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5.1 INTRODUCTION

The ToR for the EIS requires Waratah Coal to undertake a Cumulative Impact Assessment (CIA) that provides clear and concise information on the cumulative effects of the project, and to discuss the interrelationship of these impacts with other existing and proposed projects.

The concept of cumulative impacts can be generally considered to be the situation whereby two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. Cumulative impacts, either positive or adverse, can result from singularly minor but collectively significant actions taking place over a period of time. These impacts can occur at either the local level or with a broader regional context.

The International Finance Corporation (2006) defines cumulative impacts as “the combination of multiple impacts from existing projects, the proposed project, and/or proposed projects that may result in significant adverse and / or beneficial impacts that would not be expected in case of a standalone project”. The US Council on Environmental Quality defines cumulative effects as “the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable

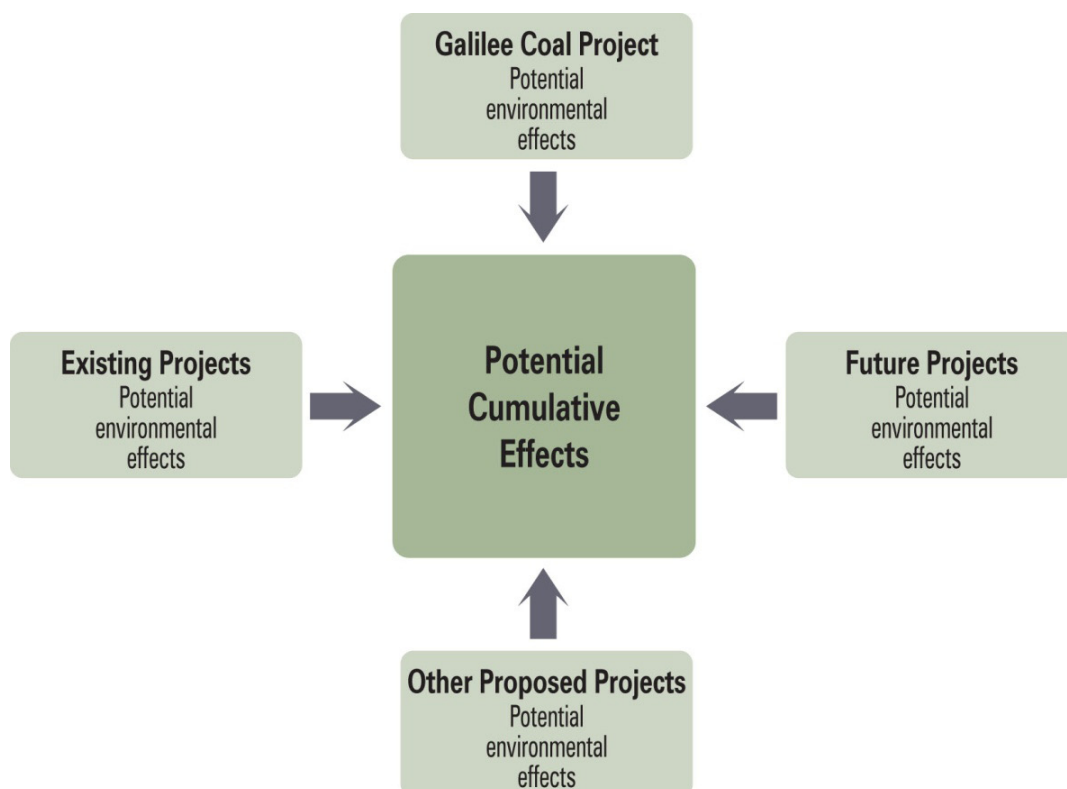
future actions regardless of who undertakes such other actions.”

Each definition introduces the concept that sound Environmental Impact Assessment (EIA) considers the potential impacts from a project as part of the quantum of potential impacts from other known temporally and / or spatially related actions rather than as an isolated action. A schematic showing the CIA approach is shown in **Figure 1**.

This concept has been adopted by Waratah Coal throughout the preparation of the EIS and the consideration as to the potential cumulative environmental effects arising from the project.

It is also recognised that there is a potential for consequential impacts as a result of the interaction of the project with other existing, proposed or future projects. Consequential impacts are generally indirect impacts which arise as a consequence of the project. Assessments undertaken to address cumulative impacts and propose subsequent mitigation measures, will aim to minimise any consequential impacts as a result.

Figure 1. Cumulative Impact Assessment Concept Schematic



5.2 ASSESSMENT METHOD

5.2.1 ASSESSMENT MATRIX

The assessment of cumulative effects have been undertaken on the information available at the time of submitting this EIS for assessment. Where there was a lack of available data for a project, Waratah Coal undertook a qualitative approach in assessing the potential cumulative effects of the various projects. Where a suitable level of data was available a semi-qualitative approach was applied. The metrics used for assessing the likelihood and consequences in the semi-qualitative approach are shown in **Table 1** and **Table 2**, respectively.

The unmitigated potential cumulative impact level for each aspect was determined by mapping the consequence and likelihood rating in accordance with the risk assessment matrix shown at **Table 3**. The impact level was determined by adding the consequence and likelihood score and mapping its location in the appropriate block. For example, a potential impact assessed as having “Almost Certain” Likelihood of occurring and a “Moderate” Consequence is allocated a potential impact level of “Medium” and an unmitigated potential impact score of 8.

