



ARTC

Melbourne–Brisbane
Inland Rail Alignment Study

Final Report July 2010

Appendix H
Preliminary Environmental
Assessment

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1. Introduction

1.1 Background

The early focus of the Melbourne to Brisbane Inland Rail Alignment Study involved assessing broad route options at a high level based on capital cost, journey time and environmental and land issues. Initially, major cost drivers such as topography, geotechnical and flooding characteristics, alignment length and land-use were considered. Route options having significantly higher capital costs or critical environmental characteristics were not considered further.

Following selection of a general route for the inland railway, environmental and land use assessments were undertaken along each route section. The purpose of the environmental and land use assessment was to outline the potential environmental and land use constraints and opportunities of the route to assist in route option selection. In addition, key issues along the route were documented to focus the preliminary environmental assessment. The approach, methodology and findings of the earlier environmental and land use assessment work is detailed in Appendix D.

To further develop the route, including considering the natural terrain, topographic features and environmental constraints in greater detail, a series of workshops were carried out. A key component of the workshops included considering broad and local alignment alternatives to avoid key environmental and land use constraints to integrate the concepts of ecologically sustainable development into the design of the alignment. Engineering and infrastructure requirements and cost savings opportunities were also considered.

Environmental constraints mapping was produced, and detailed survey data was obtained, to assist with the alignment development. During this process, environmental risks were eliminated or minimised through consideration of local alternatives and shifting the alignment to avoid significant constraints where possible.

The outcome of the workshopping and alignment refinement process was the selection of the proposed alignment. The approach, methodology and results of the alignment development, including a detailed description of the proposed alignment, are presented in Appendix E.

This appendix details the Preliminary Environmental Assessment. Appendix F includes a series of maps showing the proposed alignment.

1.2 Objectives

This report documents the Inland Rail Preliminary Environmental Assessment and has the following objectives:

- To identify the key environmental risks for each route section
- To identify potential mitigation measures
- To outline likely future assessment requirements.

In addition, the report provides an outline of the key issues and recommendations for more detailed environmental assessment as part of future project approvals.

1.3 Report outline

The Preliminary Environmental Assessment has built on the earlier environment and land assessment work undertaken as part of the Inland Rail Alignment Study (refer Appendix D and Appendix E) and would be used as the basis for more detailed environmental assessments required as part of the statutory assessment and approval process for the project.

During development of the alignment, an environmental risk assessment was undertaken to identify the key risks along each route section. The environmental risk assessment served to both identify issues for consideration during refinement of the alignments and to focus the efforts of the Preliminary Environmental Assessment. The environmental risk assessment for each route section is presented in a series of data sheets in section 2. These are ordered linearly from Melbourne to Brisbane (Acacia Ridge).

At the completion of the alignment development process, the alignments were prepared for the preliminary environmental assessment to be undertaken.

The preliminary environmental assessment was undertaken as a desktop assessment, using information collected during the study. The approach and methodology of the assessment is detailed in Chapter 3.

The preliminary environmental assessment of each route section is presented in section 4 and includes a discussion of:

- Existing environment
- Proposed works
- Potential impacts
- Potential mitigation and further assessment.

The level of detail and content presented varies depending on the extent of the proposed works.

Due to the different construction requirements along the route, the preliminary environmental assessment has been grouped by construction treatment rather than linearly from south to north. This has allowed a general discussion of construction methods and common impacts for similar route sections, e.g. greenfield sections (section 4.2), existing sections to be upgraded or converted to dual gauge (sections 4.3 and 4.4) and existing sections with no works required (section 4.5). Specific alignment and construction issues are discussed for each route section where relevant.

2. Environmental risk assessment

2.1 Overview

As part of the development of scoping alignments and the early options assessment phase, key environmental constraints were identified along each route section of the alignment. Further environmental risk identification was carried out as part of the route alignment optimisation process (refer Appendix E). This information was used to determine the key environmental risks of the proposed alignment for each route section in order to focus the preliminary environmental assessment.

2.2 Risk analysis

The environmental risk analysis was workshopped and categories assigned to each identified environmental risk. These categories are described in Table 2-1. Where a particular constraint was not identified along the alignment, the issue was not assigned an environmental risk category for that section of the alignment.

Environmental Risk Assessment data sheets identifying key risks were prepared for each route section of the proposed alignment and are presented in the following pages. Risk categories for each of the key issues along each route section of the alignment are summarised in Table 2-1.

Table 2-1 Risk category descriptions

Risk category	Description
A	May have high or moderate impacts. More detailed assessment would be necessary to determine the level of potential impact and to develop appropriate measures to mitigate and manage the impacts.
B	May have high or moderate impacts. These can be mitigated by the application of standard environmental management measures.
C	Low impacts. These can be managed by standard environmental management measures.

Table 2-2 Environmental Risk Assessment Data Sheet – Melbourne to Illabo

Environmental Risk Assessment Data Sheet – Melbourne to Illabo			
Description of route and proposed treatment		This route section comprises wholly existing track. The existing track is standard gauge, Class 1, and is approximately 496 km in length. No works would be carried out as part of the Inland Rail project. Operational rail traffic would not significantly change as a result of the project.	
Reference to where assessed		Section 4.5.1	
Aspect	Key Issues	Potential mitigation measures	Risk
N/A	<ul style="list-style-type: none"> No upgrading works or increase in rail traffic is proposed along this section of alignment. 	<ul style="list-style-type: none"> N/A 	N/A

Table 2-3 Environmental Risk Assessment Data Sheet – Illabo to Stockinbingal

Environmental Risk Assessment Data Sheet – Illabo to Stockinbingal			
Description of route and proposed treatment		This route section is a greenfield alignment. Approximately 37 km of new track would be constructed between Illabo and Stockinbingal.	
Reference to where assessed		Section 4.2.2	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Clearing of native vegetation including potential Endangered Ecological Community (EEC), potential habitat for the Superb Parrot and riparian vegetation along Ironbong Creek, would be required. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	B
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> A bridge would be constructed over Dudauman Creek and bridges or culverts may be required over a number of minor waterways. This may affect flow regimes and flood behaviour, and may result in scouring impacts. 	<ul style="list-style-type: none"> Bridges or culverts should be designed to ensure that the existing flow regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers and abutments, and culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Water quality impacts may result from construction works close to waterways. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls should be installed and maintained around waterways and drainage lines for the duration of construction works. 	C
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the NSW <i>Land Acquisition (Just Terms Compensation) Act 1991</i>. Alternative access should be provided as necessary. 	C

Table 2-4 Environmental Risk Assessment Data Sheet – Stockinbingal to Parkes (south)

Environmental Risk Assessment Data Sheet – Stockinbingal to Parkes (south)			
Description of route and proposed treatment		This route section comprises wholly existing track. The existing track is standard gauge, Class 1, and is approximately 174 km in length. No works would be carried out as part of the project. Operational rail traffic would increase as a result of the project.	
Reference to where assessed		Section 4.5.2	
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during operation from increased rail traffic. 	<ul style="list-style-type: none"> Noise mitigation to reduce noise impacts to an acceptable level during operation should be considered. 	C

Table 2-5 Environmental Risk Assessment Data Sheet – Parkes to Narromine

Environmental Risk Assessment Data Sheet – Parkes to Narromine			
Description of route and proposed treatment		This route section comprises wholly existing track. The existing track is standard gauge, Class 2, and is approximately 106 km in length. The track would be upgraded to Class 1 track.	
Reference to where assessed		Section 4.4.2	
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation should be considered. 	C
Soils and water quality	<ul style="list-style-type: none"> Water quality impacts may result from construction activities close to waterways. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls should be installed and maintained around waterways and drainage lines for the duration of construction works. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	B
Traffic, transport and access	<ul style="list-style-type: none"> Some track possession would likely be required during the construction period. The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> Consultation should be undertaken with other rail users to minimise impacts on existing rail operation. The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed rail line upgrade. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Infrastructure and land use	<ul style="list-style-type: none"> Construction works would have the potential to disrupt overhead high 	<ul style="list-style-type: none"> All utilities should be protected and relevant authorities and/or operators 	C

Environmental Risk Assessment Data Sheet – Parkes to Narromine

	voltage power lines.	consulted.	
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Table 2-6 Environmental Risk Assessment Data Sheet – Narromine to Curban

Environmental Risk Assessment Data Sheet – Narromine to Curban

Description of route and proposed treatment	This route section is a greenfield alignment. Approximately 90 km of new track would be constructed between the existing line north-west of Narromine and the Dubbo to Coonamble railway south of Curban.		
Reference to where assessed	Section 4.2.3		
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Clearing of native vegetation including potential EEC, potential habitat for threatened and riparian vegetation, would be required. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	B
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> This section of the alignment crosses a designated flooding area and may impact flood behaviour. Bridges would be required over a number of waterways, which may also affect flood behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> The track and bridges should be designed to ensure that the existing hydrological regime is maintained as much as practicable. A flood study should be undertaken at the detailed environmental assessment stage to further assess the impacts of the project on flooding. 	B
Soils and water quality	<ul style="list-style-type: none"> Water quality impacts may result from construction activities close to waterways. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls should be installed and maintained around waterways and drainage lines for the duration of construction works. 	C
Indigenous heritage	<ul style="list-style-type: none"> A number of previously recorded Aboriginal heritage sites are located along the alignment. Given the presence of existing sites, it is possible that other archaeological sites or places of Indigenous cultural significance occur along the alignment, particularly around creek lines and river beds. Potential impacts to these sites may occur during construction. 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any NSW Department of Environment, Climate Change and Water requirements and a detailed archaeological and cultural assessment 	B
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C

Environmental Risk Assessment Data Sheet – Narromine to Curban			
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the NSW <i>Land Acquisition (Just Terms Compensation) Act 1991</i>. Alternative access should be provided as necessary. 	C
Infrastructure and land use	<ul style="list-style-type: none"> Construction work in the southern portion of the alignment may impact on irrigation infrastructure. The proposed alignment traverses land subject to a mining exploration lease. 	<ul style="list-style-type: none"> Consultation with the local land owner's should occur at the detailed environmental assessment stage. Consultation with any mining lease holders should be carried out during development of the concept design. 	C

Table 2-7 Environmental Risk Assessment Data Sheet – Curban to Gwabegar

Environmental Risk Assessment Data Sheet – Curban to Gwabegar			
Description of route and proposed treatment	This route section comprises greenfield alignment and track upgrade. Approximately 99 km of new track would be constructed and approximately 19 km of the Wallerawang-Gwabegar line would be upgraded.		
Reference to where assessed	Section 4.2.4		
Aspect	Key Issues	Potential mitigation measures	Risk
Protection areas	<ul style="list-style-type: none"> The existing track section of the alignment passes through the Merriwindi State Forest. Minimal clearing may be required during construction works. 	<ul style="list-style-type: none"> Planning approvals and revocation of State Forest for the railway needs to be progressed as per the requirements of the <i>Forestry Act 1916</i>. Vegetation offsets may also be required. Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	C
Flora and fauna	<ul style="list-style-type: none"> Clearing of native vegetation including potential EEC, potential habitat for threatened and riparian vegetation, would be required. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	A
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> This section of the alignment crosses a designated flooding area. Bridges would be required over a number of waterways, which may also affect flood behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> Track and bridges should be designed to maintain the existing hydrology of the area as much as practicable. A flood study should be undertaken at the detailed environmental assessment stage to further assess the impacts of the project on flooding. 	B

Environmental Risk Assessment Data Sheet – Curban to Gwabegar			
Soils and water quality	<ul style="list-style-type: none"> Water quality impacts may result from construction activities close to waterways. Disturbance of potentially contaminated soil associated with the existing rail section. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls should be installed and maintained around waterways and drainage lines for the duration of construction works. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	C
Indigenous heritage	<ul style="list-style-type: none"> A number of previously recorded Aboriginal heritage sites are located along the alignment. Given the presence of existing sites, it is possible that other archaeological sites or places of Indigenous cultural significance occur along the alignment, particularly around creek lines and river beds. Potential impacts to these sites may occur during construction. 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any NSW Department of Environment, Climate Change and Water requirements and a detailed archaeological and cultural assessment 	B
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the NSW <i>Land Acquisition (Just Terms Compensation) Act 1991</i>. Alternative access should be provided as necessary. 	C

Table 2-8 Environmental Risk Assessment Data Sheet – Gwabegar to Narrabri

Environmental Risk Assessment Data Sheet – Gwabegar to Narrabri			
Description of route and proposed treatment		This route section comprises greenfield construction and upgrading of existing track. Approximately 89 km of new track would be constructed and a short section of the existing Narrabri to Walgett railway line would be upgraded.	
Reference to where assessed		Section 4.2.5	
Aspect	Key Issues	Potential mitigation measures	Risk
Protection areas	<ul style="list-style-type: none"> The proposed alignment cuts across a portion (<20 ha) of the Quegobla State Forest. The proposed alignment is in close proximity to a number of other state forests and the Pilliga State Conservation Area. 	<ul style="list-style-type: none"> Planning approvals and revocation of State Forest for the railway needs to be progressed as per the requirements of the <i>Forestry Act 1916</i>. Vegetation offsets may also be required. Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	A
Flora and fauna	<ul style="list-style-type: none"> The construction of the alignment would require extensive vegetation clearing, including riparian vegetation, vegetation connected to state forests and the Pilliga State Conservation Area, potential EEC, and potential habitat for numerous threatened fauna species. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	A
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> The northern section of alignment is close to a designated flooding area and may impact flooding behaviour. Bridges would be required over a number of waterways, which may also affect flood behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> The track and bridges should be designed to ensure that the existing hydrological regime is maintained as much as practicable. A flood study should be undertaken at the detailed environmental assessment stage to further assess the impacts of the project on flooding. Scour protection measures should be installed around bridge piers and abutments. 	B
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation caused by construction works close to creeks may have impacts on water quality. Disturbance of potentially contaminated soil associated with the existing rail section. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	C

Environmental Risk Assessment Data Sheet – Gwabegar to Narrabri			
Indigenous heritage	<ul style="list-style-type: none"> A number of previously recorded Aboriginal heritage sites are located along the alignment. Given the presence of existing sites, it is possible that other archaeological sites or places of Indigenous cultural significance occur along the alignment, particularly around creek lines and river beds. Potential impacts to these sites may occur during construction. 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any NSW Department of Environment Climate Change and Water requirements and a detailed archaeological and cultural assessment 	B
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a small number of local access roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line in a rural landscape. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access, particularly along Yarrie Lake Road. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i>. Alternative access should be provided as necessary. 	B
Infrastructure and land use	<ul style="list-style-type: none"> The proposed alignment would sever an expired NSW mineral title. The alignment passes immediately south of a solar observatory. 	<ul style="list-style-type: none"> Consultation with any mineral title holders would be carried out during development of the concept design. Consultation with the CSIRO with regards to the solar observatory should be undertaken 	B

Table 2-9 Environmental Risk Assessment Data Sheet – Narrabri bypass

Environmental Risk Assessment Data Sheet – Narrabri bypass			
Description of route and proposed treatment		This route section comprises greenfield construction. Approximately 10 km of new track would be constructed to bypass the town of Narrabri.	
Reference to where assessed		Section 4.2.6	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> The construction of the alignment would require vegetation clearing, including riparian vegetation. There is the potential for EEC to exist in and around the proposed alignment. There have been sightings of threatened species such as the Grey-crowned Babbler, Black-necked Stork, Koala, Spiny Peppercreep, and Slender Darling Pea. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project and, where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. Appropriate fauna mitigation measures should be implemented. 	B
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts would occur during construction works and during operation from proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce noise impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should occur. 	B
Hydrology and flooding	<ul style="list-style-type: none"> The alignment is located within the Lower Namoi Designated Floodplain. Bridges would be required across the Namoi River, Narrabri Creek, an unnamed watercourse and irrigation canal. Bridge works may affect flooding behaviour and cause scouring impacts on creek beds. 	<ul style="list-style-type: none"> The track and bridges should be designed to ensure that the existing hydrological regime is maintained as much as practicable. A flood study should be undertaken at the detailed environmental assessment stage to further assess the impacts of the project on flooding. 	A
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation caused by construction works close to creeks may have impacts on water quality. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. 	C
Indigenous heritage	<ul style="list-style-type: none"> A number of previously recorded Aboriginal heritage sites are located along the alignment. Given the presence of existing sites, it is possible that other archaeological sites or places of Indigenous cultural significance occur along the alignment, particularly around creek lines and river beds. Potential impacts to these sites may occur during construction. 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any NSW Department of Environment Climate Change and Water requirements and a detailed archaeological and cultural assessment 	B
Traffic, transport and access	<ul style="list-style-type: none"> The alignment crosses the Kamilaroi Highway and runs parallel to a section of the Newell Highway. Local roads and traffic flows could be affected during the 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C

Environmental Risk Assessment Data Sheet – Narrabri bypass			
	construction phase.		
Visual amenity	<ul style="list-style-type: none"> Visual impacts associated with the proposed new rail line, in an area of many sensitive receivers, would occur. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts such as landscape screening should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i>. Alternative access should be provided as necessary. 	B
Infrastructure and land use	<ul style="list-style-type: none"> The alignment passes through an area which is a designated flooding irrigation area for cotton. The alignment traverses land where a NSW Coal Title is held. Construction works would have the potential to disrupt overhead high voltage power lines. 	<ul style="list-style-type: none"> Consultation with any mineral title holders should be carried out during development of the concept design. All utilities should be protected and relevant authorities and/or operators consulted. 	B

Table 2-10 Environmental Risk Assessment Data Sheet – Narrabri (north) to Camurra (south)

Environmental Risk Assessment Data Sheet – Narrabri (north) to Camurra (south)			
Description of route and proposed treatment	This route section comprises wholly of existing track. The existing track is standard gauge, predominantly Class 2 track (with approximately 9 km of Class 3 track to the south of Camurra), and is approximately 103 km in length. The existing Class 2 and 3 track would be upgraded to Class 1 track as part of the project.		
Reference to where assessed	Section 4.4.3		
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation should be considered. 	C
Soils and water quality	<ul style="list-style-type: none"> Water quality impacts may result from construction activities close to waterways. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls should be installed and maintained around waterways and drainage lines for the duration of construction works. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	C
Non-indigenous heritage	<ul style="list-style-type: none"> This track section contains two steel bridges listed on the ARTC s. 170 Register; one at Moree over the Mehi River and one at Camurra over the Gwydir River. There would be potential for upgrading works to impact on 	<ul style="list-style-type: none"> Consultation with ARTC and the Department of Planning, Heritage Branch and a heritage impact assessment in accordance with Heritage Branch requirements should be carried out. 	

Environmental Risk Assessment Data Sheet – Narrabri (north) to Camurra (south)			
	these bridges.		
Traffic, transport and access	<ul style="list-style-type: none"> Some track possession would likely be required during the construction period, which would impact existing rail traffic. The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> Consultation should be undertaken with other rail users to minimise impacts on existing rail operations. The relevant road authority and/or local government should be consulted. 	C

Table 2-11 Environmental Risk Assessment Data Sheet – Camurra deviation

Environmental Risk Assessment Data Sheet – Camurra deviation			
Description of route and proposed treatment	This route section is a greenfield alignment. Approximately 2.6 km of new track would be constructed to bypass the town of Camurra.		
Reference to where assessed	Section 4.2.7		
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Some vegetation removal may be required. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation would occur after construction. Vegetation offsets may also be required. 	C
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> This section of the alignment is within a designated flooding area and may impact flood behaviour. Bridges would be required over a number of waterways, which may also affect flood behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> The track and bridges should be designed to ensure that the existing hydrological regime is maintained as much as practicable. A flood study should be undertaken at the detailed environmental assessment stage to further assess the impacts of the project on flooding. 	B
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation from construction works close to the river may affect water quality in the river. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls should be installed and maintained around waterways and drainage lines for the duration of construction works. 	C
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the NSW <i>Land Acquisition (Just Terms Compensation) Act 1991</i>. Alternative access should be provided as 	C

Environmental Risk Assessment Data Sheet – Camurra deviation

	necessary.	
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Table 2-12 Environmental Risk Assessment Data Sheet – Camurra (north) to North Star
Environmental Risk Assessment Data Sheet – Camurra (north) to North Star

Description of route and proposed treatment	This route section comprises wholly existing track, which forms part of the Moree to North Star railway line. The existing track is Class 3, and approximately 79 km in length. The existing track would be upgraded to Class 1 as part of the project.		
Reference to where assessed	Section 4.4.4		
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation should be considered. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation from construction works close to the river may affect water quality in the river. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	C
Traffic, transport and access	<ul style="list-style-type: none"> Some track possessions would likely be required during construction, which would affect existing rail traffic. The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> Consultation should be undertaken with other rail users and local land owners to minimise impacts on existing rail operations. The relevant road authority and/or local government should be consulted. 	C

Table 2-13 Environmental Risk Assessment Data Sheet – North Star to Yelarbon

Environmental Risk Assessment Data Sheet – North Star to Yelarbon			
Description of route and proposed treatment	This route section is a greenfield alignment. Approximately 64 km of new track would be constructed between North Star (beginning from the existing Moree to North Star railway line) and Yelarbon.		
Reference to where assessed	Section 4.2.8		
Aspect	Key Issues	Potential mitigation measures	Risk
Protection areas	<ul style="list-style-type: none"> The proposed alignment passes to the west of Dthinna Dthinnawan Nature Reserve. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project. 	C
Flora and fauna	<ul style="list-style-type: none"> The construction of the alignment would require extensive vegetation clearing, including riparian vegetation, vegetation connected to the Nature Reserve and potential habitat for threatened species, including the Koala. In the Queensland portion of the alignment, some vegetation associated with the Yetman and Yelarbon Desert Regional Ecosystems and other significant corridors would require clearing. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	A
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should occur. 	C
Hydrology and flooding	<ul style="list-style-type: none"> This section of the alignment is close to a designated flooding area and may impact flood behaviour. Bridges would be required over a number of waterways, including the Mobindry Creek, Ottley Creek, Macintyre River, Dumaresq River and Macintyre Brook, which may also affect flood behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> The track and bridges should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. A flood study should be undertaken at the detailed environmental assessment stage to further assess the impacts of the project on flooding. 	B
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation caused by construction works close to creeks may affect water quality. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. 	C
Indigenous heritage	<ul style="list-style-type: none"> The proposed alignment passes near a cluster of Indigenous archaeological sites in NSW, around the area of Dumaresq River. Other archaeological sites or places of Indigenous cultural significance may exist along the alignment, particularly around creek lines and river beds. These 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any NSW Department of Environment, Climate Change and Water and Queensland Department of Environment and Resource Management requirements and a detailed archaeological and cultural assessment should be undertaken. 	A

Environmental Risk Assessment Data Sheet – North Star to Yelarbon			
	sites may be affected during the construction phase.		
Traffic, transport and access	<ul style="list-style-type: none"> The alignment would cross a number of roads, including the Bruxner Highway and Cunningham Highway. Construction activities may cause some disruption to highway traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts associated with acquisition and severance of rural properties, including land currently used for cropping. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the NSW <i>Land Acquisition (Just Terms Compensation) Act 1991</i> and the Queensland <i>Acquisition of Land Act 1967</i> or <i>Land Act 1994</i>. Alternative access to be provided as necessary. 	C
Infrastructure and land use	<ul style="list-style-type: none"> The alignment traverses a travelling stock route. 	<ul style="list-style-type: none"> Consultation with the Queensland Department of Environmental and Resource Management should occur regarding impacts to the travelling stock route. 	C

Table 2-14 Environmental Risk Assessment Data Sheet – Yelarbon to Inglewood

Environmental Risk Assessment Data Sheet – Yelarbon to Inglewood			
Description of route and proposed treatment		This route section is wholly within an existing rail corridor. The existing rail corridor is approximately 34 km in length and currently contains narrow gauge track. The existing track would be dual gauged mainly within the existing corridor.	
Reference to where assessed		Section 4.3.2	
Aspect	Key Issues	Potential mitigation measures	Risk
Protection areas	<ul style="list-style-type: none"> The alignment passes through Whetstone State Forest. Some minor vegetation clearing may be required for the temporary establishment of construction compounds or access tracks. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for construction of the project, and where appropriate, revegetation should occur after construction. 	C
Flora and fauna	<ul style="list-style-type: none"> The proposed alignment for this route section occurs within an existing rail corridor. The alignment crosses, and is close to, small patches of 'Endangered' Regional Ecosystem. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for construction of the project, and where appropriate, revegetation should occur after construction. 	C
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation should occur. 	C
Hydrology and flooding	<ul style="list-style-type: none"> A bridge would be required over MacIntyre Brook, which may affect flood behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> Bridges should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers and abutments. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation caused by construction works close to creeks may affect water quality. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	C
Traffic, transport and access	<ul style="list-style-type: none"> Some track possession would likely be required during the construction period. Construction of an overbridge across the Cunningham Highway may cause some disruption to highway traffic. 	<ul style="list-style-type: none"> Consultation should be undertaken with other rail users to minimise impacts on existing rail operations. The relevant road authority and/or local government should be consulted. 	C

