Appendix D
Environmental Risk Assessment Report

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A Environmental Risk Assessment Criteria

B Risk Register

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1. Introduction

An Environmental Risk Assessment has been undertaken by the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) for the Maitland to Minimbah Third Track Project (referred to as 'the Project'). This report has been prepared to identify the environmental risks of the Project and provide a framework for assessment of the Project.

1.1 The Project Background

ARTC was created by the Commonwealth and State Governments in 1998 to provide a single body responsible for the National Interstate Rail Network. ARTC is a Commonwealth Government corporation and currently has responsibility for the management of over 10,000 route kilometres of standard gauge interstate rail track in South Australia, Victoria, Western Australia and New South Wales (NSW), as well as the Hunter Valley Rail Network and other regional rail links in NSW.

The Hunter Valley Rail Network extends from the Port of Newcastle to Ulan and Narrabri in the west. It is used by passenger services, freight, wheat and coal services. The majority of trains carry coal from mines located across the Hunter Valley to either Carrington (Port Waratah) or Kooragang Island ports at Newcastle for loading onto ships for export.

Due to the forecast increase in coal throughput at the Port of Newcastle to 190 million tonnes per annum (mtpa) by 2012, a number of rail infrastructure improvements to the Hunter Valley Rail Network have been proposed by ARTC. One of the key improvement projects included in the ARTC ten-year strategic plan is a proposed third track adjacent to the existing Main Northern Railway between Maitland and Whittingham, known as the Maitland to Whittingham Third Track Project.

The Maitland to Whittingham Third Track Project is divided into two stages. Stage 1 consists of the construction of the third track between Minimbah and Whittingham. Project Approval for this project was granted by the Minister of Planning on 26 May 2009 and construction commenced in July 2009.

Stage 2 consists of the construction of the third track between Maitland and Minimbah, known as the Maitland to Minimbah Third Track Project. Stage 2 is the subject of this Environmental Risk Assessment and is referred to as 'the Project'.

The purpose of the Project is to increase rail reliability and future capacity between the Hunter Valley and the Port of Newcastle. In addition to providing increased track capacity, the Project aims to improve operational performance along the route. These improved efficiencies would be created through:

- Reduced impacts on coal traffic due to track maintenance activities.
- Reduced loss of freight train paths due to shadow effects from passenger services.
- Reduced loss of available train paths due to train breakdowns.

The Project would also bring benefits to the local and broader community by generating up to 650 full time jobs during construction, creating opportunities for local and regional goods and service providers, and providing greater security for existing coal industry jobs.

1.2 Description of the Project

The Hunter 8 Alliance, on behalf of the ARTC, is proposing to construct a third track adjacent to the existing Main Northern Railway between Maitland and Minimbah. The proposed third track would commence in Farley approximately 2 kilometres west of Maitland Station at approximate chainage 194.500 kilometres and would run adjacent to the Main Northern Railway for approximately 30 kilometres concluding at Minimbah at approximate chainage 224.200 kilometres.

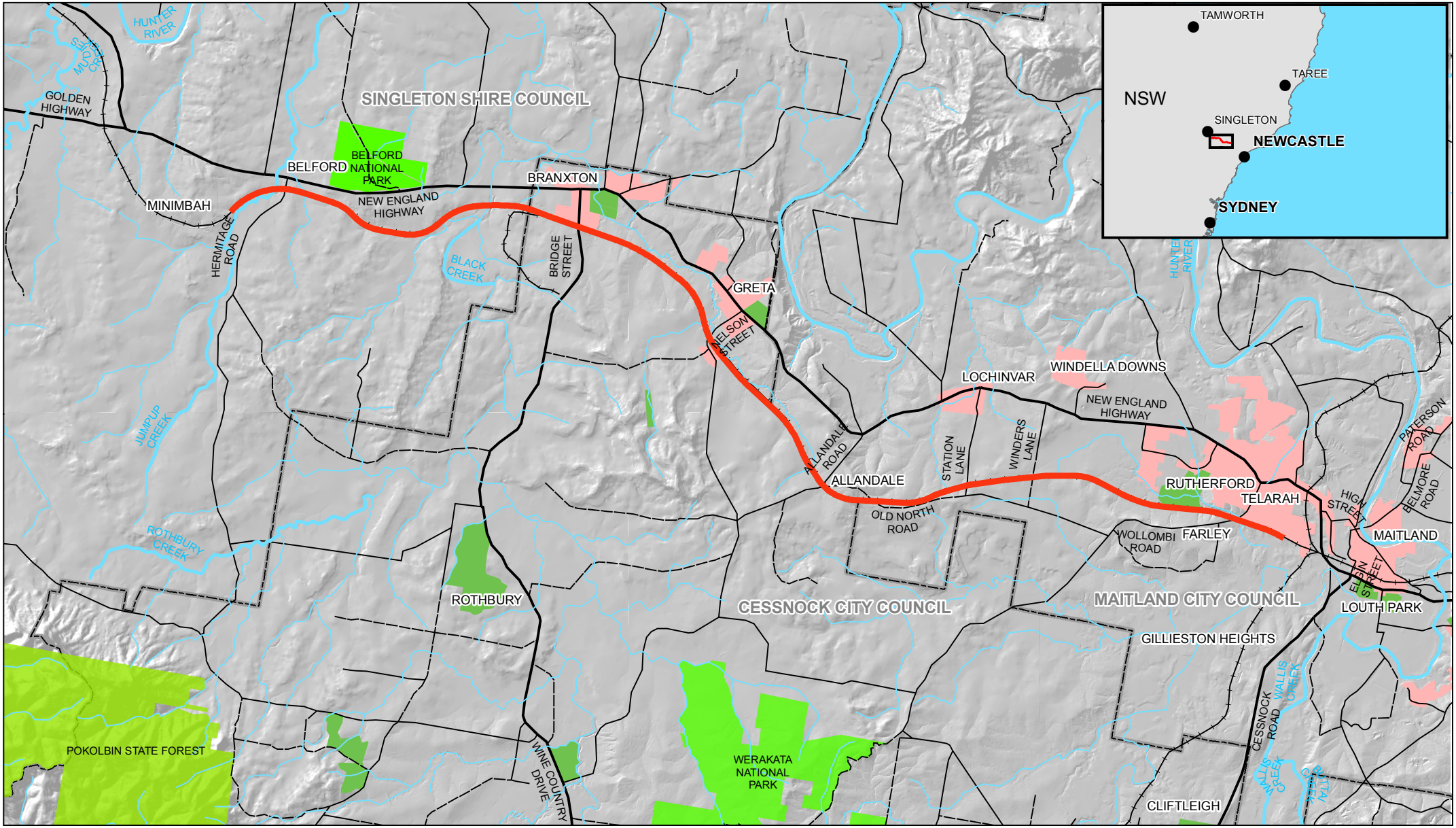
The proposed third track would be predominantly located on the Up side of the Main Northern Railway. Approximately 3 kilometres of track, from chainages 210.170 kilometres to 211.180 kilometres and 214.060 kilometres to 216.000 kilometres, would be located on the Down side.

The Project would involve the construction of approximately 30 kilometres of new rail track as well as construction and/ or modification of major infrastructure along the Main Northern Railway. A summary of the major elements of the Project is provided in Table 1-1 and shown in Figure 1-1.

Table 1-1 Major Project Elements

Project Elements	
Earthworks	Major cut and fill earthworks along the route. Other minor earthworks.
Track	Approximately 30 km of new track including turnouts and junctions. Relocation of turnouts from Minimbah and Branxton to Belford. Upgrade of maintenance siding turnouts at Branxton. Track reconditioning of existing Up Main at Greta and Branxton Stations and of the Branxton crossovers.
Drainage	Central and cess track drainage. Amendments to 53 culverts for cross drainage. Re-alignment of Sawyers Creek. Other drainage works around new structures.
Bridges	A new rail underbridge at Stony Creek and Wollombi Road, Farley. Closure of the stock crossing at Farley. Demolition of the existing rail overbridge at Old North Road, Allandale. A new rail underbridge at Allandale Road, Allandale.

Project Elements	
	A new rail underbridge for an unnamed tributary of Anvil Creek (chainage 207.776 km). Demolition and replacement of the existing rail underbridge at an unnamed tributary of Anvil Creek, Greta (chainage 209.989 km). A new rail underbridge at Sawyers Creek, Greta. Modification of the existing rail overbridge at Bridge Street, Branxton. A new rail underbridge at Black Creek, Belford. A new rail underbridge at Jump Up Creek, Belford.
Station Modifications	Modifications to Lochinvar Railway Station. Modifications to Greta Railway Station. Modifications to Branxton Railway Station.