Once potential cumulative impacts were assessed, dependent on the individual ranking, the following occurred:

- where activities ranking were identified as “Low” to “Medium” it was assumed that those could be effectively managed through the mitigation measures outlined in the Construction and Operational EMP process.
- where activities were ranked as “High” or “Extreme”, mitigation measures were applied to each of these potential impact profiles. Aspects were then re-evaluated and re-mapped using the mitigated potential impact profile was for the “High” to “Extreme” activities to take the mitigation measures into consideration. The outcome of this approach was to reduce the mitigated impact to “Low” or “Medium” categories.

In undertaking this CIA, Waratah Coal has adopted a conservative approach to impact identification. For example, the CIA has assumed that the timing of the construction of the assessed projects will be concurrent with the project. Whilst this is not necessarily the case in reality, the assumption of concurrence has allowed the proponent to apply a conservative approach to the assessment.

Table 1. Likelihood of the impact occurring

SCORE	DESCRIPTOR	DESCRIPTION
5	Almost Certain	Is expected to occur
4	Likely	Will probably occur
3	Possible	Might occur
2	Unlikely	Unlikely to occur
1	Rare	May occur in exceptional circumstances

Table 2. Consequence if the impact occurs

SCORE	DESCRIPTOR	DESCRIPTION
5	Severe	Massive temporal and spatial effect
4	Major	Major temporal and spatial effect
3	Moderate	Moderate temporal and spatial effect
2	Minor	Minor temporal and spatial effect
1	Negligible	Slight temporal and spatial effect
	Positive effect	A positive outcome is expected

Table 3. Potential impact assessment matrix

LIKELIHOOD	CONSEQUENCE					
	Severe (5)	Major (4)	Moderate (3)	Minor (2)	Negligible (1)	Positive
ALMOST CERTAIN (5)	Extreme (10)	High (9)	High (8)	Medium (6)	Medium (6)	Positive effect
LIKELY (4)	High (9)	High (8)	Medium (7)	Medium (6)	Medium (5)	Positive effect
POSSIBLE (3)	High (8)	Medium (7)	Medium (6)	Medium (5)	Low (4)	Positive effect
UNLIKELY (2)	Medium (7)	Medium (6)	Medium (5)	Low (4)	Low (3)	Positive effect
RARE (1)	Medium (7)	Medium (5)	Low (4)	Low (3)	Low (2)	Positive effect

5.3 PROJECT FRAMEWORK ASSESSMENT METHOD

5.3.1 DESKTOP ASSESSMENT

To develop a list of potential projects considered relevant for inclusion in the CIA, Waratah Coal reviewed the list of projects that an EIS was required under the following legislation and that the project’s potential area of influence included the project’s footprint:

- *State Development and Public Works Organisation (SDPWO) Act 1971;*
- *Environmental Protection Act 1994 (EP Act); and*
- *Sustainable Planning Act 2009.*

Projects requiring assessment under the EPBC Act but not requiring an EIS under State legislation were also included in the review. A total of 71 projects were identified through this process.

Waratah Coal then undertook a high level review of the available data for each project to assess if there was a potential for material cumulative effects to occur. Where a project could not reasonably and practically be assessed for impacts due to a lack of available information, the project was not considered for any further assessment. Ultimately, this process resulted in eight projects being identified, of which were considered to potentially contribute to either cumulative construction phase impacts or operational phase impacts concurrently with the Gallilee Coal (Northern Export Facility) project (“the project”). As a result of this process, these eight projects have been incorporated in the CIA.

The final list of identified projects was presented to the Department of Infrastructure and Planning (DIP) and Department of Environment and Resource Management (DERM) for consideration and agreement. After consultation with DIP and DERM, the projects listed in **Table 4** and **Table 5** and as shown on **Figure 2**, **Figure 3** and **Figure 4**, constitute the agreed list of projects included in the CIA. Where a project was considered to have a cumulative effect on a specific aspect of the project, it was included in the assessment of the specific area of the project. High level reviews to establish the inter-relatedness of each project to the three (coal mine, rail alignment and coal terminal) components of the project were undertaken. Key issues that were considered during this review for each component; were the geographical overlap of one or more of the projects, and the extent to which the inter-relatedness of these projects resulted in creating a significant impact on the environmental values. These environmental values include built, natural social and cultural attributes within the project area of influence.

Impacts on local amenities including road and coal terminal systems, logistic networks, housing and accommodation, and in general the usability and maintenance of existing infrastructure were all considered. From a social perspective, aspects which were considered included the influences and potential impacts to education and health systems, resource consumption, employment, labour market and economic influences; and existing community infrastructure. Potential changes to the baseline environment were considered which included the sustainable use of natural resources (i.e. protection of water quality values and water consumption availability), potential impacts

Table 4. Projects being reviewed under the SDPWO Act included in the Cumulative Impact Assessment