Table 2-15 Environmental Risk Assessment Data Sheet – Inglewood to Millmerran

Environmental Risk Assessment Data Sheet – Inglewood to Millmerran			
Description of route and proposed treatment		This route section is a greenfield alignment. Approximately 71 km of new track would be constructed between Inglewood and Millmerran.	
Reference to where assessed		Section 4.2.9	
Aspect	Key Issues	Potential mitigation measures	Risk
Protection areas	<ul style="list-style-type: none"> The proposed alignment parallels an existing road corridor within the Bringalilly State Forest. 	<ul style="list-style-type: none"> Consultation should be undertaken with the Queensland Department of Environment and Resource Management regarding impacts to the Bringalilly State Forest. 	A
Flora and fauna	<ul style="list-style-type: none"> The proposed alignment would require some vegetation clearing, including vegetation mapped as 'endangered' and 'of concern' Regional Ecosystem and being of high conservation value. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	A
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation of the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> Bridges and/or culverts would be required over Canning Creek and other smaller waterways. This would have the potential to impact flood behaviour and cause scouring. 	<ul style="list-style-type: none"> Bridges and culverts should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers and abutments and culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation caused by construction works close to creeks may affect water quality. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. 	C
Indigenous heritage	<ul style="list-style-type: none"> The alignment passes within 1 km of previously recorded Indigenous sites near Millmerran. It is unlikely that these sites would be impacted by construction activities due to their distance from the proposed alignment. However, given the presence of existing sites, it is possible that other archaeological sites or places of Indigenous cultural significance exist along the alignment. 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any Queensland Department of Environment and Resource Management requirements and a detailed archaeological and cultural assessment should be carried out. 	B
Traffic, transport and access	<ul style="list-style-type: none"> The alignment crosses and runs adjacent to Millmerran Inglewood Road through the Bringalilly State Forest. This road is also a designated travelling stock route. Other smaller road crossings would also be required and may impact traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	B
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts should be implemented. 	C

Environmental Risk Assessment Data Sheet – Inglewood to Millmerran			
	rail line.		
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the Queensland <i>Acquisition of Land Act 1967</i> or <i>Land Act 1994</i>. Alternative access should be provided as necessary. 	C
Infrastructure and land use	<ul style="list-style-type: none"> The proposed alignment traverses an area known to contain coal reserves and which is the subject of an expired Mineral Development Licence, the proposed alignment also passes to the west of an open cut coal mine. 	<ul style="list-style-type: none"> Consultation with any mining lease holders should be carried out during development of the concept design. 	B

Table 2-16 Environmental Risk Assessment Data Sheet – Millmerran to Brookstead

Environmental Risk Assessment Data Sheet – Millmerran to Brookstead			
Description of route and proposed treatment	This route section is within the existing rail corridor. The existing rail corridor is approximately 20 km in length and currently contains narrow gauge track. The existing track would be upgraded to dual gauge track,		
Reference to where assessed	Section 4.3.3		
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> New and/or upgraded bridges would be required over various waterways including Grasstree Creek and the Condamine River. This would have the potential to impact flood behaviour and cause scouring. 	<ul style="list-style-type: none"> Bridges or culverts should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation from construction works close to waterways may affect water quality. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	B
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts associated with the proposed new rail line may occur. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C

Table 2-17 Environmental Risk Assessment Data Sheet – Brookstead to Yargullen

Environmental Risk Assessment Data Sheet – Brookstead to Yargullen			
Description of route and proposed treatment		This route section is predominantly a greenfield alignment, but lies partially within an existing abandoned rail corridor. The total length of the alignment is approximately 37 km. Approximately 70 per cent of new track would be constructed along the greenfield portion of the route section and 30 per cent within the existing rail corridor.	
Reference to where assessed		Section 4.2.10	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Some vegetation clearing would be required, including vegetation along waterways, property boundaries, roadsides and within the abandoned rail corridor. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	C
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation of the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> Bridges or culverts would be required over numerous waterways. This would have the potential to impact flow regimes and cause scouring. 	<ul style="list-style-type: none"> Bridges or culverts should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers and abutments and culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation from construction works close to waterways may affect water quality. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project, and best practice erosion and sediment controls installed and maintained around water courses and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	C
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts associated with acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the Queensland <i>Acquisition of Land Act 1967</i> or Queensland <i>Land Act 1994</i>. Alternative access should be provided as necessary. 	B
Infrastructure and land use	<ul style="list-style-type: none"> The rail alignment would intersect infrastructure such as the Moonie to Brisbane Oil Pipeline. 	<ul style="list-style-type: none"> All utilities should be protected and relevant authorities and/or operators consulted. 	C

Table 2-18 Environmental Risk Assessment Data Sheet – Oakey bypass

Environmental Risk Assessment Data Sheet – Oakey bypass			
Description of route and proposed treatment		This route section is a greenfield alignment. Approximately 16 km of new track would be constructed to bypass the town of Oakey.	
Reference to where assessed		Section 4.2.11	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Some vegetation clearing would be required, including vegetation mapped as 'Not of Concern' Regional Ecosystems. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	C
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level during operation, or acquisition of affected properties if mitigation is not reasonable or feasible, should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> Bridges or culverts would be required over numerous waterways, including Westbrook and Gowrie creeks. This would have the potential to impact flow regimes and flood behaviour and cause scouring. 	<ul style="list-style-type: none"> Bridges or culverts should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers and abutments, and culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation from construction works close to waterways may affect water quality. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. 	B
Traffic, transport and access	<ul style="list-style-type: none"> Reconfiguration of the existing Warrego Highway would be required to provide a road overbridge, which may cause disruption to highway traffic. 	<ul style="list-style-type: none"> Consultation should occur with the road authority and/or the local council and design and staging of works should aim to minimise disruption to highway traffic. 	B
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line. 	<ul style="list-style-type: none"> Standard mitigation measures for visual impacts, such as landscape screening, should be provided. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts associated with severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the Queensland <i>Acquisition of Land Act 1967</i> or Queensland <i>Land Act 1994</i>. Alternative access to be provided as necessary. 	C
Infrastructure and land use	<ul style="list-style-type: none"> The rail alignment would intersect with infrastructure such as the Roma to Brisbane Gas Pipeline. 	<ul style="list-style-type: none"> All utilities should be protected and relevant authorities and/or operators consulted. 	C

Table 2-19 Environmental Risk Assessment Data Sheet – Oakey to Gowrie

Environmental Risk Assessment Data Sheet – Oakey to Gowrie			
Description of route and proposed treatment		This route section is primarily within an existing rail corridor. The existing corridor is approximately 10 km in length and currently contains narrow gauge track. The existing line would be duplicated and dual gauging provided on both the existing and new tracks. Some construction activities may occur outside of the existing corridor.	
Reference to where assessed		Section 4.3.4	
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce noise impacts to an acceptable level should be considered. 	C
Hydrology and flooding	<ul style="list-style-type: none"> Bridges would be required over waterways, including Gowrie Creek. This would have the potential to impact flood behaviour and cause scouring. 	<ul style="list-style-type: none"> Bridges should be designed to ensure that the existing hydrological regime is maintained, as far as practicable. Scour protection measures should be installed around bridge piers and abutments, and culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Erosion and sedimentation from construction works close to waterways may affect water quality. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project, and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	B
Traffic, transport and access	<ul style="list-style-type: none"> Some track possession would likely be required during the construction period. The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> Consultation should occur with other rail users to minimise impacts on existing rail operation. The relevant road authority and/or local government should be consulted. 	C

Table 2-20 Environmental Risk Assessment Data Sheet – Gowrie to Helidon

Environmental Risk Assessment Data Sheet – Gowrie to Helidon			
Description of route and proposed treatment		Approximately 30 km of new dual gauged track would be constructed, including 5 km of tunnel in the vicinity of Murphy's Creek.	
Reference to where assessed		Section 4.2.12	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Construction of the alignment would require some vegetation clearing, including vegetation classified as 'Endangered', 'Of Concern' and 'Not of Concern' Regional Ecosystems and areas mapped as Essential Habitat. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	A
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation of the proposed new rail line. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce noise impacts to an acceptable level during operation, or acquisition of affected properties if mitigation not reasonable or feasible, should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> A section of tunnelling (approximately 5 km) would be required along this route section, which would have significant construction impacts and may have permanent impacts on local hydrogeology. Bridges or culverts would be required over a number of waterways including Murphy's and Lockyer creeks, which could affect flow regimes, flooding behaviour and cause scouring impacts. 	<ul style="list-style-type: none"> Detailed environmental assessment and flood studies should be undertaken to develop appropriate mitigation strategies for impacts associated with tunnelling. Bridges and/or culverts should be designed to ensure that the existing hydrological regime is maintained. Scour protection should be installed around bridge piers and abutments and/or culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Construction close to waterways may also result in water quality impacts from erosion and sedimentation. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project and best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor should occur to determine the level of management required. 	B
Indigenous heritage	<ul style="list-style-type: none"> The proposed alignment is in close proximity (approximately 500 m) to a previously recorded Indigenous site. It is possible that unknown archaeological sites or places of Indigenous cultural significance exist in the area. Potential impacts to these sites may occur during 	<ul style="list-style-type: none"> Extensive consultation with local Indigenous groups should be carried out in accordance with any Queensland Department of Environment and Resource Management requirements and a detailed archaeological and cultural assessment should be carried out. 	C

Environmental Risk Assessment Data Sheet – Gowrie to Helidon			
	construction.		
Non-Indigenous heritage	<ul style="list-style-type: none"> The proposed alignment passes through the Murphy's Creek railway Complex (a Registered Heritage Place) on the Main Range Railway, which is listed on the Register of National Estate. The alignment would also parallel the Lockyer Creek Railway Bridge (Guinn Park) and the Lockyer Creek Railway Bridge (Lockyer), both of which are Registered Heritage Places. Construction of the project may result in some impact to these heritage items. 	<ul style="list-style-type: none"> Consultation should be undertaken with the Queensland Department of Environment and Resource Management regarding impacts to non-Indigenous heritage items. Construction works should seek to minimise damage to these items. Protection measures should be established where necessary. Assessment of National Heritage items under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> should be carried out. 	B
Traffic, transport and access	<ul style="list-style-type: none"> The proposed alignment crosses a number of roads. Construction of the alignment may have some impact on local traffic. 	<ul style="list-style-type: none"> The relevant road authority and/or local government should be consulted. 	B
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line in a scenic landscape. 	<ul style="list-style-type: none"> Appropriate mitigation for visual impacts should be investigated during the concept design phase. 	B
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts associated with severance of residential and rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the Queensland <i>Acquisition of Land Act 1967</i> or <i>Land Act 1994</i>. Alternative access should be provided as necessary. 	B
Infrastructure and land use	<ul style="list-style-type: none"> The alignment will intersect infrastructure such as high voltage powerlines and the Roma to Brisbane Gas Pipeline. 	<ul style="list-style-type: none"> All utilities should be protected and relevant authorities and/or operators consulted. 	B

Table 2-21 Environmental Risk Assessment Data Sheet –Helidon to Laidley

Environmental Risk Assessment Data Sheet –Helidon to Laidley			
Description of route and proposed treatment		The total length of this route section is approximately 34 km. The proposed works would include construction of dual gauged track and track upgrading. The works would be within the existing corridor except where curves require easing.	
Reference to where assessed		Section 4.3.5	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Construction of the alignment may require some vegetation clearing if the existing corridor is not wide enough, including vegetation classified as 'Endangered', 'Of Concern' and 'Not of Concern' Regional Ecosystems and areas mapped as Essential Habitat. 	<ul style="list-style-type: none"> Clearing should be minimised to the extent necessary for the project, and where appropriate, revegetation should occur after construction. Vegetation offsets may also be required. 	B
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce noise impacts to an acceptable level should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> Bridges or culverts would be required over a number of watercourses including Lockyer Creek, Sheep Station Creek and Sandy Creek. This would have the potential to impact on flooding behaviour and may result in scouring impacts. 	<ul style="list-style-type: none"> Bridges or culverts should be designed to ensure that the existing hydrological regime is maintained. Scour protection should be installed around bridge piers and abutments and culvert openings. 	C
Soils and water quality	<ul style="list-style-type: none"> Construction close to watercourses may impact water quality due to erosion and sedimentation. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project, with best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor to determine the level of management required. 	B
Non-Indigenous heritage	<ul style="list-style-type: none"> Three Registered Heritage Places — the Gatton Boer War Memorial (also on the Register of National Estate), the Weeping Mother Memorial and the University of Queensland (Gatton Campus) — are located along the existing rail line to the east of Gatton. Potential impacts to these heritage items could occur during construction works. 	<ul style="list-style-type: none"> Consultation will be undertaken with the Queensland Department of Environment and Resource Management regarding non-Indigenous heritage items. Construction works should seek to minimise damage to these items. Protection measures should be established where necessary. National Heritage items are matters of national environmental significance requiring assessment under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i>. 	B
Traffic, transport and access	<ul style="list-style-type: none"> Some track possession would likely be required during the construction period. Realigning the Warrego Highway would be required to provide a road overbridge which would 	<ul style="list-style-type: none"> Consultation should occur with other rail users to minimise impacts on existing rail operations. Consultation should occur with the road authority and/or the local council. Design and staging of the works should aim to 	B

Environmental Risk Assessment Data Sheet – Helidon to Laidley			
	cause disruption to highway traffic.	minimise disruption to highway traffic.	
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from severance of properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the Queensland <i>Acquisition of Land Act 1967</i> or <i>Land Act 1994</i>. Alternative access to be provided as necessary. 	B

Table 2-22 Environmental Risk Assessment Data Sheet – Laidley to Grandchester/Rosewood

Environmental Risk Assessment Data Sheet – Laidley to Grandchester/Rosewood			
Description of route and proposed treatment	This route section comprises existing track and greenfield sections. The total length of the route section is approximately 20 km. Approximately 8 km of existing, narrow gauged track would be dual gauged largely within the existing rail corridor. Approximately 12.5 km of new track would be constructed to bypass the town of Laidley. The proposed new track section would include approximately 500 m of tunnel.		
Reference to where assessed	Section 4.2.13		
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> Some vegetation clearing would likely be required including vegetation mapped as the 'Endangered', 'Of Concern' and 'Not of Concern' Regional Ecosystems and Essential Habitat. 	<ul style="list-style-type: none"> Clearing would be minimised to the extent necessary for the project, and where appropriate, revegetation would occur after construction. Offsets will be required for clearing of vegetation and essential habitat. 	B
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce noise impacts to an acceptable level should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> Tunnelling (approximately 500 m) would be required along this route section, which would have significant construction impacts and may have permanent impacts on local hydrogeology. A bridge would be required over Western creek and culverts required over minor waterways. This would have the potential to impact on flooding behaviour and may result in scouring impacts. 	<ul style="list-style-type: none"> Detailed environmental assessment and flood studies will be undertaken to develop appropriate mitigation strategies for impacts associated with tunnelling. Bridges or culverts should be designed to ensure that the existing hydrological regime is maintained. Scour protection should be installed around bridge piers and abutments and culvert openings. 	C

Environmental Risk Assessment Data Sheet – Laidley to Grandchester/Rosewood			
Soils and water quality	<ul style="list-style-type: none"> Construction close to watercourses may impact water quality due to erosion and sedimentation. Disturbance of potentially contaminated soil associated with the existing rail corridor. 	<ul style="list-style-type: none"> Erosion and sediment control plans should be developed for the project, with best practice erosion and sediment controls installed and maintained around waterways and drainage lines for the duration of construction. Further investigation into the potential contamination levels of the rail corridor to determine the level of management required. 	B
Indigenous heritage	<ul style="list-style-type: none"> The proposed alignment is in close proximity to previously recorded Indigenous sites. It is possible that unknown archaeological sites or places of Indigenous cultural significance exist in the area. Potential impacts to these sites may occur during construction. 	<ul style="list-style-type: none"> Consultation with local Indigenous groups should be undertaken in accordance with Queensland Department of Environment and Resource Management requirements, including detailed archaeological and cultural heritage assessments. 	C
Non-Indigenous heritage	<ul style="list-style-type: none"> Grandchester Railway Complex a Registered Heritage Place is located within the existing rail corridor. Potential impacts to these heritage items could occur during construction works. 	<ul style="list-style-type: none"> Consultation will be undertaken with the Queensland Department of Environment and Resource Management regarding non-Indigenous heritage items. Construction works should seek to minimise damage to these items. Protection measures should be established where necessary. National Heritage items are matters of national environmental significance requiring assessment under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i>. 	B
Traffic, transport and access	<ul style="list-style-type: none"> Some track possession would likely be required during the construction period. Rosewood Laidley Road and other minor road crossings. 	<ul style="list-style-type: none"> Consultation should occur with other rail users to minimise impacts on existing rail operation. Consultation should occur with the road authority and/or the local council and design and staging of the works should aim to minimise disruption to highway traffic. 	C
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line in a scenic landscape. 	<ul style="list-style-type: none"> Appropriate mitigation for visual impacts should be investigated during the concept design phase. 	C
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts from acquisition and severance of properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the Queensland <i>Acquisition of Land Act 1967</i> or <i>Land Act 1994</i>. Alternative access to be provided as necessary. 	B

Table 2-23 Environmental Risk Assessment Data Sheet –Grandchester/Rosewood to Kagaru

Environmental Risk Assessment Data Sheet –Grandchester/Rosewood to Kagaru			
Description of route and proposed treatment		<p>This route section is a greenfield alignment. Approximately 54 km of new dual gauge track would be constructed between Grandchester/Rosewood and Kagaru.</p> <p>The alignment for this route section has been adopted from the Queensland Department of Transport and Main Roads, who have conducted a study in parallel with community consultation known as the Southern Freight Rail Corridor (SFRC).</p>	
Reference to where assessed		Section 4.2.14	
Aspect	Key Issues	Potential mitigation measures	Risk
Flora and fauna	<ul style="list-style-type: none"> The proposed alignment would require clearing of 'Not of Concern' and 'Of Concern' Regional Ecosystems, Essential Habitat to the Koala and vegetation within an area mapped as Koala Habitat Area. 	<ul style="list-style-type: none"> Clearing would be minimised to the extent necessary for the project, and where appropriate, revegetation would occur after construction. Some offsets may also be required. 	A
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during construction works and during operation from increased rail traffic. 	<ul style="list-style-type: none"> Standard construction noise mitigation measures should be implemented. Noise mitigation to reduce impacts to an acceptable level should be considered. 	B
Hydrology and flooding	<ul style="list-style-type: none"> Tunnelling (approximately 1050 m and 200 m) and bridge/viaduct structures would likely be required along this section of the alignment. This would have significant construction impacts and may have permanent impacts on local hydrogeology. Bridges and culverts would be required over a number of waterways including Bremer River and Warrill Creek. This would have the potential to impact flow regimes, flood behaviour and may result in scouring. 	<ul style="list-style-type: none"> Detailed environmental assessment and flood studies will be undertaken to develop appropriate mitigation strategies for impacts associated with tunnelling. Bridges would be designed to ensure that the existing hydrological regime is maintained. Scour protection would be installed around bridge piers. 	B
Soils and water quality	<ul style="list-style-type: none"> Construction close to waterways and drainage lines may impact water quality due to erosion and sedimentation. 	<ul style="list-style-type: none"> Erosion and sediment controls would be installed around waterways. 	B
Indigenous heritage	<ul style="list-style-type: none"> The proposed alignment is in proximity to previously recorded Indigenous sites. It is possible that unknown archaeological sites or places of Indigenous cultural significance exist in the area. Potential impacts to these sites may occur during construction. 	<ul style="list-style-type: none"> Consultation with local Indigenous groups should be undertaken in accordance with Queensland Department of Environment and Resource Management requirements, including detailed archaeological and cultural heritage assessments. 	B
Traffic, transport and access	<ul style="list-style-type: none"> Reconfiguration of the existing Cunningham Highway would be required to provide a road overbridge, which would cause 	<ul style="list-style-type: none"> Consultation should occur with the road authority and/or the local council and design and staging of the works should aim to minimise disruption to highway traffic. 	B

Environmental Risk Assessment Data Sheet –Grandchester/Rosewood to Kagaru			
	disruption to highway traffic.		
Visual amenity	<ul style="list-style-type: none"> Visual impacts may occur associated with the proposed new rail line in a scenic landscape. 	<ul style="list-style-type: none"> Appropriate mitigation for visual impacts should be investigated during the concept design phase. 	B
Socio-economic	<ul style="list-style-type: none"> Socio-economic impacts associated with acquisition and severance of rural properties and changes to access. 	<ul style="list-style-type: none"> Where appropriate, affected land owners should be compensated in accordance with the <i>Queensland Acquisition of Land Act 1967</i> or <i>Queensland Land Act 1994</i>. Alternative access to be provided as necessary. 	B
Infrastructure and land use	<ul style="list-style-type: none"> The proposed alignment traverses an area known to contain coal reserves. Construction works would have the potential to disrupt overhead high voltage power lines and will intersect the Moonie to Brisbane oil pipeline. 	<ul style="list-style-type: none"> Consultation with any mining lease holders would be carried out during development of the concept design. All utilities should be protected and relevant authorities and/or operators consulted. 	B

Table 2-24 Environmental Risk Assessment Data Sheet – Kagaru to Brisbane (Acacia Ridge)

Environmental Risk Assessment Data Sheet – Kagaru to Brisbane (Acacia Ridge)			
Description of route and proposed treatment	This route section comprises wholly existing track. The existing track is Class 1, and approximately 36 km in length. No works would be required as part of the project.		
Reference to where assessed	Section 4.4.5		
Aspect	Key Issues	Potential mitigation measures	Risk
Noise and vibration	<ul style="list-style-type: none"> Noise and vibration impacts may occur during operation from increased rail traffic. 	<ul style="list-style-type: none"> Noise mitigation to reduce impacts to an acceptable level should be considered. 	C

2.3 Summary of risk analysis

A summary of the risk assessment data sheets is presented in Table 2-2.

Table 2-25 Summary of Risk Categories

Route section	Environmental risk category										
	Protection areas	Flora and fauna	Noise and vibration	Hydrology and flooding	Soils and water quality	Indigenous heritage	Non-Indigenous heritage	Traffic, transport and access	Visual amenity	Socio-economic ¹	Infrastructure and land use ²
Melbourne to Illabo											
Illabo to Stockinbingal		B	C	C	C			C	C	C	
Stockinbingal to Parkes (south)			C								
Parkes (north) to Narromine (south)			C		B			C	C		C
Narromine to Curban			C	B	C	B		C	C	C	C
Curban to Gwabegar	A		C	B	C	B		C	C	C	
Gwabegar to Narrabri	A	A	B	B	C	B		C	C	B	B
Narrabri bypass		B	B	A	C	B		C	C	B	B
Narrabri (east) to Camurra (south)			C		C			C			
Camurra deviation		C	B	B	C			C	C	C	
Camurra (north) to North Star			C		C			C			
North Star to Yelarbon	C	A	C	B	C	A		C	C	C	C
Yelarbon to Inglewood	C	C	C	C	C			C			
Inglewood to Millmerran	A	A	C	C	C	B		B	C	C	B
Millmerran to Brookstead			C	C	B			C	C		
Brookstead to Yargullen		C	B	C	C			C	C	B	C
Oakey bypass		C	C	C	B			B	C	C	C
Oakey to Gowrie			C	C	B			C			
Gowrie to Helidon		A	B	C	B	C	B	B	B	B	B
Helidon to Laidley		B	B	C	B		B	B		B	
Laidley to Grandchester/Rosewood		B	B	C	B	C	B	C	C	B	
Grandchester/Rosewood to Kagaru		A	B	B	B	B		B	B	B	B
Kagaru to Brisbane			C								

1. Includes property severance, acquisition and access impacts.

2. Includes impacts on mining leases/licence areas, irrigation, utilities and powerlines.

3. Environmental assessment methodology

3.1 Overview

A preliminary environmental assessment of the proposed alignment was carried out. This desktop assessment included consideration of all route sections involving greenfield construction, dual gauging or construction adjacent to existing track, track upgrades and sections where no work is proposed but where operational traffic would increase as a result of the project. No environmental assessment was undertaken between Melbourne and Illabo as no works are proposed along this section as part of the Inland Rail project. Further, rail traffic would not increase along this section as a result of the project.

The environmental issues that were assessed for each route section of the proposed alignment include:

- Protection areas
- Flora and fauna
- Noise and vibration
- Hydrology and flooding
- Soils and water quality
- Indigenous heritage
- Non-Indigenous heritage
- Traffic, transport and access
- Air quality
- Visual amenity
- Social impacts
- Land use.

The following sections describe these issues and outline the assessment approach undertaken as part of the preliminary environmental assessment of the proposed alignment.

3.2 Protection areas

3.2.1 Overview of issue

Protection areas include lands that have been established or dedicated as areas with a specific purpose or use, particularly associated with the conservation or protection of the physical environment or values associated with the environment.

Development within protection areas is generally restricted. Detailed environmental assessment and complex negotiations with the relevant administrative bodies and other stakeholders would be required if such areas were to be directly impacted by the proposed rail line.

3.2.2 Assessment approach

Protection areas in NSW considered as part of the preliminary environmental assessment include:

- Ramsar wetlands
- National Parks
- State Forests
- State Conservation Areas.

Protection areas in Queensland considered as part of the environmental assessment include:

- Ramsar wetlands
- National Parks
- State Forests
- Forest reserves
- Timber reserves.

Impacts to protection areas were assessed along each route section of the proposed alignment using spatial records of protection areas and aerial photography in a Geographic Information System (GIS) database. Most identified protection areas, with the exception of some areas of state forest, were avoided during the selection and refinement of the alignment.

The project is considered to have direct impacts on a protection area if the proposed alignment crosses through a protection area. Where the proposed alignment is located directly adjacent to a protection area, or crosses significant areas of vegetation connected to a protection area, it was considered that the project would have the potential to indirectly impact that protection area.

3.3 Flora and fauna

3.3.1 Overview of issue

The key areas of concern regarding flora and fauna impacts for this project are:

- Impacts to threatened species, populations, ecological communities, ecosystems and fauna habitats
- Fragmentation of wildlife areas and habitats, and severance of wildlife corridors
- Matters of National Environmental Significance.

