56]	3,430	166	54,775	86,905	3	-	-	304	3,432	1,403	-	583
PCT248 [PCT56]	-	-	2,960	4,972	-	-	-	-	549	-	-	-
PCT628 [PCT56]	-	-	287	-	-	-	-	-	-	-	-	-
PCT206 [PCT71]	-	-	10,790	30	-	-	-	-	373	3,611	-	-
PCT227 [PCT71]	1	-	8	-	-	-	-	-	46	-	-	-
PCT428 [PCT71]	250	-	-	-	-	-	12	-	-	-	-	-

PCT36 [PCT78]	3,021	5,452	41,187	40,349	-	-	-	5	2,746	392	1	125
PCT112 [PCT78]	708	3	-	-	121	487	1,309	3,334	-	-	-	165
PCT72 [PCT135]	-	-	-	213	-	-	-	-	-	-	-	-
PCT98 [PCT135]	80	33	42,522	36,511	-	-	-	-	417	7	-	-
PCT103 [PCT135]	-	-	-	0.35	-	-	-	-	-	-	-	-
PCT105 [PCT135]	-	-	-	41	-	-	-	-	-	-	-	-
PCT109 [PCT135]	-	-	-	34	-	-	-	-	-	-	-	-
PCT145 [PCT135]	669	589	66,310	53,223	4	1	236	87	287	1,166	-	19
PCT429 [PCT413]	740	-	-	-	-	-	-	302	-	-	-	-
PCT435 [PCT413]	13	-		-	-	-	10,570	3,412	8,055	7	-	-
PCT453 [PCT413]	360	-	-	-	469	-	-	-	-	-	-	-

PCT527 [PCT413]	187	-	-	-	260	-	-	-	-	-	-	73
PCT549 [PCT413]	382	-	-	-	998	-	-	-	-	-	-	934
PCT564 [PCT413]	178	-	-	-	358	-	-	3,638	-	-	-	57
PCT591 [PCT413]	144	-	-	-	-	17,589	1,557	63,635	-	-	-	-
PCT594 [PCT413]	6,821	-	-	-	349	2,280	2,929	54,055	-	-	-	21,896
PCT595 [PCT413]	1,784	-	-	-	32							31,259
PCT596 [PCT413]	574	-	-	-	1,252							55,667
PCT597 [PCT413]	27,797	13	-	-	9,728	2,061	1,293	23,354	2	-	-	279
PCT598 [PCT413]	3,210	-	-	-	289	72	149	25,777				977

Table 5-9 Koala habitat impact PCT area (ha) in each impact subregion and adjoining subregion.

Koala Habitat (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT39	63	7,395	169,884	9,294	-	-	73	-	-	650	-	-
PCT78	2,772	252	719	32	5	334	6,651	3,838	4,261	1,404	-	2,368
PCT56	1,988	8,677	80,704	16,508	-	-	7	3	520	2,066	-	-
TOTAL	4,823	16,324	251,307	25,834	5	334	6,731	3,841	4,781	4,120	-	2,368
Grand Total												**320,468**

Table 5-10 Finger panic grass habitat in impact and alternative PCT area (ha) in each impact subregion and adjoining subregion.

Finger panic grass (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT27	5,038	8,631	43,623	36,991	166	16	1,833	99	938	108	-	-
PCT35	5,735	4,521	564	-	-	-	25	-	16	10,770	-	-

Finger panic grass (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT39	63	7,395	169,884	9,294	-	-	73	-	-	650	-	-
PCT52	-	-	-	-	-	-	-	-	-	-	-	-
PCT56	1,988	8,677	80,704	16,508	-	-	7	3	520	2,066	-	-
PCT135	1	-	-	34	-	-	-	-	2	-	-	-
TOTAL	12,825	29,224	294,775	62,827	166	16	1,938	102	1,476	13,594	-	-
Grand Total												**416,943**

Table 5-11 **Creeping tick-trefoil habitat impact PCT area (ha) in each impact subregion and adjoining subregion.**

Creeping tick-trefoil (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT27	5,038	8,631	43,623	36,991	166	16	1,833	99	938	108	-	-
PCT35	5,735	4,521	564	-	-	-	25	-	16	10,770	-	-

Creeping tick-trefoil (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT39	63	7,395	169,884	9,294	-	-	73	-	-	650	-	-
PCT52	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	10,836	20,547	214,071	46,285	166	16	1,931	99	954	11,528	-	-
Grand Total												**306,433**

Table 5-12 **Belson's panic habitat impact PCT area (ha) in each impact subregion and adjoining subregion.**

Belson's panic (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT27	5,038	8,631	43,623	36,991	166	16	1,833	99	938	108	-	-
PCT35	5,735	4,521	564	-	-	-	25	-	16	10,770	-	-
PCT52	-	-	-	-	-	-	-	-	-	-	-	-
PCT56	1,988	8,677	80,704	16,508	-	-	7	3	520	2,066	-	-

Belson's panic (Associated PCT)	Area (ha) – Impact Subregions			Area (ha) – Adjoining Subregions								
	Northern Basalts	Northern Outwash	Castlereagh-Barwon	Bogan-Macquarie	Inverell Basalts	Kaputar	Liverpool Plains	Peel	Pilliga	Pilliga Outwash	Moonie-Barwon Interfluve	Nandewar Northern Complex
PCT71	1	1	1,862	-	-	-	-	-	-	-	-	-
PCT135	1	-	-	34	-	-	-	-	2	-	-	-
TOTAL	12,763	21,830	126,753	53,533	166	16	1,865	102	1,474	12,944	-	-
Grand Total												**231,446**

5.3.4. Supplementary Measures

Under the Major Projects Offsets Policy, a proponent may use supplementary measures which are defined as: *another measure undertaken as part of the BOS that is likely to lead to improvements in biodiversity or other environmental values that are not on an offset site*. The policy states that proponents can provide funds for supplementary measures when offsets are not available and requires that supplementary measures be of an equivalent cost to the provision of offsets.

A search of the OEH biodiversity credits register for the impacted PCTs (performed in March 2017) indicated there were no suitable credits available for purchase. Subsequently, an evaluation of all available offset transactions listed in the OEH biodiversity credits register for 2015 and 2016 has been completed to support determination of the cost to provide ecosystem and species credits.

The estimated cost has been calculated using the average range of price per credit of all available transactions per year and averaged between years to determine the current market for estimated costs of providing offsets for unavoidable impacts.

5.3.5. Ecosystem Supplementary Measures

To support a quantification of what the extent of funds may be required for supplementary measures, an evaluation of costs associated with approved biodiversity offsets was undertaken. There was a total of 102 available transactions for analysis. The costs for offsets in years 2015-2016 was calculated at an average of $10,554 per ecosystem credit and ranged from $1,451 - $24,482 per ecosystem credit. Costs include landholder payments and ongoing management payments. The transactions were from a variety of subregions predominantly in urban areas such as Cumberland-Sydney Metro, coastal regions such as Jervis and Bateman or resource focused areas such as Upper Hunter. Due to the location of these transactions the calculated costs are likely to be inflated compared to the proposals impact and adjacent subregions. Results of the cost analysis for each impact PCT and required ecosystem credits are shown in Table 5-13.

Table 5-13 Estimated offset delivery costs for ecosystem credits

Impact PCT	Proposal Credits Required	Minimum Cost Range ($)	Maximum Cost Range ($)	Average Total Cost ($)
PCT27	254	368,554	6,218,428	3,292,491
PCT35	250	362,750	6,120,500	3,241,625
PCT39	63	91,413	1,542,366	816,889.50
PCT52	11,046	16,027,746	270,428,172	143,227.96
PCT56	3,386	4,913,086	82,896,052	43,904,569
PCT56 (Derived Natural Grassland)	2,917	4,232,567	71,413,994	37,823,280.50
PCT71	2	2,902	48,964	25,933
PCT78	675	979,425	16,525,350	8,752,387.50

Impact PCT	Proposal Credits Required	Minimum Cost Range ($)	Maximum Cost Range ($)	Average Total Cost ($)
PCT135	133	192,983	3,256,106	1,724,544.50
PCT413	100	145,100	2,448,200	1,296,650

5.3.6. Species Supplementary Measures

There was a total of nine available transactions for analysis. The average cost for years 2015-2016 was calculated at a rate of $2,410.70 per species credit with a range of $5.50 - $7,750.00 per species credit. Due to the location of these transactions being in coastal regions of NSW the calculated costs are likely to be inflated compared to the proposals impact and adjacent subregions. The impacted PCTs and some alternate PCTs provide suitable habitat for the threatened species required to be offset. It is therefore proposed the species credits will be offset as a component of the PCT offset areas, therefore there should be no additional costs to delivering ecosystem offset areas.

Table 5-14 Estimated offset deliver costs for species credits

Impact Species	Credits Required	Minimum Range Cost ($)	Maximum Range Cost ($)	Average Total Cost ($)
koala	1,632	8,976	12,648,000	6,328,488
finger panic grass	364	2,002	2,821,000	1,411,501
creeping tick-trefoil	2,607	14,338.50	20,204,250	10,109,294.25
Belson's panic	1,898	10,439	14,709,500	7,359,969.50

6. CONCLUSION

This report has assessed the proposal's ecosystem and species offset requirements and estimated the availability of offsets in accordance with the NSW Major Projects Offset Policy and FBA.