PROPONENT	PROJECT	DESCRIPTION	LOCATION	STATUS	RELATIONSHIP / IMPACT ON WARATAH COAL
IsaLink Pty Ltd	IsaLink High Voltage Direct Current Transmission	Construction of 1100 km of transmission line, a converter station at the connection to National Grid, a converter station (at or near the mine) and an upgrade of the existing AC line between Ernest Henry and Mount Isa.	Rockhampton to Cloncurry	EIS is on hold.	Directly affected. Transmission line crosses mining tenements of Waratah Coal.
Hancock Prospecting Pty Ltd	Alpha Coal Mine	Construction and operation of a mine, rail line and coal terminal facilities.	Alpha and Abbot Point or Dudgeon Point	EIS submitted.	Directly affected. Overlap of proposed rail line.
Galilee Power Pty Ltd, a fully owned subsidiary of Waratah Coal Pty Ltd	Galilee Basin Power Station	Coal-fired power station that incorporates clean-coal low emission power generation technology and carbon capture and storage (CCS) to comply with the Queensland Government's "ClimateQ: toward a greener Queensland" strategy.	Alpha	IAS submitted further documentation on hold.	Owned by Waratah Coal.
Hancock Galilee Pty Ltd, wholly owned by Hancock Prospecting Pty Ltd	Kevin's Corner	Open cut and underground coal mine.	Alpha	IAS submitted, ToR finalised and EIS in progress.	Direct impact on Waratah Coal.
NQBPC	Abbot Point Multi Cargo Facility	Multi-cargo coal terminal facility at Coal terminal of Abbot Point to provide for coal terminal/coal terminal of, predominantly, bulk commodities.	Abbot Point	EIS submitted.	Will be used as offshore component of this project.
AMCI (Alpha) Pty Ltd	South Galilee Coal Project (SGCP)	SGCP proposes to develop a Greenfield coal mine.	Immediately SW of the township of Alpha – 160 km W of Emerald and 450 km W of Rockhampton	IAS submitted, ToR finalised and EIS in progress.	SGCP plans to utilise common-user rail and coal terminal facilities proposed to be developed by Waratah Coal Pty Ltd.

Table 5. Projects being reviewed under the EP Act included in the Cumulative Impact Assessment

PROPONENT	PROJECT	DESCRIPTION	LOCATION	STATUS	RELATIONSHIP / IMPACT ON WARATAH COAL
NQBPC	Terminals 2 & 3	Expansion of the T2 (previously X80) and T3 (previously X110) projects	Abbot Point	Draft Voluntary EIS (VIES) submitted.	Close proximity to the proposed Terminals T4-7 for Abbot Point.
Drake Coal Pty Ltd	Drake Coal Project	New Coal mine and CHPP.	17km south of Collinsville	VEIS approved.	Proposed rail line will pass near this project.

Figure 2. Proximity of Projects included in the Cumulative Impact Assessment to the Mine Site

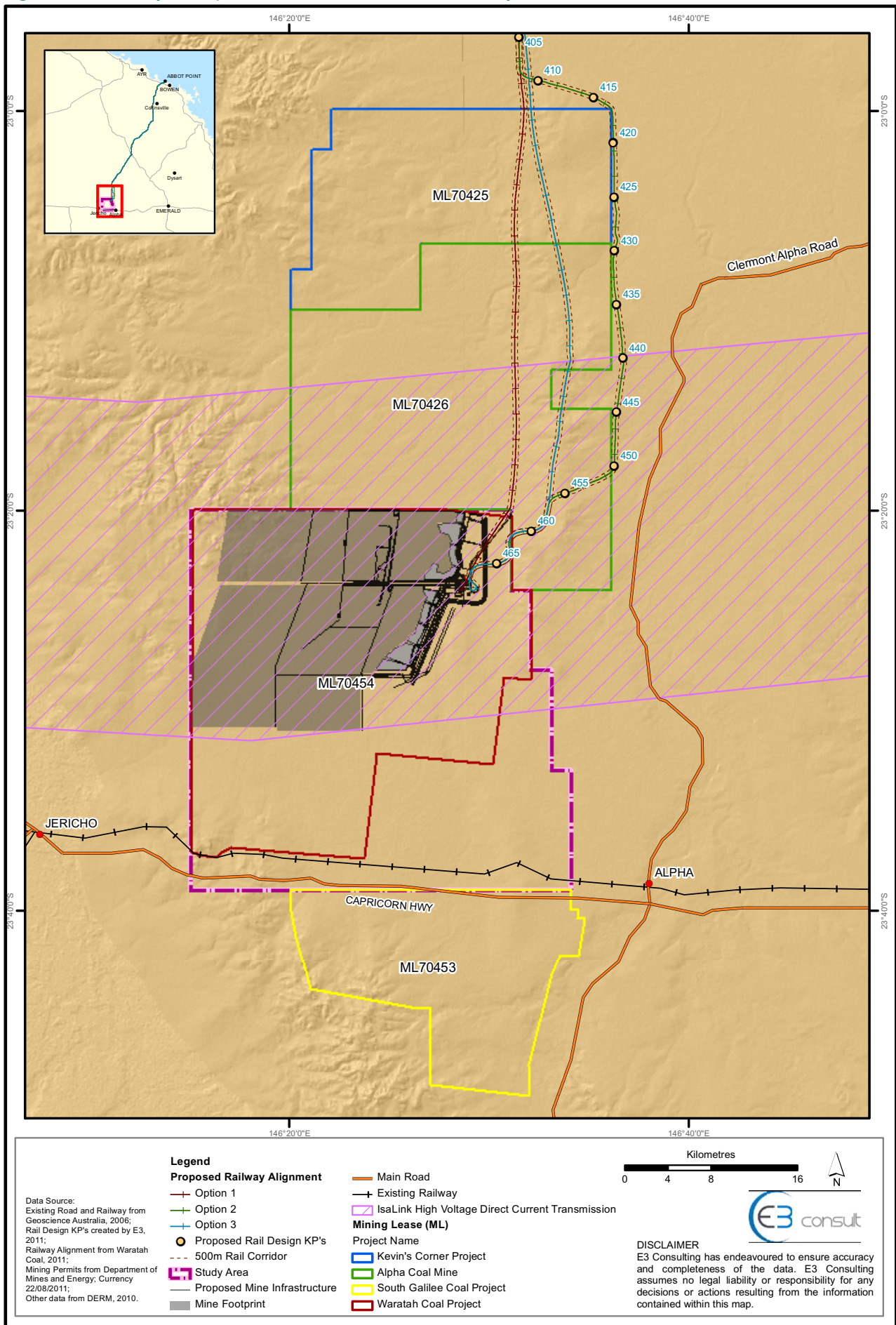


Figure 3. Proximity of Projects included in the Cumulative Impact Assessment to the Rail Alignment