Vegetation communities are areas of vegetation with similar floristic assemblages and can be defined by key indicator species specific to that type of community as well as landscape characteristics (e.g. floodplain). An ecological community encompasses all living things in an area and includes assemblages of interdependent species and populations of plants, animals, fungi and bacteria.

Endangered Ecological Communities (EECs) are communities that are protected under state and/or Commonwealth legislation because they are threatened.

Wildlife corridors are areas of vegetation (either linear or spot areas) used by wildlife to move between larger vegetated areas. Severance or removal of wildlife corridors may have wider

effects than just the removal of the remnant vegetation, as it may inhibit the ability of populations to move between larger areas, creating small and isolated populations.

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments. The newly created habitat may be used by generalist species that are often considered aggressive, which further decreases population levels of the species remaining in the fragments.

3.3.2 Commonwealth protected flora and fauna

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary piece of legislation that provides protection for Matters of National Environmental Significance (MNES), which includes nationally and internationally important flora and fauna and ecological communities, wetlands of international significance (Ramsar wetlands), World Heritage properties, National Heritage places, Commonwealth marine areas and nuclear actions. The Australian Government maintains a database of MNES known as the protected matters search tool.

MNES considered as part of the assessment of flora and fauna impacts included Commonwealth listed threatened species and ecological communities, migratory species and Ramsar wetlands. World Heritage properties and National Heritage places were considered as part of the assessment of protection areas and non-Indigenous heritage respectively. Due to the location of the proposed inland rail alignment and nature of works, Commonwealth marine areas and nuclear actions are not relevant to the project and are not considered further.

Under the EPBC Act, there are a number of categories of listed threatened species and ecological communities. These are described in Table 3-1.

Table 3-1 Threatened species categories

Relevant threatened species and ecological community category ¹	Eligibility for inclusion of native species or community in category
Critically endangered	The species or community is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	The species or community is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	The species or community is not critically endangered or endangered; and it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

1. 'Extinct' and 'extinct in the wild' categories also exist for threatened species. However, these are not relevant to the assessment of flora and fauna impacts of the inland rail project and have, therefore, not been provided.

Under the EPBC Act, Commonwealth approval is required for activities that have, or are likely to have, a significant impact on listed threatened species, ecological communities, migratory species and declared Ramsar wetlands. The EPBC Act and how it may apply to the project is further discussed in Appendix I.

3.3.3 Flora and fauna in NSW

Native vegetation management

The clearing of native vegetation or protected regrowth requires approval in NSW unless the clearing is a permitted activity. This process is controlled by the *Native Vegetation Act 2003* and the *Native Vegetation Regulation 2005*.

Approval for clearing of native vegetation or protected regrowth can only be given by the local catchment management authority when the clearing will improve or maintain environmental outcomes.

Approval for clearing of native vegetation or protected regrowth can be sought by applying to the catchment management authority to prepare a Property Vegetation Plan or make an application for development consent, which is decided on a case-by-case basis for each proposal (DECCW 2009).

Listed threatened species, populations and ecological communities

In NSW, threatened species, populations and ecological communities are protected under the *Threatened Species Conservation Act 1995*.

In NSW, threatened species databases comprise survey information based on sightings of threatened species.

3.3.4 Flora and fauna in Queensland

Regional Ecosystems

Regional Ecosystems are mapped vegetation communities that are consistently associated with the relevant bioregion and a particular combination of geology, landform and soil type. Each Regional Ecosystem is assigned a conservation status under the *Vegetation Management Act 1999* and is based on its current remnant extent (i.e. how much of it remains) in its bioregion.

The *Vegetation Management Act 1999* prescribes three categories under which Regional Ecosystems may be defined. Table 3-2 provides a description of the Regional Ecosystem status and their classification criteria.

Table 3-2 Regional Ecosystem categories

Regional Ecosystem status	Characteristics of classification
Endangered	<10% of its pre-clearing extent remains across the bioregion; or 10–30% of its pre-clearing extent remains and the remnant vegetation is <10,000 ha.
Of Concern	10–30% of its pre-clearing extent remains across the bioregion; or >30% its pre-clearing extent remains and the remnant extent is <10,000 ha.
Not of Concern	>30% of its pre-clearing extent remains across the bioregion, and the remnant extent is >10,000 ha.

The *Vegetation Management Act 1999* regulates the clearing of remnant vegetation over most land tenures in rural and urban areas through a number of performance criteria. Prior to clearing of vegetation within an Regional Ecosystem, a vegetation clearing permit from the Queensland Department of Environment and Resource Management (DERM) is required as well as a relevant offset, where applicable (refer to section 3.3.5 Vegetation and biodiversity offsets).

The *Vegetation Management Act 1999* also protects native vegetation that is not remnant on state lands.

It should be noted that if a Regional Ecosystem listed under the *Vegetation Management Act 1999* is also protected as a threatened ecological community under the *Environment Protection and Biodiversity Act 1999*, approval may be required under both Acts prior to clearing activities.

Essential Habitat

Essential Habitat is a mapping layer over remnant vegetation in which a species listed as endangered, vulnerable, near threatened or rare has been known to occur¹. These species and their status are specifically listed under the *Nature Conservation Act 1992* and may also be listed under the EPBC Act.

The clearing of mapped Essential Habitat is regulated by the *Vegetation Management Act 1999*, with permission required as part of the vegetation clearing permit from the Queensland DERM. This type of clearing would also require an offset specifically targeting the species affected.

Moratorium areas

The *Vegetation Management (Regrowth Clearing Moratorium) Act 2009* enforced a moratorium placed over certain vegetation throughout Queensland in April 2009 and was in force until 7 October 2009. From 8 October 2009, a new arrangement protecting high value regrowth vegetation and regrowth of identified watercourses came into effect, and replaces the regrowth moratorium.

High value regrowth vegetation is mature native vegetation that has not been cleared since 31 December 1989. All native vegetation within 50 m of a regrowth watercourse is regulated in priority Great Barrier Reef catchments (i.e. Mackay/Whitsunday, Wet Tropics and the Burdekin).

If clearing native vegetation on freehold, leasehold or other state land, the clearing must qualify for an exemption (otherwise approval from the DERM is required) or must comply with the *Regrowth Vegetation Code*. The regrowth vegetation map identifies areas, in the first instance, where clearing must comply with the *Regrowth Vegetation Code*. Regrowth not shown on the regrowth map is exempt and is unaffected (DERM 2009).

Protected native flora

The *Nature Conservation Act 1992* regulates the clearing of Category 1, 2 and 3 species in Queensland. Prior to clearing plants (individuals), a clearing permit from the DERM and a biodiversity offset² would be required. This would form a separate application to that required for clearing under the *Vegetation Management Act 1999*.

If a species is listed under both the *Nature Conservation Act 1992* and the EPBC Act, approval may be required under both Acts prior to clearing activities.

3.3.5 Vegetation and biodiversity offsets

Residual impacts are those that remain after the implementation of a project and all associated mitigation and other environmental management measures have been undertaken. Where there is residual loss or degradation of vegetation and habitat after

¹ Essential Habitat mapping in Queensland is carried out by the Department of Environment and Resource Management and is based on actual recorded locations of the species and/or habitat modeling.

² If threatened species, populations and/or ecological communities are located within the disturbance footprint, steps must be taken to avoid impacting them. Offsets are viewed by both Commonwealth and State environmental agencies as a last resort only.

detailed design and determination of mitigation measures, compensation in the form of compensatory habitat, land rehabilitation and/or contribution to research can be employed (i.e. offsets). Offset strategies or packages for projects are usually developed in consultation with the Queensland Environmental Protection Agency (EPA) and NSW Department of Environment Climate Change and Water (DECCW) as well as the Commonwealth Department of Environment, Water Heritage and the Arts (DEWHA) and give consideration to relevant state and Commonwealth policies relating to offsets (as outlined in each section below). Offsets strategies or packages should address both state and Commonwealth offsetting requirements or principles.

3.3.6 Assessment approach

The locations of Ramsar wetlands were obtained from the Department of Environment, Water, Heritage and the Arts (DEWHA) and mapped in the GIS database. A search of the protected matters search tool was undertaken for greenfield route sections plus a 5 km buffer in October 2009. The results of these searches were considered as part of the preliminary environmental assessment.

Threatened species records for NSW were obtained from the National Parks and Wildlife Service (part of the Department of Environment Climate Change and Water (DECCW)) and mapped in the GIS database.

Existing vegetation mapping within NSW was included in the GIS mapping of the route, including Moree Plains vegetation, vegetation formations for NSW and ACT (Keith, 2002 and Keith and Simpson 2006) and NSW National Parks and Wildlife Service's Estate Mapping.

In addition, characteristics of landscapes were mapped through inclusion of Mitchell Landscapes, a state-wide map of landscapes that describes land attributes considered to be important for ecosystem processes. These include geology, geomorphology and soil characteristics.

Regional Ecosystem and Essential Habitat mapping for Queensland was also included in the GIS database and additional information was obtained from the DERM using the Regional Ecosystem database search form. Key identification numbers were used to identify the Regional Ecosystem description of a mapped area, including categories of threatened species (e.g. endangered, vulnerable, near threatened and least concern) likely to be present in an area.

3.3.7 Limitations

In NSW, records of threatened species are more concentrated in areas where there have been ecological surveys, or around towns and populous places. Although threatened species data points, when mapped, are generally within 1 km of an actual sighting location, they are not sufficiently accurate to enable protection of the species' exact location.

In Queensland it is difficult to pinpoint the exact location of the species. A further limitation is that mapping does not provide information on the density or richness of the species in that area.

In an attempt to overcome these shortcomings, mapping is used in NSW and Queensland to identify areas where threatened species are more likely to exist. In NSW the existence and density of a species was measured using clusters of sightings, whereas in Queensland measurement was based on the identification of larger, more densely plotted areas. Where

possible, aerial photography is used to identify sensitive areas, such as vegetation and water bodies, where the possibility of the occurrence of threatened species is greatest.

3.4 Noise and vibration

3.4.1 Overview of issue

The key potential noise and vibration impacts of the project include:

- Noise and vibration impacts to residences and other sensitive receivers (e.g. schools, hospitals, churches) associated with new track within greenfield areas or increased rail traffic on existing track
- Construction noise and vibration impacts.

Guidelines

In NSW the *Interim Guidelines for the Assessment of Noise from Rail Infrastructure Projects* (NSW Interim Guidelines, 2007) have been adopted. Noise triggers have been established for further assessment where an increase in noise level occurs above 55–60 dB(A) $L_{Aeq, 9h}$ and 80–85 dB(A) L_{Amax} for new and redeveloped rail sections. The Interim Guidelines provide further recommendations for sensitive receiver noise triggers of 40–45 $L_{Aeq, (1hr)}$.

In Queensland the *Environmental Protection (Noise) Policy, 1997* planning noise levels of 65 dB(A) $L_{Aeq, T}$ 24 hour average and 87 dB(A) L_{Amax} single pass-by level should not be exceeded.

Guidance for the assessment of potential sleep disturbance has been adopted from Australian Standard AS 2107:2000 *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors*.

AS 2107 recommends internal noise levels of ‘satisfactory’ 30 dB(A) L_{Aeq} and ‘maximum’ 40 dB(A) L_{Aeq} conducive for sleep in typical urban/suburban environment. In areas of negligible transportation influence, indicative of sensitive rural noise environments, noise levels of ‘satisfactory’ 25 dB(A) L_{Aeq} and ‘maximum’ 35 dB(A) L_{Aeq} are recommended.

3.4.2 Assessment approach

The prediction of operational airborne noise impact from existing rail operations was undertaken for existing rail operations and an initial operating scenario for 2020. The assessment approach has been developed for the prediction of worst case operational noise impacts for the route.

The prediction of rail noise levels was undertaken applying the NORDIC Rail Prediction Method as recommended by state rail guidelines. The Nordic model was adopted as it calculates L_{Aeq} and L_{Amax} rail noise levels, required for the assessment of peak short term and long term rail noise planning objectives.

Site specific noise propagation models were developed using the SoundPLAN (version 6.5) software, for the assessed route sections.

Route sections representative of areas influenced by existing rail operations (including existing track sections and new track within 500 m of existing track) and greenfield alignments were assessed, to provide an indicative assessment for the whole alignment.

Based on existing freight and passenger rail operations on some route sections, including between Melbourne and Illabo and between Stockinbingal and Parkes, potential increases in

rail noise levels are not expected to trigger the state rail noise planning objectives, accordingly these sections have not been included in this assessment.

Existing rail movements were adopted from the ARTC Working Timetable and typical 'as required' seasonal traffic from the Train Control Offices. Future rail movements were estimated by adding 4 rail movements (total for both directions) to existing daily rail movements on redeveloped and new route sections.

Ambient noise level measurements were taken at two locations — on the existing Main South line and along the proposed alignment between Stockinbingal and Illabo — to provide indicative background noise levels for both upgrade and new build sections of the project.

Sensitive receivers in rural areas and towns and rural dwellings were mapped using GIS and aerial photography. Predicted noise impacts were determined for individual sensitive receiver locations.

Limitations

The noise assessment was based on indicative modelling and a worst case scenario of rail traffic assumptions was adopted.

Ambient noise levels at each route section may vary according to site-specific conditions (e.g. surrounding landforms, presence of water bodies, rail speed limit and track formation).

Noise modelling did not consider the temporary and transient impacts associated with construction (e.g. construction machinery and equipment); therefore, construction noise mitigation should be reviewed during future design stages.

3.5 Hydrology and flooding

3.5.1 Overview of issue

Where alignments cross flood-prone land, the effect on floodwaters would have to be assessed during design to minimise downstream or upstream flooding issues. Downstream flood impacts may include changes to hydrology as a result of channelling or redirection of flow through altered bridge openings and/or culverts and reduction of flows to ecosystems or farm properties that rely on periodic flooding. Upstream impacts may include increased depth of floodwaters, changes in inundation periods or floodwater retention time and changes in flow velocity.

Construction across flood-prone land would require careful planning and consideration of engineering solutions to minimise cost and program implications and to address operational functionality during flood events.

3.5.2 Assessment approach

Hydrology and flooding issues were assessed for each route section through identification of flood prone and low-lying areas provided in GIS mapping. Topographical mapping was reviewed to determine the likelihood of potential hydrological impacts, and susceptibility to flooding.

Limitations

The level of information available varied along the preferred alignment. Generally, the assessment was undertaken at an adequate level of detail for the concept design of bridges and culverts, and to identify the likely constraints of selected routes. Further hydrologic analysis would be required for detailed design.

3.6 Soils and water quality

3.6.1 Overview of issue

Construction works would disturb the soil and may result in soil erosion. The preferred alignment crosses numerous rivers, creeks and drainage lines and passes a number of farm dams and water holes. Construction works close to watercourses and surface water bodies could have potential impacts on water quality due to soil erosion or as a result of contamination by chemicals or other hazardous substances.

While the project has aimed to achieve a local balance of cut and fill, additional material may be required in some areas and excess spoil may be created in other. Tunnelling has the potential to generate significant amounts of spoil, which may require transportation and disposal offsite where reuse is not possible.

Existing track sections would have the potential for soil contamination to be present from historic and current rail traffic.

3.6.2 Assessment approach

Water quality was assessed at a detailed route option level with the number of major and minor waterway crossings identified and categorised as an environmental limitation. The number of likely waterway crossings informed the potential risk to water quality and hydrology impacts for each route section.

Soil properties along the preferred alignment were reviewed where information was available. Additional soil and underlying lithological descriptions were sourced from GIS mapping.

Topographical and aerial mapping was used to identify areas that would require extensive cut and fill or tunnelling.

All existing track sections, including where greenfield sections interface with existing track (i.e. turnouts), were considered to have the potential for contamination to be present. In Queensland, the locations of landfill sites were identified using available GIS mapping undertaken by Hyder Consulting for the North-South Rail Corridor study (2006).

3.7 Indigenous heritage

3.7.1 Overview of issue

Indigenous heritage relates to places and items that are significant, or contribute, to the understanding of Aboriginal and Torres Strait Islanders and their attachment to Australian land before (and during) European settlement. Indigenous heritage is often associated with remnants, evidence of settlement or movement patterns of Aboriginal people, but may also include places of spiritual or ceremonial importance.

In NSW, Aboriginal heritage is protected by the *National Parks and Wildlife Act 1974*. The NSW DECCW maintains a register, known as the Aboriginal Heritage Information Management System (AHIMS), of previously recorded Aboriginal sites, items and places that have been reported in NSW.

In Queensland, Indigenous heritage is protected by the *Aboriginal Cultural Heritage Act 2003*. The Queensland DERM maintains a database of previously recorded Indigenous sites in Queensland, known as the Aboriginal and Torres Strait Islanders Cultural Heritage

database. The database contains records of sites and the location, type and Indigenous party for the area in which the site is located.

3.7.2 Assessment approach

A preliminary desktop study of Indigenous heritage, comprising searches of the AHIMS database in NSW and the Aboriginal and Torres Strait Islanders Cultural Heritage database, mapping of recorded sites/items, and preliminary predictive modelling, to identify areas of potential heritage sensitivity, was undertaken for sections of the alignment comprising new track.

Areas of Indigenous heritage sensitivity based on predictive modelling

Indigenous heritage sites may be found anywhere in Australia, but are often located in areas most suitable for particular activities. For example, occupation sites (physical evidence for which may include stone artefacts, shell middens and scarred trees) are often located in areas with access to water and food resources, such as creeks, swamps, and along the coast, and may be found in shelters where appropriate overhangs are present.

There is potential for Indigenous heritage sites to be present within the study area, particularly in association with the following landforms:

- Stone outcrops and overhangs/shelters, particularly sandstone. Potential for shelter occupation sites, art/engraving sites, and grinding grooves (generally associated with running water). Stone quarries may be present in areas where outcrops or resources, such as cobbles, are of suitable material, such as chert, silcrete, mudstone or quartz
- Water resources, including creeks, rivers, and swamps. Potential for occupation sites (particularly comprising stone artefacts and scarred trees) and possibly burials. While occupation sites are found in all environmental contexts, larger and denser sites tend to be found in association with high order streams, particularly on ridgelines and other areas that offer movement routes
- Areas with minimal tree clearing and disturbance. Sites that may be present in these landforms include scarred trees, and ceremonial sites including carved trees and stone arrangements, in addition to occupation sites.

Given that the majority of land in the new sections of the railway alignment has predominantly been subject to pastoral use, cultivation and rural residential use, sites may have been disturbed or damaged to some degree.

Limitations

The NSW AHIMS and Queensland Aboriginal and Torres Strait Islanders Cultural Heritage databases are not comprehensive and only contain items or sites which have been previously identified and reported on. The locations of previously recorded items or sites may also be inaccurate. Field surveys would be required to verify the locations of previously recorded items or sites and to determine if previously unrecorded items or sites are present.

3.8 Non-Indigenous heritage

3.8.1 Overview of issue

Non-Indigenous heritage places and items are generally associated with past land uses and settlement history. This includes places, objects or structures with a cultural or historical significance that give context to how a place, community or nation has evolved.

Non-Indigenous heritage can be listed at Commonwealth, state and/or local government level.

Non-listed items or places may also have heritage significance. The NSW *Heritage Act 1977* provides statutory protection for relics, archaeological deposits, features or deposits in NSW and requires that excavation of land that is likely to contain archaeological relics be undertaken with an excavation permit issued by the Heritage Council. Section 170 of the *Heritage Act 1977* requires government bodies to establish and maintain heritage and conservation registers. These registers, known as s. 170 Registers, must include heritage items owned or occupied by statutory bodies.

The *Queensland Heritage Act 1992* regulates excavation of sites in Queensland that may contain objects of heritage significance.

3.8.2 Assessment approach

A preliminary desktop study was undertaken for the proposed alignment in NSW and Queensland to identify the location and significance of non-Indigenous heritage items and places. As the project does not propose any activities in Victoria, no searches were undertaken for the route in this state. The following heritage registers and lists were searched as part of the study:

- Australian Heritage Database
- Commonwealth Heritage List
- National Heritage List
- Register of National Estate
- NSW State Heritage Register (incorporating the ARTC s. 170 Register)
- DECCW s.170 Register
- Department of Agriculture s. 170 Register
- NSW Department of Health s.170 Register
- NSW Fire Brigades s. 170 Register
- State Rail Authority (SRA) s. 170 Register
- Coolah Local Environmental Plan 2000
- Coonabarabran Local Environmental Plan 1990
- Junee Local Environmental Plan 1992
- Moree Plains Local Environmental Plan 1995
- Murrurundi Local Environmental Plan 1993
- Narrabri Local Environmental Plan 1992
- Narrabri Local Environmental Plan No 2
- Narromine Local Environmental Plan 1997
- Parkes Local Environmental Plan 1990
- Wellington Local Environmental Plan 1995
- National Trust of Queensland
- Queensland Heritage Register
- Barraba Local Environmental Plan 1990
- Bingara Local Environmental Plan 1994

- Coonamble Local Environmental Plan 1997
- Gilgandra Local Environmental Plan 2004
- Inverell Local Environmental Plan 1988 and Amendments
- Gatton Shire Planning Scheme 2007
- Laidley Planning Scheme 2002
- Parry Local Environmental Plan 1987

While the NSW State Heritage Register contains most of the items listed under the ARTC s. 170 Register, further consultation was undertaken with ARTC to ensure that any items not included in the State Heritage Register were considered.

Items were mapped in a GIS database and maps were reviewed to determine if impacts were likely.

Limitations

Only formal Commonwealth, state or local government lists/registers were reviewed for non-Indigenous cultural heritage items for each route section.

The lack of identified heritage items is not indicative; there is potential for rail infrastructure, particularly timber bridges, rural homesteads and other buildings or facilities to have heritage significance.

3.9 Traffic, transport and access

3.9.1 Overview of issue

The development of rail infrastructure may impact existing rail operations and road traffic where level crossings or road over bridges are required.

Existing transport routes, including road, rail and travelling stock routes, may also experience temporary disruptions during the construction periods. The project would have the potential to sever access to properties or along travelling stock routes temporarily during construction or permanently during the operation of the project. Where this occurs, alternative access arrangements would need to be investigated.

3.9.2 Assessment approach

In developing the preferred alignment, built up areas and urban centres were avoided where possible to reduce potential impacts to existing roads. Property severance was also minimised which would reduce property access issues.

GIS mapping was used to identify significant transport routes, such as main roads and existing rail lines, and travelling stock routes to determine whether the project would be likely to impact on these.

3.10 Air quality

3.10.1 Overview of issue

The introduction of rail traffic in areas previously bereft of trains, and increases in rail traffic on existing rail lines, would have the potential to reduce local air quality from freight diesel emissions. Emissions generally disperse at a distance of 50 to 100 m from the source depending on topographic and climatic factors. Therefore, sensitive receivers located

greater than 100 m from the proposed alignment or existing rail lines would be unlikely to be affected.

Earthmoving and other dust generating activities during construction works would have the potential to reduce local air quality.

3.10.2 Assessment approach

In developing the preferred alignment, existing rail corridors were used wherever practicable.

Potential impacts to air quality were considered at a local level based on the type of infrastructure proposed (i.e. rail) and the spatial extent of the individual route sections.

3.11 Visual amenity

3.11.1 Overview of issue

Temporary impacts to visual amenity may occur during construction activities as a result of vegetation removal, earthworks and construction vehicles and machinery being located on site. More permanent impacts may occur where the project would result in permanent changes to the landscape. Impacts would be most severe where new rail infrastructure is introduced into an area or where extensive vegetation clearing or significant earthworks are required. Rural or natural landscapes would be particularly affected.

3.11.2 Assessment approach

In developing the preferred alignment, significant areas of vegetation were avoided and topographical features were avoided where possible which would reduce visual amenity impacts on the landscape.

Existing landscape features, such as vegetation, waterways and landforms, and settlement patterns were reviewed through aerial imagery and GIS mapping to determine the likely scenic value and visual sensitivity of landscapes and the potential impacts of the project on visual amenity.

3.12 Social impacts

3.12.1 Overview of issue

The development of the project may result in a number of social impacts to local land owners and the community. These would be associated with:

- Land severance and acquisition
- Construction works, including traffic, noise, dust, loss of amenity
- Impacts associated with the operation of the rail line, including noise, vibration and visual impacts (particularly where a new rail line is introduced through a town or village)
- Impacts to community facilities, such as showgrounds, hospitals, schools
- Improved freight access for rural areas to transport goods to ports.

As much of the preferred alignment is located within rural areas, land severance is considered to be a significant issue and would have the potential to affect the use of the land for agricultural activities. In urban areas, communities may be impacted by changes in access to residences and other facilities (e.g. heritage listed places, schools, sporting and recreational facilities and shops).

3.12.2 Assessment approach

In developing the preferred alignment, potential land severance was minimised through following cadastral boundaries and road reserves as much as possible. Land severance was unable to be avoided along sections of the alignment. Where severance would occur, the impacts were discussed.

Community facilities were identified through aerial imagery and GIS mapping to identify key issues along the route.

3.13 Land use

3.13.1 Overview of issue

The project may impact on the existing and future use of land along the proposed alignment or may be impacted by existing or future surrounding land uses. The development of the inland railway may impact on existing grazing, cultivation or irrigation activities along the proposed alignment. Severance of rural properties may impact on the lands suitability for agricultural uses if residual land parcels are too small.

The proposed alignment also traverses, or lies adjacent to, numerous mineral exploration areas, mining areas, and land known to contain coal and mineral resources. Development of the railway through mining exploration areas or land known to contain mineral resources may impact on the future extraction of this resource. In most cases, the railway line would be able to be moved to allow mining to occur. The development of a major freight railway line would be of benefit to mines within the vicinity of the project.

3.13.2 Assessment approach

In developing the preferred alignment, potentially conflicting land uses were avoided where possible.