The BAR has identified nine PCTs (PCT27, PCT35, PCT39, PCT52, PCT56, PCT71, PCT78, PCT135, PCT413) across 10 condition classes, three listed flora species (finger panic grass, creeping tick-trefoil, Belson's panic) and one fauna species (koala) as requiring biodiversity offsets as a result of the proposal. Under the EPBC Act assessments it was identified there are two MNES required to be offset being; the Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland TEC and the koala. The TEC will be offset as part of offsetting PCT52 and habitat for the koala will be offset as part of offsetting PCT39, PCT78 and PCT56 and koala species credit requirements.

In total 18,826 ecosystem credits (across nine PCTs) and 6,501 species credits (koalas, finger panic grass, creeping tick-trefoil and Belson's panic) need to be retired for the proposal. It is proposed the retirement of ecosystem credits associated with the native vegetation communities occurring in the proposal site also incorporates the required species credits.

Analysis has been undertaken using desktop information to identify the availability of these offset requirements. A range of sources were investigated including the OEH biodiversity credits register, EOI register and desktop spatial analysis using available PCT mapping. The assessment identified that there are no existing registered suitable ecosystem credits or flora species credits occurring in the impact subregions or adjacent subregions. There are two EOI's located in an impact subregion that may contain areas of impact PCT71 and PCT78. These EOI will be explored further in the next stage for their suitability. For koala species credits there are three existing credit registered offset areas, and 14 EOI within NSW. It is likely there would be adequate koala credits available to meet the proposal's requirements. Under the FBA proponents are permitted to offset for a threatened species within other subregions that are within the known geographic distribution of the threatened species impacted.

In order to assess offset availability more broadly, a spatial analysis of OEH's VIS database and mapping was undertaken. Desktop analysis found that for the majority of impact PCTs there are adequate areas mapped within the impact subregions and adjoining subregions to meet the proposal's offset requirements. For impact PCT52 Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains various data sources will be used in the next phase to identify potential offset areas given the extent of clearing in the region. The community is over 75% cleared in the Border Rivers/Gwydir and Namoi catchment areas, due to historical clearing for agriculture, cropping and changes to hydrology in these regions. Due to finer scale ground-truthing for the proposal vegetation surveys have confirmed the presence of this ecological community within the disturbance footprint. PCT135 Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion has only 1ha mapped within an impact subregion and 36ha mapped in adjoining subregions. Therefore offsets for these PCTs may need to use alternate PCTs.

Due to a lack of suitable registered offsets for ecosystem and flora species credits ARTC will need to investigate sourcing their own offset sites and register BioBanking agreements with landowners. A preference will be for land-based offsets that are strategically located in the impact or adjacent subregions, where a number of PCTs and species habitats can be co-located, and 'like for like' conservation outcomes are achieved.

The analysis suggests there is ample opportunity to identify potential offsets for impact PCTs within either an impact subregion or adjoining subregion as summarised in Table 6-1. The two PCTs with more limited availability are PCT52 and PCT135. PCT 135 has smaller credit requirements, however PCT52 requires larger areas. Therefore, further investigation into the occurrence of PCT52 and alternative PCTs will be undertaken in the next stage.

Table 6-1 Summary of area (ha) of impact PCTs in each impact subregion and adjoining subregion

Offset Value	Development Impact Area (ha)	Offset Avail. Impact Subregions (ha)	Offset Avail. Adjoining Subregions (ha)	Comments
Impact PCTs				
PCT27 (BR233, NA219)	5.05	57,292	40,151	Scattered patches of PCT27 are mapped in the impact and adjoining subregions. Very little alternative PCTs are mapped.
PCT35 (BR120, NA117)	3.54	10,820	10,812	The most of PCT35 patches are in the northern areas of the proposal. Alternative PCTs are mapped to the south of the proposal in adjoining subregions.
PCT39 (BR130, NA129)	1.19	177,342	10,017	There are substantial areas of PCT39 mapped to the west of the proposal in the impact subregions. There are also large areas of alternative PCTs mapped to the west and south-west.
PCT52 (BR191, NA187)	237.41	tbd	tbd	There are no mapped areas of PCT52 in the impact or adjoining subregions using NSW vegetation mapping. Other data sources including native grassland mapping in the Namoi Catchment will be used to support identification of available offset areas. There are large areas of alternative PCTs mapped to the south-west of the proposal in impact and adjoining subregions north of Dubbo.
PCT56 (BR186, NA182)	142.94	91,369	19,103	Areas of PCT56 are mapped in proximity to the proposal and north of proposal. Larger areas of alternative PCTs are mapped to the south-west of the proposal, west of Dubbo.
PCT71 (BR127, NA126, WE128)	0.04	1,864	0	Only small areas of PCT71 are mapped to the west of the proposal. There is also limited alternative PCTs available south-west of the proposal around Coonamble.
PCT78 (BR196, CW184, NA193)	14.59	3,743	18,893	Areas of PCT78 are mapped along rivers and drainage lines to the east of the proposal in impact and adjacent subregions. Alternative PCTs are also mapped to the west of the proposal restricted to rivers and drainage lines.
PCT135	3.57	1	36	Very small areas of PCT135 occur in the impact or adjoining subregions. Larger areas of alternative

Offset Value	Development Impact Area (ha)	Offset Avail. Impact Subregions (ha)	Offset Avail. Adjoining Subregions (ha)	Comments
(BR284, CW246, NA271)				PCTs are mapped to the west of the proposal north-east of Nyngan and around Coonamble.
PCT413 (BR346, NA348)	2.29	3,318	336	Only minor areas of PCT413 are mapped to the east of the proposal. However there is greater availability of alternative PCTs to the east in adjoining subregions west of Inverell and north-east of Tamworth.

The next steps will be to:

- Confirm the ecosystem credits and species credits required to be offset with relevant agencies through finalisation of the approval process and detailed design.
- A 'credits wanted' request will be prepared and submitted on the OEH credits wanted register for the approximate number and type of credits required for the proposal.
- Develop a shortlist of preferred offset properties based on desktop analysis. Preference would be properties that contain a number of the required PCTs, suitable habitats for those species required to be offset and are located in the impact or adjacent subregions and are strategically located.
- Undertake landholder engagement and field surveys to validate the presence of the biodiversity offset values, management actions required and overall suitability of the site.
- Based on the results of preliminary field surveys and landholder discussions, final offset sites would be selected. These sites would then be assessed by an accredited BioBanker and the number and type of biodiversity credits that can be generated would be finalised.

- Within 12 months of commencement of construction, ARTC would prepare a Biodiversity Offset Strategy (BOS) Phase 3 for approval. This report would include:
    i. Details of the final offset sites
    ii. Ecosystem credits and species credits created at an offset site
    iii. Credit profiles for ecosystem credits and species credits at the offset site
    iv. Identification of any ecosystem and species credits that are proposed to be converted to a supplementary measure
    v. A summary of biodiversity offset measures and how these match to credit requirements created by the development site
    vi. A management plan detailing management actions and the vegetation zones to which they will apply in accordance with BBAM Section 12.9.

7. REFERENCES

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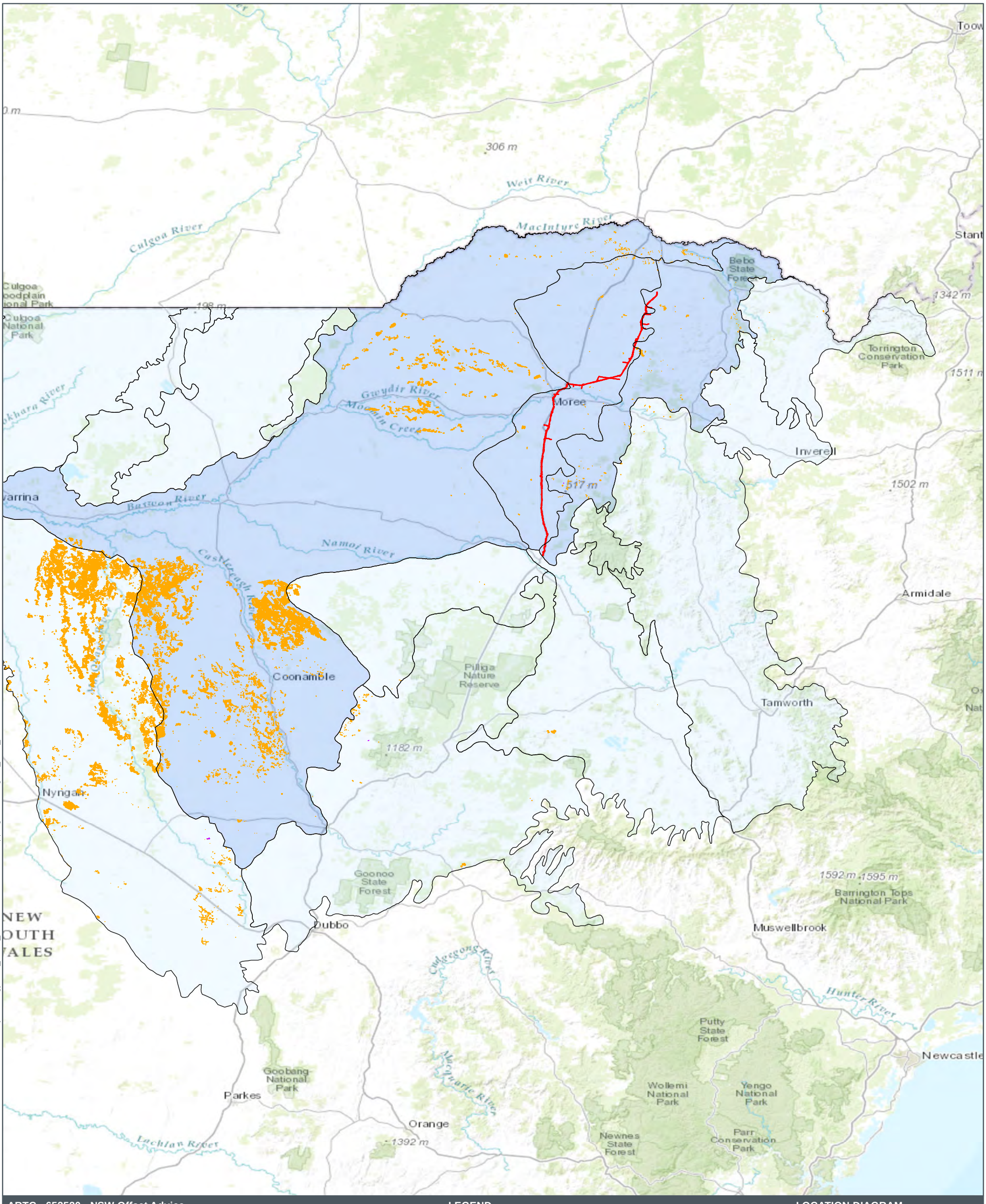
APPENDIX A – MAPPING OF PCT DISTRIBUTION IN THE IMPACT AND ADJOINING SUBREGIONS