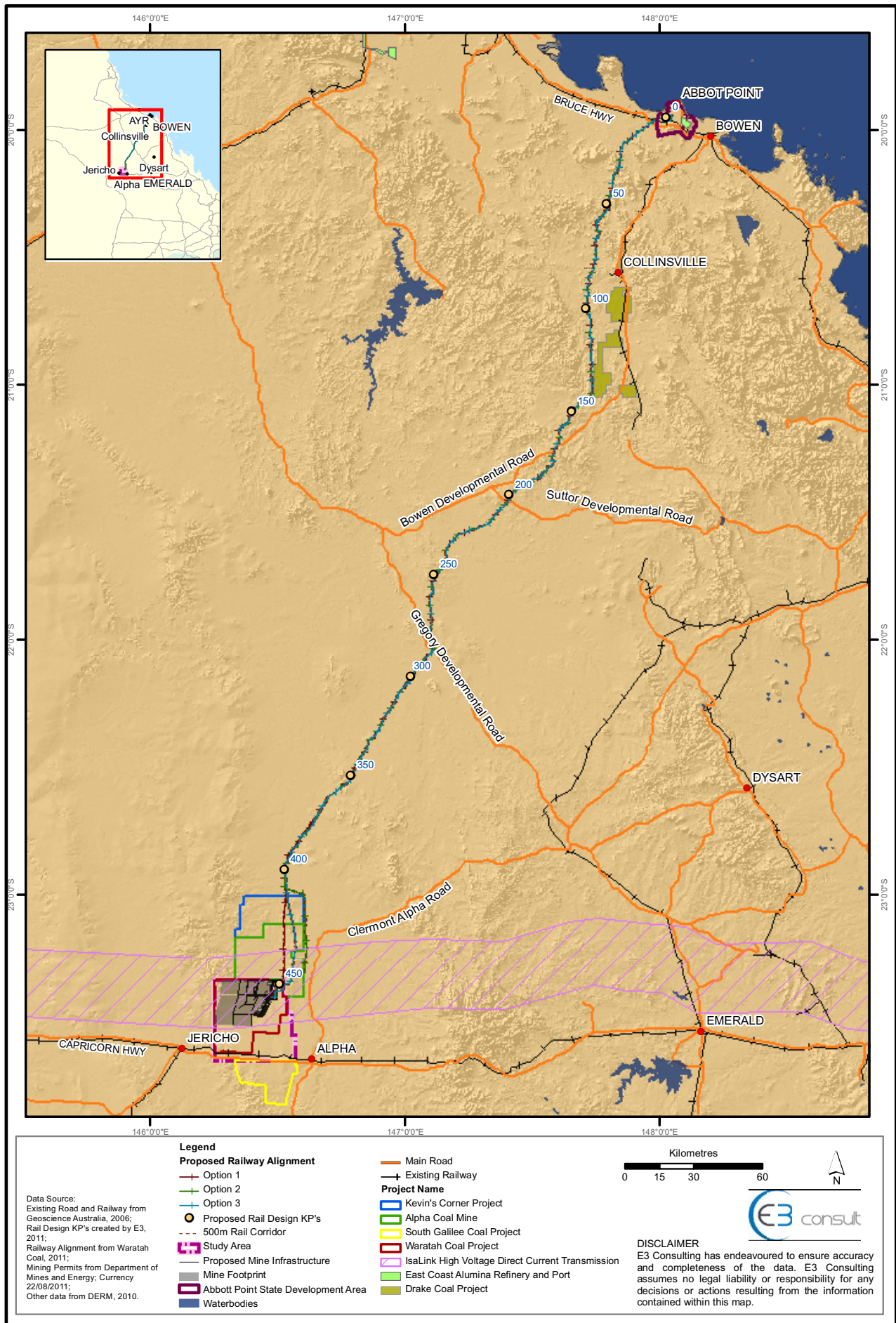
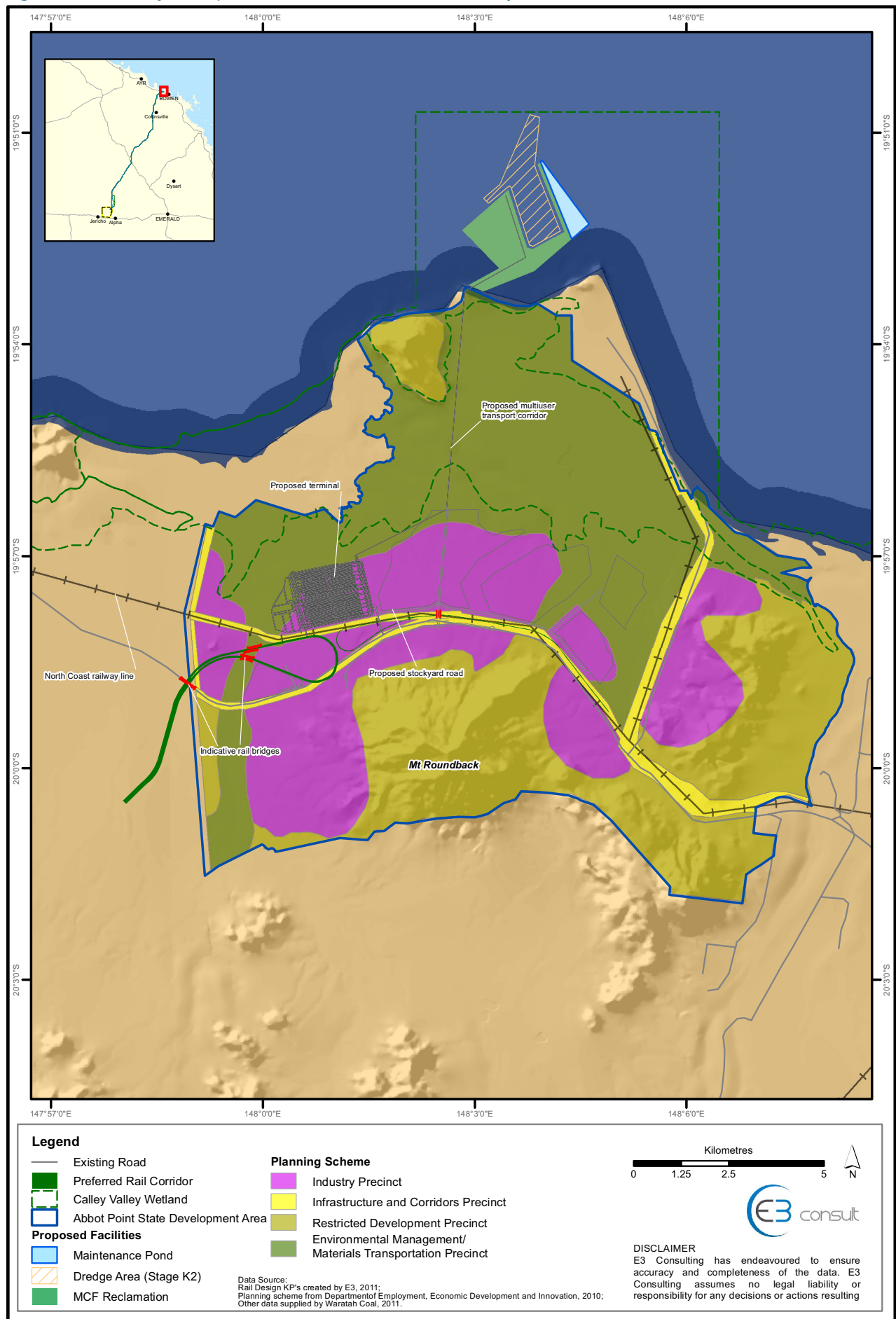