Aerial imagery, land use mapping and mapping of mining lease and exploration areas was reviewed to identify any potential conflicts with existing land uses.

Statutory land zoning along the preferred alignment was considered as part of Appendix I.

4. Preliminary environmental assessment

4.1 Overview

A preliminary environmental assessment of each route section of the proposed alignment was undertaken. These assessments are presented below according to treatment type (i.e. greenfield construction, construction adjacent to existing track, including dual gauged track, track upgrades, and no works).

The potential impacts and mitigation measures common to all route sections as well as impacts and mitigation measures specific to each route section are discussed.

4.2 Greenfield construction

4.2.1 General assessment of all route sections

Construction works

Prior to commencement of construction, early works would be carried out to prepare the site for construction activities. This would involve the establishment of access roads and construction compounds, installation of temporary fencing for safety and security reasons, clearing and grubbing of vegetation, and the stripping and stockpiling of topsoil.

Environmental controls would be implemented prior to the commencement of works.

Earthworks would involve excavation of cuttings using bulldozers and scrapers. For deeper cuts, blasting may be required. Fill material would be placed and compacted using vibratory rollers and water. Any excess material would be stockpiled or transported to other areas of the project requiring fill. Where additional fill is required, this would be taken from borrow pits or existing quarries.

New track would be constructed with a tracklaying machine. Temporary turnouts would be required at each end of the section of track. Once construction of the track is complete, signage, signalling and communication facilities would be installed. Tie-in with the existing track would need to occur under track possession.

Other works would include the construction of road overbridges or level crossings, drainage works, the construction of turnouts and passing loops, and the construction of bridges and tunnels. Where possible, tunnel spoil would be stockpiled for later use as fill.

Potential impacts

During construction of greenfield route sections, the following impacts may occur:

- Clearing of vegetation for the new track, construction compounds, ancillary facilities and access tracks
- Disturbance of Indigenous heritage items or sites within or adjacent to the construction footprint
- Damage to non-Indigenous heritage items or sites within or adjacent to the construction footprint
- Construction noise impacts to nearby sensitive receivers
- Erosion and sedimentation from construction activities and associated impacts on water quality
- Disruption to freight and passenger rail services during tie-in works to the existing rail network

- Traffic impacts such as delays or diversions as a result of construction of road bridges or level crossings, or from construction vehicles on the local road network
- Restrictions or changes to property access, and temporary use of land for access, site compounds or staging activities
- Generation of dust from earthworks
- Water quality impacts as a result of spills or leaks from construction vehicles or machinery or from chemical stores on site
- Decreased visual amenity from construction plant and machinery, stockpiles and general construction activities
- Disturbance of potentially contaminated soil during construction of turnouts where new track joins with existing track
- Positive economic benefits for local communities associated with increased expenditure from construction personnel purchasing local goods, services and accommodation.

The following impacts may occur during operation of greenfield route sections:

- Operational rail noise impacts to nearby sensitive receivers
- Reduced local air quality from freight diesel emissions
- Reduced visual amenity as a result of introduction of rail infrastructure into rural or natural view sheds
- Permanent removal of native vegetation and associated habitat fragmentation and reduction
- Where the alignment crosses floodplains or significant water courses, changes to the existing hydrological regime and increased risk of flooding
- Where structures are to be built across water courses, changes to flow velocity and associated scouring around bridge piers or sedimentation within waterways around structures
- Socio-economic issues associated with the permanent severance of rural properties.

Suggested mitigation measures

Suggested mitigation measures for construction impacts are as follows:

- Vegetation clearing should be minimised to the extent necessary for construction of the rail line and establishment of construction compounds and access tracks. Construction compound sites and sites for other temporary facilities should be selected to minimise disturbance to vegetation. The limits of clearing should be clearly demarcated on site to prevent excess clearing
- Where there is a risk of Indigenous heritage being present, an assessment in accordance with NSW DECCW or Queensland DERM requirements, and involving local Indigenous stakeholders, would be required. The assessment should identify and assess the significance of any previously recorded or unrecorded Indigenous archaeological sites or cultural heritage places in the locality. Development of the concept design should seek to minimise impacts to Indigenous heritage. Where potential impacts are likely, these should be assessed and recommendations for specific mitigation measures provided

- Where non-Indigenous heritage is present, an assessment in accordance with the NSW Department of Planning Heritage Branch or Queensland DERM requirements would be required. This should assess the significance of the heritage item. Development of the concept design should seek to minimise impacts to non-Indigenous heritage. Where potential impacts are likely, these should be assessed and recommendations for specific mitigation measures provided
- Where turnouts are to be constructed to tie new track sections into existing track, an investigation into potential soil contamination would need to be undertaken in accordance with the NSW *Contaminated Land Management Act 1997* or the Queensland *Environmental Protection Act 1994* to determine appropriate management measures and remedial actions.

Construction environmental management plans (CEMPs) and sub-plans would need to be developed and implemented for any construction works. These plans would detail measures for the remaining general construction impacts outlined above. As a minimum, the following measures would likely be required:

- A community notification strategy should be developed which should establish a project information line and complaints handling procedure
- A construction noise and vibration management plan detailing construction noise mitigation measures should be prepared and implemented as part of CEMP prior to commencement of construction activities
- A construction traffic management plan should be prepared and implemented as part of the CEMP prior to commencement of construction activities
- Erosion and sediment control plans would need to be developed and implemented during any construction works. Control measures should be installed and maintained around watercourses and drainage lines for the duration of construction to reduce adverse water quality impacts. Where there is a high risk of erosion, additional mitigation measures may be necessary. This could include employing a soil conservation specialist to manage the site for the duration of construction works.
- Dust suppression measures, such as watering exposed soil and ceasing dust generating activities during periods of high wind, should be implemented
- Potentially hazardous and/or contaminating materials should be stored appropriately (e.g. in bunded areas) to minimise the risk of leaks or spills contaminating watercourses. Construction vehicles and machinery should be maintained to ensure that no leaks occur. Procedures should be put in place to ensure that any spill is contained immediately and the appropriate authorities are contacted

Suggested mitigation measures for general operational impacts include:

- Investigation of noise mitigation where operational noise levels exceed targets
- During the development of any concept design, a more detailed flora and fauna assessment, including field surveys, should be undertaken to determine the existing vegetation communities, fauna habitat areas and presence of rare or threatened species, populations or ecological communities. The concept design should seek to minimise impacts to biodiversity. Revegetation should take place at the completion of construction works. It may also be necessary to provide offsets depending on the extent and type of vegetation cleared
- Revegetation of the rail corridor may provide some mitigation for impacts on visual amenity. Additional mitigation measures for visual impacts, such as screening of

individual properties, should be investigated during the detailed environmental assessment stage

- Where the proposed alignment crosses an area with a moderate or higher risk of flooding, such as over a designated floodplain, hydrological investigations would likely be required during the development of any concept design. Where possible, the concept design, including the design of bridges or culverts, should seek to ensure that the extent of flooding is not increased by the project
- Where structures are required over watercourses, scour protection measures should be installed on bridge piers and abutments, and culvert openings, to prevent scouring of the creek bed.

4.2.2 Illabo to Stockinbingal

Existing environment

The proposed alignment from Illabo to Stockinbingal falls within the mid-Murrumbidgee catchment management area and passes through rural land predominantly used for cropping and grazing. The terrain along the proposed alignment is flat to undulating, but becomes hillier to the east and west of the alignment. The Bethungra Ranges lie to the east of the proposed alignment.

The alignment crosses a number of watercourses, including Ironbong Creek, Bland Creek, Dudauman Creek, and their tributaries. Dudauman Creek is known to flood, with flood levels being recorded at 304 m Australian height datum (mAHD) during the probable maximum flood event.

Alluvium soils with high erosion potential and areas of dry land salinity occur along the proposed alignment.

Vegetation in the area has largely been cleared, but occurs as scattered paddock trees and patchy remnants predominantly along creek lines and roadsides. Patches of Western slopes grassy woodland, which may be associated with White Box Yellow Box Blakely's Red Gum Woodland, occur at the northern end of the alignment. White Box Yellow Box Blakely's Red Gum Woodland is listed under the NSW *Threatened Species Conservation Act 1995* as an Endangered Ecological Community. A larger tract of vegetation exists in the central portion of the route section approximately 2 km to the east of the alignment. This connects to the Ulandra National Park to the south-east.

The Superb Parrot, listed under both the EPBC Act and the NSW *Threatened Species Conservation Act* as vulnerable, has been recorded within 2 km of the proposed alignment, indicating that potential habitat for the species exists in the area.

A search of the EPBC Act protected matters search database was undertaken to identify relevant MNES potentially affected by the project. The results indicate that Ramsar wetlands, Fivebough and Tuckerbil Swamps, are located within the catchment. However, they are located more than 120 km from the proposed alignment. Two threatened ecological communities, 16 threatened species (birds, mammals, ray-finned fish, reptiles and plants) and 11 migratory species were identified within 5 km of the alignment. One State and Territory Reserve, the Ulandra Nature Reserve, and a Commonwealth land area was identified within 5 km of the alignment.

Two AHIMS sites, a scarred tree and an unnamed site, are located approximately 3.5 km east of the proposed alignment on the north-western outskirts of the town of Bethungra.

Given the existence of these sites, there is potential for other Aboriginal archaeological sites or areas of cultural significance to occur in the locality.

The proposed alignment would stem from the Main South line adjacent to the Olympic Highway and would cross three minor roads: Old Sydney Road, Old Cootamundra Road, and Dudauman Road. These roads serve as connector roads between Stockinbingal, Cootamundra and Illabo.

Rural residences are located along the route section, some within 200 m of the proposed alignment. There is potential for homesteads or other farm infrastructure or items to have historical heritage value.

The southern and northern portions of the proposed alignment cross mineral exploration leases. The main lease is held by Carpentaria Exploration Limited.

Proposed works

This route section is approximately 37 km in length and would provide a new direct route between Illabo and Stockinbingal, bypassing the towns of Cootamundra and Bethungra. The alignment would leave the existing Main South line via a new turnout approximately 6 km north-east of Illabo. The alignment generally travels north from Illabo and has been designed to minimise impacts on rural properties by following cadastral boundaries and roads/road reserves where possible. The alignment would link back into the existing Cootamundra to Parkes line via a new turnout to the east of Stockinbingal.

A bridge would be constructed over Dudauman Creek directly west of Stockinbingal. Bridges or culverts may also be required over other minor watercourses, including Ironbong and Bland creeks. Grade crossings would be provided on Old Sydney Road, Old Cootamundra Road, and Dudauman Road.

Potential impacts

Construction of the proposed alignment would require the permanent removal of vegetation, some of which may fit within the definition of the White Box Yellow Box Blakely's Red Gum Woodland EEC. The vegetation to be cleared may also comprise potential habitat for the Superb Parrot. During construction works some vegetation removal may also be necessary to allow the temporary establishment of construction compound sites and access tracks.

Construction works close to watercourses may result in erosion and sedimentation, which could potentially affect water quality of creeks. Proposed bridges or culverts over watercourses may result in scouring of creek beds. Construction of a bridge over Dudauman Creek would have the potential to alter the existing flood regime.

Whilst there were no previously recorded Indigenous archaeological sites in the immediate vicinity of the proposed alignment, there is potential for unrecorded sites in the area. These may be damaged or destroyed by construction activities if they are not identified and adequate mitigation provided.

The alignment traverses numerous rural properties and would result in varying degrees of severance and impacts to property access. Full or partial acquisition of a number of rural properties would be necessary to construct the alignment.

Predicted noise impacts of 52-63 dB(A) $L_{Aeq, 9hr}$ at receivers within 250 m of the rail line are potentially up to 8 dB(A) in exceedance of the adopted 55 dB(A) $L_{Aeq, 9hr}$ planning noise criteria at nearest receivers. Dependent upon direct line of sight to the rail line, compliance with the planning noise criteria would be expected at greater than 250 m from the rail line.

There may be some impacts to traffic during construction of road overbridges and level crossings and as a result of additional construction vehicles on the local road network.

There is likely to be some visual impact due to the introduction of a new rail line in a generally flat to undulating rural landscape.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna surveys would be required to gather baseline information on local biodiversity, including the vegetation communities within the study area and threatened species or communities likely to occur in the locality, and assessment of impacts to biodiversity once the extent of vegetation clearance is determined. The extent of vegetation clearing should be limited to that necessary to construct the alignment. Depending on the extent, quality and status of vegetation to be removed, vegetation offsets may be required.

An Indigenous heritage assessment as described under section 4.2.1 would likely be required.

Visual impacts may require mitigation depending on the outcome of further assessment. Potential mitigation measures are described in section 4.2.1.

To reduce flooding impacts, the formation upstream of the Dudauman Creek crossing should be higher than 309 mAHD. Flooding impacts could be mitigated with bridge design as described in section 4.2.1. Scour protection may be required as described in section 4.2.1.

Where it is necessary to fully or partially acquire land, impacts would be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991*. Consultation with affected land owners would be carried out during all stages of concept design development and the detailed environmental assessment.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 19 properties may require noise management and mitigation measures to reduce potential received noise impacts along this route section.

4.2.3 Narromine to Curban

Existing environment

The proposed alignment from Narromine to Curban falls within the Central West catchment management area and primarily passes through rural freehold land used for cropping and grazing, as well as some areas of Crown land. A number of rural residences exist along the proposed alignment, some within 40 m of the alignment.

The terrain along the proposed alignment is flat to undulating. Isolated patches of remnant vegetation exist along the alignment, predominantly along creek lines and roadsides. EECs that may be present in the area, according to National Parks and Wildlife Service data, include:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions
- White Box Yellow Box Blakely's Red Gum Woodland.

A number of threatened fauna species, including the Superb Parrot, Grey-crowned Babbler, Little Lorikeet, Speckled Warbler, Glossy Black Cockatoo and Bush Stone-curlew, listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) have been previously recorded within approximately 5 km of the proposed alignment. The Superb Parrot is also listed under the EPBC Act. One threatened flora species, listed under the *Threatened TSC Act* and the EPBC Act, Bluegrass, has been previously recorded within approximately 5 km of the proposed alignment.

A search of the EPBC Act protected matters search database was undertaken to identify MNES potentially affected by the project. The results indicate that the Macquarie Marshes Nature Reserve Ramsar wetland is located within the same catchment. However, it is located more than 100 km from the proposed alignment. Three threatened ecological communities, 15 threatened species (birds, mammals, ray-finned fishes and plants) and 17 migratory species were also identified. Four places on the Register of National Estate were identified, these are all Aboriginal sites — Euromedah Carved Tree, Narromine Carved Tree, Stockyard Park Carved Trees and Terramungamine Reserve. Two Commonwealth land areas were identified.

Nineteen AHIMS sites, all scarred trees, are located within 1 km of the proposed alignment, the closest of which is located approximately 20 m east of the alignment. Given the existence of these sites, there is potential for other Aboriginal archaeological sites or areas of cultural significance to occur in the locality.

One non-Indigenous heritage item, the Narromine Station Group listed under the State Rail Authority section 170 Register, is located within approximately 1 km of the alignment. This heritage item is located on the existing Main Western railway line.

The alignment crosses a number of watercourses, including the Macquarie River, Ewenmar Creek, Goulburn Creek, Emogandry Creek, Kickabil Creek, Millpulling Creek and their tributaries. The southern portion of the alignment crosses the Macquarie designated floodplain area and is located within an irrigation area.

The proposed alignment would stem from the Main Western railway line adjacent to the Mitchell Highway, and would cross a number of roads including Morris Road, Warren Road, Burroway Road and Collie Road. The proposed alignment parallels a number of roads including Gobocco Road and an unnamed dirt road.

The southern 30 km of the proposed alignment traverses land subject to two Mineral Exploration Leases held by Australian Pacific Mines Pty Ltd and Horizon Pacific Mines Pty Ltd. These Exploration Leases expire in June 2010 and July 2010 respectively.

The proposed alignment passes under high voltage power lines in the vicinity of Burroway Road.

Proposed works

The proposed alignment from Narromine to Curban stems from the Main Western railway at Narromine and would comprise approximately 90 km of greenfield construction. The alignment would leave the existing railway approximately 4 km to the north-west of Narromine. The alignment generally follows a northerly direction from Narromine and parallels existing roads or road reserves wherever possible to minimise land acquisition

requirements and severance of rural properties. The proposed alignment would connect to the existing Dubbo to Coonamble railway near Curban.

Up to 12 bridges would be required to cross numerous watercourses including the Macquarie River, Ewenmar Creek, Goulburn Creek, Emogandry Creek, Kickabil Creek, Millpulling Creek, and irrigation channels. Culverts would be required to cross numerous minor water courses.

Grade crossings would be provided at numerous road crossings.

Potential impacts

Construction of the proposed alignment would require the permanent removal of vegetation, some of which may comprise Endangered Ecological Community or habitat for threatened species.

Construction works would have the potential to disturb previously recorded and unrecorded Aboriginal heritage sites if adequate mitigation is not provided.

Construction works close to water courses may result in erosion and sedimentation which could potentially affect water quality. Proposed bridges or culverts over water courses may result in scouring of creek and river beds. Construction of bridges may alter the existing flooding regime.

The alignment would result in the severance of a number of rural properties, or access to these properties, and would require the demolition of at least one rural residence and a number of other farm structures. Access to farm dams may be severed as a result of the project. At least one farm dam would need to be filled in to construct the alignment. Construction works within the irrigation area would also have the potential to damage irrigation infrastructure.

Predicted noise impacts of 36-68.5 dB(A) are potentially up to 13.5 dB(A) in exceedance of the adopted 55 dB(A) $L_{Aeq, 9hr}$ planning noise criteria. Compliance with the planning noise criteria would be expected at the majority of receivers located greater than 500 m from the rail line.

Based on a 27.5 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative greenfield location, rail pass by events in all greenfield routes would be expected to be audible within 500 m of the rail line.

Construction of level road crossings and the addition of construction vehicles on the local road network may cause delays or diversions for local traffic.

The introduction of a railway line in the rural landscape may reduce visual amenity particularly where the alignment parallels a road and would be visible to passing vehicles.

Development of a railway line across Mineral Exploration Lease areas may affect the future extraction of any resource. The new railway line would provide improved access to a major piece of transport infrastructure for any future mine.

Construction activities under the high voltage power lines would have the potential to disrupt these power lines if not managed properly.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna field surveys should be undertaken along the alignment as described in section 4.2.1, particularly for the riparian vegetation surrounding the Macquarie River. The extent of the vegetation clearance should be limited to that necessary to construct the alignment. Depending on the extent, quality and status of vegetation to be removed, vegetation offsets may be required.

An Indigenous heritage assessment as described under section 4.2.1 would likely be required.

Further investigation into the existing hydrological regime should be undertaken during development of a concept design and, where necessary, bridge design should ensure that the existing flooding regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers and abutment, and culvert openings to prevent scouring of creek beds.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 27 properties may require noise management and mitigation measures to reduce potential received noise impacts.

Mitigation measures for impacts to visual amenity, such as revegetation of the rail corridor, should be investigated during development of the concept design.

Protection should be provided for the high voltage power lines during construction works. Consultation should be carried out with the service provider during the detailed environmental assessment phase.

Where it is necessary to fully or partially acquire land, impacts should be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, and with consultation as described in section 4.2.1. Where construction of the railway would result in the severance or removal of residential dwellings, other buildings and farm dams, these would likely require relocation or replacement.

4.2.4 Curban to Gwabegar

Existing environment

The proposed alignment between Curban and Gwabegar comprises predominantly greenfield construction with a small section of existing track in the north. The alignment falls within the Central West catchment management area and passes through rural freehold land, Crown land and a small area of state forest. A number of rural residences exist along the proposed alignment, the closest within 20 m of the alignment.

The terrain along the proposed alignment is flat to undulating in the southern and northern portions of the alignment but becomes more undulating to hilly in the central portion of the alignment. The Warrumbungle National Park is located approximately 14 km to the east of the central portion of the alignment.

The proposed alignment passes along the western border of the Curban State Forest approximately 6 km from its southern extent, and traverses an area of the Merriwindi State Forest approximately 1.5 km south of the proposed tie-in with the existing track section. The existing track section also passes through the Merriwindi State Forest, although the rail corridor is not designated as state forest.

Isolated patches of remnant vegetation exist along the alignment, predominantly along creek lines and roadsides. Vegetation surrounding the existing track section of the alignment,

within the state forest, is denser. Endangered Ecological Communities that could be present in the area, according to National Parks and Wildlife Service data, include:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions
- White Box Yellow Box Blakely's Red Gum Woodland.

A number of threatened fauna species, including the Greater Long-eared Bat, Grey-crowned Babbler, Superb Parrot, Bush Stone-curlew, Koala, Pilliga Mouse, Barking Owl and the Pale-headed Snake, listed under the NSW *Threatened Species Conservation Act 1995*, have been recorded within approximately 5 km of the proposed alignment. The Superb Parrot and Pilliga Mouse are also listed under the EPBC Act.

A search of the EPBC Act protected matters search database was undertaken to identify relevant MNES potentially affected by the project. The results indicate that Macquarie Marshes Nature Reserve is located within the same catchment. However this is located more than 100 km from the proposed alignment. Three threatened ecological communities, 18 threatened species (birds, mammals, ray-finned fishes and plants) and 11 migratory species were also identified. Two State and Territory Reserves, the Pilliga Nature Reserve and Warrumbungle National Park, and 4 places listed on the Register of the National Estate, one Indigenous (Tara Cave) and three natural (Chalk Mountain Area, Pilliga Nature Reserve and Warrumbungle National Park), were identified. Five Commonwealth land areas were identified.

Twenty-nine AHIMS sites, including 23 scarred trees, 4 artefact sites and 1 waterhole, are located within approximately 1 km of the proposed alignment. Given the existence of these sites, there is potential for other Aboriginal archaeological sites or areas of cultural significance to occur in the locality.

The proposed alignment crosses a number of water courses including the Castlereagh River, Teridgerie Creek, Frazers Creek and the Baronne Creek.

The proposed alignment would parallel and cross a number of minor rural roads.

Proposed works

The proposed alignment from Curban to Gwabegar extends for approximately 118 km, and would comprise approximately 99 km of greenfield construction and 19 km of track upgrade. The section of track to be upgraded is standard gauge and forms part of the Wallerawang to Gwabegar railway.

Up to 11 bridges would be required to cross numerous water courses including the Castlereagh River, Judes Creek, Tooraweena Creek, Baronne Creek, Tenandra Creek, Frazers Creek, Quanda Quanda Creek, Noonbar Creek and Teridgerie Creek and unnamed water courses.

Grade crossings would be required where the alignment crosses rural roads.

Potential impacts

Construction of the proposed alignment would require the permanent removal of vegetation, some of which may comprise Endangered Ecological Community or habitat for threatened species. Construction of the alignment would fragment part of the Merriwindi State Forest which would reduce habitat connectivity and may impact on species using this area.

The area of state forest to be severed is approximately 9 ha in size. The State Forest designation of this land would need to be revoked in accordance with the *Forestry Act 1916* prior to being acquired for the purpose of developing the railway line.

Construction works would have the potential to disturb previously recorded and unrecorded Aboriginal heritage sites if adequate mitigation is not provided.

Construction works close to water courses may result in erosion and sedimentation which could potentially affect water quality. Proposed bridges or culverts over water courses may result in scouring of creek and river beds. Construction of a bridge over the Castlereagh River may alter the existing flooding regime.

The alignment would result in the severance of a number of rural properties, or access to these properties. Access to farm dams may be severed as a result of the project. At least one farm dam would likely need to be filled in to construct the alignment.

Predicted noise impacts of 36-68.5 dB(A) are potentially up to 13.5 dB(A) in exceedance of the adopted 55 dB(A) $L_{Aeq, 9hr}$ planning noise criteria. Compliance with the planning noise criteria would be expected at the majority of receivers located greater than 500 m from the rail line.

Based on a 27.5 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative greenfield location, rail pass by events in all greenfield routes would be expected to be audible within 500 m of the rail line.

Construction of level road crossings and the addition of construction vehicles on the local road network may result in delays or diversions for local traffic.

The introduction of a railway line in the rural landscape may reduce visual amenity.

Upgrading of the existing track section and tie-in works would need to occur under track possession which would disrupt existing rail services along this route.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna field surveys should be undertaken along the alignment as described in section 4.2.1, particularly in the northern section of the alignment where the alignment would sever the Merriwindi State Forest. The extent of the vegetation clearance should be limited to that necessary to construct the alignment. Depending on the extent, quality and status of vegetation to be removed, vegetation offsets may be required. Consultation with the NSW Department of Primary Industry (Forestry) should be undertaken during development of any concept design and the detailed environmental assessment phase.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately two properties may require noise management and mitigation measures to reduce potential received noise impacts.

Further investigation of the existing hydrological regime should be undertaken during development of a concept design and, where necessary, bridge design should ensure that

the existing flooding regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers and abutment, and culvert openings to prevent scouring of creek beds.

Mitigation measures for impacts to visual amenity, such as revegetation of the rail corridor, should be investigated during development of the concept design.

Where it is necessary to fully or partially acquire land, impacts should be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, and through consultation. Where construction of the railway would result in the severance of access to, or removal of, farm dams, these would likely require relocation or replacement.

4.2.5 Gwabegar to Narrabri

Existing environment

The proposed alignment from Gwabegar to Narrabri falls within the Namoi catchment management area and passes through rural freehold land, Crown land and a small area of state forest. A number of rural residences exist along the proposed alignment, some within 500 m of the alignment. There is a higher density of residences in the northern portion of the alignment as it approaches Narrabri.

The alignment crosses an area of the Quegobla State Forest approximately 10 km from its southern extent and passes the western border of the Pilliga State Conservation Area for approximately 1.5 km. The Euligal State Forest is located approximately 300 m east of the proposed alignment where it crosses the Quegobla State Forest. Other protection areas within the vicinity of the proposed alignment include the Pilliga National Park and the Etoo, Minnon and Janewindi state forests.