ARTC - 652520 - NSW Offset Advice

PCT135

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
World Base Map Copyright © 2015 DeLorme

LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

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Kilometers

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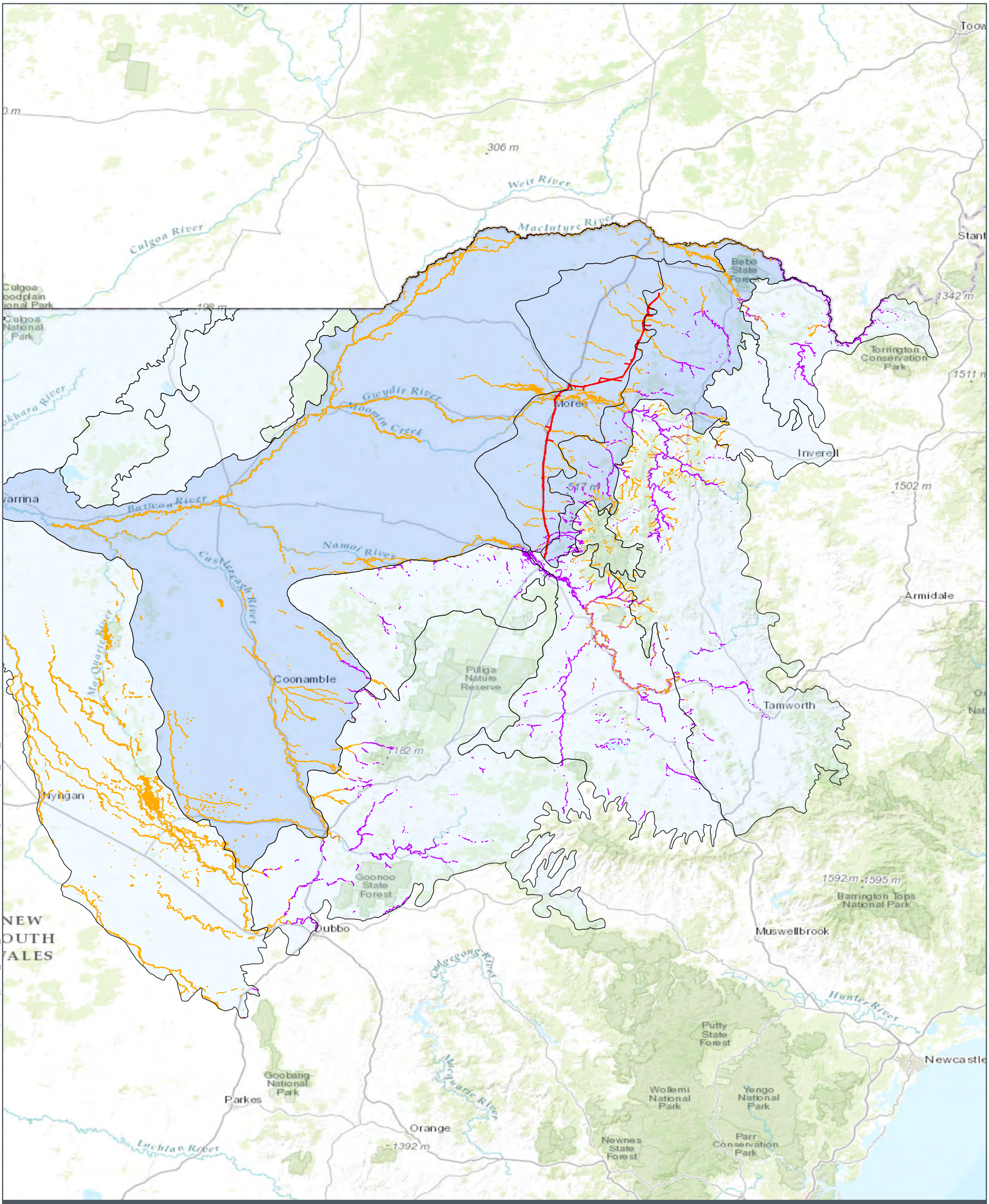
LOCATION DIAGRAM

Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS_NSW_Parkes to Narromine\Mapping\N2NSW\Figure_PCT_RevA.mxd



ARTC - 652520 - NSW Offset Advice

PCT78

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
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LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

amec foster wheeler

0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

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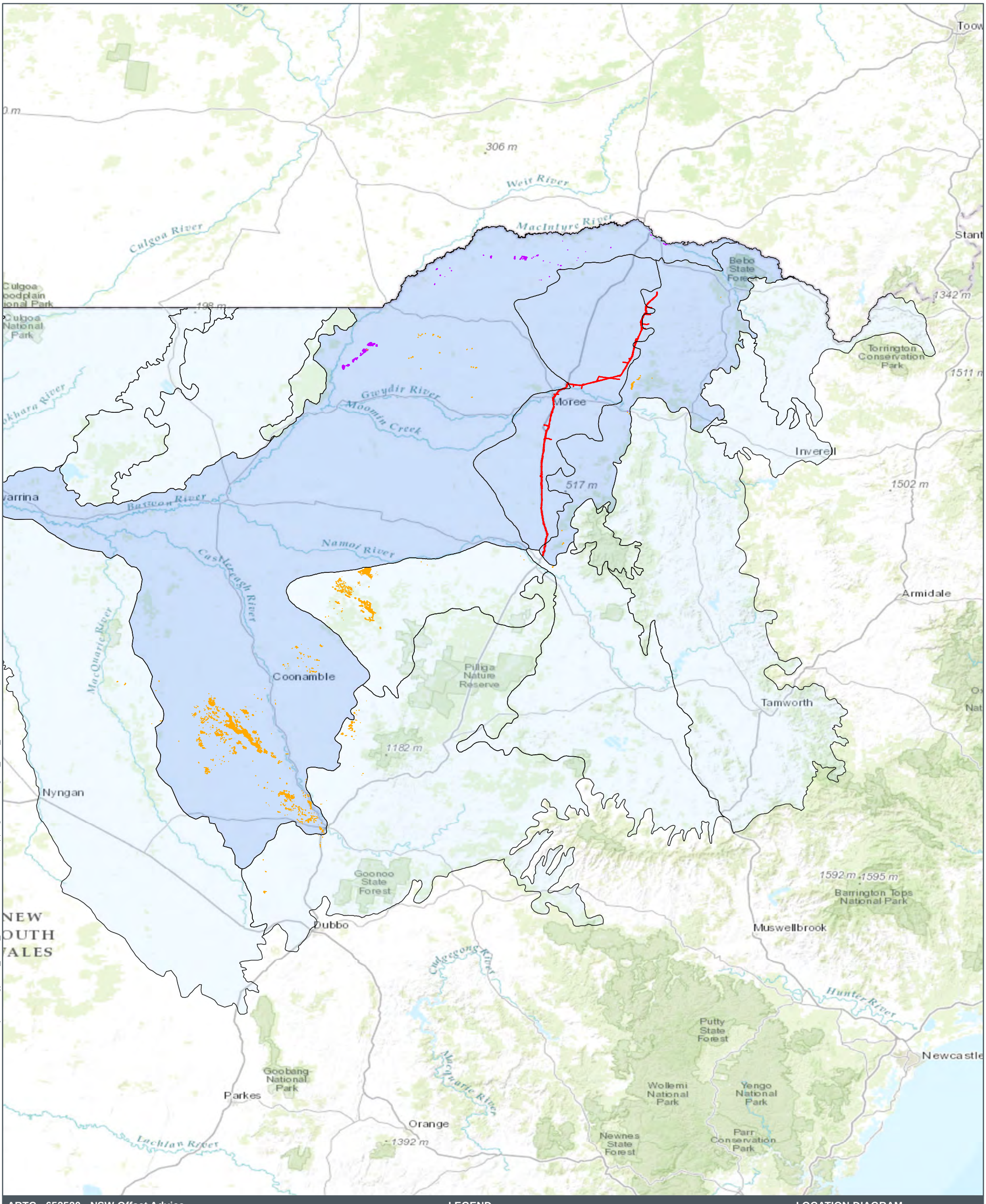