Figure 4. Proximity of Projects included in the Cumulative Impact Assessment to the Coal Terminal



associated with land clearing and modifications to the hydrological regime. Cumulative effects considered relevant to the cultural environment included potential impacts to the cultural values of country and artifacts. Potential issues associated with education, employment, training and health were dealt with in the social impacts and the SIA, located in Volume 5.

5.4 CUMULATIVE IMPACT ASSESSMENTS

It should be noted that the description of the stockpiling and export elements of the project provided in the Initial Advice Statement of October 2008, proposed either use of the Multi-Cargo Facility (MCF) or a jetty berth design similar to that currently in use at Abbot Point. Since then, as a result of the outcomes of detailed engineering studies by Waratah Coal and the opportunity for Waratah Coal to minimize environmental impacts and exploit economic opportunities by sharing facilities in multi-user infrastructure arrangements, the jetty berth design has been removed as an option for the project, and use of facilities within the proposed Terminal 4-7 (T4-7), Multi-User Corridor (MUC) and MCF remains the sole option for the stockpiling and port export elements of the project.

The project will utilise future coal stockpiling and port loading facilities to be developed by North Queensland Bulk Ports Corporation (NQBP) within planned infrastructure at the APSDA and the Port of Abbot Point. Waratah Coal intends to utilise facilities for coal stockpiling at the proposed T4-7 within the APSDA.

The MCF Environmental Impact Statement process is well underway, and Federal Government approval is expected in 2011. However, the MCF EIS does not include undertaking the following activities and development of the following structures:

- Wharf structures;
- Ship loading and unloading infrastructure and associated facilities of private port users as well as operation of these facilities; and
- Conveyors, pipelines etc. servicing the MCF

It is anticipated that once NQBP has received their approval, Waratah Coal will need to undertake additional approvals processes to facilitate the above activities and development.

Given that the coal terminal and port infrastructure are largely the subject of current and future assessments by NQBP, this EIS does not consider the potential impacts

of these projects. However, an overview of existing environment within the APSDA and the Port of Abbot Port, as well as the probable coal terminal design and infrastructure requirements is provided in Volume 4 of this EIS.

5.4.1 LAND USE

5.4.1.1 Project Impacts

The assessed high level cumulative impacts associated with the project are documented in Table 6.

The nature of construction and operation of both mining and rail project components will result in long-term impacts to land use. To illustrate, in the case of both mining and rail activities, the impact on Good Quality Agricultural Land (GQAL) is assessed as Medium (Table 6). In order to mitigate the long-term impacts, the mine at end of production will be remediated to a state commensurate with pre-mining land use which is predominately grazing.

Currently, Waratah Coal's study rail corridor for the project overlaps approximately 71, 520 ha of GQAL. Generally, the GQAL portion for the rail study corridor is classed C and D, (see Volume 5 Appendix 7). With further refinement of this rail alignment during the project's final design phase, it is estimated that ultimately 4,470 ha of GQAL will be impacted. Again, primarily lower quality class C and D GQAL will be affected by this development. Due to the nature of linear infrastructure GQAL which overlaps the ultimate design will be permanently sterilised.