Vegetation cover along the alignment varies from isolated patches of vegetation occurring along creek lines and roadsides and as scattered paddock trees to dense tracts of vegetation connected to the surrounding state forests and conservation areas. Endangered Ecological Communities that could be present in the area, according to National Parks and Wildlife Service data, include:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions.

A number of threatened fauna species, including the Black-striped Wallaby, Bush-stone Curlew, Superb Parrot, Painted Honeyeater, Speckled Warbler, Brown Treecreeper and Koala, listed under the *Threatened Species Conservation Act 1995* have been previously recorded within approximately 5 km of the proposed alignment. The Superb Parrot is also listed under the EPBC Act.

A search of the EPBC Act protected matters search database was undertaken to identify relevant MNES potentially affected by the project. Four threatened ecological communities, 22 threatened species (birds, frogs, mammals, ray-finned fish, reptiles and plants) and 11 migratory species were identified within 5 km of the alignment. One State and Territory

Reserve, the Brigalow Nature Reserve, and four Commonwealth land areas were also identified within 5 km of the alignment. Four places on the Register of the National Estate, mostly in the town of Narrabri, were also documented in the search area.

Six AHIMS sites, including 5 artefact sites and 1 scar tree, are located within 1 km of the proposed alignment. Given the existence of these sites, there is potential for other Aboriginal archaeological sites or areas of cultural significance to occur in the locality.

The alignment crosses a number of watercourses, including Baradine Creek, Etoo Creek, Coghill Creek and Bohena Creek, and lies to the south of the Lower Namoi Designated Flood Plain.

The proposed alignment would cross a number of small roads. Towards Narrabri, the alignment runs parallel to Yarrie Lake Road which provides access to residences and the CSIRO Culgoora solar observatory located adjacent to the proposed alignment.

At the northern section of the alignment, just outside the town of Narrabri, the alignment traverses an expired mineral title was held by Matilda Minerals Ltd until May 2009.

Proposed works

The proposed alignment from Gwabegar to Narrabri stems from the existing Wallerawang to Gwabegar railway line and generally heads in a north-easterly direction for approximately 89 km before joining the existing Walgett railway line. The proposed alignment would comprise predominantly greenfield construction, with a small section of existing track, that would require upgrading, at the northern extent.

Seventeen bridges would be required to cross a number of watercourses including Baradine Creek, Etoo Creek and Coghill Creek. Forty-five culverts have been proposed along various sections of the alignment.

Grade crossings would be required at a number of roads.

Potential impacts

Construction of the proposed alignment would require the permanent removal of vegetation, including riparian vegetation and vegetation comprising potential Endangered Ecological Community or habitat for threatened species. Construction of the alignment would fragment part of the Quegobla State Forest and other vegetation connecting to surrounding State Forests, a State Conservation Area and a National Park. Fragmentation of these areas would reduce habitat connectivity and may impact on species using these areas.

The area of the Quegobla State Forest to be severed would be approximately 2.4 hectares in size. The state forest designation of this land would need to be revoked in accordance with the *Forestry Act 1916* prior to being acquired for development of the railway line.

Construction works would have the potential to disturb previously recorded and unrecorded Aboriginal heritage sites if adequate mitigation is not provided.

Bridge works may affect flooding behaviour and cause scouring of creek beds. Erosion and sedimentation caused by construction works close to creeks may affect on water quality.

Predicted noise impacts of 36-68.5 dB(A) are potentially up to 13.5 dB(A) in exceedance of the adopted 55 dB(A) $L_{Aeq, 9hr}$ planning noise criteria. Compliance with the planning noise criteria would be expected at the majority of receivers located greater than 500 m from the rail line.

Based on a 27.5 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative greenfield location, rail pass by events in all greenfield routes would be expected to be audible within 500 m of the rail line.

Construction of level crossings and the addition of construction vehicles on the local road network may result in delays or diversions for local traffic. Construction works adjacent to Yarrie Lake Road may temporarily sever access to the residences and solar observatory located on this road.

Upgrading of the existing Walgett railway line would need to occur under track possession which would cause disruptions to existing services using this line.

Full or partial acquisition of a number of rural properties would be necessary to construct the alignment. There would be socio-economic impacts associated with the severance of rural properties including land currently used for cropping. Construction of the proposed alignment may also result in the severance of access to properties and farm dams.

The introduction of railway infrastructure into a scenic landscape may reduce visual amenity. New bridges, in particular, would become a highly visual feature in the landscape. Passing rail traffic along the new railway would provide a passing source of light which may adversely affect the operation of the Culgoora Solar Observatory.

The future exploration and/or extraction of coal within the area may be affected by development of the proposed alignment.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna field surveys should be undertaken along the alignment as described in section 4.2.1. The extent of the vegetation clearance should be limited to that necessary to construct the alignment. Depending on the extent, quality and status of vegetation to be removed, vegetation offsets may be required. Consultation with the NSW Department of Industry and Investment regarding impacts to the Quegobla State Forest should be undertaken during development of any concept design and the detailed environmental assessment phase.

An Indigenous heritage assessment as described in section 4.2.1 would likely be required.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately two properties may require noise management and mitigation measures to reduce potential received noise impacts.

Further investigation of the existing hydrological regime should be undertaken during development of a concept design and, where necessary, bridge design should ensure that the existing flooding regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers and abutment, and culvert openings to prevent scouring of creek beds.

Mitigation measures for impacts to visual amenity, such as revegetation of the rail corridor, should be investigated during development of the concept design.

Where it is necessary to fully or partially acquire land, impacts should be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, and through consultation. Where construction of the railway would result in the severance of access to, or removal of,

farm dams, these would likely require relocation or replacement. Where access to a property or dam is affected, alternative access arrangements would be provided.

4.2.6 Narrabri bypass

Existing environment

The proposed Narrabri bypass alignment falls within the Namoi catchment management area and passes through cleared land used for grazing. The alignment provides a bypass to the west of the town of Narrabri.

Vegetation along the alignment has been cleared in the past. Remnant vegetation occurs as scattered paddock trees and along creek lines and the Namoi River. Potential Endangered Ecological Communities that may be present in the area, according the National Parks and Wildlife Service data, include:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions.

A number of threatened fauna species, including the Grey-crowned Babbler, Black-necked Stork and Koala listed under the *Threatened Species Conservation Act 1995* have been previously recorded within 5 km of the alignment. Two threatened flora species, including the Spiny Peppergrass and Slender Darling Pea, listed under that Act have also been recorded within proximity to the alignment.

A search of the EPBC Act protected matters search database was undertaken to identify relevant MNES potentially affected by the project. Four threatened ecological communities, 12 threatened species (birds, mammals, ray-finned fish, reptiles and plants) and 10 migratory species were identified within 5 km of the alignment. Three Commonwealth lands and four places on the Register of the National Estate were found to occur within the search area.

Two AHIMS sites, including one artefact site and one burial site, are located within 1 km of the proposed alignment. Given the existence of these sites, there is potential for other Aboriginal archaeological sites or areas of cultural significance to occur in the locality.

One non-Indigenous heritage item, the Narrabri Station Group listed on the State Rail Authority section 170 Register, is located within approximately 2.5 km of the proposed alignment. This heritage item is located on the existing Werris Creek Moree railway line.

The alignment crosses a number of water courses including the Namoi River, Narrabri Creek and an irrigation channel, and extends along land which is part of the Lower Namoi Designated Floodplain.

The proposed alignment would cross the Kamilaroi Highway, which extends from Willow Tree to Bourke providing the most direct route to outback Australia. A number of local roads and vehicular tracks would also be crossed. The proposed track runs parallel to the Newell Highway for 2 km at the northern extent of the alignment.

Several rural residences exist along the alignment. These are generally located greater than 300 m from the alignment with the exception of residences in the vicinity of the Kamilaroi Highway where the closest is approximately 45 m from the alignment. There are also a number of industrial buildings, a race track and a sewage treatment plant in the vicinity of the Kamilaroi Highway.

A designated flood irrigation area for cotton is located along the northern section of the alignment. High voltage power lines also cross the alignment in this area.

The alignment passes through a NSW Coal Title which is currently held by the Director-General of the NSW Department of Primary Industries (now part of the Department of Industry and Investment) on behalf of the Crown. The licence is due to expire in February 2011.

Proposed works

The proposed alignment is approximately 10 km in length. The alignment stems from the Walgett railway at Narrabri and bypasses the town of Narrabri before joining back into the existing Werris Creek to Moree railway.

The proposed rail alignment has been designed to minimise property severance by following property boundaries and road reserves where possible. It was considered unviable to use the existing rail network and pass through the centre of the town. Construction impacts, including noise, would have affected a larger quantity of the town's population.

Four bridges would be required to cross the Namoi River, Narrabri Creek, an unnamed watercourse and an irrigation channel. Six culverts have been proposed along various sections of the alignment.

Grade crossings of numerous roads would be provided. A road overbridge of the Kamilaroi Highway would be provided.

Potential impacts

Construction of the alignment would require some vegetation clearing, including riparian vegetation and vegetation comprising potential Endangered Ecological Community and habitat for threatened species.

Construction works would have the potential to disturb previously recorded and unrecorded Aboriginal heritage sites if adequate mitigation is not provided.

Predicted noise impacts of 37-59 dB(A) $L_{Aeq, 9hr}$ at receivers within 250 m of the proposed bypass route are considered to be compliant with NSW planning noise goals.

Based on existing ambient noise environment of 50 dB(A) L_{Aeq} and greenfield 27 dB(A) L_{Aeq} , proposed operations are likely to be audible at nearest receivers within 250 m of the rail line.

The construction of bridges over the Namoi River and Narrabri Creek may affect flooding behaviour and result in scouring of creek or river beds. Erosion and sedimentation caused by construction works close to creeks may have impacts on water quality.

Full or partial acquisition of a number of rural properties would be necessary to construct the alignment. There would be socio-economic impacts associated with the severance of rural properties including land currently used for cropping. Construction of the proposed alignment may also result in the severance of access to properties.

Construction of level crossings and the addition of construction vehicles on the local road network may result in delays or diversions for local traffic, particularly on the Kamilaroi Highway.

The introduction of rail infrastructure into a rural landscape may reduce visual amenity, particularly at the northern extent of the alignment where the railway may be visible from properties located on the western outskirts of the town.

Upgrading of the existing Walgett railway, and tie-in works to the Werris Creek-Moree railway, would need to occur under track possession which would cause disruptions to existing services using these lines.

Construction works would have the potential to disrupt overhead high voltage power lines present in the northern part of the alignment.

The future exploration and/or extraction of coal within the area may be affected by development of the proposed alignment.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna field surveys should be undertaken along the alignment as described in section 4.2.1. The extent of the vegetation clearance should be limited to that necessary to construct the alignment. Depending on the extent, quality and status of vegetation to be removed, vegetation offsets may be required.

An Indigenous heritage assessment as described under section 4.2.1 would likely be required.

Further investigation of the existing hydrological regime should be undertaken during development of a concept design and, where necessary, bridge design should ensure that the existing flooding regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers and abutments, and culvert openings to prevent scouring of creek beds.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 20 properties would potentially require noise management and mitigation measures.

Mitigation measures for impacts to visual amenity, such as revegetation of the rail corridor, should be investigated during development of the concept design.

Where it is necessary to fully or partially acquire land, impacts should be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, and through consultation.

Consultation should be undertaken with any mining title or lease holders during the development of any concept design and throughout the detailed environmental assessment process.

Protection for the overhead high voltage power lines should be provided for the duration of construction works in this area. Consultation should be carried out with the service provider during development of any concept design and the detailed environmental assessment phase.

4.2.7 Camurra deviation

Existing environment

The proposed Camurra deviation alignment falls within the Border Rivers Gwydir catchment management area, and passes through rural land predominantly used for cropping (such as hay, oats, wheat, barley, nuts, stone fruit and cotton). The terrain along the deviation is predominantly flat, crossing the Gwydir River. The southern and northern extent of the deviation fall within the Lower Gwydir Valley designated floodplain area. The soil profile within the area of the deviation comprises predominantly alluvium soils with low erodibility. Black soils, which can be highly erodible once exposed, may also be present along the alignment.

Vegetation occurs as scattered paddock trees and riparian vegetation along the Gwydir River. The riparian vegetation is part of the Coolibah-Red Box Woodland. This woodland may be consistent with the Coolibah-Black Box Woodland of the Northern Riverine Plains in the Darling Riverine Plains and Brigalow Belt South bioregions Endangered Ecological Community listed under the NSW *Threatened Species Conservation Act 1995*.

A search of the EPBC Act protected matters database was undertaken to identify relevant MNES potentially impacted by the project. The results indicate one Ramsar wetland, the Gwydir Wetlands, is located within the same catchment. One Endangered Ecological Community, 2 critically Endangered Ecological Communities, 12 threatened species (birds, mammals, fish reptiles and plants) and 9 migratory birds were also identified.

There are no previously recorded Indigenous heritage sites in close proximity to the alignment. However, as the deviation crosses the Gwydir River, there is the potential for Indigenous sites or areas of Indigenous cultural significance within this area.

The existing rail line is currently used for freight only, and heading north from Moree, it branches at Camurra to travel north-west to Weemelah, or north-east to North Star. The proposed alignment bypasses an existing loop to create a more direct route from Camurra (south) to Camurra (north).

The alignment runs parallel to the Newell Highway. River Road, a local road, is also located in the vicinity of the proposed alignment.

While the majority of the land surrounding the site is rural, there are a few nearby properties with one property located within 300 m of the deviation.

Proposed works

The deviation at Camurra would provide a more direct route between Moree and North Star. The deviation would extend 2.6 km and would remove the need to use the existing tight curve at Camurra. Trains would still be able to travel north-west to Weemelah.

The deviation would require the construction of two bridges, one over the Gwydir River (580 m from the southern extent of the deviation) and the other over an irrigation channel (1.71 km from the southern extent of the deviation).

Potential impacts

The proposed bridge over the Gwydir River may affect flood behaviour and result in scouring, which would have the potential to impact the structure and safety of the bridge. Erosion and sedimentation caused by construction works in and around the Gwydir River may lead to deterioration of water quality and adverse effects on aquatic habitat.

Predicted noise impacts of 37-59 dB(A) $L_{Aeq, 9hr}$ at receivers within 250 m of the proposed bypass route are considered to be compliant with NSW planning noise goals.

Based on existing ambient noise environment of 50 dB(A) L_{Aeq} and greenfield 27 dB(A) L_{Aeq} , proposed operations are likely to be audible at nearest receivers within 250 m of the rail line.

As well as erosion and sedimentation issues, construction in and around the Gwydir River could also detrimentally affect the riparian vegetation along the river, as it is likely that some vegetation may need to be removed.

There is the potential for Indigenous heritage artefacts to occur along the proposed alignment due to the proximity of the Gwydir River. If such items do exist, construction activities would have the potential to disturb and/or destroy heritage items.

Traffic impacts to the Newell Highway would be associated with construction traffic, and there is also potential for impacts to River Road during the construction period. However these effects are expected to be minor and of short duration.

As a new section of track, the Camurra deviation would affect a number of rural properties with varying impacts on severance and property access. There is a property access track running to the north of the Gwydir River connecting to River Road that would be affected by the deviation, this access would either need to be kept open or alternative access arranged.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna field surveys should be undertaken along the alignment as described in section 4.2.1, particularly for the riparian vegetation surrounding the Gwydir River and the aquatic environment of the river. The extent of the vegetation clearing should be limited to that necessary to construct the alignment. Depending on the extent, quality and status of riparian vegetation to be removed, vegetation offsets may be required.

Further investigation of the existing hydrological regime should be undertaken during development of a concept design, and where necessary, bridge design should ensure that the existing flood regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers to prevent scouring of creek beds.

An Indigenous heritage assessment as described in section 4.2.1 would likely be required. If any impact to Indigenous heritage is likely, specific mitigation measures would need to be developed.

Based on the estimated number of receivers within 500 m of the rail line no properties would require noise mitigation.

Where it is necessary to fully or partially acquire land, impacts should be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, with consultation as described in section 4.2.1.

4.2.8 North Star to Yelarbon

Existing environment

The proposed alignment from North Star to Yelarbon falls within the Border Rivers-Gwydir catchment management area. The alignment traverses cleared land used for agriculture, areas of native vegetation and the Yelarbon Desert, a natural saline discharge area. The terrain is mostly flat to undulating with non-dispersive alluvium soils with low erosion potential. Soils in the Yelarbon Desert have undergone significant sheet and tunnel erosion (Fensham et al 2007).

The proposed alignment crosses five major waterways, including Mobbindry Creek, Ottley's Creek, Macintyre River, Dumaresq River, Macintyre Brook and over ten other drainage lines. The eastern extent of the Macintyre River floodplain is located 2 to 3 km west of the proposed alignment.

Much of the alignment is located on cleared pastoral land. However as the alignment travels north it crosses patches of intact vegetation. The vegetation is in proximity to the Dthinna Dthinawan Nature Reserve and Dthinna Dthinawan National Park and may contain threatened flora species or comprise EECs. There have been sightings of several listed threatened flora and fauna species in the area including the Glossy Black Cockatoo and Speckled Warbler. A Koala sighting has also been recorded approximately 8 km along the southern section of the alignment.

The proposed alignment passes through the Yelarbon Desert as it crosses the NSW/Queensland border. The Yelarbon Desert is listed as an 'of concern' Regional Ecosystem under the Queensland *Vegetation Management Act 1999*. Vegetation consists of *Triodia sp.* (Spinifex) grassland with scattered low trees and shrubs. The proposed alignment crosses two travelling stocks routes that were used extensively until the 1960s (Fensham et al 2007). Grazing of these stock routes has resulted in the loss of much of the vegetation cover. However, because there has been lighter grazing in recent decades, some recovery has occurred (Fensham et al 2007).

A search of the EPBC Act protected matters search database was undertaken to identify MNES potentially affected by the project. The results indicate that 2 Critically Endangered Ecological Communities, 2 Endangered Ecological Communities and 18 threatened species (bird, mammal, fish, reptile and plant) and 9 species of migratory bird may occur within 5 km of the proposed alignment.

A large number of previously recorded Indigenous heritage sites are located in proximity to the Dumaresq River. Fifteen sites have been identified 1.5 to 5 km to the west of the proposed alignment. One Queensland Indigenous site has also been identified approximately 4.5 km west of the alignment. Given the presence of previously recorded sites, there is potential for other archaeological sites or places of Indigenous cultural significance to occur along the alignment, particularly around creek lines and river beds.

The proposed alignment would cross the Bruxner and Cunningham highways and other smaller roads including Peates Road, Tucka Tucka Road, Holdfast Road and Desert Creek Road (which is also a travelling stock route that bisects the Yelarbon Desert). The Bruxner Highway connects Boggabilla with Ballina on the east coast. The Cunningham Highway extends from Goondiwindi to Ipswich.

There are rural residences in the area between North Star and Yelarbon, including a number located within 500 m of the proposed alignment.

Proposed works

The proposed alignment would deviate from the existing rail line at North Star in NSW, where freight services presently terminate, and extend through a greenfield site to Yelarbon, Queensland.

The alignment extends from North Star in a north-easterly direction crossing the Bruxner Highway before extending north towards Yelarbon across the NSW/Queensland border, Dumaresq River and Cunningham Highway. The total length of the new build is approximately 64 km.

The proposed rail alignment has been designed to minimise property severance and vegetation clearing where possible. Through the Yelarbon Desert, the rail line has been designed to run adjacent to an existing travelling stock route.

Nineteen bridges would be provided to cross a number of watercourses and rivers, including Mobbindy Creek, Back Creek, Ottley's Creek, Seereys Creek, Macintyre River, Dumaresq River and Macintyre Brook. Culverts would be provided along various sections of the alignment for smaller drainage lines.

A passive level crossing is proposed at the alignment's intersection with the Bruxner Highway. A grade separated 'road-over-rail' crossing is proposed at the alignment's intersection with the Cunningham Highway.

Potential impacts

The construction of the alignment would require extensive vegetation clearing, including riparian vegetation and vegetation connected to the Dhinna Dhinawan Nature Reserve and National Park, which may include potential habitat for threatened species including the Koala. In the Queensland portion of the alignment, some vegetation associated with the Yelarbon Desert Regional Ecosystem and other significant corridors would require clearing. Clearing would result in habitat fragmentation and severance of wildlife corridors, which may impact fauna movement and/or result in genetic isolation of species. Habitat fragmentation may create edge effects whereby a zone of changed environmental conditions occurs at the edge of the newly created fragment.

Development of a rail line along the proposed alignment would have the potential to impact flood behaviour within the floodplain. Bridge works may also affect flood behaviour and cause scouring impacts on creek beds. Erosion and sedimentation caused by construction works close to creeks may impact water quality, which would have the potential to harm aquatic ecology.

Construction works would have the potential to disturb and/or destroy any previously unrecorded Indigenous heritage items in the area.

Potential traffic impacts, such as disruptions or diversions, may occur during construction of the grade separated crossing at the Cunningham Highway and level crossing at the Bruxner Highway. These effects would be temporary. A number of heavy vehicles would also use the local road network for deliveries and transport of fill, which may impact local traffic flows.

Where the alignment intersects with travelling stock routes, there is the potential to disrupt livestock transport.

Full or partial acquisition of a number of rural properties would be necessary to construct the new alignment. Socio-economic impacts, such as reduced property values and disruption to economic activities, such as cropping, may occur as a result of property severance. There is also likely to be some impact on property/water access.

Noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ have been predicted on the greenfield route, with potential exceedance of up to:

- 23 dB(A) above the adopted 55 dB(A) $L_{Aeq, 9hr}$ NSW planning noise criteria
- 13 dB(A) above the adopted 65 dB(A) $L_{Aeq, 9hr}$ Queensland noise goal are predicted.

The introduction of a new railway line to the landscape would have some visual impact. New bridges, in particular, would become a highly visual feature in the landscape.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna surveys would need to be undertaken to determine the vegetation communities present and any habitat for threatened species. The extent of vegetation clearing should be minimised through concept design development and through the mitigation measures outlined in section 4.2.1. Vegetation offsets would likely be required depending on the extent, quality and status of vegetation to be removed.

Further investigation of the existing hydrological regime should be undertaken during development of a concept design, and where necessary, bridge design should ensure that the existing flood regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers to prevent scouring of creek beds.

An Indigenous heritage assessment as described in section 4.2.1 would likely be required. If an impact to Indigenous heritage is likely, specific mitigation measures would need to be developed.

Impacts to the travelling stock route should be managed through consultation with the Queensland DERM.

Based on the estimated number of receivers within 500 m of the rail line no properties are expected to require noise mitigation.

Where it is necessary to fully or partially acquire land, impacts should be managed through the NSW *Land Acquisition (Just Terms Compensation) Act 1991* and the Queensland *Acquisition of Land Act 1967*, with consultation as described in section 4.2.1. Where access to a property or dam is affected, alternative access arrangements should be provided.

Mitigation measures for impacts to visual amenity, such as revegetation of the rail corridor, should be investigated during development of the concept design.

4.2.9 Inglewood to Millmerran

Existing environment

The proposed alignment from Inglewood to Millmerran falls within the Border Rivers-Gwydir and Condamine catchment management areas. The alignment traverses cleared land used for grazing, an area of State Forest and an area known to contain coal reserves over which several Mineral Development Licences are currently held.

The terrain can be described as undulating and rolling, with soils comprising soft rock and non-dispersive alluvium with low erodibility. The alignment crosses numerous waterways, including Canning Creek, approximately 6 km north of the Cunningham Highway.

As the alignment travels north it runs parallel to the Inglewood-Millmerran Road and passes through the Bringalily State Forest. The State Forest contains 'endangered' and 'of concern'

Regional Ecosystem. The endangered Regional Ecosystem comprises *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks. The Devine State Forest is located approximately 4 km to the east of the alignment. Riparian vegetation occurs along the banks of Canning Creek.

A search of the EPBC Act protected matters search tool was undertaken to identify MNES potentially affected by the project. The results indicate that the Narran Lake Nature Reserve Ramsar Wetland is located within the same catchment as the alignment. Two critically endangered ecological communities, 2 EECs, 26 threatened species (bird, mammal, fish, reptile and plant), and 9 migratory bird species were identified within approximately 5 km of the proposed alignment.

The alignment passes within 1 km of previously recorded Indigenous sites near Millmerran. There are six artefact sites and one scar tree located east of the proposed alignment along a creek line. There is potential for other archaeological sites or places of Indigenous cultural significance to occur along the alignment, particularly around creek lines.

The proposed alignment crosses the Cunningham Highway and other smaller roads. The Cunningham Highway extends from Goondiwindi to Ipswich and is an important transport route for the district.

The alignment would intersect a travelling stock route in 5 different locations. Travelling stock routes provide routes for cattle and sheep and are often areas with intact vegetation.

Rural residences are located within 500 m of the alignment, particularly at the southern and northern extents of the alignment. Some homesteads and associated farm infrastructure have the potential to have heritage value.

The northern portion of the proposed alignment traverses a known coal resource and areas of land subject to Mineral Development Licences (valid till end of 2009). Licences are held by Newmont Pacific Energy Pty Ltd and Queensland Power Company Ltd. The proposed alignment travels to the west of an existing open cut coal mine owned by Commodore Coal Mine. A high voltage power line extends east to west, just south of the coal mine.

Proposed works

The proposed alignment would comprise greenfield construction for almost the entire distance between Inglewood and Millmerran. The alignment branches off from the existing railway approximately 3.5 km east of Inglewood and extends north through the Bringalily State Forest and then heads in a north-easterly direction towards Millmerran. The total length of greenfield construction would be approximately 71 km.