ARTC - 652520 - NSW Offset Advice

PCT71

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
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LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

amec foster wheeler

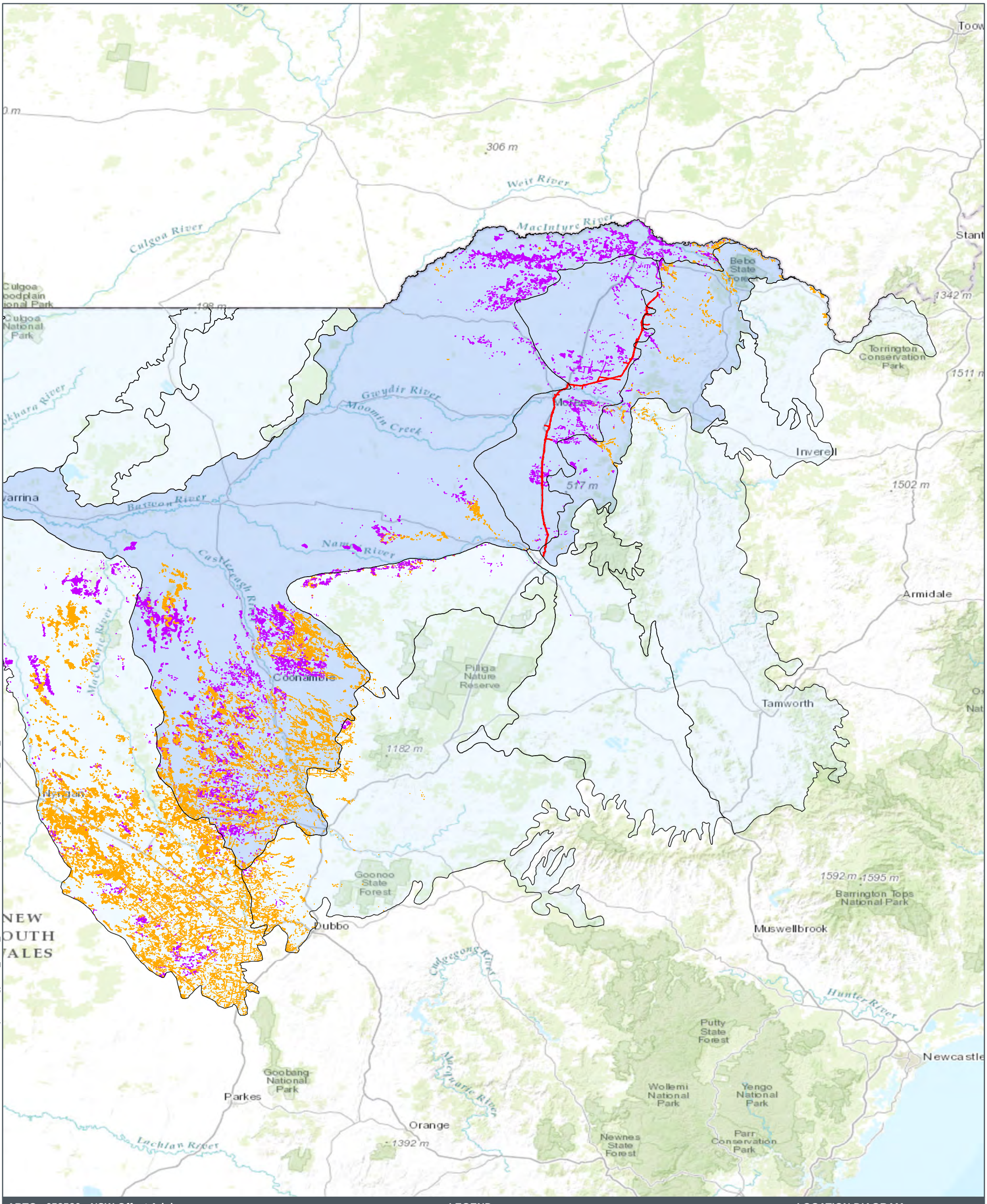
0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS_NSW_Parkes to Narromine\Mapping\N2NS\Figure_PCT_RevA.mxd



ARTC - 652520 - NSW Offset Advice

PCT56

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
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LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

amec foster wheeler

0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
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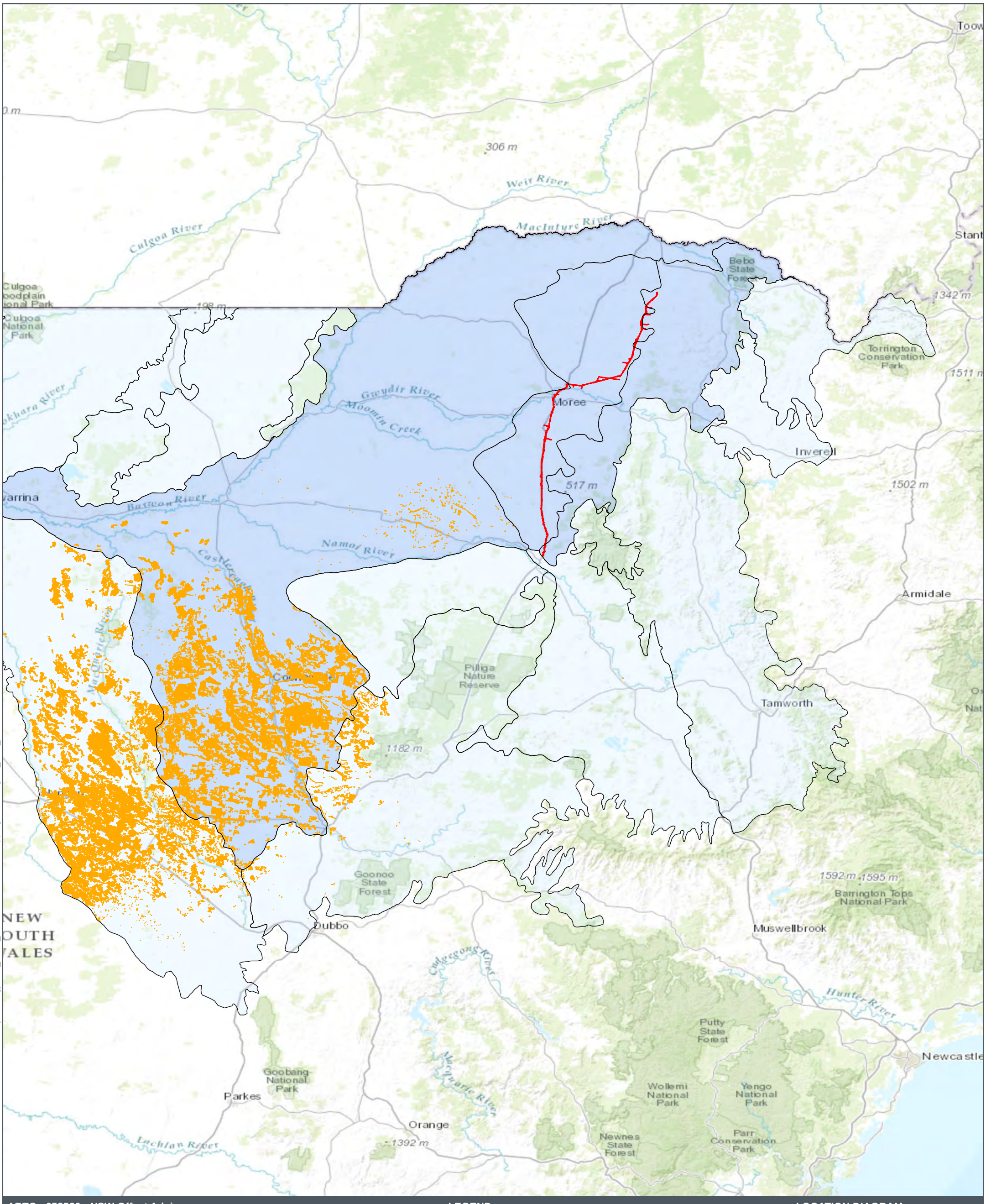
Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS_NSW_Parkes to Narromine\Mapping\N2NSIFigure_PCT_RevA.mxd



ARTC - 652520 - NSW Offset Advice

PCT52

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
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LEGEND

- Proposal Site
- Impacted PCT Value (Nil in Data)
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
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amec foster wheeler