1:125,000 (at A4)

0 600 1,200 2,400 3,600 4,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Project Location
- Railway
- Watercourse
- Highway
- Unsealed
- Main Road
- Minor Road
- Recreation Areas
- State Forest
- National Park
- Built Up Area
- LGA

Maitland To Minimbah Third Track
Environmental Assessment

Job Number	22-14471
Revision	A
Date	May 2010

Regional Location

Figure 1.1

G:\22\14471\GIS\Maps\Deliverables\EA\EA_Regional_Plan_20091203.mxd
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com.au W www.ghd.com.au

Data Source: GeoScience Australia: 250k Topo Data - Series 3. Created by: msmiljkovski, tmorton, fmackay

2. Purpose of the Risk Assessment

Risk assessment is an important part of the environmental assessment process for the Project. The Director General's Requirements for the Environmental Assessment of the Project (May 2009) identifies environmental risk analysis as a key issue for the Environmental Assessment:

Notwithstanding the key assessment requirements [listed within the DGRs]*, the Environmental Assessment must include an environmental risk analysis to identify:*

- *Potential environmental impacts associated with the project (construction and operation);*
- *Proposed mitigation measures; and*
- *Potentially significant residual environmental impacts after the application of proposed mitigation measures.*

Where additional key environmental impacts are identified through this risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the Environmental Assessment.

The purpose of the risk assessment is to address the Director General's Requirements relating to environmental risk assessment and analysis. The approach to risk assessment is consistent with the *AS4360 : Risk Management* and provides a structured framework for analysis.

The objectives of the risk assessment are to:

- Identify and confirm key environmental impacts of the Project which require detailed investigation and summarise the risk assessment findings.
- Facilitate a consistent approach to risk assessment across the various environmental programs. This framework should be applied conservatively to the project through a repeatable and robust process.
- Inform the ongoing design and construction processes of key risks and provide a clear process for the formulation and management of measures to mitigate the risk.
- Encourage the level of investigation of various project risks to be commensurate with the risk of the environmental impacts.

This approach is to be applied in an iterative manner and is widely recognised as a tool to assist environmental assessment in determining the level of impacts and identifying relevant mitigation measures. The process is outlined in Figure 2-1.

A risk assessment approach is used in environmental impact assessment to assist in providing an assessment framework that will support the inherent uncertainty within the impact assessment practice. It adds value to the overall process through alleviation of uncertainty by identifying and outlining environmental issues, providing a means to prioritise these risks through assessment of the likelihood and consequence, and apply appropriates management and mitigation measures.

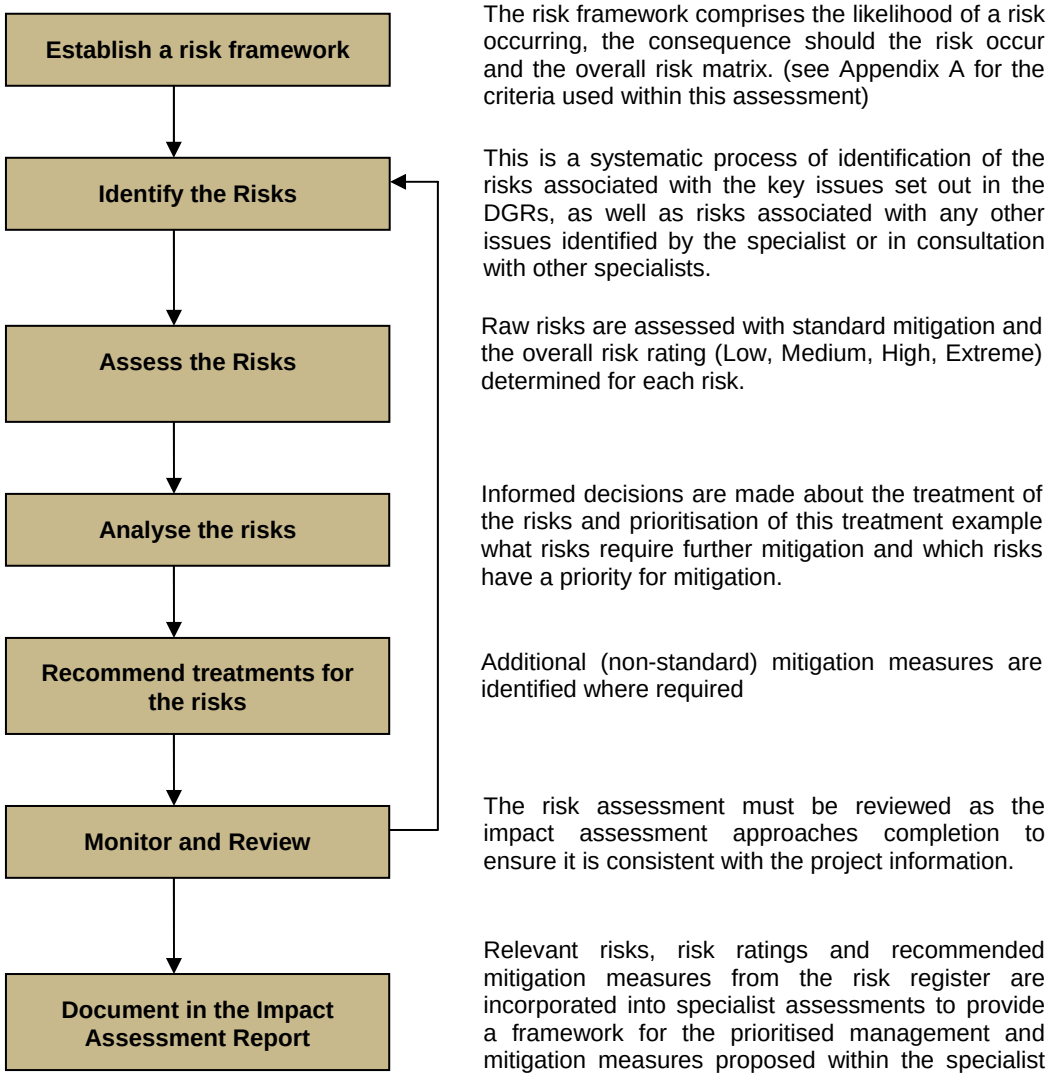


Figure 2-1 Risk Management Process in Accordance With AS4360

Risk assessment is a component of the overall integrated assessment approach for this environmental assessment and draws upon the interrelated and interdependent aspects of environmental assessment (Figure 2-2). The method outlined within this report is developed under the Hunter 8 Alliance risk assessment process and has been developed to support the environmental impact assessment process through providing a consistent framework for assessment across all environmental elements, The assessment process is also able to help design be developed in accordance with the principles of Ecologically Sustainable Development.

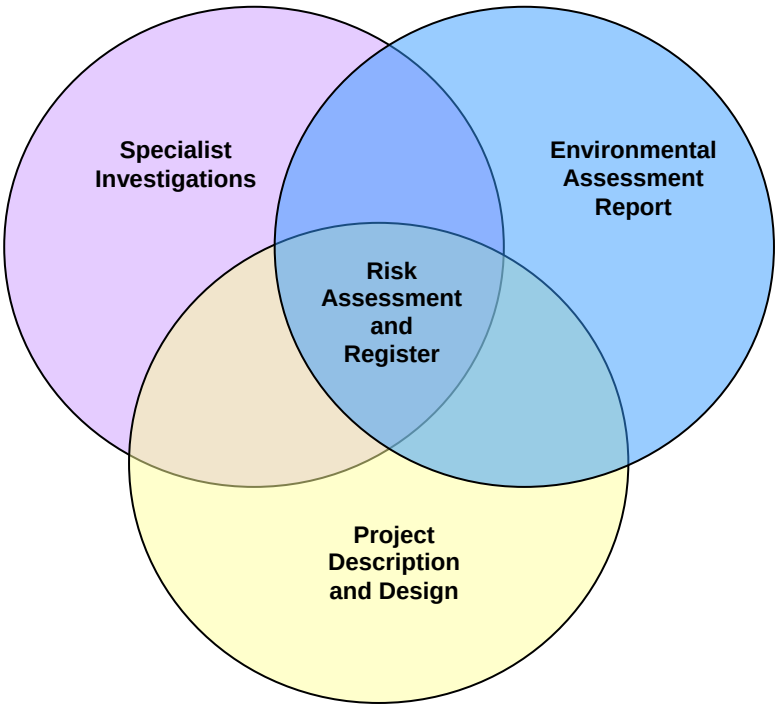
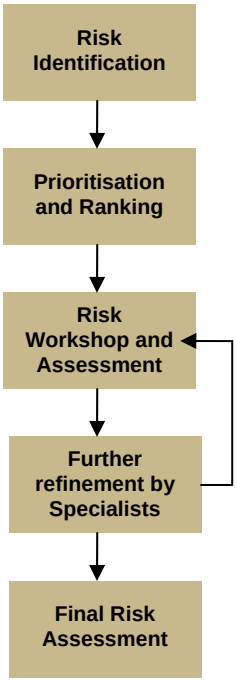


Figure 2-2 Relationship Between Risk and Project

3. Risk Analysis

The scope of the Project is outlined in Section 1.2 and provides a summary of the detailed Project Description given to the specialists to undertake their investigations. The framework for risk assessment was established early in the Project and refined as the investigations took place (refer Appendix A).