The proposed alignment has been designed to minimise property severance and vegetation clearing where possible. The track has been designed to run adjacent to the Inglewood-Millmerran Road through the Bringalily State Forest to minimise biodiversity impacts in this area.

Seven bridges are proposed to cross Canning Creek and other watercourses. Numerous culverts are proposed along various sections of the alignment.

A grade separated road-over-rail crossing would be required at the Cunningham Highway. At-grade or level crossings would be required at Grays Road, the Inglewood-Millmerran Road, Koorongara Road, the Millmerran-Owens Scrub Road and Pfeffers Lindenmayer Road.

Potential impacts

The construction of the alignment would require vegetation clearing, including small areas of vegetation within the Bringalily State Forest, riparian vegetation, and vegetation classified as 'endangered' and 'of concern' Regional Ecosystem. The removal of vegetation may also fragment habitats and sever wildlife corridors. This may affect fauna movement patterns, result in genetic isolation of fauna species, and create edge effects.

Development of a rail line through known coal reserves may affect the future extraction of this coal should a mining lease be granted. Future development of an open cut coal mine may require the railway to be removed.

The proposed alignment's proximity to the open-cut pit may compromise the mine's future expansion. However, the mine would benefit from improved access to a major piece of transport infrastructure.

Construction works would have the potential to disturb and/or destroy any previously unrecorded items or sites of Indigenous heritage significance.

Disruption to traffic may occur during construction of the grade separated crossing at the Cunningham Highway and other level crossings. A number of heavy vehicles would use the road for deliveries and transport of fill, which may impact traffic flows.

The crossing of the travelling stock route would have the potential to interrupt flora connectivity and disrupt livestock transport. An alternative stock route would need to be found.

Construction of a bridge across Canning Creek may affect flood behaviour and cause scouring of creek beds, which can lead to destabilisation and in extreme cases lead to bridge collapse. Erosion and sedimentation caused by construction works close to creeks may affect water quality, which in turn may affect aquatic ecology.

Full or partial acquisition of a number of rural properties would be necessary to construct the rail line. The severance of rural properties would have socio-economic impacts, such as devaluation of properties and loss of income. There is also likely to be effects on property/water access and some land use may be adversely affected.

Noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ have been predicted on the greenfield route, a potential 13 dB(A) exceedance of the adopted 65 dB(A) $L_{Aeq, 9hr}$ noise goal is predicted.

A new rail line would introduce a new visual element into the landscape. New bridges, in particular, would become a highly visual feature in the landscape.

Potential mitigation and further assessment

General construction impacts should be managed through the preparation and implementation of a CEMP and sub-plans, including the measures outlined in section 4.2.1.

Flora and fauna surveys would need to be undertaken to determine the vegetation communities present and any habitat for threatened species. The extent of vegetation clearing should be minimised through concept design development and through the mitigation measures outlined in section 4.2.1. Vegetation offsets would likely be required depending on the extent, quality and status of vegetation to be removed. Consultation would be undertaken with the Queensland DERM regarding impacts to the Bringalily State Forest.

Further investigation into the existing hydrological regime should be undertaken during development of a concept design, and where necessary, bridge design should ensure that the existing flood regime is maintained as described in section 4.2.1. Scour protection

measures as outlined in section 4.2.1 should be installed on bridge piers and abutments to prevent scouring of creek beds.

Development of the rail line in the Bringalily State Forest would require revocation of the affected land's dedication as State Forest. The process of revoking the dedication of land as State Forest is described in Appendix I.

Consultation should be undertaken with any Mineral Development Licence holders during the development of any concept design. Consultation with the mine owner and operator would also need to be undertaken.

An Indigenous heritage assessment as described in section 4.2.1 would likely be required. If any impact to Indigenous heritage is likely, specific mitigation measures would need to be developed.

Impacts to the travelling stock route should be managed through consultation with the Queensland DERM.

Where it is necessary to fully or partially acquire land, impacts should be managed through the Queensland *Acquisition of Land Act 1967*, with consultation as described in section 4.2.1. Where access to a property or dam is affected, alternative access arrangements should be provided.

Based on the estimated number of receivers within 500 m of the rail line no properties are expected to require noise mitigation.

Mitigation measures for impacts to visual amenity, such as revegetation of the rail corridor, should be investigated during development of any concept design.

4.2.10 Brookstead to Yargullen

Existing environment

Land use between Brookstead and Yargullen is primarily rural, with cropping and grazing the most common activities. The proposed alignment traverses relatively flat terrain in the south from Brookstead and crosses numerous waterways, including Fourteen Mile Creek and tributaries of the Condamine River North Branch, on the approach to Yargullen. The Balonne River Floodplain, which falls within the Balonne-Condamine Basin, occurs in the southern portion of the alignment.

The proposed alignment intersects a number of roads including St Helens Road, Evanslea Road, Pipeline Road, Mondam Road, and a number of property access roads and tracks. The proposed alignment parallels Evanslea Road for approximately 2 km.

The proposed alignment passes through the township of Mount Tyson via an abandoned rail corridor. The township consists of residential, commercial and industrial facilities. Rural residences occur in areas adjacent to the proposed alignment, with the nearest residence within approximately 40 m of the alignment.

Infrastructure in the vicinity of the proposed alignment includes the Moonie to Brisbane Oil Pipeline, which the alignment intersects, and land designated as Sanitary Landfill on the Oakey-Pittsworth Road, located adjacent to the abandoned rail corridor.

Vegetation in the area has been extensively cleared. Patchy remnant vegetation, including some mapped moratorium areas, occurs along property boundaries, roadsides, watercourses and within the abandoned rail corridor. Mapped Regional Ecosystem occurs

adjacent to the existing abandoned rail corridor in the vicinity of Mount Tyson and through to Yargullen.

Five threatened ecological communities; 23 threatened species (birds, mammals, ray-finned fishes, reptiles and plants); and 13 migratory terrestrial, wetland, marine birds species listed under the EPBC Act were identified in the protected matters search area.

The Irongate Conservation Park, located approximately 12 km east of the alignment, was identified in the search results as a State and Territory Reserve.

Further assessment will be required to confirm the results of the EPBC Act database search prior to detailed design.

Soil types of the Brookstead to Yargullen area include black self-mulching cracking clays, as described in the Queensland Mines and Energy interactive resource and tenure maps.

Proposed works

This route section would provide a direct route from Brookstead to Yargullen, approximately 37 km in length. New track would be provided partially within greenfield areas in a northerly direction from the existing Millmerran Branch before joining the existing abandoned rail corridor through Mount Tyson and towards Yargullen in a north-easterly direction.

Impacts to rural properties have been minimised by locating the rail alignment parallel to property boundaries and existing roads, and by using the existing abandoned rail corridor, where possible.

A number of bridges or culverts would be required over numerous watercourses and drainage lines. Level crossings would be required at Mondam Road, Pipeline Road, St Helens Road and Mathies Road.

Where access is limited, temporary roads/tracks may be required to provide access during construction.

Potential impacts

Although the proposed alignment traverses greenfield areas for most of this route section, vegetation clearing will be limited to farming and grazing properties and remnant vegetation currently mapped as moratorium areas. Provided that the proposed alignment remains within the existing rail corridor, no clearing of Regional Ecosystem will be required.

As there are numerous waterways and drainage lines crossing the alignment, water quality may be adversely affected due to erosion and sedimentation arising from construction works and increased surface runoff. Works within thinly vegetated watercourses and drainage lines could result in increased surface runoff and increased sediment loads.

Existing flow regimes and water volumes in waterways and drainage lines may also be affected due to the construction of culverts or bridges. Scouring of creek beds may also occur.

Noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ have been predicted on the greenfield route, a potential 13 dB(A) exceedance of the adopted 65 dB(A) $L_{Aeq, 9hr}$ noise goal is predicted.

Property impacts, including access and severance issues, would occur in the southern greenfield section of the proposed alignment. Construction of the alignment would require full or partial acquisition of a number of rural properties. Due to the level crossings required on roads that the alignment intersects, interruptions to local traffic are expected to occur during construction and operation.

Impacts to visual amenity are expected due to the introduction of a new railway through a flat to undulating rural landscape, particularly in the southern route section from Brookstead to Mount Tyson.

Air quality is not expected to be a significant issue in the long term (i.e. during rail operation). Construction activities would be likely to generate some dust.

There may be social impacts associated with the establishment of the rail line through Mount Tyson, including the effect that noise and reduced air quality (though minor) would have on the community as well as the physical severance of the community,

Land within the existing abandoned rail corridor is assumed to be listed on the Queensland DERM Environmental Management/Contaminated Lands Register, and Queensland Rail's risk register, since a Notifiable Activity (railway operation) has taken place. These risk registers identify sites that are deemed contaminated by a hazardous substance (such as arsenic or oil), which may pose a risk to human health or the environment. As the proposed rail alignment would require connection to the existing rail line, disturbance to potentially contaminated land may occur.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Flora and fauna surveys would need to be undertaken to determine the vegetation communities present and any habitat for threatened species. The extent of vegetation clearing should be minimised through concept design development and through the mitigation measures outlined in section 4.2.1. Vegetation offsets would likely be required.

Further investigation into the existing hydrological regime should be undertaken during development of a concept design, and where necessary, bridge design should ensure that the existing flood regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers and abutments to prevent scouring of creek beds.

Indigenous cultural heritage assessments may be required to ensure the proposed rail alignment complies with the *Aboriginal Cultural Heritage Act 2003*, 'Duty of Care Guidelines' (2004). Initial consultation with relevant Aboriginal parties may be conducted to determine the potential significance of features within the area. Should it be determined that impacts to Indigenous cultural heritage may occur, an assessment will be undertaken to assist in developing suitable recommendations for addressing potential cultural heritage impacts.

To address potential impacts to traffic and transport routes, further detailed assessments will be required, particularly to develop mitigation measures for property access and severance issues. These issues may need to be resolved through the property acquisition process under the applicable legislation. Consultation with affected land owners, road authority and the local council would be carried out during design development and the detailed environmental assessment phases.

All infrastructures (such as pipelines and powerlines) intersecting with the alignment, would be protected and relevant authorities and/or operators consulted.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, up to 15 properties may require noise mitigation.

An air quality investigation will also be required to assess potential air quality impacts. Air quality impacts during construction and operation should be managed through dust suppression activities.

Further investigation into the potential contamination levels of the existing rail corridor, in accordance with applicable legislation, would be required to determine level of management required and identify any potential permits.

Consultation with the community will be required to inform them, and determine management strategies for the potential social impacts of the project.

4.2.11 Oakey bypass

Existing environment

The proposed alignment of the Oakey bypass provides a southern bypass of the Oakey township within the jurisdiction of the Toowoomba Regional Council. The alignment crosses two minor watercourses — Westbrook and Gowrie Creeks, tributaries of Oakey Creek — and falls within the Condamine-Balonne catchment management area.

The alignment passes through rural land predominantly used for cropping and grazing. The terrain along the proposed alignment is flat to undulating with hills.

Black self mulching cracking clay soils, as classified by the Australian Soil Atlas, are the dominant soil group within the area. Further geotechnical and soils investigations will be required to determine soil characteristics and their impact on the construction of the alignment.

Vegetation in the area has been predominantly cleared for agricultural purposes. The existing vegetation is largely associated with the undulating hills and places of residence. Areas classified as Regional Ecosystem with a Biodiversity Status 'Not of Concern' under the Queensland *Vegetation Management Act 1999* will be affected by the proposed alignment. These areas exist within the initial 6 km of alignment. The Regional Ecosystem is identified as 11.8.5 *Eucalyptus orgadophila* grassy open woodland (DERM 2009).

Four threatened ecological communities; 21 threatened species (birds, mammals, ray-finned fishes, reptiles and plants); and 13 migratory terrestrial, wetland, marine birds species listed under the EPBC Act were identified by a protected matters search.

The alignment crosses a number of rural roads as well as more significant routes, such as the Oakey-Pittsworth Road, the Oakey-Crosshill Road and the Oakey-Biddeston Road. These roads provide an alternative route to the Warrego Highway connecting Oakey to the towns of Toowoomba and Pittsworth. The alignment will also cross the Warrego Highway, which connects the Darling Downs to the eastern coastal centres. The Warrego Highway is identified as part of Queensland's Stock Route Network regulated by the Queensland *Land Protection (Pest and Stock Route Management) Act 2002*.

The Roma to Brisbane Gas Pipeline also parallels the Warrego Highway, and a power transmission line easement intersects the Oakey-Biddeston Road.

Rural residences are located in proximity to the proposed alignment, with three residences located within 200 m.

Proposed works

This section of the proposed rail corridor is approximately 16 km in length within a greenfield landscape of predominantly cleared agricultural land providing a bypass of Oakey township to the south.

The alignment intersects the Warrego Highway approximately 500 m south-east of the Gowrie Creek crossing. The crossing of the Warrego Highway is likely to require reconfiguration to provide for a road over rail crossing. At-grade crossings would be likely at the Oakey-Pittsworth Road, the Oakey-Crosshill Road, the Oakey-Biddeston Road and Croxley Road. A few smaller crossings would be required where the alignment intersects rural roads.

A power transmission line easement will be intersected in the vicinity of the Oakey-Biddeston Road and the alignment will traverse the Roma to Brisbane Gas Pipeline which parallels the Warrego Highway.

Bridge or culvert structures would be required for the crossings of Westbrook and Gowrie Creeks.

Potential impacts

The proposed alignment would require the permanent removal of approximately 2.45 hectares of 'Not of Concern' Regional Ecosystem, and would therefore, require a vegetation clearing permit under the *Vegetation Management Act 1999* and the development of offsets in accordance with the *Policy for Vegetation Management Offsets 2008*. Further vegetation clearing would be required throughout the alignment. However this would be limited mainly to isolated trees. All native vegetation to be cleared will trigger assessment under the *Nature Conservation Act 1992*.

Predicted noise impacts of 37-59 dB(A) $L_{Aeq, 9hr}$ at receivers within 250 m of the proposed bypass route are considered to be compliant with Queensland planning noise goals.

Based on existing ambient noise environment of 50 dB(A) L_{Aeq} and greenfield 27 dB(A) L_{Aeq} , proposed operations are likely to be audible at nearest receivers within 250 m of the rail line.

Crossings of the creek systems would involve works within a watercourse triggering the Queensland *Water Act 2000* and the potential requirement for Riverine Protection Permits to be obtained. Works in proximity to watercourses have the potential to cause erosion and sedimentation if not appropriately managed. The land within the alignment corridor is highly disturbed with little vegetation cover. For this reason, the potential impacts resulting from erosion and sedimentation are likely to be high.

The alignment traverses numerous rural properties and would result in varying degrees of severance and impacts to property access. Where possible, the alignment would parallel property boundaries and existing road reserves. Full or partial acquisition of a number of rural properties would be necessary to construct the alignment.

Noise and visual impacts may be associated with the introduction of a new rail line into a rural landscape. However the potential impact has been significantly reduced by bypassing the township of Oakey.

The existing Queensland Rail line is listed on the Contaminated Land Register a register of risk sites that are deemed contaminated by a hazardous substance (such as arsenic or oil), which may pose a risk to human health or the environment. The connection with the existing rail line will require disturbance of potentially contaminated land.

Traffic impacts would occur where road crossings are required along the alignment. The greatest impact would be associated with the crossing of the Warrego Highway. Within the same location, the Queensland stock route would be affected.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

A flora assessment confined to the vegetated region between the Oakey Pittsworth Road and the Oakey-Crosshill Road would be required to validate the current mapping of the 'Not of Concern' Regional Ecosystem to identify the vegetation communities impacted by the alignment and to ensure rare or threatened species are not present. Validation of the Regional Ecosystem could potentially reduce the offset requirements of the project.

Hydrologic and hydraulic assessment of the watercourses during detailed design would determine the requirements for either bridges or culvert structures, and the extent of scour protection and velocity control required to prevent erosion and sedimentation.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately eight properties potentially require noise management and mitigation measures.

Where it is necessary to fully or partially acquire land, impacts would be managed through the Queensland *Acquisition of Land Act 1967* and/or the Queensland *Land Act 1994*. Consultation with affected land owners would be carried out during all stages of concept design development and the detailed environmental assessment phases.

The rail alignment will predominantly follow the contours of the landscape and would, therefore, not require significant cuttings or embankments, reducing the potential visual impacts in the greenfield environment. Additional mitigation, such as screening of individual properties, should be investigated during the detailed environmental assessment where necessary.

Further investigation into the potential contamination levels of the existing rail corridor in accordance with the Queensland *Environment Protection Act 1994* would be required to determine level of management required and identify any potential permits.

Consultation with the Queensland Department of Main Roads and the local council will be required with regard to the intersection of the alignment with the Warrego Highway as well as the impact on the Queensland stock route.

4.2.12 Gowrie to Helidon

Existing environment

The proposed section from Gowrie to Helidon crosses the Great Dividing Range on the northern outskirts of Toowoomba and descends the range via the Murphy's Creek valley where it parallels the existing rail alignment in sections. The terrain on the eastern side of the range between Toowoomba and Helidon is steep and heavily vegetated, with intermittent rural settlement. A key objective has been to optimise the horizontal and vertical alignment, shortening the overall travel distance and minimising, where possible, the extent of new land clearing, property acquisition and severance.

Land use between Gowrie and Helidon is primarily rural and residential, with the exception of some areas zoned for special use west of Murphy's Creek and at Helidon. The alignment traverses rural properties east of Gowrie before entering into tunnel through the top of the range into the Murphy's Creek valley, which contains mostly residential properties. South of Murphy's Creek the area is mostly rural before the alignment enters the residential areas of Helidon. The nearest residences are situated within 100 m of the alignment.

The main transportation routes potentially intersecting with the alignment include Paulsens Road, the Gowrie-Birnam Road, Montgomery's Road, Murphy's Creek Road and Lockyer Siding Road. Other minor roads and access tracks, particularly around Murphy's Creek and the Warrego Highway at Helidon, will intersect with the proposed alignment. The Roma to Brisbane Gas Pipeline and a high voltage power line will intersect the alignment south of Murphy's Creek, just before entering the existing rail corridor through Helidon.

From Gowrie to the tunnel portal at Murphy's Creek, the vegetation includes 'not of concern' and 'of concern' Regional Ecosystem. Vegetation occurring at Murphy's Creek includes 'not of concern' Regional Ecosystem. Lockyer Creek contains vegetation identified as 'endangered' Regional Ecosystem, which extends from south of Murphy's Creek through to Helidon. With the exception of Murphy's Creek valley, the range is highly vegetated.

Areas of high value regrowth vegetation and Essential Habitats are mapped along various sections of the proposed rail alignment from Gowrie to Helidon. Vegetation along roadsides, waterways and property boundaries may also occur.

Numerous waterways and drainage lines occur between Gowrie and Helidon. From Gowrie, the proposed alignment is expected to intersect with Gowrie Creek at more than one location, before intersecting with Murphy's Creek and its tributaries (north east).

Lockyer Creek meanders down the eastern side of the proposed alignment, through Helidon, and continuing to Gatton. Lockyer Creek and its tributaries are the main watercourses in the Lockyer Valley, which covers approximately one quarter of the Brisbane River catchment.

The landform of the Gowrie area includes rolling basaltic uplands, with soils generally described as black self-mulching cracking clays. The predominant underlying geology of the Gowrie area is basalt of the Tertiary geological period, as described in the Queensland Mines and Energy interactive resource and tenure maps. Further east at Murphy's Creek the landform is steep hilly to sub-mountainous basaltic uplands crests and steep slopes of flat topped and rounded hills. This section of alignment (and tunnel) traverses soils described as shallow friable loams with rough-ped fabric with an underlying geology of ferricrete of the Tertiary period.

Generally, from Murphy's Creek, the alignment traverses predominant alluvium (Quaternary period) and arenite (Jurassic period) underlying geological layers with the dominant lithology being clay, silt, sand, gravel (flood plain alluvium) and sandstone (DEEDI 2009).

A registered Indigenous cultural heritage site is located less than approximately 500 m west of the proposed alignment south of the Lockyer Creek Railway Bridge (Guinn Park). Non-Indigenous heritage items include the Main Range railway from the end of Murphy's Creek Station to Ruthven Street overbridge, Harlaxton. The Murphy's Creek Railway Complex, Lockyer Creek Railway Bridge (Guinn Park) and Lockyer Creek Railway Bridge (Lockyer) are also registered heritage places and occur in close proximity to the proposed alignment.

Four threatened ecological communities; 34 threatened species (birds, frogs, mammals, ray-finned fishes, reptiles and plants); and eighteen migratory terrestrial, wetland, marine birds species listed under the EPBC Act were identified by a protected matters search. Nine places on the Register of the National Estate were identified but only five of these could be affected by the project.

Proposed works

New track would be constructed within a rural and residential area, after deviating off the existing rail corridor east of Gowrie. From Gowrie the alignment will require a tunnel (approximately 5 km in length) to Murphy's Creek. Ventilation structures may be required as part of the tunnelling works.

Once the alignment exits the tunnel towards Murphy's Creek Railway Complex, it is expected to connect with the existing rail corridor through to Helidon.

Parallel rail bridges (adjacent to existing rail bridges) are proposed south-east of Murphy's Creek on the Main Range railway towards Helidon.

Where access is limited, temporary roads/tracks may be required to provide access during construction.

The length of the proposed rail alignment from Gowrie to Helidon is approximately 30 km.

Potential impacts

Due to the proximity of the alignment to residences and rural properties, associated socio-economic impacts expected to occur include severance of properties and changes to access.

Traffic and transport impacts may be experienced due to the installation of level crossings which may be required at Paulsens Road, the Gowrie-Birnam Road, Montgomery's Road, Murphy's Creek Road, Lockyer Siding Road and other minor roads and access tracks in the locality. In addition, reconfiguration of roads may be required, such as at the Gowrie-Birnam Road at Gowrie. Temporary minor increases in vehicle traffic are also expected.

The alignment will intersect infrastructure, such as high voltage powerlines and the Roma to Brisbane Gas Pipeline, with these issues to be addressed through suitable engineering in design.

The introduction of a new rail line in greenfield areas would result in potential noise and vibration impacts to rural residences in close proximity to the rail alignment, particularly during construction. In some cases, for example where residences are located close to the existing rail corridor, the noise environment may not change substantially, and for some residences may be improved. However, proposed alignment deviations or new greenfield sections are likely to introduce a new noise source to a number of sensitive receptors which would need to be managed. Comprehensive noise and vibration investigations would be required as part of any detailed environmental assessment of the proposed alignment.

A tunnel approximately 5 km in length would be required between Gowrie and Murphy's Creek, which may have significant construction impacts (such as spoil, noise and dust management) and permanently impact on local hydrogeology.

Noise impacts of 57-74 dB(A) $L_{Aeq, 9hr}$ have been predicted on the greenfield route, a potential 9 dB(A) exceedance of the adopted 65 dB(A) $L_{Aeq, 9hr}$ noise goal is predicted. Compliance with the adopted criteria would be expected at the majority of receivers located greater than 250 m from the rail line. At discrete receiver locations greater than 250 m, where receivers have direct line of sight to the rail line, potential exceedance of the planning goal may occur.

Significant visual amenity impacts are not expected where there is existing rail corridor. However some impacts may arise from the development of new rail in greenfield areas at Gowrie, particularly if tunnel ventilation structures are required.

Construction of the alignment would include clearing of vegetation identified as or associated with the 'endangered', 'of concern' and 'not of concern' Regional Ecosystems and areas mapped as Essential Habitat. Newly developed protection measures for managing areas mapped as high value regrowth vegetation will apply during detailed design stage. Riparian zones along waterways and vegetation along property boundaries and roads may also be disturbed.

Bridges or culverts would be required over a number of watercourses including Murphy's Creek and Lockyer Creek which could affect flow regimes, flooding behaviour and cause scouring impacts. Construction close to waterways may also result in water quality impacts from erosion and sedimentation and increased surface runoff.

Land within the existing rail corridor is assumed to be listed on the DERM's Environmental Management Register/Contaminated Land Register, and Queensland Rail's risk register, since a Notifiable Activity (railway operation) has taken place. These risk registers identify sites that are deemed contaminated by a hazardous substance (such as arsenic or oil), which may pose a risk to human health or the environment. As the proposed rail alignment will connect to the existing rail line, disturbance to potentially contaminated land may occur.

As the proposed alignment is located within close proximity (approximately 500 m) to a recorded Indigenous site (south west of Lockyer Creek Railway Bridge (Guinn Park)), it is possible that unknown archaeological sites or places of Indigenous cultural significance also exist in the area. Potential impacts to these sites may occur during construction.

The proposed alignment passes through the Murphy's Creek Railway Complex (a Registered Heritage Place), on the Main Range Railway, which is listed on the Register of National Estate. The alignment will also run parallel to the Lockyer Creek Railway Bridge (Guinn Park) and the Lockyer Creek Railway Bridge (Lockyer), which are Registered Heritage Places. Construction of the project may result in some impact to these heritage items.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Flora and fauna surveys would need to be undertaken to determine the vegetation communities present and any habitat for threatened species. The extent of vegetation clearing should be minimised through concept design development and through the mitigation measures outlined in section 4.2.1. Offsets will be required for clearing of vegetation and essential habitats. Areas mapped as high value regrowth vegetation will require further assessment and review of applicable legislation to determine appropriate mitigation measures and permits.

Further investigation into the existing hydrological regime should be undertaken during development of a concept design, and where necessary, bridge design should ensure that the existing flood regime is maintained as described in section 4.2.1. Scour protection measures as outlined in section 4.2.1 should be installed on bridge piers and abutments to prevent scouring of creek beds.

To address socio-economic impacts, extensive consultation would occur with the community regarding construction works prior to construction commencing.