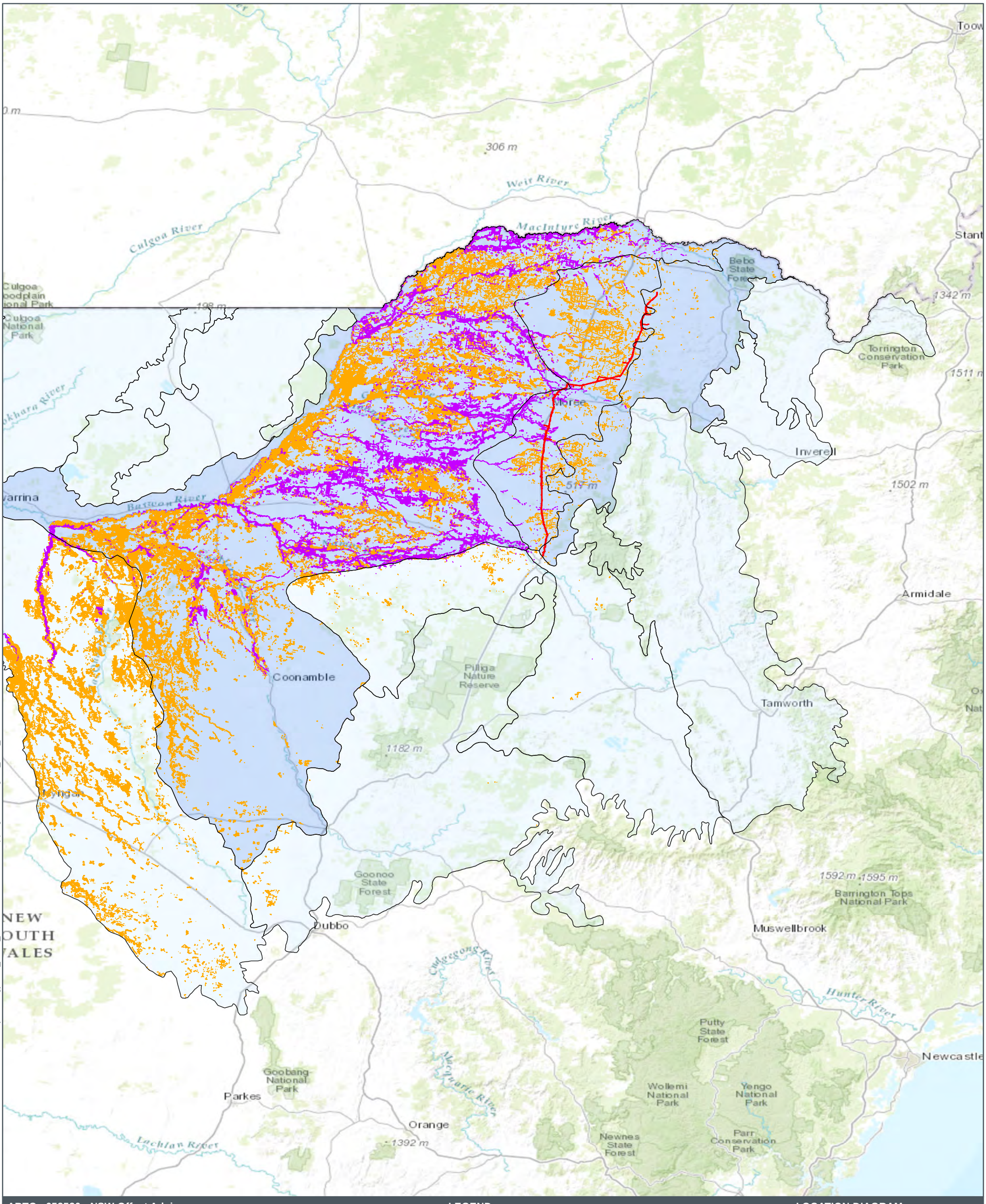
0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS\GIS_NSW_Parkes to Narromine\Mapping\N2NSI\Figure_PCT_RevA.mxd



ARTC - 652520 - NSW Offset Advice

PCT39

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
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LEGEND

- Proposal Site
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- Alternate PCT Values
- Impacted Sub-Region
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ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

amec foster wheeler

0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

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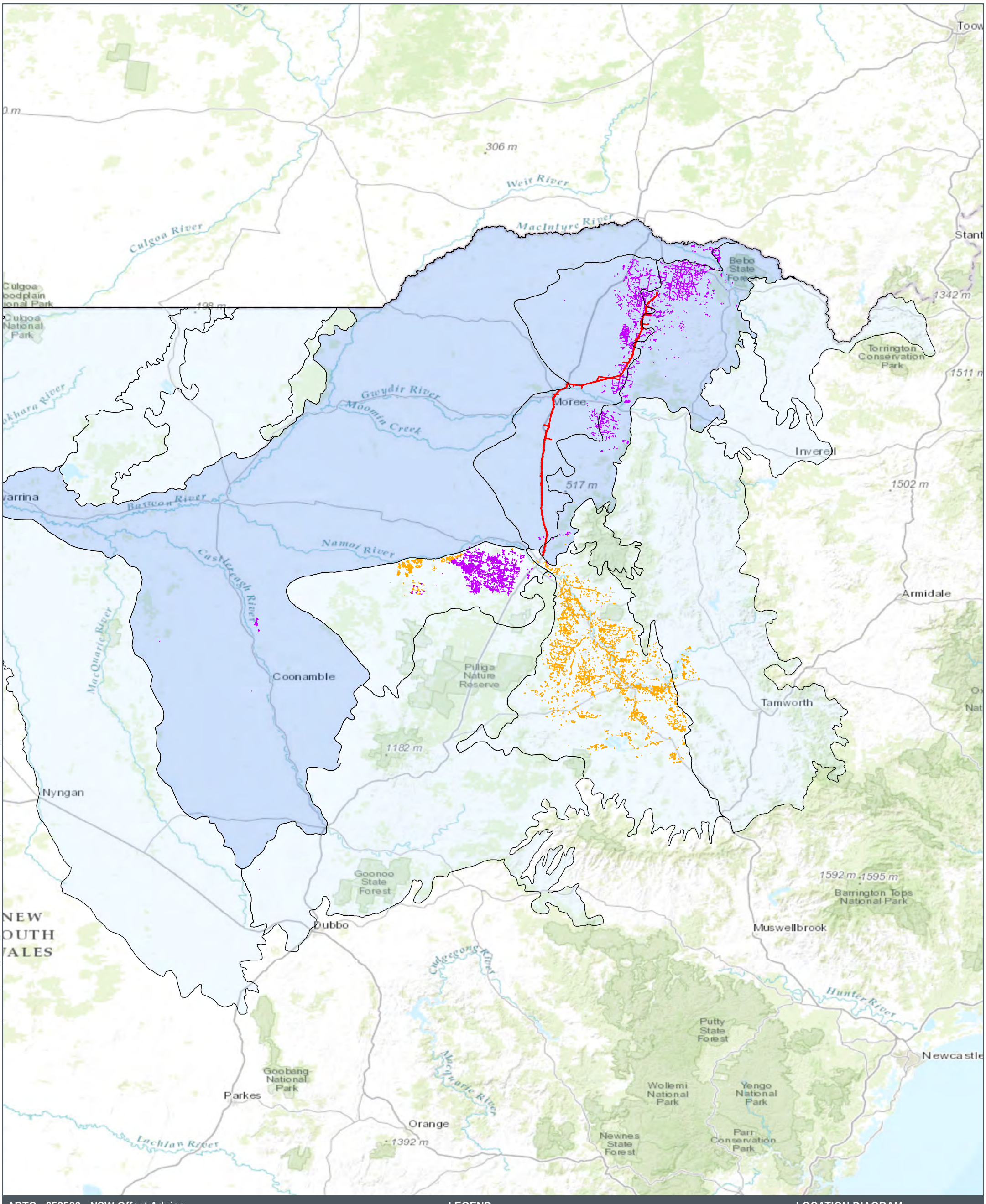

ARTC - 652520 - NSW Offset Advice

PCT35

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
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LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

amec foster wheeler

0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS_NSW_Parkes to Narromine\Mapping\N2NSWFigure_PCT_RevA.mxd

ARTC - 652520 - NSW Offset Advice

PCT27

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
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ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

amec foster wheeler

0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

LOCATION DIAGRAM

Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS_NSW_Parkes to Narromine\Mapping\N2NSIFigure_PCT_RevA.mxd

Culgoa River
MacIntyre River
Weir River
Culgoa National Park
Culgoa Floodplain National Park
Bebo State Forest
Torrington Conservation Park
Gwydir River
Moomin Creek
Moree
Inverell
Barwon River
Namoi River
Castlereagh River
MacQuarie River
Coonamble
Pilliga Nature Reserve
Armidale
Nyngan
Goonoo State Forest
Dubbo
Barrington Tops National Park
Muswellbrook
Culgoa River
Hunter River
Putty State Forest
Newcastle
Goobang National Park
Parkes
Orange
Lachlan River
Wollemi National Park
Yengo National Park
Newnes State Forest
Parr Conservation Park
306 m
198 m
1342 m
1511 m
517 m
1502 m
1592 m
1595 m
1392 m

ARTC - 652520 - NSW Offset Advice

PCT413

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
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LEGEND

- Proposal Site
- Impacted PCT Value
- Alternate PCT Values
- Impacted Sub-Region
- Neighbouring Sub-Region

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
24/03/2017	MG	BE	BE	A	Issued for Review