3.1 Methodology

Initially a broad risk identification and prioritisation was undertaken to rank potential risks to the project. This initial workshop provided a basis for scoping the key risks for the project. From this risk identification workshop specialists were asked to undertake further environmental assessment before application of the risk framework outlined in Figure 2-1.

A second risk workshop was undertaken on the 7 October 2009 to assess the risks under the framework provided in Appendix A. This workshop provided an opportunity for all specialties to come together and undertake an integrated risk assessment, refine the design and construction parameters of the Project and confirm if there are any key environmental issues which would require further investigation. Review of the criteria in Appendix A was also undertaken during the risk workshop.

After the workshop specialists were required to further refine the risk assessments as they completed their impact assessments and complied into a central risk register maintained by the Environmental Manager.

3.2 Mitigation

Where appropriate, mitigation measures should be recommended to reduce the level of risk. The treated risk pathway is then assessed again to confirm that the mitigation measure has the desired effect and reduces the level of risk. In some cases the risk rank may be elevated due to an incomplete investigation, or uncertainty. In these instances some mitigation measures may in fact be the requirement to undertake further investigation, rather than a standard topical mitigation.

3.3 Risk Register

Identified risks and associated ratings submitted by specialists are to be compiled into a central risk register maintained by the Environmental Manager. Specialists will be requested to update their component of the risk register at regular intervals as further information becomes available and as impacts assessments progress.

4. Results

The specialists that participated in the risk assessment workshops are detailed below:

Design Manager

Construction Manager

Environmental Manager

Approval Manager

Environmental Risk Manager

Flora Specialist

Aquatic Ecology Specialist

Fauna Specialist

Indigenous Heritage specialist

Non-Indigenous Heritage specialist

Noise and Vibration Specialist

Air Quality Specialist

Traffic and Transport Specialist

Social Impact Specialist

Land Use and Planning Specialist

Surface Water Specialist

Contaminated land Specialist

Groundwater specialist

The initial risk identification and prioritisation provided a list of potential risks and confirmed the key risks to be addressed by the specialist reports. From this the multi-disciplinary risk workshop was undertaken and the project assessed with input from all specialists, design and construction teams. Detailed results of the risk assessment are included in Appendix A. A summary of potential risks/impacts, proposed management and mitigation measures and risk categories is provided in Table 4-2. Ranking of the risks has been undertaken to group risks into the three categories identified in Table 4-1. Impacts assigned a risk category level of 'A' are considered to be key issues for the Project.

Table 4-1 Environmental Risk Analysis Risk Level Definitions

Risk level	
A	May have high or moderate impacts. Detailed assessment 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 but these can be mitigated by the application of standard environmental management measures.
C	Will have low impacts, which can be managed by standard environmental management measures.

Table 4-2 Summary of Environmental Risk Assessment and Analysis

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Noise and Vibration	Yes	Impacts of noise and vibration due to construction activities	Mitigation measures would be implemented to limit construction noise impacts and would be refined during detailed design. This would be done with consideration of the following guidelines. *Environmental Noise Control Manual* (EPA 1994) *Assessing variation: A Technical Guideline* (Dec 2006) Construction activities would be conducted consistent with the provisions of Environment Protection Licence 3142 for construction activities. Construction noise and vibration impacts would be managed in accordance with the Construction, Vibration and Blasting Management Plan which would be developed for the Project. Noise, Vibration and Blasting Management Plan would be implemented which would include notification to residences outside of standard construction hours. The approach to mitigating exceedances of construction targets is substantially extracted from Transport Infrastructure Development Corporation's *Construction Noise Strategy 2007* with variations specific to this Project. Approximately 44 receivers that would likely be effected by noise impacts and may require noise attenuation. Dilapidation survey would be undertaken at residences and structures likely to be impacted by vibration.	A

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
	Yes	Impacts of operation noise and vibration	Mitigation measures would be implemented to limit operation noise impacts and would be refined during detailed design. This would be done with consideration of the following guidelines. - *Environmental Noise Control Manual* (EPA 1994) - *Assessing variation: A Technical Guideline* (Dec 2006) Vibration control should be considered where dwellings are located within approximately 40 m from the nearest rail track, which involves the following receivers: ◗ Two residences east of Lovedale Road (MMD-021 and Lot 261 DP / 755211) in NCA D9. ◗ Clifton House (MMD-029) in NCA D11. ◗ One residence at the end of Winders Lane, Lochinvar (MMU-061) in NCA U8. ◗ Two residences at eastern end of Wollombi Road (including MMD-041) in NCA D12. ◗ Westernmost residences on Wentworth Street and Railway Parade, Telarah in NCA U11.	B

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Traffic and Access	Yes	Community access (both vehicle and pedestrian) to property, facilities and business services during construction	A Construction Traffic Management Plan and Traffic Control Plans would be implemented to manage delays and community consultation. Where possible access would be maintained. All relevant authorities would be notified of potential delays to roads throughout the construction of the project. Speed limits would be reviewed and potentially reduced in areas with measurable risk. Appropriate signs warning of trucks entering should be erected on the approach to all haul road crossing points. Specifically at Allandale Road and Wollombi Road haul road crossings. Where possible, try to minimise or avoid road closures during peak times.	B
	Yes	Road closure, traffic diversions and traffic flow during construction	As Above	B

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Air Quality	Yes	Impacts to amenity due to construction activities	Implementation of an Air Quality Management Plan within the Construction Environment Management Plan that would include standard dust management measures and controls such as hydromulch and wetting down the construction areas. Weather and dust monitoring would be undertaken to provide warning of dusty activities to construction staff and community. Spoil would be managed with a Spoil and Fill Management Plan to maintain stockpiles are of a suitable height, width and slope and surface treatment. A Reinstatement Plan would be applied to all areas once construction works are complete. Construction traffic would be controlled by designated construction traffic speeds and routes.	A
	No	Impacts on local water availability due to construction activities	Wetting down the construction site would be required. A large volume of water would be required to achieve this. Investigation of the use of hydrocarbons on stockpiles would be undertaken.	A
Flora	Yes	Impacts to Endangered Ecological Communities	Approximately 81.6 ha of endangered ecological communities would be removed as a result of construction. Preparation of a Compensatory Habitat Strategy (an Offset Strategy) consistent with Department of Environment, Climate Change and Water (DECCW) guidelines. A revegetation plan would be prepared, including strategies for protection and rehabilitation of Slaty Red Gum and EECs that occur in the study area.	B

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
	Yes	Impacts to Threatened Flora Potential removal of native vegetation	Approximately 14.6 ha of threatened flora would be removed as a result of construction. During construction exclusion fencing of sensitive environmental areas that are to be retained would be undertaken. Education of construction workers through the site induction process would be employed. Implementation of a Flora and Fauna Management Plan which would include a Reinstatement Plan, a Weed Management Strategy and a Pre-clearance Survey Protocol. The restoration, regeneration and rehabilitation of areas would be undertaken as soon as possible post construction. These activities would be carried out in such a way as to increase visual amenity and habitat value of the areas.	B

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Fauna	Yes	Impacts to Threatened Fauna or habitat areas Vegetation clearing impacting habitat and connectivity	Pre-clearing survey would be undertaken by a qualified ecologist to relocate individuals prior to clearing activities. Action for relocation would be determined by specialist advice. Implementation of a rehabilitation management plan would be undertaken to replace lost habitat where possible. Areas for habitat clearance would be minimised where practicable to reduce the potential impact to the receiving environment. A Compensatory Habitat Strategy (an Offset Strategy) would be prepared consistent with Department of Environment, Climate Change and Water (DECCW) guidelines. Vehicle speed would be limited to 20km/h on site to avoid vehicle collisions with macro fauna. An Air Quality Management Plan and Erosion Soil and Fill Management Plan within the Environment Management Plan would be implemented to control the release of dust and sediment to the receiving environment. Flora, leaf litter and mulch from vegetation removal would be reinstated post construction. Culverts identified in the environmental assessment as having a potential role in fauna crossing would be designed to facilitate fauna movements.	C