The impacts of the Coal terminal component of Waratah Coal's project will be minimal as the proponent will generally use previously cleared areas and associated infrastructure. The Abbot Point State Development Area is an industrial precinct for large scale industries located at Abbot Point near Bowen in North Queensland. One of the main functions of the APSDA is to provide coal terminal services for coal and other mining industries which are incompatible with agricultural uses. The project is consistent with the intent of the area.

5.4.1.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the project and assessed mining projects are documented in Table 7.

All assessed project are likely to have similar construction impacts to those of Waratah Coal's project. Collectively, these projects will impact GQAL during construction phase with a loss of land use for the duration of mine operations. In addition to the 84,200 ha of GQAL impacted by Waratah Coal's proposal, the Alpha Coal Mine proposal is estimated to impact a further 100,000 ha of Class C GQAL. It is currently unclear to what extent GQAL will be impacted by the Kevin's Corner project and other future projects. Based on local area GQAL mapping, it is anticipated that the regional availability of Class C GQAL will be further impacted by this project.

Rail Alignment

The high level cumulative impacts associated with Waratah Coal project and projects potentially impacting the rail alignment are documented in **Table 8**.

Alpha Coal's proposed rail corridor will have similar land use impacts to those of Waratah Coal's project, particularly in regards to impacts on GQAL. If both of these projects are commissioned, collectively it is estimated that approximately 8,000 ha (approximately 4,500 ha and 3000 ha for Waratah Coal and Alpha Coal respectively) of predominately Class C and D GQAL will be permanently sterilised across the proposed rail corridors.

5.4.1.3 Mitigation Measures

To mitigate sterilisation, fragmentation and impacts on GQAL across the project's footprint Waratah Coal commits to:

- avoiding where practicable GQAL and avoiding smaller land parcels where the relative impact will be greater;
 - locate pipelines and access roads along fence lines and property boundaries;
 - liaise with relevant landholders and Indigenous Peoples regarding their site specific land use practices and measures to minimise interference from project activities;
 - realign the rail alignment to avoid impacts on homesteads;
 - rehabilitation of areas affected by construction with landowners affected as practically as possible following development and to promote regrowth around the construction area/s;
 - hierarchy will be implemented with respect to agricultural and fragmentation of land: avoid, minimise, rehabilitate and to offset where appropriate; and
- implement Community Consultation Program throughout the process to the boarder community.

5.4.2 SURFACE WATER AND AQUATIC ECOLOGY

5.4.2.1 Project Impacts

The assessed high level cumulative impacts associated with the project are documented in **Table 9**.

Of the major potential impacts on aquatic ecology identified in Waratah Coal's EIS, actions associated with changes to water flow paths associated with mine subsidence, the linear nature of the rail alignment disrupting and concentrating surface flows and works which will impact waterways (such as culvert construction) have the highest likelihood of causing cumulative impacts to the natural environment. However, given the geographic expanse of the project, the cumulative impacts as a result of construction and/or operation of other projects identified would be relatively minor. For example, minor changes in hydrological regimes at the mine site are unlikely to have cumulative impacts on regional water quality even if the rail alignment leads to changes in overland flow paths near Abbot Point.

Given the high likelihood of impacts associated with the activity, Waratah is proposing the following mitigation strategies:

- implement effective design which adheres to engineering standards such that hydrological devices such as culverts and drainage systems are designed to minimise impacts to waterways;
- manage issues such as erosion and sediment control at site level and approved Environmental Management Plan and specific erosion and Sediment Control Plans;
- regularly auditing the effectiveness of erosion and sediment control measures implemented at work sites;
- complying with regulatory requirements associated with general legislative requirements and license and approval conditions; and
- engage in a long-term monitoring program specifically designed to identify issues which may cause harm and adaptively manage these issues. For example, where subsidence occurs and is likely to impact flow regimes, re-contouring of landforms is to occur as soon as practical after the event to reinstate flow paths and minimise local ponding.

Table 6. Galilee Coal Project impacts: land use

ASSESSED CUMULATIVE IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING		MITIGATION	MITIGATION RATING			
				L	C		L	C		
Reduction of GQAL	V	V	V	3	3	Manage as per EMP	2	2	R	4 (Low)

Table 7. Mine cumulative impacts: land use

IMPACT	WARATAH COAL	ALPHA COAL	KEVIN'S CORNER	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	IMPACT RATING		MITIGATION	MITIGATION RATING		
							L	C		L	C	
Reduction of GQAL	V	V	V	V	V	V	3	3	6 (Medium)	2	2	4 (Low)

Table 8. Rail cumulative impacts: land use

IMPACT	WARATAH COAL	ALPHA COAL	IMPACT RATING		MITIGATION	MITIGATION RATING		
			L	C		L	C	
Reduction of GQAL	V	V	3	3	Manage as per EMP	2	2	4 (Low)

Table 9. Galilee Coal Project impact: surface water and aquatic ecology

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING		MITIGATION	MITIGATION RATING		
				L	C		L	C	
Erosion and sedimentation of waterways	V	V	V	3	3	Manage as per EMP	2	2	4 (Low)
Contamination of waterways via chemical spills	V	V	V	3	3	Manage as per EMP	2	2	4 (Low)
Changes to natural water flow paths / regimes via subsidence, construction of culverts etc	V	V	V	5	4	Manage as per EMP and Conditions of approvals	4	3	7 (Medium)
Creek Diversions	V			5	4	Manage as per EMP and Conditions of approvals	4	3	7 (Medium)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

5.4.2.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal project and assessed projects are documented in **Table 10**.

The most likely cumulative impacts associated with the local mine sites described in **Table 10** are associated with changes to flow regimes and creek diversions. As all projects are located within Sandy Creek Catchment there is a potential that these mines may change the overall natural flow heights and flow characteristics of this catchment which are important to stream health. If these characteristics change, water quality is also likely to be impacted. The degree of impact will be moderated by local mines' effective mine management of water, adherence to water release license conditions and the appropriate management of onsite dam infrastructure.