Consultation would be undertaken with residents/land owners, road authority and/or the local council to minimise disruption to local and highway traffic from proposed construction works (e.g. repositioning of the Gowrie-Birnam Road). Further assessments will be required to

develop mitigation measures during design development and the detailed environmental assessment phase.

Based on the estimated receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 10 properties may require noise management and mitigation measures to reduce potential received noise impacts

Further investigation into the potential contamination levels of the rail corridor will be required, in accordance with appropriate legislation, to determine level of management required and potential permits that may be applicable.

Consultation with local Indigenous groups shall be undertaken in accordance with applicable legislation, and where required, detailed archaeological and cultural heritage assessments shall be undertaken to ensure the project adheres to its 'Cultural Heritage duty of care'.

Consultation with relevant government agencies/authorities will be undertaken regarding appropriate planning and mitigation measures to address potential impacts to non-Indigenous heritage items identified between Gowrie and Helidon.

Where possible, reuse of spoil from tunnelling as fill/embankments would assist in reducing the need to transport spoil offsite. Further geotechnical investigations would be required to determine the suitability of cut material for fill.

4.2.13 Laidley to Grandchester/Rosewood

Existing environment

Land use between Laidley and Grandchester is predominantly rural, with some urban settlements, such as at Laidley township. Residences are located adjacent to the alignment in some areas at Laidley and the small townships of the outlying areas of Ipswich City. The nearest residence is 30 m from the proposed alignment. A sporting facility is located off the Laidley-Plainland Road, north of Laidley. The existing corridor intersects the Rosewood-Laidley Road and other local roads and access tracks.

The alignment bypasses Laidley on its northern side; otherwise it is proposed to generally follow the existing rail corridor for most of its length, the only other deviation being immediately to the east of Laidley, where an improved horizontal alignment (including a short section of tunnel) has been identified through the small range between Laidley and Grandchester.

Approximately three quarters of the land adjoining this alignment comprises cultivated areas, with the balance comprising natural/regrowth vegetation cover. Significant portions of the proposed alignment pass through, or in close proximity to, Essential Habitat, 'endangered', 'of concern' and 'not of concern' Regional Ecosystems.

There are a number of minor watercourses, which form tributaries of the Western Creek system. Watercourses in the area form part of the Lockyer sub-catchment and the Greater Brisbane catchment. Western Creek contain riparian areas of State significance which are remnant vegetation habitat (Essential Habitat).

The predominant underlying geologies of the Laidley to Grandchester alignment are alluvium and colluvium of the Quaternary and Pleistocene periods. These lithology includes residual soils, sand, soil, clay and rock debris. In the vicinity of Laidley, Gatton Sandstone and sedimentary sandstones of the Kowkandowie Formation are present. The lithology of both of these geological units includes labile sandstone, siltstone and shale. The soils of this

route section of the alignment are described as hard pedal mottled-yellow duplex soils in the Queensland Mines and Energy interactive resource and tenure maps.

The Grandchester Railway Complex and Grandchester Sawmills are Registered Heritage Places. The alignment will use the existing rail corridor of which the railway complex forms a part. The Grandchester Sawmills are located approximately 300 m north of the rail corridor.

Three registered Indigenous cultural heritage sites are located north of the proposed rail alignment, to the west of Grandchester. The nearest site is located approximately 50 m from the existing rail corridor, west of Grandchester.

Proposed works

A deviation into a greenfield area, north-east of Laidley, to bypass Laidley township, will connect to the existing rail corridor south-east of Laidley. Significant cut and fill will be required through mountainous and low lying areas in this section of the route, including a tunnel approximately 500 m in length. Once the alignment exits the tunnel, it will then rejoin the existing rail corridor through Grandchester/Rosewood as dual track.

The total length of proposed alignment is approximately 20 km.

Potential impacts

The majority of the alignment would use the existing rail corridor, therefore, the potential impacts would mostly be localised, where deviations are required in the vicinity of Laidley. The alignment traverses numerous rural properties and would result in varying degrees of severance and impacts to property access. Where possible, the alignment has followed property boundaries and existing road reserves. Full or partial acquisition of a number of rural properties would be necessary to construct the alignment. Some disruptions to traffic may occur where works are required at intersections and crossings.

It is assumed that land within the existing rail corridor is listed on the DERM's Environmental Management Register/Contaminated Land Register and Queensland Rail's risk register that a Notifiable Activity (railway operation) has taken place. Therefore, the disturbance of potentially contaminated soil is likely to affect the project. As such, it represents an environmental risk that must be considered as many Queensland Rail corridors contain soil contaminated by the metal arsenic due to former operational activities.

Clearing of vegetation mapped as 'endangered', 'of concern' and 'not of concern' Regional Ecosystems and Essential Habitat will be required. In particular, the proposed alignment would require the clearing of an area of 'of concern' Regional Ecosystem, and therefore, would require a vegetation clearing permit and offsets in accordance with applicable legislation and policies. Similarly, all native vegetation to be cleared will require permits under applicable legislation.

Bridges or culverts may be required over waterways, which could affect flow regimes, flooding behaviour and cause scouring impacts. Works in proximity to watercourses may require permits and have the potential to cause erosion and sedimentation if not appropriately managed.

Tunnelling beneath the small range between Laidley and Grandchester would have construction impacts and may impact local hydrogeology. In addition tunnelling and earthworks would require the excavation and disposal of large quantities of spoil. Tunnel spoil would likely be used as fill material in the approaches to the tunnel, but importation of fill material may also be required, this would need to be appropriately managed.

Proposed rail operations are predicted to result in noise impacts of 61-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line. Potential exceedance of the planning noise criteria by up to 13 dB(A) has been predicted. Proposed rail operations represent a potential 2.5 dB(A) increase to existing rail traffic noise. The majority of receivers located greater than 500 m would be expected to be compliant with the adopted noise criteria.

Visual impacts may be associated with the introduction of a new rail line in a rural landscape. However the potential impact has been significantly reduced by bypassing the township of Laidley.

The proposed alignment is in proximity to previously recorded Indigenous cultural heritage sites. It is possible that unknown archaeological sites or places of Indigenous cultural significance exist in the area. Potential impacts to these sites may occur during construction. The project would be obliged to observe the 'cultural heritage duty of care' under applicable legislation.

The project has the potential to impact on the Grandchester Railway Complex (Registered Heritage Place) due to its location within the existing rail corridor.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Clearing would be minimised to the extent necessary for the project and, where appropriate, revegetation would occur after construction. Offsets will be required for clearing of vegetation and essential habitats. Further vegetation surveys will be required to ground-truth mapped vegetation and to verify species/communities within an area during the detailed environmental assessment phase.

Bridges or culverts would be designed to ensure that the existing hydrological regime is maintained. Scour protection would be installed around bridge piers.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 18 properties may require noise mitigation.

To address potential impacts to traffic and transportation routes, further detailed assessments should be undertaken, particularly to develop mitigation measures for property access and severance issues. These issues may need to be resolved through the property acquisition process. Consultation with affected land owners, road authority and the local council would be carried out during design development and the detailed environmental assessment phases.

Further investigation into potential contamination within the existing rail corridor, in accordance with applicable legislation, will be required to determine the level of management required and the potential permits in order to relocate or dispose of soils within the rail corridor.

Where possible, earthworks should be minimised to reduce deep cuts and steep embankments. Reuse of spoil as fill/embankments from tunnelling would reduce the need to transport and dispose of spoil offsite. Further geotechnical investigations would be required to determine suitability.

An air quality investigation will also be required to assess potential air quality impacts. Due to the expected (relative) low frequency of train pass-by during operations, and the existing

air quality environment, air quality impacts during operation are not expected to be significant.

Indigenous cultural heritage assessments may be required to ensure the proposed rail alignment complies with the *Aboriginal Cultural Heritage Act 2003*, 'Duty of Care Guidelines' (2004). Initial consultation with relevant Aboriginal parties may be conducted to determine the potential significance of features within the area. Should it be determined that impacts to Indigenous cultural heritage may occur, an assessment will be undertaken to assist in developing suitable recommendations for addressing potential cultural heritage impacts.

Consultation shall occur with the community, local government and DERM regarding non-Indigenous heritage items occurring within the project area. Construction works would seek to minimise damage to these items and appropriate protection measures shall be established where necessary.

4.2.14 Grandchester/Rosewood to Kagaru

Queensland Department of Transport and Main Roads (TMR) has been conducting a separate study, somewhat in parallel with this study known as the Southern Freight Rail Corridor (SFRC) Study³. This route would be used by the inland railway to connect to the existing coastal route near Kagaru. TMR's study has included extensive public consultation and engagement with affected parties. The general arrangement of the SFRC route identified by TMR has been adopted for the inland railway and included in the scope of works required.

The SFRC study Draft Assessment Report examines the environmental impacts and assessment in great detail and therefore has not been repeated here.

The proposed alignment would comprise approximately 54 km of new dual gauge track.

4.3 New track construction within existing rail corridors (including dual gauge track)

4.3.1 General assessment of all route sections

Construction works

Construction adjacent to existing track, including dual gauged track, would need to be undertaken under track possession. Prior to commencement of construction, early works would be carried out to prepare the site for construction activities. This would involve establishing access roads and construction compounds, installing temporary fencing for safety and security reasons, and installing protection between new construction areas and the existing railway. Environmental controls would be implemented prior to the commencement of works.

Earthworks would involve excavation of cuttings using bulldozers and scrapers. Fill material would be placed and compacted using vibratory rollers and water. Any excess material would be stockpiled or transported to other areas of the project requiring fill. Where additional fill beyond what can be provided by the project is required, this would be taken from borrow pits or existing quarries.

³ Queensland Transport 2008, Southern freight rail corridor study - Draft Assessment Report prepared by Maunsell, October 2008.

Where new track is to replace the existing track, temporary turnouts would be removed and the new track would be joined to the existing track. New track would be constructed with a tracklaying machine. Once construction of the track is complete, signage, signalling and communication facilities would be installed.

Existing culverts would be extended by placing pipes or boxes on a prepared base and filling over. New culvert headwalls would be constructed.

Other works would include the construction of road overbridges or level crossings, drainage works, the construction of turnouts and passing loops, and the construction or upgrading of bridges.

Potential impacts

The following construction impacts would be associated with dual gauging and construction adjacent to existing track:

- Disruption to freight and passenger rail services
- Clearing of vegetation for construction compounds, ancillary facilities and access tracks
- Damage to non-Indigenous heritage items, including listed and non-listed items with heritage value such as timber bridges, located within the rail corridor
- Construction noise impacts to nearby sensitive receivers
- Erosion and sedimentation from construction activities and associated impacts on water quality
- Disturbance of potentially contaminated soil within the existing corridor associated with historic and current rail traffic
- Traffic impacts such as delays or diversions from construction vehicles on the local road network, or from works near level crossings
- Restrictions or changes to property access, and temporary use of land for access, site compounds or staging activities
- Generation of dust from earthworks
- Water quality impacts as a result of spills or leaks from construction vehicles or machinery or from chemical stores on site
- Decreased visual amenity from construction plant and machinery, stockpiles and general construction activities
- Positive economic benefits for local communities associated with increased expenditure from construction personnel purchasing local goods, services and accommodation.

The following impacts may occur during operation of dual gauged sections or sections adjacent to existing track:

- Operational rail noise impacts to nearby sensitive receivers
- Reduced local air quality from freight diesel emissions
- Where the alignment crosses floodplains or significant water courses, changes to the existing hydrological regime and increased risk of flooding
- Where structures are to be built across water courses, changes to flow velocity and associated scouring around bridge piers or sedimentation within waterways around structures.

Suggested mitigation measures

Suggested mitigation measures for general construction impacts include:

- Vegetation clearing should be minimised to the extent necessary for construction of the rail line and establishment of construction compounds and access tracks. Construction compound sites and sites for other temporary facilities should be selected to minimise disturbance to vegetation. The limits of clearing should be clearly demarcated on site to prevent excess clearing
- Where non-Indigenous heritage is present, an assessment in accordance with the NSW Department of Planning Heritage Branch or Queensland DERM requirements would be undertaken. This assessment should determine the significance of the heritage item. Development of the concept design should seek to minimise impacts to non-Indigenous heritage. Where potential impacts are likely, these should be assessed and recommendations for specific mitigation measures provided
- Investigation into potential soil contamination would need to be undertaken in accordance with the NSW *Contaminated Land Management Act 1997* or the Queensland *Environmental Protection Act 1994* to determine appropriate management options and remedial actions.

CEMPs and sub-plans would need to be developed and implemented for any construction works. These plans would detail measures for the remaining general construction impacts outlined above. The CEMP would likely need to include the measures outlined in section 4.2.1.

Suggested mitigation measures for general operational impacts include:

- Investigation of noise mitigation where operational noise levels exceed targets
- Where the proposed alignment crosses an area with a moderate or higher risk of flooding, such as over a designated floodplain, hydrological investigations would likely be required during the development of any concept design. Where possible, the concept design, including the design of bridges or culverts, should seek to ensure that the extent of flooding is not increased by the project
- Where structures are required over watercourses, scour protection measures should be installed on bridge piers and abutments, and culvert openings to prevent scouring of the creek bed.

4.3.2 Yelarbon to Inglewood

Existing environment

The proposed alignment between Yelarbon and Inglewood is within an existing rail corridor with narrow gauge track. The existing rail corridor is approximately 34 km in length and begins to the west of the Cunningham Highway. The corridor crosses to the eastern side of the Cunningham Highway, approximately 14 km north of the southern extent of the route section.

The corridor passes through farmland and significant areas of vegetation, some of which is mapped as 'Of Concern' and 'Not of Concern' Regional Ecosystem. The existing corridor also passes through the Whetstone State Forest.

Some rural residences are located in proximity (within 300 m) of the existing corridor.

Existing rail traffic on this section of the alignment is up to 2 train movements in total (in both directions) per day.

The existing corridor crosses the MacIntyre Brook approximately 13 km north of the southern extent and 3 km south of the northern extent of the route section.

Proposed works

New Class 1, standard gauge track would be constructed within the existing rail corridor adjacent to the existing track. Turnouts would be constructed at the southern and northern extents of the alignment to tie-in to the existing track. Bridges would be required over the MacIntyre Brook.

Potential impacts

Tie-in works would need to be undertaken during track possession. During possession, limited or no trains would be able to operate along the existing track. The timing and duration of track possession would be investigated further during the concept and detailed design phases of the project.

Construction compounds would need to be established along the alignment during construction. Land would need to be leased from local landowners for this purpose. Suitable locations for these compounds would be investigated during the concept design phase of the project and would be selected to minimise impacts on residences and vegetation.

Some minor vegetation clearing may be required around water crossings for construction of bridges. This would be minimised to the extent necessary for the works.

Delivery of at least some construction materials and equipment would be by road, which could impact local traffic. Construction works at road crossings may require temporary road closures and traffic detours.

Predicted noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 13 dB(A) in exceedance of the planning noise goal at nearest receivers. Proposed rail operations represent a potential 6.5 dB(A) increase to existing rail traffic noise.

Compliance with the adopted criteria would be expected at the majority of receivers located greater than 250 m from the rail line. At discrete receiver locations greater than 250 m, where receivers have direct line of sight to the rail line potential exceedance of the planning goal may occur.

Erosion and sedimentation close to watercourses would have the potential to impact water quality.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

If any vegetation clearing is required, offsets would need to be investigated in accordance with Queensland DERM requirements.

Based on the estimated number of receivers within 500 m of the rail line no properties would require noise mitigation.

4.3.3 Millmerran to Brookstead

Existing environment

The proposed alignment from Millmerran to Brookstead is within an existing rail corridor with narrow gauge track. The existing rail corridor is approximately 20 km in length and passes through rural cropping land. The existing corridor passes in proximity to a number of rural residences and to a larger cluster of dwellings located approximately 7 km south-west of Brookstead.

The existing corridor crosses Grasree Creek and the Condamine River. Vegetation mapped as 'Of Concern' and 'Not of Concern' Regional Ecosystem exists along these riparian areas.

The existing corridor crosses the Millmerran-Layburn Road and runs adjacent to the Gore Highway for approximately 3.5 km, from 10 km north of the southern extent of the alignment, before crossing the highway.

Proposed works

New Class 1, standard gauge track would be constructed within the existing rail corridor adjacent to the existing track. Turnouts would be constructed at the southern and northern extents of the alignment to tie-in to the existing track. Bridges would be required over Grasree Creek and the Condamine River.

Potential impacts

Tie-in works would need to be undertaken during track possession. During possession, limited or no trains would be able to operate along the existing track. The timing and duration of track possession would be investigated further during the concept and detailed design phases of the project.

Construction compounds would need to be established along the alignment during construction. Land would need to be leased from local landowners for this purpose. Suitable locations for these compounds would be investigated during the concept design phase of the project and would be selected to minimise impacts on residences and vegetation.

Some minor vegetation clearing may be required around waterway crossings for construction of bridges. This would be minimised to the extent necessary for the works.

Delivery of at least some construction materials and equipment would be by road which could affect local traffic. Construction works at road crossings may require temporary road closures and traffic detours.

Predicted noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 13 dB(A) in exceedance of the planning noise goal at nearest receivers. Proposed rail operations represent a potential 6.5 dB(A) increase to existing rail traffic noise. Compliance with the adopted criteria would be expected at the majority of receivers located greater than 250 m from the rail line. At discrete receiver locations greater than 250 m, where receivers have direct line of sight to the rail line potential exceedance of the planning goal may occur.

Erosion and sedimentation close to watercourses would have the potential to impact on water quality.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

If any vegetation clearing is required, offsets would need to be investigated in accordance with Queensland DERM requirements.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 16 properties may require noise mitigation.

4.3.4 Oakey to Gowrie

Existing environment

The proposed alignment lies between the townships of Oakey and Gowrie, passing the southern extent of the township of Kingsthorpe. The alignment provides a connection between the Oakey bypass and Gowrie. This section of the project falls within the jurisdiction of the Toowoomba Regional Council.

There are operating stations at both Kingsthorpe and Gowrie. The existing alignment includes level crossings at T Moore Road, the Oakey-Kingsthorpe Road and Paulsens Road.

Three bridge structures span Gowrie Creek and its tributaries, as well as providing an underpass for the Kingsthorpe-Tilgonda Road, Morris Road and East Paulsens Road. Numerous culverts provide for cross drainage of the existing rail infrastructure.

There are existing sidings at Kingsthorpe and the Gowrie Loop.

The landscape adjoining the rail corridor is cleared for cropping and grazing purposes, rural residential development or road reserves which run parallel to the rail corridor.

Rural residences are located along the route section with a number of residences located within 100 m of the existing rail corridor.

Four threatened ecological communities; 29 threatened species (birds, frogs, mammals, ray-finned fishes, reptiles and plants); and 15 migratory terrestrial, wetland, marine birds species listed under the EPBC Act were identified by a protected matters search.

Further assessment will be required to confirm the results of the EPBC Act database search prior to detailed design.

Black cracking clay soils, as classified by the Australian Soil Atlas, are the dominant soil group within the area. Further geotechnical and soils investigations will be required to determine soil characteristics and their impact on the construction of the alignment.

Proposed works

This section of the alignment would provide a duplication of approximately 10 km of the existing Western Freight track and include dual gauging of both tracks. The proposed alignment begins approximately 6 km south-west of Oakey township on the Western Freight line and continues through to the township of Gowrie, via the township of Kingsthorpe. Works would predominantly be within the existing rail corridor. Areas outside of the corridor may be required for construction purposes.

Duplication of existing bridge structures would be required for the crossing of Gowrie Creek and associated tributaries. Numerous culvert extensions would be required to align with the drainage structures of the existing rail line.

The proposed alignment would be constructed on fill material.

Potential impacts

The existing Queensland Rail rail corridor is listed on the Contaminated Land Register. Construction of the alignment within the existing rail corridor would involve disturbance and management of potentially contaminated soils.

Crossing of the Gowrie Creek system would involve works within a watercourse, which may require approval under the Queensland *Water Act 2000*. Works in the vicinity of watercourses have the potential to cause erosion and sedimentation if not appropriately managed. The land along which the alignment would traverse is highly disturbed, with little vegetation cover. Coupled with the presence of black cracking clays, the potential impacts resulting from erosion and sediment are likely to be high.

Proposed rail operations are predicted to result in noise impacts of 61-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line. Potential exceedance of the planning noise criteria by up to 13 dB(A) has been predicted. Proposed rail operations represent a potential 2.5 dB(A) increase to existing rail traffic noise. The majority of receivers located greater than 500 m would be expected to be compliant with the adopted noise criteria.

Visual impacts should not be significant as the infrastructure already exists, and the proposed changes would be minimal.

It is unlikely that land acquisition would be required for the proposed alignment due to it falling within the existing corridor.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Further investigation into the potential contamination levels of the existing rail corridor in accordance with the Queensland *Environment Protection Act 1994* would be required to determine the level of management required and identify any potential permits.

Hydrologic and hydraulic assessment of the watercourse and tributaries during detailed design would determine the requirement for either bridges or culvert structures and the extent of scour protection and velocity control required to prevent erosion and sedimentation.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 10 properties may require noise mitigation.

4.3.5 Helidon to Laidley

Existing environment

The terrain on the eastern side of the range between Toowoomba and Helidon is steep and heavily vegetated, with intermittent rural settlement. From Helidon the landscape consists of low lying areas to steep and hilly terrain near Laidley.

Land use between Helidon and Laidley is primarily rural and residential, with the exception of some areas zoned for special use at Helidon and Laidley. East of Gatton the proposed alignment traverses rural areas that consist of arable land and pasture. The nearest residences are situated within 100 m of the alignment.

The main transportation routes potentially intersecting with the alignment includes the Warrego Highway at Helidon and the Gatton-Helidon Road at Gatton.

Lockyer Creek contains vegetation identified as 'endangered' Regional Ecosystem which extends from south of Murphy's Creek through to Helidon. From Lockyer Creek at Helidon to Gatton, the 'endangered' riparian vegetation is identified as Regional Ecosystem. However mapped areas are outside of the existing rail corridor.

Regrowth vegetation areas and Essential Habitats are mapped along various sections of the proposed rail alignment from Helidon to Gatton. Vegetation along roadsides, waterways and property boundaries may also occur along this route section.

Waterways and drainage lines occur between Helidon and Laidley. Lockyer Creek meanders down the eastern side of the proposed alignment, through Helidon, and continuing to Gatton. Lockyer Creek and its tributaries are the main watercourses in the Lockyer Valley which covers approximately one quarter of the Brisbane River catchment.

Sheep Station Creek and Sandy Creek crossings at Helidon are expected to require additional design treatment due to their current interaction with the existing rail corridor.

Generally, from Murphy's Creek, north of Helidon, to Gatton, the alignment traverses predominant alluvium (Quaternary period) and arenite (Jurassic period) underlying geological layers with the dominant lithology being clay, silt, sand, gravel (flood plain alluvium) and sandstone. In the vicinity of Laidley, Gatton Sandstone and sedimentary sandstones of the Kowkandowie Formation are present. The lithology of this geological unit includes labile sandstone, siltstone and shale (DEEDI 2009).

Within Helidon, a registered heritage site (former bank) is located approximately 125 m south of the existing rail corridor. At Gatton, the Boer War Memorial and the Weeping Mother Memorial are located adjacent to, and more than approximately 30 m from, the existing rail corridor. The University of Queensland (Gatton Campus) is a Registered Heritage Places and is located adjacent to the existing rail line to the east of Gatton.

Proposed works

The proposed works would include construction of 34 km of new dual gauge track predominantly within the existing rail corridor between Helidon and Laidley. Minor deviations from the existing rail corridor are required due to engineering constraints.

Where access is limited, temporary roads/tracks may be required to provide access during construction.

Potential impacts

Due to the proximity of the alignment to residences and rural properties, associated socio-economic impacts expected to occur include severance of properties and changes to access.

Traffic and transport impacts may be experienced due to the installation of level crossings, which may be required at minor roads and access tracks in the locality. In addition, works may be required to the existing rail over road bridge and the Warrego Highway bridge over rail at Helidon to accommodate the new alignment, resulting in disruptions to traffic during construction. Temporary minor increases in vehicle traffic are also expected.

Proposed rail operations are predicted to result in noise impacts of 61-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line. Potential exceedance of the planning noise criteria by up to 13 dB(A) has been predicted. Proposed rail operations represent a potential 2.5 dB(A) increase to existing rail traffic noise. The majority of receivers located greater than 500 m would be expected to be compliant with the adopted noise criteria

Significant visual amenity impacts are not expected where there is existing rail corridor. Vegetation identified as or associated with the 'endangered', 'of concern' and 'not of concern' Regional Ecosystem and areas mapped as Essential Habitat have been identified to occur adjacent to the rail corridor. Newly developed protection measures for managing areas mapped as high value regrowth vegetation will apply during detailed design stage. Riparian zones along waterways and vegetation along property boundaries and roads may also be disturbed.

Bridges or culverts would be required over a number of watercourses including Lockyer Creek, Sheep Station Creek and Sandy Creek, which could affect flow regimes, flooding behaviour and cause scouring impacts. Construction close to waterways may also result in water quality impacts from erosion and sedimentation and increased surface runoff.

Land within the existing rail corridor is assumed to be listed on the DERM's Environmental Management Register/Contaminated Land Register, and Queensland Rail's risk register, since a Notifiable Activity (railway operation) has taken place. These risk registers identify sites that are deemed contaminated by a hazardous substance (such as arsenic or oil), which may pose a risk to human health or the environment. As the proposed rail alignment will connect to the existing rail line, disturbance to potentially contaminated land may occur.