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Aquatic Ecology	Yes	Impacts to aquatic fauna and habitat areas	A Reinstatement Plan would be implemented for all new waterway crossings and re-alignments. Waterway crossings would be designed to facilitate fish passage where appropriate. Loss of riparian vegetation would be minimised and where possible avoided. A Spoil and Fill Management Plan would be implemented within the Environment Management Plan to control the release of sediment to the receiving environment. Design considerations would take into account the existing conditions and improve or maintain the status quo. Construction would be scheduled to avoid breeding cycles where possible.	B
	No	Impacts to Groundwater Dependent ecosystems	A Groundwater Management Plan would be implemented. Design would minimise impacts to groundwater sources where possible.	C
Heritage	Yes	Indigenous heritage sites or places of significance	Identified Aboriginal heritage sites and potential archaeological deposits would be clearly identified on construction drawings. Monitoring for stone artefacts and skeletal remains would take place throughout construction. All project and contract staff would undergo adequate heritage training to assist in artefact identification and protection. Any Aboriginal heritage items directly affected would be managed in consultation with Aboriginal stakeholders and DECCW. This would include providing the Aboriginal stakeholders with the opportunity to salvage items to be directly affected. Should any skeletal remains be identified, work would cease and the appropriate authorities (NSW Police, DECCW) would be notified.	A

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
	Yes	Non-Indigenous impacts to heritage and values	Survey of the alignment prior to construction would be undertaken. All heritage identified would be protected where possible and managed through a Heritage Management Plan.	A
Land Use and Access	Yes	Impacts to affected properties including access, severance, business viability and property infrastructure	Acquisition of farmland would be minimised, Where this occurs appropriate compensation would be made. Sterilisation of land as a result of construction. The Project would seek to minimise property disruption through appropriate notification and careful planning. Access to private property would be maintained at all times throughout the Project. Implement appropriate attenuation measures for impacts likely to affect property values (such as noise). Implement measures to compensate/offset significant impacts on dams and buildings. Measures to be developed in consultation with affected landholders.	A
	Yes	Integration with the current and future land uses of the region	Implement appropriate compensation measures where approved development plans are shown to be detrimentally impacted. Develop and implement a workforce accommodation strategy. Implement a public information program that addresses community values to help improve the public perception of the Project. Implement complaint monitoring and response measures.	C
Hydrology	Yes	Impacts to flood characteristics on surrounding land, property and infrastructure	The potential for flooding changes to private land as a result of construction is likely, however the magnitude of this change is not anticipated to create great disturbances. The detailed design would consider installation of structures to minimise flooding effects.	B

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Contamination	No	Impacts to the receiving environment from contaminated land, dust or groundwater	Undertake Phase 1 and 2 assessments in areas likely to contain contaminants. If contamination is found to pose unacceptable risk to either the environment or human health, a remedial action plan would be developed and remediation works undertaken. Management and disposal of any contamination would be detailed in a Contaminated Soil Management Plan contained within the Environment Management plan. Contaminated Soil Management Plan to contain outline of the activities required to prevent contaminants escaping the site through leeching or blowing away as dust or waste. Should acid sulfate soils or asbestos be identified, an Acid Sulfate Soil Management Plan or Asbestos Management Plan would be implemented as appropriate as a part of the Environment Management Plan.	C
Groundwater	No		Implementation of a Spoil and Fill Management Plan which would include baseline monitoring prior to construction. Groundwater quality monitoring would be undertaken across six control bores and of down gradient bores every six months following construction, and would be reviewed after 12 months (two post construction sampling rounds). These would be assessed against the baseline monitoring.	C
Greenhouse Gas	No		Energy efficient work practices would be adopted to limit energy use. Measures would include conducting awareness programs for all site personnel regarding energy conservation methods and conducting energy audits during the Project to identify and address energy waste.	C

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Social and Economic	No		Access would be maintained to properties at all times. Negotiations for agricultural property acquisition would include consultation on property adjustments where required to limit the impact on farm management practices. Changes to land use and acquisition would be managed through appropriate consultation. The Project would seek to minimise property, community and business disruption through appropriate notification and careful planning. No adverse effects are anticipated from the existing commercial centres.	B
Visual	No		Changes to visual amenity and landscape character would be managed through the development of a Landscaping Plan that draws together the outcomes of the above integrated design and assessment process. In addition to this the Project would undertake early identification of landscape 'hot spots' and integration of mitigation strategies to minimise landscape and visual impacts. Communicate future changes (such as via Project newsletter/updates, advertisements) to help the community understand what the proposal site will look like after construction activities. Where adverse light impacts on residences may occur implement attenuation measures, such as screening of sensitive receptors. Disturbed areas would be progressively revegetated with consideration to related controls such as erosion and sedimentation, drainage and future safety requirements. Monitoring of the reinstatement program would be undertaken to confirm success of rehabilitation works. The schedule of species to be used in the landscaping treatments would include native and locally indigenous plants. Detailed design would seek to minimise the interference with existing landscape values.	C

Issue	Key issue in Director-General requirements?	Impacts	Analysis – Mitigation Measures and (if any) key residual impact	Risk category following analysis
Waste	No		Waste would be minimised using the waste hierarchy principles of avoid/recover/dispose. Waste would be managed in accordance with DECCW's Waste avoidance and Resource Recovery Strategy (2007).	C

5. Conclusions

The risk assessment process has identified that the key impacts for this project are:

- Impacts to affected properties including access, severance, business viability and property infrastructure.
- Impacts on local water availability due to construction activities.
- Non-Indigenous impacts to heritage and values.
- Indigenous heritage sites or places of significance.
- Impacts due to construction activities on amenity.
- Impacts of noise and vibration due to construction activities.

These are impacts that have a medium or higher level of risk even after treatment with additional mitigation measures.

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Appendix A

Environmental Risk Assessment Criteria

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Method for Assigning Risk Rankings

Table A-1 Likelihood Table

Likelihood	Description
Almost Certain	The event is expected to occur in most circumstances.
Likely	The event will probably occur in most circumstances.
Possible	The event could occur.
Unlikely	The event could occur but not expected.
Rare	The event occurs only in exceptional circumstances.

Table A-2 Consequence Table

Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Flora and fauna species (including EPBC protected species)	Population change not detectable.	Detectable change in population without impact on population viability.	Detectable change in population and impact on population viability that is significant at a local level.	Detectable change in population and impact on population viability that is significant at a regional level.	Detectable change in population and impact on population viability that is significant at a State or Commonwealth level.
Endangered Ecological communities (EEC)	Insignificant loss of native vegetation.	Loss of EEC significant at the local level. Net gain achievable.	Loss of EEC significant at the regional level. Net gain achievable.	Loss of EEC significant at the State level. Net gain achievable.	Loss of EEC significant at the State level. Net gain not achievable.
Waterways and floodplain function	Negligible change to existing waterway condition and flow regime.	Minor changes to existing waterway condition or flow regime.	Moderate changes to existing waterway condition or flow regime.	Existing conditions of waterway or floodplain significantly compromised.	Existing condition of waterway irreversibly disturbed or extensive impact to floodplain function.

Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Cultural heritage (Aboriginal and non-Aboriginal)	No impact to heritage sites.	Disturbance or partial removal of a small number of heritage artefacts.	Complete removal of one or more heritage artefacts confined to a small number of locations.	Complete removal of many heritage artefacts across many locations. Disturbance of a heritage site of high scientific significance.	Widespread removal of heritage artefacts across a region. Destruction of a heritage site of high scientific significance.
Air quality, noise and water quality	Applicable air quality, noise and water quality standards met across the region.	Isolated exceedence of air quality, noise or water quality standards that is short lived.	Exceedence of applicable air quality, noise or water quality standards in a local area.	Exceedence of applicable air quality, noise or water quality standards in a number of local areas.	Widespread exceedence of applicable air quality, noise or water quality standards across the region.
Groundwater	Negligible change to groundwater regime and availability.	Changes to groundwater regime and availability but no significant implications.	Changes to groundwater regime and availability with minor implications.	Groundwater regime or availability significantly compromised.	Widespread groundwater resource depletion and subsidence.
Economic impacts on businesses	Loss of annual revenue less than $100,000.	Loss of annual revenue less $1M but greater than $100,000.	Loss of revenues less than $10M but greater than $1M.	Loss of revenues less than $100M but greater than $10M.	Loss of revenues less than $1B but greater than $100M.
Land use planning impacts	Land use changes resulting in consistency with planning policies.	Land use changes result in minor inconsistency with planning policies.	Land use changes result in significant inconsistency with local planning policies.	Land use changes result in significant inconsistency with state planning policies.	Land use changes result in complete inconsistency with planning policies.

Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Social	Changes to amenity, access, view shed, community facilities are not noticeable or displacement of a small number of residences.	Changes to amenity, access, view shed, community facilities are noticeable. or displacement of a number of residences within a local area.	Changes to amenity, access, view shed, community facilities are noticeable and causing community concern. or displacement of a number of residences effecting a small section of the region.	Changes to amenity, access, view shed, community facilities are noticeable and causing major community concern. or displacement of a number of residences effecting a large part of the region.	Changes to amenity, access, view shed, community facilities are noticeable and causing major community concern perhaps resulting in negative media attention. or displacement of a number of residences effecting the entire region.
Health and safety	Minor injury or illness to less than 10 individuals. Major injury or illness to one individual.	Minor injury or illness to 10 to 100 individuals. Major injury or illness to between 1 and 10 individuals.	Minor injury or illness to between 100 and 1000 individuals. Major injury or illness to between 10 and 100 individuals.	One fatality or permanent disability.	Between one and ten fatalities or permanent disabilities.
Traffic and Transport	Temporary and localised changes in the road network.	Short term impacts to road networks within the localised area. Delays in traffic of up to 10 mins or restriction to access for less than one week.	Impacts on traffic and transport that negatively impact access and use. Delays of 10-30 mins and restrictions in access for over one week to one month.	Significant impacts on the road network or delays to traffic of greater than 30 mins, of restriction to access for greater than one month to one year.	Permanent changes to the road network resulting in negative impacts to use, access and traffic movement.
Project cost	Negligible increase in project costs.	Increase in project costs by up to 5%.	Increase in project costs by up to 15%.	Increase in project costs by up to 50%.	Increase in project costs by more than 50%.
Project delay	Delay in project of < 1 week.	Delay in project of 1-4 weeks.	Delay in project of 1-3 months.	Delay in project of 3-6 months.	Project cancelled or delayed indefinitely.

Table A-3 Risk Matrix

Likelihood Level	Consequence Level				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Negligible	Low	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	High
Rare	Negligible	Negligible	Low	Medium	Medium

Appendix B

Risk Register

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Hunter 8 Maitland to Minimbah Third Track
Environmental Risk Register

Specialist Field	Risk Pathway	Consequence (IMPACT)	Project Controls	Consequence	Likelihood	Risk	Additional Controls	Consequence	Likelihood	Risk
Air Quality and Dust	Construction of Project creates construction dust.	Loss of local amenity (clarify) Use of water, where from hydrocarbon use on stockpiles	Implementation of a Dust Management Plan that includes standard dust management measures and controls such as hydromulch Wetting down construction areas, adopting low dust work practices Reinstatement Plan,	Moderate	Almost Certain	High	Enhanced mitigation measures - Real-time dust and weather monitoring to provide a warning (via an audible or visible signal) to a delegated responsible officer at the construction site so that prompt dust suppression and enhanced mitigation actions could be taken, such as: If dusty activity is to take place, communicate this to the residences Use non-potable water for dust suppression activities	Minor	Likely	Medium
Air Quality and Dust	Operation of the Project generates fugitive dust from uncovered coal in wagons.	Exceedence of DECC air quality impact assessment criteria for Dust, TSP and PM10 at sensitive receptors Loss of local amenity eg soiled laundry	Railway verges covered using cobbles or coarse gravel to reduce fugitive dust emissions. Coal spillage in the corridor should be cleaned up on a regular basis.	Moderate	Possible	Medium	Dust monitoring should be undertaken at strategic points inside and adjacent to the rail corridor to provide an indication of the total dust impact and the contribution of dust from the Project to the local environment. This monitoring data would be used to inform the need to consider the implementation of enhanced mitigation measures, such as the application of chemical dust suppressants.	Minor	Unlikely	Low
Air Quality and Dust	Operation of the Project generates fugitive dust from	Exceedence of DECC air quality impact assessment criteria for Dust, TSP and PM10 at sensitive receptors Loss of local amenity eg soiled laundry	Nil	Moderate	Possible	Medium	Dust monitoring as above.	Moderate	Unlikely	Medium
Air Quality and Dust	Operation of the Project generates exhaust emissions from diesel locomotive engines.	Exceedence of DECC air quality impact assessment criteria for Dust, TSP and PM10 at sensitive receptors Loss of local amenity eg soiled laundry	Improved traffic flow and improved operating efficiency for all vehicles e.g. flattening of grades part of project description track grades will not be altered on Stage 2.	Minor	Possible	Low				
Hazard and Risk	Fire - grass fire in particular - resulting from construction activities including welding, rail grinding, cigarettes		Bush fire equipment, work on total fire ban days Prohibit works potentially generating sparks and other fire-generating sources from within 20m of native vegetation/ long grass							
Hazard and Risk	Itinerant dumping during construction process from local residents/businesses									
Contaminated Land	Construction of the Project results in disturbance of Contaminated Soils within the area of construction during Earthworks	Pollution of adjoining waterways Pollution of groundwater Pollution of uncontaminated soils Generation of soils requiring specialist, management, treatment and/or disposal. Workers and Residents exposed to contaminants by ingestion, inhalation or dermal contact.	Undertake Phase 1 and 2 Contamination Assessments in areas likely to contain contaminants Implementation of a Contaminated Soil Management Plan as part of an Environmental Management Plan, including procedures for management and disposal should contamination be identified and OH&S procedures Implementation of a Contaminated Soil Management Plan, includes stockpile management and contamination identification Manage waste in accordance with relevant legislation	Minor	Possible	Low				
Contaminated Land	Construction of project results in generation of dust containing contaminants	Pollution of adjoining waterways Pollution of uncontaminated soils Workers and Residents exposed to contaminants by ingestion, inhalation or dermal contact.	Undertake Phase 1 and 2 Contamination Assessments in areas likely to contain contaminants Implementation of Environmental Management Plan, including procedures for management and disposal should contamination be identified Implementation of Construction Management Plan	Minor	Unlikely	Low				
Contaminated Land	Construction of Project results in dewatering of contaminated groundwater or groundwater close to an existing contaminant plume	Pollution of adjoining waterways Migration of groundwater plume Pollution of uncontaminated soils Generation of contaminated water requiring specialist management, treatment and/or disposal. Workers and Residents exposed to contaminants by ingestion, or dermal contact.	Undertake Phase 1 and 2 Contamination Assessments in areas likely to contain contaminants Implementation of Environmental Management Plan, including procedures for management, treatment and/or disposal should contamination be identified Implementation of Construction Management Plan	Minor	Unlikely	Low				
Contaminated Land	Construction of the Project results in disturbance of asbestos in soils during earthworks	Generation of asbestos in soil requiring specialist management and disposal. Workers and residents exposed to asbestos by inhalation contact.	Undertake Phase 1 and 2 Contamination Assessments in areas likely to contain contaminants including asbestos Implementation of Asbestos Management Plan, including procedures for management and disposal should asbestos be identified Implementation of Construction Asbestos Management Plan	Moderate	Possible	Medium	Conduct air monitoring down wind of any works requiring disturbance of identified or suspected asbestos materials	Minor	Possible	Low
Contaminated Land	Construction of the project results in disturbance of Acid Sulphate Soils	Potential for the generation of acidic leachate and mobilisation of metals (aluminium, iron) from disturbed soil Potential for pollution of groundwater and surfac water (such as through increased acidiity and increased concentrations of metals)	Implementation of an Acid Sulfate Soil Management Plan as part of the Construction Environmental Management Plan (CEMP - this is what it is called in Queensland at least)	Minor	Almost Certain	Medium				