amec foster wheeler

0 25 50
Kilometers

1:2,000,000

(A3) GCS GDA 1994

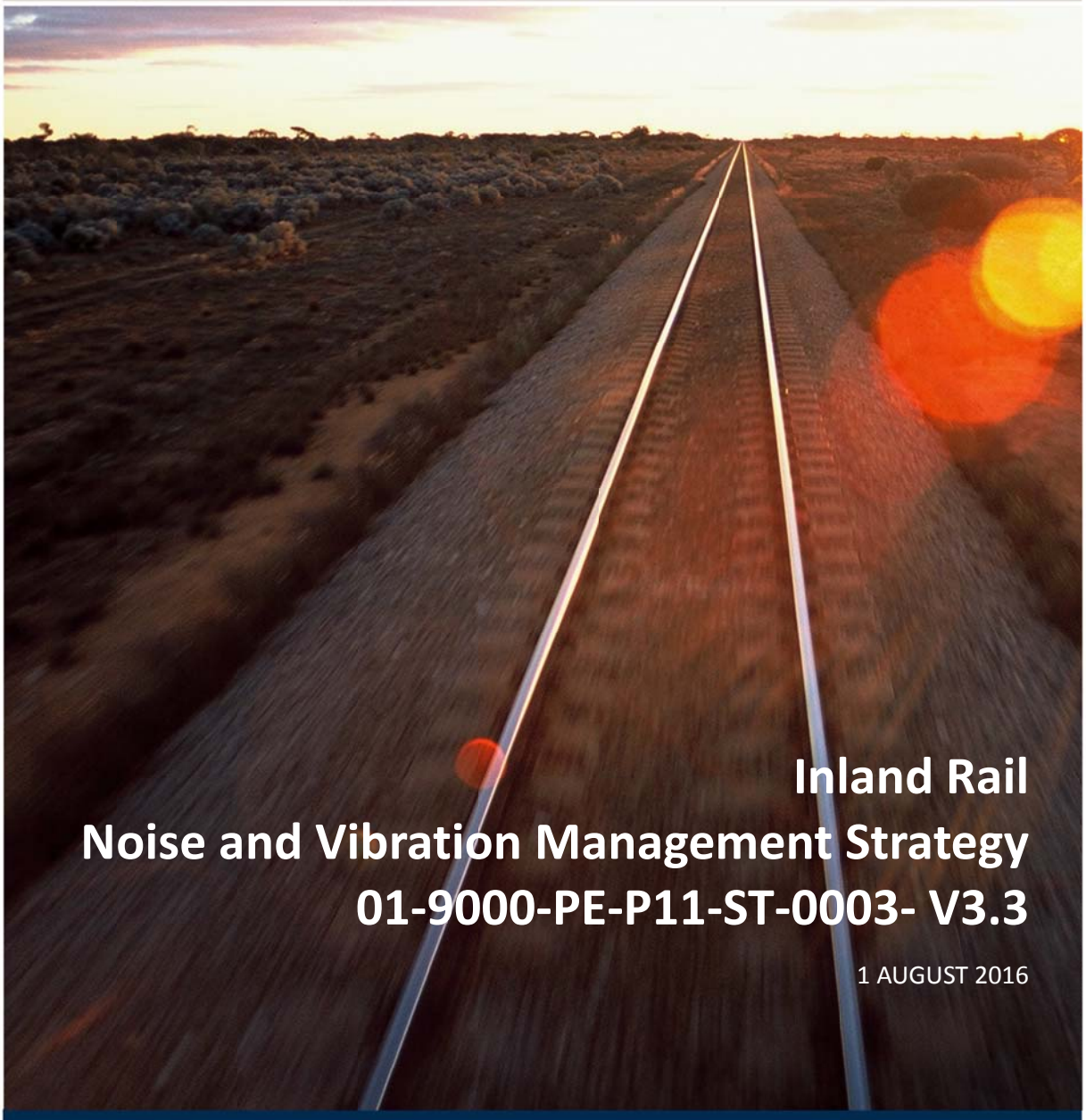
LOCATION DIAGRAM

Path: W:\BD\01 Opportunities_Mktg\00000 ARCHIVE\802780EI - ARTC - Inland Rail Biodiversity Strategy\GIS_NSW_Parkes to Narromine\Mapping\N2NSIFigure_PCT_RevA.mxd

Appendix M – Inland Rail Noise and Vibration Strategy

ARTC InlandRail

The Australian Government's priority freight rail project



Inland Rail
Noise and Vibration Management Strategy
01-9000-PE-P11-ST-0003- V3.3

1 AUGUST 2016

Document Control

Client:	Australian Rail Track Corporation
Project:	Inland Rail
Document title:	Noise and Vibration Management Strategy
Date issued:	1 August 2016
Revision:	3.3
Prepared by:	Susan Kay
Purpose:	To guide noise and vibration management during construction and operation of Inland Rail
Endorsed by:	Geoff Hudson
Approved by:	Inland Rail Executive
Date approved:	4 May 2016 (Rev.3.1)
Issued to:	Geoff Hudson, Environment Manager Inland Rail
Filename:	Noise Strategy_V3.3
Status:	Approved
Further work:	

Revision history

REVISION	DATE ISSUED	TO	DESCRIPTION
1.0	29/09/15	Geoff Hudson, Stuart Ross	First draft for review
2.0	14/10/15	Geoff Hudson	Revised draft incorporating Stuart Ross comments

3.0	06/04/16	Stuart Ross, Geoff Hudson	Final version for approval
3.1	07/04/16	Inland Rail Executive	Final version for approval incorporating RING scenario updates
3.2	4/06/16	Inland Rail Executive	Revision according to style guide
3.3	06/07/16	Inland Rail Executive	Incorporating QLD Transport and Main Roads (TMR) comments

CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

The Inland Rail programme will complete the backbone of the national rail freight network between Melbourne and Brisbane through regional Victoria, New South Wales and Queensland. The Programme will deliver freight out of the congested Sydney network, saving approximately ten hours of travelling time. Trains travelling on this new, more direct route will travel at up to 115 kilometres per hour and use significantly less fuel.

The 1,700 kilometre route leverages the earlier investment in the Australian rail freight network following the existing interstate line from Melbourne to Illabo. The route then uses a combination of capacity improvements, major track upgrades and new track through Parkes, Moree, North Star, Oakey, Toowoomba, Gatton and Rosewood.

The construction and operation of the Programme has potential to impact the amenity of adjacent noise sensitive receivers. Rail operations, rail infrastructure maintenance and construction generate noise that can have an adverse effect on people living alongside railway lines. Noise can disturb sleep, affect speech intelligibility and cause annoyance.

The purpose of this document is to guide the management of noise and vibration for the Inland Rail programme in line with the Australian Rail Track Corporation's (ARTC) existing management practices and relevant state legislation.

2. BACKGROUND AND OBJECTIVES

2.1. Objective

Provide a noise and vibration strategy for the Programme to guide assessment and construction of new and upgraded infrastructure and the operation of the completed route.

The strategy:

- Incorporates existing legislation, licences and state guidelines.
- Incorporates relevant environmental strategies detailed in the Inland Rail Environmental Strategy[1].
- Aims for consistency in the management of noise and vibration between states as specified in Section 5.2.3 Inland Rail Environmental Strategy. A consistent strategy, will simplify the assessment process and operation of the Programme, while treating all noise sensitive receivers adjacent to Inland Rail equitably, regardless of what state they are located in.
- Integrates with existing ARTC policies and procedures.

2.2. Preliminary Environmental Risk Assessment – Environmental Strategy

The Preliminary Environmental Risk Assessment (PERA) for the Inland Rail programme identified noise and vibration as an 'environmental indicator that poses greatest environmental risk'. Specifically, the following noise management strategies were identified in the PERA:

- Implement applicable state policy and noise levels for each state jurisdiction.
- Manage noise impacts through appropriate rail alignment design and location of signals, passing loops and passing lanes in consultation with design engineers.

[1] Melbourne to Brisbane Inland Rail Environmental Strategy, November 2014 Parsons Brinkerhoff

- Investigate expanding the Rail Noise Abatement Program (RNAP) across all state jurisdictions and include measures to manage noise impacts to sensitive receivers from rail traffic increases which are exempt from the New South Wales Rail Infrastructure Guideline (RING).
- Manage noise complaints through liaison with rail operators to address operator specific noise complaints.
- Investigate and consider opportunities for noise control at the source to manage operational noise through engagement with federal and state governments and rail operators, possibly over time to mitigate future noise impacts (2036 and beyond).

These strategies have been incorporated into this document, either directly or through existing ARTC processes (e.g. complaint handling and liaison with operators).

3. NOISE AND VIBRATION LEGISLATION AND GUIDELINES

Noise and vibration generated by construction and maintenance activities is generally well covered by state guidelines, policies and/or legislation. Operational noise and vibration generated by new rail infrastructure projects or existing railways is less regulated. Section 3.1 gives a state based overview of legislation relating to operational rail noise. Section 3.2 summarises noise and vibration state guidelines relevant to the construction and operation of the Inland Rail programme.

3.1. Operational rail noise

3.1.1. Queensland

The *Queensland Environment Protection Act 1994* Schedule 1 Part 1 excludes 'noise from the ordinary use of a busway, light rail or rail transport infrastructure' from the definition of environmental nuisance. However, the Environment Protection Act, 1994 requires the Inland Rail to meet a general environmental duty to undertake all reasonable and practicable measures to prevent or minimise environmental harm. The *Environment Protection (Noise) Policy 2008*, Acoustic Quality Objectives do not apply to activities listed in Schedule 1 Part 1 of the Queensland Environment Protection Act (i.e. noise from rail transport infrastructure)..

3.1.2. New South Wales

In New South Wales, ARTC holds an Environment Protection Licence (EPL) for railway systems activities under the *Protection of the Environment Operations Act 1997*. The EPL contains requirements for operational noise (Conditions L2, L2.1), maintenance and construction noise (Condition O4). EPL 3142 is available at www.epa.nsw.gov.au. Noise management in New South Wales will therefore be guided by ARTC's EPL.

3.1.3. Victoria

The *Victorian Environment Protection Act 1970* states that 'objectionable noise' is an offence (Part 8, Section 48), and the State Environmental Protection Policy (SEPP) 'Control of noise from Commerce Industry and Trade' regulates operational noise associated with fixed infrastructure sites including stations, maintenance facilities and stabling yards. No specific requirements exist for the operation of a railway.

3.2. State guidelines summary

Existing relevant state guidelines and licences are listed in Table 1.

Table 1 Relevant state requirements

TYPE OF NOISE	QUEENSLAND	NEW SOUTH WALES	VICTORIA
Operation *operation of the existing network*	NA[2]	New South Wales Environment Protection Licence 3142	NA
Construction *construction of new rail infrastructure*	Transport Noise Management Code of Practice Volume 2 – Construction Noise and Vibration[3]	Interim Construction Noise Guideline New South Wales Environment Protection Licence 3142	Noise Control Guidelines
Maintenance *maintenance or renewal of rail infrastructure*	NA	Interim Construction Noise Guideline New South Wales Environment Protection Licence 3142	Noise Control Guidelines
New rail infrastructure *operation of rail infrastructure projects*	NA	New South Wales Rail Infrastructure Noise Guideline	NA
Fixed infrastructure[4]	Queensland Environmental Protection (Noise Policy) Schedule 1 – Acoustic Quality Objectives	New South Wales Industrial Noise Policy	State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 (SEPP N-1)
New developments adjacent to existing railways	State Development Assessment Provisions (SDAP) Module 1 for Community Amenity	Development Near Rail Corridors and Busy Roads – Interim Guideline 2008	NA
Vibration			
New rail infrastructure	Assessing Vibration: a technical guideline[5]	Assessing Vibration: a technical guideline	NA

[2] The Queensland Rail Code of Practice – Railway Noise Management, Queensland Rail 2012 is no longer in force.
[3] Applies where a Compliance Management Plan is sought under 477G of Transport Infrastructure Act.
[4] Applies to non-train noise from fixed infrastructure (e.g. tunnel ventilation or maintenance activities from a yard). It does not apply to level crossing bells.