As the alignment will also run parallel to three Registered Heritage Places, construction of the project may result in some impact to these heritage items.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

To address socio-economic impacts, extensive consultation would occur with the community regarding construction works prior to construction commencing. Consultation would be undertaken with residents/land owners, the road authority and/or the local council to minimise disruption to local and highway traffic from proposed construction works. Project traffic control will be enforced to manage construction vehicle traffic.

As works are proposed to occur within existing rail corridor, where possible, earthworks shall be minimised to reduce deep cuts and steep embankments.

Clearing of vegetation would be minimised to the extent necessary for the project and where appropriate, revegetation would occur after construction. Offsets will be required for clearing of vegetation and essential habitats. Areas currently mapped as high value regrowth vegetation will require further assessment and review of applicable legislation to determine appropriate mitigation measures and permits.

Bridges or culverts required for waterways and drainage lines would be designed to ensure that the existing hydrological regime is maintained. Scour protection would be installed around bridge piers and culverts. Further hydrological assessment would be required prior to detailed design.

Further investigation into the potential contamination levels of the rail corridor will be required, in accordance with appropriate legislation, to determine level of management required and potential permits that may be applicable.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately nine properties may require noise mitigation.

Consultation with relevant government agencies/authorities will be undertaken regarding appropriate planning and mitigation measures to address potential impacts to non-Indigenous heritage items identified between Helidon and Laidley.

4.4 Track upgrades

4.4.1 General assessment of all route sections

Construction works

Upgrading existing track that is currently in use would be carried out under rail possession.

Upgrading of Class 3 or any class 4 track would require the replacement or upgrading of all sub-standard structures supporting the track and the removal and replacement of track.

Early works, earthworks and tracklaying would be similar as for construction works adjacent to existing track, which is described in section 5.3.1.

Upgrading of Class 2 track to Class 1 would consist of replacement of sub-standard under structures supporting the track. Early works would be similar as for construction adjacent to existing track, which is described in section 5.3.1. Earthworks would be minimal, as the existing formation and ballast could largely be reused. The existing track would be re-sleepered using a tracklaying machine.

Upgrading abandoned track to Class 1 track would generally follow the same process as for greenfield construction described in section 4.2.1. Prior to construction commencing, the existing track and associated infrastructure would be removed and disposed of.

At the completion of track upgrades, trackside furniture, signage, signalling and communication facilities would be installed or re-installed.

Potential impacts

The following construction impacts would be associated with track upgrades:

- Disruption to existing rail traffic
- Generation of dust from earthworks;
- Construction noise impacts to nearby sensitive receivers
- Clearing of vegetation adjacent to the railway or for construction compounds, ancillary facilities and access tracks
- Erosion and sedimentation impacts near waterways, including creek and river crossings
- Disturbance of potentially contaminated soil associated with historic and current rail traffic during upgrading works
- Damage to non-Indigenous heritage items, including listed and non-listed items with heritage value such as timber bridges, located within the rail corridor
- Disruption to freight and passenger rail services during track possessions
- Traffic impacts, such as delays or diversions from construction vehicles on the local road network or upgrade works near road crossings
- Positive economic benefits for local communities associated with increased expenditure from construction personnel purchasing local goods, services and accommodation.

Operational impacts associated with upgrading existing track may include increased noise and vibration from additional rail traffic, increased incidence of fauna strike, and reduced air quality from increased diesel exhaust.

The following impacts may occur during operation of upgraded sections:

- Rail noise impacts to nearby sensitive receivers associated with increased rail traffic
- Reduced local air quality from increased freight diesel emissions.

Suggested mitigation measures

Suggested mitigation measures for general construction impacts include:

- Vegetation clearing should be minimised to the extent necessary for construction of the rail line and establishment of construction compounds and access tracks. Construction compound sites and sites for other temporary facilities should be selected to minimise disturbance to vegetation. The limits of clearing should be clearly demarcated on site to prevent excess clearing
- An investigation into potential soil contamination would need to be undertaken in accordance with the NSW *Contaminated Land Management Act 1997* or the Queensland *Environmental Protection Act 1994* to determine appropriate management options and remedial actions
- Where non-Indigenous heritage is present, an assessment in accordance with the NSW Department of Planning Heritage Branch or Queensland DERM requirements would be undertaken. This assessment should determine the significance of the heritage item. Development of the concept design should seek to minimise impacts to non-Indigenous heritage. Where potential impacts are likely, these should be assessed and recommendations for specific mitigation measures provided.

CEMPs and sub-plans would need to be developed and implemented for any construction works. These plans would detail measures for the remaining general construction impacts outlined above. The CEMP would likely need to include the measures outlined in section 4.2.1.

Suggested mitigation measures for general operational impacts include investigation of mitigation measures where operational noise levels exceed targets.

4.4.2 Parkes (north) to Narromine (south)

Existing environment

The existing rail line between Parkes (north) and Narromine (south) is a 106 km length standard gauge track to the west of the Newell Highway, which provides a direct route between the north-western outskirts of Parkes and the south-western outskirts of Narromine. Existing rail traffic along this section of the alignment is approximately 8 train movements in total (for both directions) per day.

The rail line passes through rural land used for cropping and grazing and through the town of Peak Hill. Numerous rural residences are located in proximity to the existing track along the length of the route section. More built up areas occur at the southern and northern extents of the route section (at Parkes and Narromine respectively) and in Peak Hill.

Scattered remnant native vegetation occurs within the locality, predominantly along roadsides, in riparian areas, and some sections of the rail corridor, and throughout paddocks. This vegetation may provide suitable habitat for numerous threatened species listed under the NSW *Threatened Species Conservation Act 1995* which have been previously recorded within 5 km of the existing track.

The existing rail line crosses a number of watercourses including Cookopie, Burrill and Barrabadeen creeks and their tributaries. The rail line crosses Burrill and Barrabadeen

creeks over existing bridges. The existing rail line has level crossings at Condoblin Road, Tullamore Road, and The McGrane Way, as well as numerous rural roads.

Proposed works

The existing rail line is Class 2 and would be upgraded to Class 1 as part of the project. As described in section 3.4.2, upgrading works would involve the replacement of sub-standard underbridges, timber sleepers and rail. The formation and ballast would most likely be reusable, though some additional ballast may be required.

Potential impacts

Upgrading works would need to be undertaken during track possession to ensure the safety of construction workers. During possession, limited or no trains would be able to operate. The exact timing and length of track possession would be determined at the concept and detailed design stages of the project.

Delivery of at least some construction materials and equipment would be by road, which could impact local traffic. Construction works at road crossings may require temporary road closures and traffic detours.

A number of construction compounds would need to be established along the length of the alignment during the works. Land would most likely need to be leased from local landowners for this purpose. Locations for construction compounds would need to be investigated at the concept design stage and could be selected to minimise impacts on residences and vegetation.

Predicted noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 18 dB(A) in exceedance of the planning noise goals at nearest receivers. Compliance with the 60 dB(A) $L_{Aeq, 9hr}$ planning noise goal would be expected at the majority of receivers located greater than 500 m from the rail line. The proposed upgrade of rail operations has been predicted to increase existing noise impacts by up to 6.5 dB(A), compared to the planning noise goal of an increase in rail noise of less than 2 dB(A).

Based on a 50 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative existing rail noise location, rail pass by events on existing routes would be expected to be audible within 500 m of the rail line.

Erosion and sedimentation from construction works near watercourses would have the potential to impact water quality.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 64 properties may require noise mitigation.

4.4.3 Narrabri (north) to Camurra (south)

Existing environment

The existing rail line between Narrabri (north) and Camurra (south) is a standard gauge track of approximately 103 km length. The rail line generally follows the Newell Highway for the length of the route. Existing rail traffic along this section of the alignment is up to 36 trains per day (in both directions).

The rail line passes through rural land primarily used for cropping. Numerous rural residences are located in proximity to the existing rail line for the length of the route section. The southern and northern extents of the route section (at Narrabri and Camurra respectively) and in the town of Moree are more built up.

Vegetation occurs in moderate to dense patches along this section of the alignment, particularly in riparian areas. This vegetation may provide suitable habitat for numerous threatened species listed under the NSW *Threatened Species Conservation Act 1995* which have been previously recorded in the locality.

The existing rail line crosses a number of water courses, including Gehan, Gurley, Tycannah and Halls creeks, the Mehi River at Moree, and the Gwydir River to the south of Camurra. The track between Moree and Camurra is located within a designated floodplain area associated with the Mehi and Gwydir rivers.

The existing rail line crosses the Mehi River and the Gwydir River over steel bridges which are both listed on the ARTC s. 170 Register.

The existing rail line crosses the Narrabri-Bingara Road to the north of Narrabri, the Gwydir Highway to the east of Moree.

Proposed works

The existing rail line is classified as Class 2 and 3 and would be upgraded to Class 1 as part of the project. As described in sections 3.4.1 and 3.4.2, upgrading works would involve the replacement of sub-standard underbridges, timber sleepers, rail and the reshaping of ballast and formation.

Potential impacts

Upgrading works would need to be undertaken during track possession to ensure the safety of construction workers. During possession, limited or no trains would be able to operate. The exact timing and length of track possession would be determined at the concept and detailed design stages of the project.

Construction activities would have the potential to damage or otherwise disturb the two heritage listed bridges.

Delivery of at least some construction materials and equipment would be by road, which could impact local traffic. Construction works at road crossings may require temporary road closures and traffic detours.

A number of construction compounds would need to be established along the length of the alignment during the works. Land would most likely need to be leased from local landowners for this purpose. Locations of construction compounds would need to be investigated at the concept design stage and could be selected to minimise impacts on residences and vegetation. Some minor vegetation clearing may be necessary to establish site compounds and gain access to the rail line.

Construction works within the floodplain would have the potential to affect flood behaviour and change flood flow distribution if usual flow paths were blocked with material stockpiles or equipment. There is also the potential for construction works to be affected by flooding.

Predicted noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 18 dB(A) in exceedance of the planning noise goals at nearest receivers. Compliance with the 60 dB(A) $L_{Aeq, 9hr}$ planning noise goal would be expected at the majority of receivers located greater than 500 m from the rail line. The proposed upgrade of rail operations has

been predicted to increase existing noise impacts by up to 6.5 dB(A), compared with the planning noise goal of an increase in rail noise of less than 2 dB(A).

Based on a 50 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative existing rail noise location, rail pass by events on existing routes would be expected to be audible within 500 m of the rail line.

Erosion and sedimentation from construction works near watercourses would have the potential to impact water quality.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Consultation with ARTC and the NSW Department of Planning, Heritage Branch should be undertaken regarding impacts to the steel bridges. A heritage impact statement should be prepared for the upgrading works and this should identify appropriate mitigation and management measures for impacts to the bridges.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 63 properties may require noise mitigation.

4.4.4 Camurra (north) to North Star

Existing environment

The existing rail line between Camurra (north) and North Star is Class 3, standard gauge track of approximately 79 km length. The track provides a moderately direct route between Camurra and North Star and lies approximately 25 km to the east of the Newell Highway.

The rail line passes through rural land primarily used for cropping. Numerous rural residences are located in proximity to the existing rail line along the length of the route section. More built up sections occur at the southern and northern extents of the route (Camurra and North Star respectively).

Vegetation is generally restricted to riparian areas and scattered paddock remnants. The vegetation present may provide suitable habitat for the Koala, which is listed under the NSW *Threatened Species Conservation Act 1995* and has been previously recorded in the locality.

The existing rail line crosses a number of water courses, including Gil Gil, Croppa and Mobin Dry creeks.

The existing rail line crosses the County Boundary Road approximately 25 km east of Camurra.

Proposed works

The existing rail line is classified as Class 3 and would be upgraded to Class 1 as part of the project. Upgrading works would involve the replacement of sub-standard underbridges, timber sleepers, rail and the reshaping of ballast and formation.

Potential impacts

Upgrading works would need to be undertaken during track possession to ensure the safety of construction workers. During possession, limited or no trains would be able to operate. The exact timing and length of track possession would be determined at the concept and detailed design stages of the project.

Delivery of at least some construction materials and equipment would be by road which could affect local traffic. Construction works at road crossings may require temporary road closures and traffic detours.

A number of construction compounds would need to be established along the length of the alignment during the works. Land would most likely need to be leased from local landowners for this purpose. Locations for construction compounds would need to be investigated at the concept design stage and could be selected to minimise impacts on residences and vegetation.

Predicted noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 18 dB(A) in exceedance of the planning noise goals at nearest receivers. Compliance with the 60 dB(A) $L_{Aeq, 9hr}$ planning noise goal would be expected at the majority of receivers located greater than 500 m from the rail line. The proposed upgrade of rail operations has been predicted to increase existing noise impacts by up to 6.5 dB(A), compared to the planning noise goal of an increase in rail noise of less than 2 dB(A).

Based on a 50 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative existing rail noise location, rail pass by events on existing routes would be expected to be audible within 500 m of the rail line.

Erosion and sedimentation from construction works near watercourses would have the potential to impact water quality.

Potential mitigation and further assessment

General construction impacts should be managed through the implementation of a CEMP and sub-plans including the mitigation measures outlined in section 4.2.1.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately five properties may require noise mitigation.

4.5 No works

Three route sections, Melbourne to Illabo, Stockinbingal to Parkes (south) and Kagaru to Brisbane (Acacia Ridge) would not require upgrading. There would be operational impacts associated with increased rail traffic between Stockinbingal and Parkes and Kagaru and Brisbane (Acacia Ridge). Rail traffic would not increase between Melbourne and Illabo.

4.5.1 Melbourne to Illabo

Existing environment

The existing rail line between Melbourne and Illabo is standard gauge and is currently used for passenger and freight services. This section of the alignment is approximately 496 km in length and passes through both urban and rural environments. Existing rail traffic along this section of the alignment is up to 17 movements (in both directions) per day comprising passenger and freight services.

Potential increase in rail traffic

Rail traffic between Melbourne and Illabo would not increase significantly as a result of the project. It would increase gradually with growth in overall freight volumes and an increase in rail market share.

Potential impacts

There would be no operational impacts associated with project along this section of the alignment.

Potential mitigation and further assessment

No mitigation measures or further assessment would be required along this section of the alignment.

4.5.2 Stockinbingal to Parkes (south)

Existing environment

The existing rail line between Stockinbingal and Parkes (south) is standard gauge and forms part of the Cootamundra to Parkes railway. This section of the alignment is approximately 174 km in length and passes through rural land primarily used for cropping. The alignment passes in proximity to rural residences and passes adjacent to the villages of Bribbaree, Quandialla and Caragabal, and through the town of Forbes. Existing rail traffic along this section of the alignment is up to 14 movements (in both directions) per day.

Potential increase in rail traffic

Rail traffic may increase by four train movements in each direction per day by the year 2020 as a result of the project.

Potential impacts

Potential operational impacts associated with the increase in rail traffic may include increased noise and vibration impacts on nearby rural residences and on Bribbaree, Quandialla, Caragabal and Forbes. Increased freight rail traffic may affect local air quality in these areas.

Predicted noise impacts of 45.5-78 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 18 dB(A) in exceedance of the planning noise goals at nearest receivers. Compliance with the 60 dB(A) $L_{Aeq, 9hr}$ planning noise goal would be expected at the majority of receivers located greater than 500 m from the rail line. The proposed upgrade of rail operations has been predicted to increase existing noise impacts by up to 6.5 dB(A).

Based on a 50 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative existing rail noise location, rail pass by events on existing routes would be expected to be audible within 500 m of the rail line.

Potential mitigation and further assessment

Further assessment of noise impacts should be undertaken during development of a concept design.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, approximately 43 properties may require noise mitigation.

4.5.3 Kagaru to Brisbane (Acacia Ridge)

Existing environment

The existing rail line between Kagaru and Brisbane is standard gauge and forms part of the Sydney to Brisbane railway. This section of the alignment is approximately 36 km in length and passes through urban areas. Existing rail traffic along this section of the alignment is up to 10 train movements per day (in both directions).

Potential increase in rail traffic

Rail traffic may increase by 4 train movements in each direction per day by the year 2020 as a result of the project.

Potential impacts

Potential operational impacts associated with the increase in rail traffic may include increased noise and vibration impacts on nearby rural residences. Increased freight rail traffic may affect local air quality in these areas.

Predicted noise impacts of 64-85 dB(A) $L_{Aeq, 9hr}$ within 500 m of the rail line are potentially up to 20 dB(A) in exceedance of the noise criteria. Proposed rail operations represent a potential 7 dB(A) increase to existing rail traffic noise. Dependent upon line of sight to the rail line, compliance with the adopted noise criteria would be expected greater than 500 m from the rail line.

Based on a 50 dB(A) L_{Aeq} night time ambient noise level adopted from the baseline noise survey at the indicative existing rail noise location, rail pass by events on existing routes would be expected to be audible within 500 m of the rail line.

For the Kagaru to Brisbane route the existing suburban and urban night time ambient noise environment may be greater than 50 dB(A) L_{Aeq} , reducing the potential impact of the proposed rail operations.

Potential mitigation and further assessment

Further assessment of noise impacts should be undertaken during development of a concept design.

Based on the estimated number of receivers within 500 m of the rail line, to achieve a desired goal of planning criteria compliance, it is anticipated that some properties within the built up areas alongside the railway corridor may require noise mitigation, subject to further assessment.

5. Potential further assessment and likely future consultation requirements

Prior to proceeding, the Inland Rail project will be subject to further comprehensive environmental assessment and planning approval processes (see Appendix I). Planning approvals will be required under NSW and Queensland legislation and it is also likely that Commonwealth environmental approvals under the EPBC Act will be triggered. While each of the respective statutory processes differs slightly, the overall intent is the same and the environmental assessment processes are similar. The objective in each case is to identify potential environmental risks and constraints, assess potential impacts, and provide assurances as to how those impacts will be mitigated in the project's design, construction and operation.

In NSW, the project will be subject to assessment and approval under the *Environmental Planning and Assessment Act 1979*. The Minister for Planning would be the ultimate determining authority for the project within NSW, but the detailed requirements for assessment of environmental impacts would be compiled after consultation with local government and relevant state government agencies. During the environmental assessment process, consultation would also be undertaken with communities potentially affected by the project, and all potentially affected landowners.

A similar process would be followed in Queensland, where the project would likely require the preparation of an Environmental Impact Statement under the *State Development and Public Works Organisation Act 1971*. Similarly, terms of reference for an Environmental Impact Statement would be set after consultation with relevant agencies, and community consultation would be integral to the overall process.

Of critical importance to the assessment of the project in both NSW and Queensland would be comprehensive assessments of:

- Biodiversity, with particular emphasis on identifying threatened species and important habitat areas, a rigorous assessment of the project's potential impacts, and avoiding these wherever possible
- Land use, in particular the potential loss or severance of high-value agricultural land
- Socio-economic impacts, including assessment of temporary impacts associated within construction activities and more permanent impacts associated with the severance of rural properties and operational noise
- Geology, topography and soil characteristics along the proposed alignment, and their implications for the project's construction and long-term geotechnical stability
- Ground and surface water quality, and how the project might impact on water quality directly or indirectly
- Noise impacts, particularly in areas that have not previously been exposed to noise from rail operations
- Indigenous and non-Indigenous heritage items that would be potentially affected by the project.

These and other issues would be assessed in an environmental impact assessment which, when complete, would be made available for public comment, before being determined within the respective state jurisdiction.

Once the environmental impact assessment process is complete, the project would move into the detailed design phase, wherein further environmental approvals and licences would be required with respect to specific construction and operational matters. However, these approvals would not affect the overall decision or determination (e.g. by a Minister of the Crown in NSW or Queensland), as to whether the project may proceed.

The potential future assessment and likely future consultation requirements for each route section of the alignment, as determined during the environmental risk identification and preliminary environmental impact assessment, are outlined in Table 5-1.

Table 5-1 Potential further assessment and likely future consultation requirements

Route section	Potential further assessment	Likely future consultation
Melbourne to Illabo	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Illabo to Stockinbingal	<ul style="list-style-type: none"> Flora and fauna surveys Indigenous heritage assessment Visual assessment Hydrology and flooding investigation Noise and vibration assessment Property impact assessment 	<ul style="list-style-type: none"> Local Aboriginal land council Affected land owners
Stockinbingal to Parkes (south)	<ul style="list-style-type: none"> Noise and vibration assessment 	<ul style="list-style-type: none"> Affected land owners
Parkes (north) to Narromine (south)	<ul style="list-style-type: none"> Noise and vibration assessment Contamination investigation 	<ul style="list-style-type: none"> Affected land owners
Narromine to Curban	<ul style="list-style-type: none"> Flora and fauna surveys Indigenous heritage assessment Visual assessment Noise and vibration assessment Property impact assessment 	<ul style="list-style-type: none"> Affected land owners
Curban to Gwabegar	<ul style="list-style-type: none"> Flora and fauna surveys Indigenous heritage assessment Visual assessment Noise and vibration assessment Property impact assessment Contamination investigation. 	<ul style="list-style-type: none"> Local Aboriginal land council NSW Department of Industry and Investment Affected land owners
Gwabegar to Narrabri	<ul style="list-style-type: none"> Flora and fauna surveys Indigenous heritage assessment Visual assessment Noise and vibration assessment Property impact assessment Contamination investigation 	<ul style="list-style-type: none"> Local Aboriginal land council NSW Department of Industry and Investment Affected land owners
Narrabri Bypass	<ul style="list-style-type: none"> Flora and fauna surveys Indigenous heritage assessment Visual assessment Noise and vibration assessment Property impact assessment 	<ul style="list-style-type: none"> Local Aboriginal land council Affected land owners

Route section	Potential further assessment	Likely future consultation
Narrabri (north) to Camurra (south)	<ul style="list-style-type: none"> Noise and vibration assessment Non-Indigenous heritage assessment Contamination investigation 	<ul style="list-style-type: none"> ARTC NSW Department of Planning, Heritage Branch Affected land owners
Camurra deviation	<ul style="list-style-type: none"> Hydrology and flooding investigation Flora and fauna surveys Indigenous heritage assessment Noise and vibration assessment Property impact assessment 	<ul style="list-style-type: none"> Local Aboriginal land council Affected land owners
Camurra (north) to North Star	<ul style="list-style-type: none"> Noise and vibration assessment Contamination investigation. 	<ul style="list-style-type: none"> Affected land owners
North Star to Yelarbon	<ul style="list-style-type: none"> Flora and fauna surveys Hydrology and flooding investigation Indigenous heritage assessment Travelling stock route alternatives Visual assessment Noise and vibration assessment Property impact assessment 	<ul style="list-style-type: none"> Local Aboriginal land council Affected land owners Local government Road authority
Yelarbon to Inglewood	<ul style="list-style-type: none"> Vegetation offset investigations Contamination investigation 	<ul style="list-style-type: none"> Queensland DERM Affected land owners
Inglewood to Millmerran	<ul style="list-style-type: none"> Flora and fauna surveys Geotechnical investigations Indigenous heritage assessment Investigations for alternative stock routes Noise and vibration assessment Hydrology and flooding investigation Visual assessment Property impact assessment 	<ul style="list-style-type: none"> Mineral Development License holders Owners and operators of Commodore coal mine Local Aboriginal land council Local government Road authority Power utility (high voltage power lines) Affected land owners
Millmerran to Brookstead	<ul style="list-style-type: none"> Vegetation offset investigations Contamination investigation 	<ul style="list-style-type: none"> Queensland DERM Affected land owners
Brookstead to Yargullen	<ul style="list-style-type: none"> Hydrology and flooding investigation Traffic and access assessment Noise and vibration assessment Air quality assessment Contamination assessment Indigenous heritage assessment Property impact assessment Contamination investigation 	<ul style="list-style-type: none"> Power and water utilities (high voltage power lines and pipelines) Local government Road authority Local Aboriginal land council Affected land owners

Route section	Potential further assessment	Likely future consultation
Oakey bypass	<ul style="list-style-type: none"> • Flora and fauna surveys • Hydrology and flooding investigation • Noise and vibration assessment • Visual assessment • Contamination assessment • Traffic and access assessment (including travelling stock routes) • Property impact assessment 	<ul style="list-style-type: none"> • Affected land owners • Local government • Road authority
Oakey to Gowrie	<ul style="list-style-type: none"> • Contamination assessment • Hydrology and flooding assessment • Noise and vibration assessment • Contamination investigation. 	<ul style="list-style-type: none"> • Affected land owners
Gowrie to Helidon	<ul style="list-style-type: none"> • Socio-economic assessment • Property impact assessment • Noise and vibration assessment • Air quality assessment • Geotechnical investigations • Vegetation offset investigations • Hydrology and flooding investigations • Contamination investigation. • Indigenous heritage assessment 	<ul style="list-style-type: none"> • Affected land owners • Local government • Road authority • Local Aboriginal land council
Helidon to Laidley	<ul style="list-style-type: none"> • Socio-economic assessment • Noise and vibration assessment • Air quality assessment • Vegetation offset investigations • Hydrology and flooding investigations • Contaminated land investigation • Traffic and access assessment 	<ul style="list-style-type: none"> • Affected land owners • Local government • Road authority • Queensland DERM
Laidley to Grandchester	<ul style="list-style-type: none"> • Traffic and access assessment • Property impact assessment • Contamination investigation. • Vegetation offset investigations • Hydrology and flooding investigations • Geotechnical investigations • Noise and vibration assessment • Air quality assessment • Indigenous and non-Indigenous heritage assessment 	<ul style="list-style-type: none"> • Local government • Road authority • Queensland DERM • Local Aboriginal land council • Affected land owners
Grandchester /Rosewood to Kagaru	<ul style="list-style-type: none"> • Refer to SFRC Study. 	<ul style="list-style-type: none"> • Refer to SFRC Study.
Kagaru to Brisbane (Acacia Ridge)	<ul style="list-style-type: none"> • Noise assessment 	<ul style="list-style-type: none"> • Affected land owners