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Contaminated Land	Construction of the project results in dewatering of Acid Sulphate Soils	Potential for the generation of acidic leachate and mobilisation of metals (aluminium, iron) from dewatered acid sulfate soil Potential for pollution of groundwater and surfac water (such as through increased acidiity and increased concentrations of metals) Generation of water requiring treatment prior to discharge	Implementation of an Acid Sulfate Soil Management Plan as part of the Construction Environmental Management Plan (if required)	Minor	Almost Certain	Medium				
Fauna	Construction of the project results in an area of threatened and/or migratory fauna species habitat to be removed or modified.	Loss of habitat area or individuals	Pre-clearing survey by qualified and experienced ecologist Implementation of a Rehabilitation plan - replacing habitat losses as much as possible Minimise area to be removed where possible through design and construction activities (e.g. leave hollow bearing trees where possible) Preparation of an Offset Strategy consistent with DECC guidelines	Moderate	Unlikely	Medium	Nest boxes installed in trees for hollow dependent species (e.g. squirrel glider, bats ad birds) Implement Offset strategy including option such as funding of research or recovery projects, where appropriate Species specific rehabilitation features (e.g. dam design for green and golden bell frog)	Minor	Unlikely	Low
Fauna	Construction of the Project impacts an area of fauna habitat to be removed or modified (protected but not threatened species)	Loss of habitat area for a species that may or may not significantly affect the local population. Loss of individuals during clearing process.	Pre-clearing survey by qualified and experienced ecologist Implementation of a Rehabilitation plan Minimise area to be removed where possible through design and construction activities (e.g. leave hollow bearing trees where possible)	Insignificant	Almost Certain	Low				
Fauna	Construction of the project results in noise/dust/vibration reducing habitat quality for fauna species	May result in some individuals or species moving out of the area Possible loss of reproductive efforts (e.g. nests abandoned)	Noise, dust and vibration control measures and relevant management plans	Minor	Unlikely	Low				
Fauna	Construction of the project resulting in Vehicle collisions with fauna	Loss of individuals	Limit Vehicle Speed on construction site, e.g. Vehicle access track is limited to 20km/h Control within the Environment Management Plan, in particular the traffic management plan	Insignificant	Possible	Negligible				
Fauna	Operation of the project results in vehicle collisions with fauna on access tracks by service vehicles or on the track by trains.	Loss of individuals	Limit Vehicle Speed of service vehicles during track maintenance, e.g. Vehicle access track is limited to 20km/h (IS THIS CORRECT DURING OPERATION??)	Insignificant	Almost Certain	Low				
Fauna	General construction of the project results in increased level of general disturbance through human presence and vehicle use, reducing habitat quality for fauna in nearby areas	May result in some individuals or species moving out of the area Possible loss of reproductive efforts (e.g. nests abandoned) Reduced water quality for terrestrial species Increased siltation of waterways resulting in a reduced water supply (particularly during drought)	Control vehicle Speed limits (20km/h) on construction site Control within the Environment Management Plan including a dust management plan Implement Erosion and Sedimentation management plan, including the use of sedimentation fences/traps. This will include temporary structures within the EMP and permanent structures in the design	Insignificant	Possible	Negligible				
Fauna	Construction of the project results in alteration of Sawyers Creek waterway path resulting in reduced habitat quality for fauna	Reduced access to water during construction Reduced water quality during works (increased sedimentation) Reduced amount of riparian habitat available during works and establishment of rehabilitation Erosion and sedimentation impacts on aquatic habitat and species. Loss of aquatic and riparian habitat.	Implement Erosion and Sedimentation management plan, including the use of sedimentation fences Implementation of a Rehabilitation Plan for realignment of waterways, replicate waterway area where possible and reinstate riparian vegetation and refuge - fish	Insignificant	Likely	Low				
Aquatic Ecology	Construction of the project impacts on water quality and habitat in creeks, drainage lines and wetlands.	Erosion and sedimentation impacts on aquatic habitat and species. Loss of aquatic and riparian habitat.	Implementation of an Environmental Management Plan (EMP) which includes Erosion and Sedimentation Control Plans. EMP to include temporary sediment and erosion controls, with the Project including permanent controls. Design considerations to replicate existing environment	Minor	Likely	Medium	Implementation of a revegetation plan that includes revegetation works within disturbed riparian and aquatic habitats.	Minor	Possible	Low
Aquatic Ecology	Operation of the project impacts on water quality and habitat in creeks, drainage lines and wetlands.	Erosion and sedimentation impacts on aquatic habitat and species. Loss of aquatic and riparian habitat.	Implementation of an Environmental Management Plan (EMP) which includes Erosion and Sedimentation Control Plans. EMP to include temporary sediment and erosion controls, with the Project including permanent controls. Consideration of fish passage within culvert design	Insignificant	Likely	Low	Implementation of a revegetation plan that includes revegetation works within disturbed riparian and aquatic habitats.	Minor	Possible	Low
Aquatic Ecology	Construction of the project impacts on Groundwater Dependant Ecosystems	An increase or decrease in groundwater can lead to changes in vegetation communities, either becoming drier or wetter. This may result in loss of EEC habitat	Design of project elements Design to have minimal impact on groundwater sources. Groundwater Management Plan	Insignificant	Unlikely	Negligible				

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Flora	Construction of the project results in clearing of native vegetation including 8.3 ha of threatened flora.	Loss of Slaty Red Gum (Eucalyptus glaucina), listed as vulnerable on the TSC Act and EPBC Act.	Implementation of an Erosion and Sediment Control Plan as part of an Environmental Management Plan (EMP). Implementation of a Flora and Fauna Management Plan, which includes pre-clearance survey protocol, weed management strategy and revegetation plan. Implementation of a Compensatory Habitat Policy to offset areas of *E. glaucina* and *G. montana* within the locality for realignment of waterways, replicate waterway area where possible and reinstate riparian vegetation and geomorphic features. Minimise construction footprint	Minor	Almost Certain	Medium	Narrow construction and clearing corridor in areas of dense E. glaucina, where possible. Locate site compounds and spoil areas in existing cleared areas. Pre-clearance surveys to identify individuals that may be avoided during construction clearance. Brush mat native vegetation green waste within adjacent cleared areas (in consultation with land owners) to promote revegetation of native species. Habitat features that may be utilised by fauna such as fallen logs would be relocated into adjacent bushland. Protocols to prevent introduction or spread of Phytophthora cinnamomi should be implemented, where required, following DECC guidelines. Separate stockpiling of topsoil and vegetation removed from various areas to delineate soils containing seeds from native or exotic species. Placement of soil stockpiles away from vegetated areas.	Minor	Almost Certain	Medium
Flora	Construction of the project results in clearing approximately 48 ha of native vegetation including 47.5 ha of Endangered Ecological Communities (EEC)	Loss of Endangered Ecological Community (EEC) habitat. - Lower Hunter Spotted Gum-Ironbark Forest EEC. - Hunter Lowland Redgum Forest EEC. - Swamp Oak Floodplain Forest EEC. - Freshwater Wetland EEC. - Central Hunter Ironbark-Spotted Gum-Grey Box Forest Preliminary EEC.	Implementation of an Environmental Management Plan (EMP) which includes environmental management plans such as Erosion and Sedimentation Control Plans. Implementation of a Flora and Fauna Management Plan, which includes pre-clearance survey protocol, weed management strategy and revegetation plan. Implementation of a Compensatory Habitat Policy to offset areas of EEC habitat within the locality. Established tracks used where possible to avoid vegetation removal and reduce impacts to vegetation Minimise construction footprint.	Minor	Almost Certain	Medium	Narrow construction and clearing corridor in areas of dense *E. glaucina,* where possible. Locate site compounds and spoil areas in existing cleared areas. Pre-clearance surveys to identify individuals that may be avoided during construction clearance. Brush mat native vegetation green waste within adjacent cleared areas (in consultation with land owners) to promote revegetation of native species. Habitat features that may be utilised by fauna such as fallen logs would be relocated into adjacent bushland. Protocols to prevent introduction or spread of Phytophthora cinnamomi should be implemented, where required, following DECC guidelines. Separate stockpiling of topsoil and vegetation removed from various areas to delineate soils containing seeds from native or exotic species. Placement of soil stockpiles away from vegetated areas.	Minor	Almost Certain	Medium
Groundwater	Dewatering at Wollombi Road during construction	Localised and temporary lowering of groundwater levels in the vicinity of Stony Creek at Wollombi Road	Minimise duration and extent of construction activities	Insignificant	Almost Certain	Low				
Groundwater	Construction of the project resulting in accidental spills over and in the vicinity of groundwater bearing alluvial deposits or bedrock. Most likely to impact through infiltration at the major creek crossings and where medium to high type permeability bedrock outcrop	localised degradation in Groundwater quality from leaks and spills occur during construction	Spill and clean up kits to be on-hand and management procedures in place Conduct groundwater quality monitoring of control bores (up gradient) and of down gradient monitoring bores once per month during the construction period Regular assessment of monitoring results against baseline conditions, established prior to construction If a spill occurs, assess significance of spill and potential for impact on groundwater quality. Review the groundwater monitoring program, which may involve additional sampling/ construction of additional monitoring locations if considered necessary Emergency response plan Groundwater Management Plan Collection of groundwater quality data over a number of months prior to the start of construction to establish baseline conditions and to identify control and trigger values against which to review monitoring data collected during construction.	Minor	Possible	Low	If a monitoring bore is rendered unusable by construction activities then the bore should be replaced and relocated in a suitable alternative location, in consultation with a Hydrogeologist. If control and trigger values are exceeded, conduct an assessment and take appropriate action to mitigate impact.	Minor	Unlikely	Low