TYPE OF NOISE	QUEENSLAND	NEW SOUTH WALES	VICTORIA
operation of rail infrastructure projects			
Construction *construction of new rail infrastructure*	Transport Noise Management Code of Practice Volume 2 – Construction Noise and Vibration [6]	Assessing Vibration: a technical guideline	NA
Maintenance *maintenance or renewal of rail infrastructure*	NA	Assessing Vibration: a technical guideline	NA

3.3. Voluntary programs

ARTC have developed an RNAP for existing sections of track that have experienced significant growth in rail traffic. The aim of the program is to provide noise abatement to residents acutely affected by rail noise in a fair and sustainable way. This program is available anywhere on the ARTC network that has experienced significant growth in rail traffic and where a funding mechanism exists. The RNAP framework is included in Appendix A.

4. NOISE MANAGEMENT

4.1. Construction noise and vibration

Construction noise and vibration arising from the upgrading of existing sections of track and related infrastructure as well as establishment of new track in greenfield locations will be guided by the relevant state guidelines and licences listed in Table 1 Relevant state requirements.

In the absence of construction vibration guidance in Victoria the British Standards[7] should be used. Potential for structural damage should be assessed using British Standard 5228-2:2009 or German Standard DIN 4150-3:1999.

4.1.1. Blasting

When determining the criteria for human comfort/structural damage for airblast overpressure, consult Australian Standard AS2187.2:2006 and ANZEC *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration 1990*. There may also be other state based requirements (e.g. Queensland EPA Section 440ZB or New South Wales EPL 3142).

[5] As referenced in Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure
[6] Applies where a Compliance Management Plan is sought under 477G of Transport Infrastructure Act.
[7] British Standards BS 5228-2:2009 or BS 6472-1:2008 – whichever is deemed most relevant

4.2. Operational noise and vibration from new rail infrastructure

4.2.1. Noise

New South Wales is currently the only state on the Inland Rail route that has a guideline for noise from new freight rail infrastructure projects. The Programme will adopt the New South Wales noise and vibration requirements detailed in the RING for both Queensland and Victoria. The use of a consistent approach across the states aligns with the Inland Rail Environmental Strategy and provides the Programme with certainty around the assessment process.

RING was published in 2013 and takes a project based approach to assessment of noise and vibration. RING states:

> A key objective [of the guideline] is to identify impacts from additional traffic on redeveloped rail lines, and to minimise noise exposure levels from new rail line developments or significant redevelopment of existing rail lines.

The guideline contains noise "trigger levels" and where these are likely to be exceeded, a noise impact assessment must demonstrate feasible and reasonable mitigation measures that have been considered to reduce noise down towards these trigger levels. RING can be accessed at http://www.epa.nsw.gov.au/resources/noise/20130018eparing.pdf

RING includes various appendices which address New South Wales specific requirements beyond assessment of new rail infrastructure. Specifically appendices 1, 2, 3 and 9 are not relevant outside of New South Wales, and will not be used in the assessment of the Programme Rail in Queensland or Victoria.

Application of RING

Table 2 lists activities that may be undertaken as part of the Inland Rail programme and whether it is considered rail infrastructure works in the context of RING. In order for an activity to be considered rail infrastructure works it needs to have:

- A direct capacity or speed/operational related consequence.
- Result in the track being moved closer to residential/noise sensitive properties.

Table 2 Application of RING

ACTIVITY	RING REDEVELOPMENT	RING – NEW	RING – NA
New track – brownfield	X		
New signals on existing track	X		
Passing loops, signals, relief lines, sidings	X		
Re-opening existing lines	X		
Straightening curves	X		
Turnouts/crossovers	X		
Significant realignment outside of the existing corridor		X	

ACTIVITY	RING REDEVELOPMENT	RING – NEW	RING – NA
New track – greenfield		X	
Bridge repairs or upgrades[8]			X
Traffic increases (no infrastructure works)			X
Upgrading/construction of overbridges/underbridges			X
Lifting of temporary speed restrictions			X
Track reconditioning			X
Upgrade of level crossing from passive to active			X
Noise from tunnel fans or other fixed infrastructure			X

RING also includes requirements for ground-borne rail noise, relevant in cases such as tunnels.

It should be noted that while RING may not apply to certain works listed in Table 2, it may not preclude the requirement to undertake a noise assessment. For example, the *New South Wales Environmental Planning and Assessment Act 1979* requires the determining authority to 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity' This requirement applies regardless of the relevance of RING.

Section 2 of RING states that the noise triggers levels should be evaluated at two points in time; 1) immediately after operations commence and, 2) for a design year (typically 10 years). The Inland Rail programme is made up of number of individual brownfield and greenfield projects, each with their own planning conditions. Until all of these individual projects are complete, the Programme cannot operate as intended.

This means that completion of a single brownfield project will have minimal impact on train numbers and train speeds in the years immediately after completion, until the remaining brownfield and greenfield works are complete in 2025. However, project conditions are provided for each of the individual projects along the route of the Programme and therefore the impacts of both the individual project in isolation and its contribution to the overall Inland Rail programme need to be assessed against the RING trigger levels. Consequently the following three assessment timeframes must be evaluated as applicable, for both the build and no build scenarios:

1. Project: the individual project to which the planning conditions apply
    - no build project and build project.

[8] Not resulting in a direct increase in capacity

2. Through connection: the estimated time at which through connection between Brisbane and Melbourne is anticipated
    - no build through connection and build through connection within the project footprint.
3. Design year (e.g. 2040): a future scenario that reflects the normal operation of the Inland Rail programme
    - no build design year and build design year within the project footprint.

4.2.2. Vibration

Vibration associated with new rail infrastructure works should be assessed under the relevant state guideline (see Table 1), or the Standards listed in Section 4.1 of this document.

4.3. Operational noise and vibration from fixed infrastructure

RING only provides assessment criteria for train noise. In some locations on the Inland Rail route noise sources, such as exhaust fans for tunnel ventilation, will be introduced which are not train noise and are not specified in RING. These types of noise sources are considered to be fixed infrastructure and should be assessed in accordance with the relevant state guidelines specified in Table 1.

4.4. Cumulative impacts

New infrastructure works are not proposed along the entirety of the Inland Rail route. Consequently there will be areas on the route that do not require a noise or vibration assessment despite being exposed to increased rail movements as a result of projects on other parts of the alignment.

ARTC has developed a RNAP to address this issue. This is a voluntary program available to areas of the network that meet the following requirements:

1. Experienced significant growth in train movements.
2. Have a funding mechanism.

Eligibility of individual residents is assessed in accordance with the RNAP framework contained in Appendix A. The RNAP program applies once significant growth has occurred and is not available to residents until operations have commenced. If a RNAP is applied to the Programme it will need to be considered in the context of other acutely affected receivers on the greater ARTC network.

4.5. Operation of completed Inland Rail route

Operation and maintenance of the completed network will be undertaken in accordance with ARTC's current policies, licences and Environmental Management System (EMS). No Inland Rail specific operational noise or vibration requirements, such as those arising from approval conditions, should be committed to without consulting the ARTC Environment Manager.

4.6. Noise abatement

The Inland Rail programme will provide feasible and reasonable noise abatement to residents meeting the triggers for new or upgraded rail infrastructure (RING, 2013) or the eligibility criteria in RNAP.

For rail infrastructure projects it is important that all noise reducing design measures are in place before assessment of abatement occurs. Incorporating design measures upfront may reduce the number of receivers triggering the relevant criteria and remove the requirement to consider noise abatement at all, minimising assessment time and cost.

Measures for reducing noise and vibration impacts from railway operations follow three main control strategies: reducing noise and vibration at the source, in transmission to the receiver and at the receiver. As a track manager ARTC has focussed on reducing noise in transmission to the receiver and at the receiver (i.e. noise walls and architectural treatments to dwellings), however these control strategies should be considered in a hierarchical way so that source controls which reduce noise for a large number of receivers are exhausted before more localised mitigation measures are considered. Table 3 lists considerations when determining if noise abatement is reasonable. Feasibility generally relates to engineering constraints and has not been considered in the table below.

Inland Rail will involve raised track on viaducts and tunnels which may require the use of alternative measures. These will be determined on a case by case basis, however the following considerations may still apply.