Rail Alignment

The high level cumulative impacts associated with the Waratah Coal project and projects potentially impacting the rail alignment are documented in **Table 11**.

The construction of the rail alignment has the potential to impact on streams in the region. The risk during the ongoing operational phase is considered to be lower as works will be significantly reduced, largely revolving around minor maintenance requirements.

Similar activities associated with proposed projects, particularly the Alpha Coal Project, are also likely to contribute to the impacts on local streams spread across several catchments. The linear nature of the rail alignment in combination with the other projects may result in wide spread impacts due to altered drainage patterns and stream flows in known catchments, which may in turn affect the aquatic ecosystem health and biodiversity. Based on the project risk assessment discussed in **Volume 1, Chapter 4**, it is likely that such impacts will occur with a major temporal and spatial affect, which would result in a High impact. Waratah Coal will manage these impacts via an approved onsite EMP.

5.4.2.3 Mitigation Measures

Waratah Coal has committed to multiple mitigation and control strategies relating to the protection of water quality including designing and implementing best management erosion and sediment control plans, acid sulfate soil management plans, the diversion of clean water around disturbed areas, and appropriately engineered designs for creek crossings. It is anticipated that other linear infrastructure projects will implement similar best practice management regimes. Where the construction of these projects is undertaken in accordance with these management practices and control measures, the residual impact would be reduced to Medium.

In addition to the above, Waratah Coal will implement an aquatic ecosystem monitoring program will be put in place for construction works through the project EMPs. The monitoring program will incorporate the following:

- impact monitoring criteria will be included in the EMP. Criteria will be developed for each of the Catchments (Don, Lower Catchment, Bowen, Suttor and Belyando);
- monitoring will include visual inspections of construction areas and surrounding waters for evidence of spills; and
- physical and chemical water quality monitoring will be carried out up and down stream of work sites within the study area

5.4.3 NATURE CONSERVATION

5.4.3.1 Project Impacts

The assessed high level cumulative impacts associated with the Waratah Coal are documented in **Table 12**.

It is anticipated that the cumulative impacts of the project as will be high. The mine site will impact on sensitive environmental areas including Endangered, Of Concern and Least Concern vegetation and potentially on a suite of native fauna including the Black-chinned Honeyeater, Squatter Pigeon and the Black-throated Finch. Rail and coal terminal infrastructure construction and operation will have similar potential impacts on a suite of native flora and fauna.

Table 10. Mine cumulative impact: surface water and aquatic ecology

IMPACT	WARATAH COAL	ALPHA COAL	KEVIN'S CORNER	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	IMPACT RATING			MITIGATION	MITIGATION RATING		
							L	C	R		L	C	R
Erosion and sedimentation of waterways	V	V	V	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Contamination of waterways via chemical spills	V	V	V	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Changes to natural water flow paths / regimes via subsidence, construction of culverts etc	V	V	V	V			5	4	9 (High)	Manage as per EMP and Conditions of approvals	4	3	7 (Medium)
Creek Diversions	V	V	V	V			5	4	9 (High)	Manage as per EMP and Conditions of approvals	4	3	7 (Medium)

Table 11. Rail cumulative impact: surface water and aquatic ecology

IMPACT	WARATAH COAL	ALPHA COAL	DRAKE COAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Erosion and sedimentation of waterways	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Contamination of waterways via chemical spills	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Changes to natural water flow paths / regimes via construction of culverts etc	V	V	V	5	4	9 (High)	Manage as per EMP and Conditions of approvals	3	3	6 (Medium)
Disturbance of acid sulphate soils	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

Of further concern will be the potential for the increased incidence of weeds and pest animals associated with the project. For example, movement of rail infrastructure along the rail corridor may aid the movement of both pest flora and fauna between the mine site and the coal terminal and areas between. This could result in invasive species reaching areas which they do not currently occur.

5.4.3.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal Project and assessed mining projects are documented in **Table 13**.

Based on current knowledge, if all projects are to go ahead, it is likely that potential cumulative impacts to significant native flora and fauna will be high. It is anticipated that all projects which require the removal of native vegetation will be required to satisfy the legislative requirements for offsetting vegetation losses and that this will result in a moderation of these impacts.

Weed and pest animals have been identified as issues for all anticipated projects and will need to be controlled at a project level. For its part in contributing to cumulative impacts, Waratah coal will employ a strict weed hygiene and pest animal management regimes and adhere to the management requirements of both Commonwealth and State legislation.

Rail Alignment

The high level cumulative impacts associated with the Waratah Coal project and projects potentially impacting the rail alignment are documented in **Table 14**.

Similar to issues associated with the mine site, if all projects receive approval, it is likely that potential cumulative impacts to significant native flora and fauna will be high. It is anticipated that all projects which require the removal of native vegetation will be required to satisfy the legislative requirements for offsetting vegetation losses and that this will result in a moderation of these impacts.

Weed and pest animals have been identified as issues for all anticipated projects and will need to be controlled at a project level.

5.4.3.3 Mitigation Measures

Impacts will be minimised as far as reasonably practicable during the final design phase which will focus on locating infrastructure in a manner which reduces impacts to both native flora and fauna values. Where impacts are unavoidable, Waratah Coal will mitigate these impacts via the commissioning of an agreed environmental offset package which will be designed and implemented in accordance with Commonwealth and State requirements. Although impacts to nature conservation values cannot be totally mitigated, offset requirements will serve to moderate these impacts across the project elements.