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Groundwater	Construction of the project embankments adjacent to areas where groundwater levels are typically close to ground surface, such as creek crossings, resulting in a temporary increase of local groundwater levels. This includes intersections with Jump Up Creek, Black Creek, Stony Creek, and where Anvil Creek flows close to the Project site	Potential for temporary localised water logging as a result of (temporary) increase in groundwater levels	Groundwater level monitoring of control bores (up gradient) and of down gradient monitoring bores once per month during construction period. This includes Collection of groundwater quality data over a number of months prior to the start of construction to establish baseline conditions and to identify control and trigger values against which to review monitoring data collected during construction Regular assessment of monitoring results against baseline conditions. Soil and water management plan	Minor	Possible	Low	If a monitoring bore is rendered unusable by construction activities then the bore should be replaced and relocated, in a suitable alternative location, in consultation with a Hydrogeologist. If control and trigger values are exceeded, conduct an assessment and take appropriate action to mitigate impact	Minor	Possible	Low
Groundwater	Operational spraying of additional quantities of herbicides along the rail line to account for the third track as part of ongoing track maintenance Most likely to impact through infiltration at the major creek crossings and medium to high type permeability bedrock outcrop	Degradation in Groundwater quality as a result of the use of additional quantities of herbicides Potential to impact on the groundwater quality of existing licensed groundwater bores (and which are not indicated to be monitoring bores) located down assumed gradient of the Project site; GW 078497 ~1.3km down gradient of the Project Site at Jump Up Creek; GW 200442, GW 034601, GW 080668, GW 078378, GW 051301 and GW 029088 down gradient of the Project Site, of these GW 200442 and GW 034601 are the closest at approximately 700m south of the site in the vicinity of drainage channels/creeks that drain towards Swamp Creek	Groundwater quality monitoring of control bores (up gradient) and of down gradient monitoring bores once every 6 months following completion of construction. Regular assessment of monitoring results against baseline conditions established prior to construction. Review of the post construction monitoring program after 12 months (once two post construction sampling rounds have been completed and data reviewed)	Insignificant	Possible	Negligible				
Indigenous Heritage	Construction of the project impacts known Aboriginal sites	Removal of artefacts and potential destruction of heritage record	Survey the area of impact to determine presence of or potential for Aboriginal objects; Consultation with Aboriginal communities; Salvage of affected Aboriginal objects; Mitigation measures as agreed to by Aboriginal stakeholders; Management procedures specified in AHMP; Cultural awareness training; ARTC Indigenous Liaison Officer and Indigenous Liaison Committee	Moderate	Almost Certain	High		Moderate	Rare	Low
Indigenous Heritage	Construction of the project impacts unknown Aboriginal sites	Removal of artefacts and potential destruction of heritage record	Survey the area of impact to determine presence of or potential for Aboriginal objects; Consultation with Aboriginal communities; Mitigation measures as agreed to by Aboriginal stakeholders in areas of high potential; Management procedures specified in AHMP; Cultural awareness training; ARTC Indigenous Liaison Officer and Indigenous Liaison Committee	Moderate	Almost Certain	High				
Indigenous Heritage	Construction of the project impacts on Aboriginal cultural values	Loss of cultural value for the Aboriginal community	Consultation with Aboriginal communities to identify cultural values; Mitigation measures as agreed to by Aboriginal stakeholders if impacts cannot be avoided; Management procedures specified in AHMP; Cultural awareness training; ARTC Indigenous Liaison Officer and Indigenous Liaison Committee	Minor	Possible	Low				
Land Use	Construction and operation of the project will require acquisition of some adjacent land	Construction of the project results in the loss of some land included in local government planning strategies	Acquisition of land is limited to that directly affected by the proposed works and results in relatively minor strips of land immediately adjacent to the railway corridor	Minor	Possible	Low				
Land Use	Construction and operation of the project will require acquisition of some adjacent land	Construction of the project results in reduction of lot size resulting in the loss of residential building entitlement	Where this occurs the property owner is either compensated accordingly or the total property is purchased	Minor	Possible	Low				
Land Use	Construction and operation of the project will require acquisition of some adjacent land	Construction of the project will result in the loss of agricultural activity	The value of the relevant activity will be included in the compensation paid to the owner.	Minor	Possible	Low				
Land Use	Construction and operation of the project will require acquisition of some adjacent land	Construction of the project will result in the loss of existing residential buildings	The value of the relevant activity will be included in the compensation paid to the owner.	Minor	Possible	Low				
Land Use	Construction of the project will impact on existing farm dams	Loss of irrigation water, stock watering	Where practicable, design around impacting existing farm dams.							
Land Use	Construction of the project will impact on stock fences	Stock can escape onto rail line causing derailment resulting in loss to operators and stock owners	Fencing to be replaced in new position prior to removal of old fencing.	Major	Possible	High	Temporary electric fencing to be utilized where required. Close liaison with adjacent landowners required.	Major	Unlikely	Medium
Land Use	Construction of the project will impact on adjacent existing residential development	Reduction in value of land through loss of amenity, social impact etc.	Appropriate measures to be undertaken to physically reduce impacts, provide monetary compensation or acquire effected land.	Minor	Possible	Low				
Land Use	Construction of the project results in changes to proposed land uses.	The project impacts the proposed developments of: - Heritage Green Residential Estate -Maitland Ind. Est. -Anvil Creek -Pacific National provisioning facility -Hunter expressway -Huntlee	Acquisition of affected land will generally involve small strips of land adjacent to the existing rail corridor.	Minor	Possible	Low				

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Noise	Construction of the project exceeds noise or vibration goals (including blasting activities)	Loss of amenity for local residents, restrictions on work activities imposed by DECCW	Construction noise, vibration and blasting management plan including: review of work methods, community communication protocols, noise and vibration monitoring, management and mitigation measures etc.	Minor	Almost Certain	Medium	Further monitoring, sustained community consultation.	Minor	Almost Certain	Medium
Noise	Construction of the project creates sufficient noise to impact on threatened species	FLORA/FAUNA SPECIALIST TO ADVISE	FLORA/FAUNA SPECIALIST TO ADVISE				FLORA/FAUNA SPECIALIST TO ADVISE			
Noise	Construction of the project generates vibrations that exceed human comfort criteria (outside construction zone on sensitive receivers)	Loss of amenity for local residents, disgruntled community, restrictions on work activities imposed by DECCW	Construction noise, vibration and blasting management plan including: review of work methods, community communication protocols, noise and vibration monitoring, management and mitigation measures etc. Avoid blasting outside normal construction hours Property acquisition where impacts are unavoidable	Moderate	Almost Certain	High	Further monitoring, sustained community consultation. Consult with EA and design to bring further controls into here. Vibration impacts at known sensitive receivers should undergo dilapidation survey prior to construction, only in the vicinity of sensitive receivers (e.g. Clifton House or houses within 30m of construction)	Minor	Almost Certain	Medium
Noise	Construction of the project generates vibration that leads to structural damage to property adjacent to construction site	Loss of amenity, loss of property, reconstruction costs	Construction noise, vibration and blasting management plan including: review of work methods, community communication protocols, noise and vibration monitoring, management and mitigation measures etc.	Moderate	Unlikely	Medium	Undertake vibration monitoring for high risk activities	Moderate	Rare	Low
Noise	Operation of the project generates noise that exceed operational noise goals in residential areas	Loss of amenity, non-compliance with DECCW rail noise policies and EPL licence	Undertake modelling of rail noise emissions, identify sensitive receivers and impacted areas, determine mitigation measures (noise barriers, architectural treatments) Design to Avoid	Moderate	Unlikely	Medium	Compliance monitoring, noise control retrofitting	Minor	Unlikely	Low
Noise	Operation of the project generates vibration that exceed human comfort criteria	Loss of amenity for local residents	Undertake vibration monitoring, predict potential vibration impacts Design to avoid	Moderate	Unlikely	Medium	Undertake further vibration monitoring, property acquisition	Moderate	Rare	Low
Noise	Operation of the project generates vibration that causes structural damage to property	Loss of amenity for local residents, loss of property	Undertake vibration monitoring, predict potential vibration impacts Design to avoid	Moderate	Unlikely	Medium	Undertake further vibration monitoring, property acquisition	Insignificant	Rare	Negligible
Non-indigenous Heritage	Construction of the project will require modification or demolition of the following heritage resources: Residue of platforms at Farley and Rutherford, Residue of sidings for Rothbury/Ayrfield Colliery, Rutherford Racecourse/Munitions Works, Denton Park Colliery and Anvil Creek Collery	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Moderate	Unlikely	Medium	In respect of material evidence identified on survey, archivally record in accordance with Heritage Branch criteria prior to project works	Minor	Unlikely	Low
Non-indigenous Heritage	Construction of the project will require modification of the following archaeological/heritage resource: Penfold Winery site	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Moderate	Almost Certain	High	As deemed necessary post-survey, obtain, and comply with conditions of the grants of, necessary permits or licences from relevant authorities. Monitorand archivally record in accordance with Heritage Branch criteria during project works	Minor	Almost Certain	Medium
Non-indigenous Heritage	Construction of the project will require modification or demolition of the following resources registered on the State Heritage Register: Branxton Railway Station Branxton Railway Footbridge (retained but closed) Greta Railway Station Greta Railway Footbridge demolished	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Moderate	Almost Certain	High	Obtain, and comply with conditions of the grants of, necessary permits or licences from relevant authorities. Archivally record prior to project works; monitor and archivally record in accordance with Heritage Branch criteria during project where works cause physical impact	Minor	Almost Certain	Medium
Non-indigenous Heritage	Construction of the Project will result in visible evidence being covered by earthworks: Brick culverts Stone culverts	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Minor	Almost Certain	Medium	In respect of material evidence identified on survey, archivally record in accordance with Heritage Branch criteria prior to project works	Insignificant	Almost Certain	Low
Non-indigenous Heritage	Construction of the project will reduce s the visibility of the following heritage resources: Jump Up creek underbridge Black Creek underbridge, but with no physical impact to heritage resources	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Minor	Rare	Negligible	In respect of material evidence identified on survey, archivally record in accordance with Heritage Branch criteria prior to project works	Minor	Rare	Negligible
Non-indigenous Heritage	Construction of the project will result in the modification of small areas of the land surrounding Clifton Property, but with no impact on the building or curtilage	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Insignificant	Almost Certain	Low	No further controls considered necessary	Insignificant	Almost Certain	Low
Non-indigenous Heritage	Construction of the project will result in the demolition and replacement of the Anvil Creek underbridge	Reduction in or loss of the heritage value(s) of individual resources at State and/or local and community levels	Survey the area before construction Identify and categorise heritage values, protect where possible and otherwise adopt and comply with appropriate management recommendations	Moderate	Almost Certain	High	As deemed necessary post-survey, obtain, and comply with conditions of the grants of, necessary permits or licences from relevant authorities. Monitorand archivally record in accordance with Heritage Branch criteria during project works	Minor	Almost Certain	Medium
Non-indigenous Heritage	Construction of the project impacts on Aboriginal cultural values	Loss of cultural value for the Aboriginal community	Consultation with Aboriginal communities to identify cultural values; Mitigation measures as agreed to by Aboriginal stakeholders if impacts cannot be avoided; Management procedures specified in AHMP; Cultural awareness training; ARTC Indigenous Liaison Officer and Indigenous Liaison Committee	Minor	Possible	Low	In respect of material evidence identified on survey, archivally record in accordance with Heritage Branch criteria prior to project works	Insignificant	Almost Certain	Low