Table 3 Noise abatement considerations

STAGE	CONSIDERATION
Report review	Is the noise criteria actually triggered? Do the results make sense? If unsure undertake additional monitoring or engage a peer review.
	Are receivers correctly identified? In RING, 'residential' includes locations with long term residents, such as caravan parks, but may also include hotels or commercial dwellings with a residential component. Document all determinations on property status.
	Identify ARTC's preferred mitigation measures before discussing eligibility for abatement with residents.
Reasonable assessment (general)	New dwellings or proposed developments that have been identified for abatement should be considered in accordance with the relevant state guideline (see Table 1).
	Is the cost reasonable? This should be considered in the context of overall project cost and spending on other similarly affected residents.
	Does the ambient noise environment (e.g. road traffic) mask rail related impacts? Will abatement of rail noise change the receiver's overall noise levels?
	Is the noise reduction to be achieved reasonable? A minimum of 5dB(A) should be achieved (internal or external).
	Are mitigation measures proposed achievable by ARTC? ARTC do not operate rolling stock and commitments around rolling stock modifications or regulation of rolling stock (e.g. removing noisy rolling stock from the network) should not be made.
	Is the exceedance of criteria audible? 1dBA or less exceedances should be treated with caution.
	Community views must be considered in determining what is reasonable.
	If a receiver does not want the recommended abatement measure and an inferior abatement measure is agreed to (e.g. shorter wall), the resident must be made aware of the consequences in terms of resulting noise impact and sign a written agreement stating that they accept and understand the revised offer of abatement.

STAGE	CONSIDERATION
	Avoid triggering receivers for consideration of noise abatement by incorporating noise reducing elements into the design of the project e.g. speed changes, signal locations, track alignment.
Reasonable assessment (noise walls)	The potential for noise reflection, noise emergence, visual impacts and shading from noise walls must be assessed.
	Are the noise wall heights proposed able to be constructed? For example Hebel (aerated concrete) comes in 600 millimetre heights and therefore walls of 2.5 metres are not constructible from this material without additional expense.
	Are noise wall heights from the ground height or rail height?
	How accurate is the survey data used in the noise model, is it ground terrain survey data or LIDAR (less accurate) data?
	How will drainage of water away from the track be achieved without leaving gaps in the wall?
	Ensure the acoustic consultant includes suggestions for noise wall materials, including any absorptive panels.
	All walls must be painted to enable graffiti to be covered and to reduce any visual/structural impacts.
	Consideration of maintenance expenses.
Reasonable assessment (architectural treatment)	Can internal noise levels be reduced noticeably by architectural treatments? Weatherboard dwellings (without wall insulation) have very poor noise attenuation properties and upgrading windows and doors will not improve the internal noise environment.
	In regional areas architectural treatments may not be reasonable due to cost and lack of local expertise.
	Contractual arrangements whereby the resident maintains the relationship with the builder should be investigated to avoid deeds with individual property owners.
	Cash payments in lieu of architectural treatments are not appropriate.
	Consider use of fresh air ventilation or ceiling fans instead of air conditioning.
	Consider custom treatments based on property features and required noise reductions rather than a generic/standard set of treatments.
	Where feasible undertake baseline internal noise monitoring prior to implementing the treatments to demonstrate effectiveness.

5. NOISE ASSESSMENT INPUTS FOR NEW RAIL INFRASTRUCTURE PROJECTS

The inputs to operational noise assessments/models are central to the quality and consistency of the output. The inputs specified in Table 4 will need to be standardised and consistent for all Inland Rail noise models.

Table 4 Noise assessment inputs

INPUT	CONSIDERATION
Train horns and crossing bells	Need to be considered in the assessment9. They are generally only relevant where the project increases the use of safety warning devices or changes the location in which they are used.
Noise sensitive receivers	All noise sensitive receivers should be considered in the assessment, however only some are eligible for noise abatement under RING. The status of each noise affected property should be determined in the assessment.
Project area	The project area needs to be clearly defined and justified, either by the construction footprint or other means (e.g. signal to signal) prior to the assessment commencing.
Site specific characteristics	The noise assessment should consider site specific issues such as idling and bunching/stretching, particularly if the project is changing or increasing any of these impacts. Penalties for fixed-nose turnouts and tight radius curves should be included in the assessment where relevant.
Terrain	Where available, site specific survey data should be used. If not available state the data source and accuracy in the assessment.
Train numbers	Predicted train volumes for the project area should reflect the 'reasonable maximum train movements' (RING, 2013). The timeframes that need to be assessed against the RING trigger levels are detailed in Section 4.2.1.
Train speed	Train speed should be based on the sign posted speed. However if considered appropriate, actual speeds can be used if the sign posted speed is not achievable.
Train types	The breakdown of coal, freight and passenger trains in the project area must be described and considered in the assessment.

6. STRATEGY REVIEW

The strategy will be reviewed by the Inland Rail/ARTC at regular intervals and to incorporate changes to legislation or state guidelines.

7. CONCLUSION

This document guides noise and vibration management for; construction, assessment of new and upgraded infrastructure and the operation of the completed Inland Rail route.

Gaps in state legislation and guidelines have been identified and a position to address these inadequacies has been provided.

Consistency in assessment methods was an aim of this noise strategy document. This has been achieved for:

[9] RING, 2013 – Appendix 7

- Assessment of new (greenfield) or upgraded (brownfield) rail infrastructure through the application of the RING.
- Provision of noise abatement. Table 3 details considerations in designing and applying noise abatement so that abatement can be applied consistently across the Inland Rail programme.
- Cumulative noise impacts. The RNAP is available to any part of the ARTC network that has the following:
    - experienced significant growth in train numbers
    - a funding mechanism.
- The RNAP framework is attached in Appendix A.
- Operational noise from the completed Inland Rail programme. This will be managed inline with ARTC's existing policies and procedures.

Construction noise and vibration is generally covered by state specific guidelines. Noise and vibration criteria and standard hours of work vary from state to state. Fixed infrastructure that is not considered in RING will also be managed using the relevant state guideline (refer to Table 1 Relevant state requirements).

APPENDIX A RAIL NOISE ABATEMENT PROGRAM FRAMEWORK

ARTC RAIL NOISE ABATEMENT PROGRAM FRAMEWORK

The Rail Noise Abatement Program aims to provide noise mitigation for residential dwellings that are exposed to “acute” levels of rail noise from existing rail lines that have experienced high growth in rail traffic. Action under the program is subject to funding.

ARTC maintain that some level of noise is to be expected when living adjacent to a railway. In most cases the railway line was established well before the current occupants moved into their properties and it is therefore considered that they had adequate opportunity to understand the noise environment before purchasing/occupying their property. It is only where rail traffic has increased significantly over a short period of time that it is considered reasonable to fund noise abatement.

Program’s Guiding Principles

The Rail Noise Abatement Program aims to:

- Provide a transparent, equitable and cost-effective methodology to identify, investigate and potentially mitigate airborne noise from existing high growth railway lines at acutely affected residences;
- Identify noise mitigation measures that will contribute to reducing noise levels at acutely affected residences by as much as is feasible and reasonable; and
- Benefit ARTC’s customers without creating an unreasonable financial burden or damaging the rail industry’s reputation.

When determining if abatement is feasible and reasonable the following must be considered:

- Fulfilment of all Rail Noise Abatement Program eligibility criteria
- Engineering, operational and environmental feasibility
- Achieving a minimum 5dB L_{Aeq} reduction in noise levels at the property (either internal[1] or external[2])
- Treatment must not exceed $60,000 per benefited[3] resident
- The property must be in a reasonable state of repair to be eligible for architectural treatment (i.e. all windows, external walls and doors must be intact and safe internal access to the property must be available)
- Curving noise will only be treated with track lubrication
- Community views

Noise mitigation measures under the program may include:

- Noise walls, noise mounds, court-yard walls or fence upgrades;
- Architectural treatment of the dwelling; and
- Track lubrication.

[1] Windows closed pre-abatement compared to windows closed post-abatement
[2] At 1 metre from the façade of the residence
[3] For a residence to be “benefited” they must have at least a 5dB LAeq reduction

Triggers for Action

A Rail Noise Abatement Program is available to anywhere on the ARTC network that has:

- Significant rail traffic growth[4]; and
- Available funding.

ARTC can discontinue a Rail Noise Abatement Program at any time if operational or financial circumstances change.

Eligibility Criteria

Access to the Rail Noise Abatement Program is subject to the eligibility criteria listed below. All of the eligibility criteria must be met before a property can be placed on a waiting list for noise abatement.

- The property must be an occupied residential dwelling.
- External rail noise levels at the property (1 metre from the building façade) must be at or above 70dB$L_{Aeq(15\ hour)}$ during daytime hours[5] or 65dB(A)$L_{Aeq(9\ hour)}$ during the night[6,7]
- The property must not be part of a development approved after the commencement of State Environmental Planning Policy (Infrastructure) 2007 (NSW), Ministers Specification SA 78B (SA), State Planning Policy 5.4 (WA) or Mandatory Part 4.4 (QLD) as noise mitigation should already have been provided if necessary.
- ARTC must consider the treatment of the property is feasible and reasonable.
- Noise must originate from the ARTC network.
- Resident must have occupied the premises for greater than 7 years.
- Residence must have no more than two habitable levels.
- Residence must not have had noise abatement offered for the owner or lessee by ARTC or as part of a rail traffic generating development.

[4] Significance should be considered in terms of growth in train movements and the time period over which it occurs
[5] The day time noise level is the average noise energy level between 7am and 10pm measured in LAeq
[6] The night time noise level is the average noise energy level between 10pm-7am measured in LAeq
[7] An LAmax criterion relating to events at or above 85dB may be applied at the discretion of ARTC

APPENDIX B TERMS AND DEFINITIONS

TERM	DEFINITION
ARTC	Australian Rail Track Corporation. Australian Government-owned corporation tasked with developing a 10 year program to implement Inland Rail
EMS	Environmental Management System
EPA	Environment Protection Authority
EPL	Environment Protection Licence
PERA	Preliminary Environmental Risk Assessment
RING	New South Wales Rail Infrastructure Noise Guideline
RNAP	Rail Noise Abatement Program
SEPP	State Environmental Protection Policy
SDAP	State Development Assessment Provisions