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		Damage to property infrastructure including fencing, gates, paddocks.	Measures to minimise property damage to be included in the EMP for construction contractors. Implement ARTC and contractor conduct protocols.	Moderate	Possible	Medium				
Social	Construction of the project results in damage to private property adjoining the acquisition corridor	Some livestock escape and cause traffic disruptions, become injured.	Monitoring of construction contractors' performance quality.							
Social	Operation of the project will reduce visual amenity for neighbouring properties	Visual amenity reduced, properties devalued and/or dissuasion of future potential buyers, property owners complain and seek compensation.	Communicate future changes to help ensure the community understands what the Project would look like after construction activities.	Moderate	Almost Certain	High				
Social	Construction of the project will increase light pollution for neighbouring properties	Visual amenity reduced and people's sleep disturbed	If severe, implement attenuation measures, such as screening of sensitive receptors	Moderate	Possible	Medium				
Social	Operation of the project will increase light pollution for neighbouring properties	Visual amenity reduced and people's sleep disturbed on a permanent basis	If severe, consider implementation of attenuation measures, such as landscaping or barriers to screen sensitive receptors	Moderate	Possible	Medium				
			Communicate road changes, particularly to relevant local residents and businesses, to ensure awareness of changed access arrangements.	Moderate	Possible	Medium				
Social	Construction of the project results in a temporary change to existing access to local residential and/or business properties.	Inconvenience in additional travel time to access properties and disruption to business operations. Businesses seek compensation for loss of trade.	Implementation of a Communications Plan Implementation of a Traffic Management Plan							
Social	Construction and operation of the project results in the formation of negative opinions and attitudes about the project and ARTC	Adverse impact on ARTC and Alliance reputation. Project delays. Negative media. Potential political pressure.	Communications plan. Maintain communication lines between ARTC and the community.	Major	Likely	High	Direct consultation with relevant stakeholders. Release of media statement/s.	Moderate	Possible	Medium
			Implementation of a Communications plan Implementation of a Dust Management Plan that includes standard dust management measures and controls such as hydromulch	Moderate	Likely	High				
Social	Construction of the project results in dust at neighbouring properties	Properties require cleaning and occupants' health affected	Wetting down construction areas, adopting low dust work practices Reinstatement Plan							
Social	Operation of the project results in dust at neighbouring properties	Properties require cleaning and occupants' health affected	Railway verges covered using cobbles or coarse gravel to reduce fugitive dust emissions. Coal spillage in the corridor should be cleaned up on a regular basis.	Moderate	Likely	High				
Social	Construction of the project results in noise and vibration to neighbouring properties	People's sleep disturbed and a devaluation of impacted properties and/or dissuasion of future potential buyers.	Implementation of Communications plan. If severe impact to shift workers, consider noise screens, sequencing work according to shift workers' hours, provision of noise attenuation in home or accommodation for shift workers during particularly noisy periods.	Moderate	Likely	High				
Social	Operation of the project results in noise and vibration to neighbouring properties	People's sleep disturbed and a devaluation of impacted properties and/or dissuasion of future potential buyers.	If severe, consider implementation of attenuation measures, such as landscaping or barriers to screen sensitive receptors	Moderate	Likely	High				
Social	Operation of the project results in poor TV reception for neighbouring properties	TV reception interrupted for neighbouring properties, property owners complain	If the impact on reception is severe, install antennae and/or cabling at individual properties.	Moderate	Possible	Medium				
		Refer to Aquatic Assessment (Potential damage to aquatic habitat)	Erosion and sedimentation controls to be implemented via an Erosion and Sediment Control Plan. This is to include a response plan and monitoring.	Moderate	Possible	Medium				
Surface Water	Construction of the project results in discharge of polluted runoff to stormwater/rivers/Waterways resulting in decline in water quality	Impact to downstream water users	Undertake flood modelling to determine existing conditions and develop design to minimise potential increase	Moderate	Possible	Medium		Minor	Unlikely	Low
Surface Water	Construction works for the project results in increasing existing flood levels at Major waterways	Increased extent of inundation on adjacent properties	Design to minimise extent of impact				property acquisition			
Surface Water	Construction of the project results in scour at culvert outlets, along existing waterways and embankments	Undermining of structures, erosion of downstream system	Design protection measures to minimise the potential for scour and maximise stability	Moderate	Unlikely	Medium				
		Altered flow path		Minor	Unlikely	Low				
Surface Water	Construction of the project results in re-direction of sawyers creek	Impact aquatic habitat.	Review existing flow paths and maintain flow direction							
			Design embankments to minimise encroachment on waterways	Minor	Unlikely	Low				
Surface water	Construction of the project results in minor changes to flow regimes of waterways	Altered flow paths	Review existing flow paths and design to maintain							
Surface Water	Construction of the Project results in encroachment into existing wetlands	Removal of EEC vegetation and habitat - see Flora assessment								
			Emergency response plan.	Minor	Unlikely	Low				
Surface Water	Flooding during project construction resulting in equipment damage	Damage to equipment or persons	Store plant and equipment above 20 year flood level							
Surface Water	Construction of the project results in blockages in low flow zones such as in creeks at causeway crossings	Restriction of base flows to downstream system	Design to have causeways in creek beds or include low flow pipes to maintain base flows.	Moderate	Unlikely	Medium				
							minimising use of public roads for haulage			
Traffic and Roads	Partial road closures as a direct result of the construction of the project and delays on public roads as a result of construction, such as haul roads crossing public roads, blasting activities, road closures etc…	Delays to road traffic, additional traffic conflict points, inadequate sight distance causing increase in crashes.	Produce a traffic management plan and subsequent traffic control plans. Promote traffic changes through relevant bodies (RTA, Councils).	Moderate	Possible	Medium	If possible, identify no-go areas (e.g. Minor roads in Branxton, designated traffic routes) Road dilapidation study - what special attention for particular areas	Minor	Possible	Low
			Restrict Heavy vehicle movements on Bus routes in peak times.							
		Delays to public transport	Notify relevant authorities.	Minor	Possible	Low				
Traffic and Roads	Construction traffic obstructing and/or delays public transport and school buses	Delays in school buses	Limit Speed to appropriate limits during school hours							

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			reduce speed limits			
			Provide appropriate visibility and turn outs where possible			
		The number of accidents on the roads increases during the construction period	Restrictions in vehicle size	Moderate	Possible	Medium
		Delays causing driver frustration and community anguish	Restriction in time and use			
Traffic and Roads	Construction of the project creating further hazards on the road		Develop alternative routes			
Traffic and Roads	Pedestrian access impeded through construction activities to both road, rail and railway stations.		Additional pedestrian protection and traffic control	Minor	Likely	Medium
			Minimise the disturbance to the road as much as possible.			
			Ensure road closures, where possible, are not coincident with holidays and peak travel	Moderate	Possible	Medium
			Assess the worst case scenario and plan accordingly			
Traffic and Roads	Disruption to the traffic and flow of New England Highway	Road Closures and vehicular restrictions will be required on this road during the construction	Engage community through consultation in activities, closures and disturbances before the event			
Traffic and Roads	Cumulative traffic as a result of neighbouring construction project occurring concurrently (F3 to Braxton)	Additional traffic volumes, road closures, impact to planned haul routes	Consultation with RTA / Councils. Co-ordination of traffic management plans with other projects.	Moderate	Possible	Medium
Traffic and Roads	Construction traffic increase in school zones	Increased incidents in school zones. Heavy vehicles frequenting school zones.	Limit construction heavy vehicles delivery traffic in school zones / school zone times.	Minor	Possible	Low