Waratah Coal will undertake the following actions to minimise its contribution to regional cumulative impacts:

- Waratah Coal has committed to undertaking a final design approach which minimises the impact to sensitive vegetation, progressive rehabilitation of impacted areas and implement an agreed offset strategy which meets the requirements of both Commonwealth and State legislation; and
- Waratah Coal will employ a strict weed hygiene and pest animal management regimes and adhere to the management requirements of Commonwealth State and local government legislation.

5.4.4 GROUNDWATER

5.4.4.1 Project Impacts

The assessed high level cumulative impacts associated with the Waratah Coal project are shown in **Table 15**.

Although it is acknowledged that in isolation, each of the project components may impact on local groundwater resources, it is unlikely that a cumulative impact will occur when considered as a complete project. In general, the impacts associated with rail and coal terminal components will impact shallow local aquifers only.

5.4.4.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the project and assessed mining projects are shown in **Table 16**.

Table 12. Galilee Coal Project impacts: nature conservation

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Adverse effects to sensitive areas and protected native flora	V	V	V	5	4	9 (High)	Environmental Offsets	4	3	7 (Medium)
Adverse effects on native and or migratory fauna	V	V	V	5	4	9 (High)	Environmental Offsets	4	3	7 (Medium)
Increase in weed and pest incidence	V	V	V	5	4	9 (High)	Management Plan	3	3	6 (Medium)

Table 13. Mine cumulative impact: nature conservation

IMPACT	WARATAH COAL	ALPHA COAL	KEVIN'S CORNER	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	IMPACT RATING			MITIGATION	MITIGATION RATING		
							L	C	R		L	C	R
Adverse effects to sensitive areas and protected native flora	V	V	V	V	V	V	5	4	9 (High)	Manage as per EMP and Weed and Pest management Plans	4	3	7 (Medium)
Adverse effects on native and or migratory fauna	V	V	V	V	V	V	5	4	9 (High)	Manage as per EMP and Weed and Pest management Plans	4	3	7 (Medium)
Increase in weed and pest incidence	V	V	V	V	V	V	5	4	9 (High)	Manage as per EMP and Weed and Pest Management Plans	3	3	6 (Medium)

Table 14. Rail cumulative impact: nature conservation

IMPACT	WARATAH COAL	ALPHA COAL	DRAKE COAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Adverse effects to sensitive areas and protected native flora	V	V	V	5	4	9 (High)	Manage as per EMP	3	3	6 (Medium)
Adverse effects on native and or migratory fauna	V	V	V	5	4	9 (High)	Manage as per EMP	3	3	6 (Medium)
Increase in weed and pest incidence	V	V	V	5	4	9 (High)	Manage as per EMP and Conditions of approvals	3	3	6 (Medium)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

There is a strong likelihood that groundwater resources will be subject to cumulative impacts through development of projects neighbouring Waratah Coal's mine site. Open cut mining involves the removal of significant volumes of overburden and target material resulting in significant open voids. The open voids are likely to significantly alter the hydrogeological regime of the aquifers they intersect as they act as artificial sinks for groundwater. A cone of depression with a vertical draw down in excess of 5 m has been predicted to extend from 14 kms to as far as 30 kms in length. A similar magnitude of draw down was predicted by the Waratah Coal's numerical modelling.

It is assumed that a similar cone of groundwater depression will develop as a result of the Hancock Coal projects. The close proximity of the respective mines will lead to significant overlap between the cones of groundwater drawdown leading to compounded effects on groundwater levels. Supplementary numerical modeling will be required to gain a greater understanding of the likely combined radius of influence of the two projects.

Groundwater quality is likely to be affected throughout the development and operation of the respective coal mines, however, the impacts are likely to be restricted to localised impacts which with suitable implementation of proposed management measures will be reduced to negligible levels.

Based on modelling, it is likely that such impacts will occur with major temporal and spatial effects, which would result in a High level of impact to groundwater users. If implemented effectively the proposed mitigation and management measures will reduce the risk of cumulative impacts.

Rail Alignment

The high level cumulative impacts associated with the Waratah Coal project and projects potentially impacting the rail alignment are documented in **Table 17**.

The likelihood of cumulative impacts associated with groundwater through development of the rail corridor is Low. The impacts, including reduction in volume for neighbouring properties or cumulative effects from contamination events to groundwater resulting from the proposed Waratah Coal rail alignment are likely to be restricted to localised impacts to shallow groundwater, which with suitable implementation of proposed management measures will be reduced to negligible

levels. Waratah Coal's alignment will not contribute significantly to the cumulative impacts to groundwater from other the proposed regional activities.

It is unlikely that such impacts will occur and if they did, they would result in a slight temporal and spatial effect, which would result in a Low overall impact. If implemented effectively the proposed mitigation and management measures should reduce the risk of cumulative impacts further.

Collectively, if these projects are to use Waratah's corridor to transport coal, the combined footprint of the projects will reduce significantly therefore reducing the cumulative impacts to groundwater.

5.4.4.3 Mitigation Measures

To mitigate impacts to groundwater resources, Waratah Coal will:

- implement a long term pumping tests and other hydraulic tests of bores in the mine area to assess impacts on local users;
- update the conceptual model with data obtained during the monitoring to assess any potential impacts on the mine on groundwater ecosystems;
- implement a groundwater monitoring program;
- implement a management plans and containment structures for potential contaminants;
- remediate groundwater contamination caused by the project;
- undertake site specific investigation of the areas identified from geotechnical review; and
- enter into agreements with surrounding landowners regarding monitoring of impacts and make good provisions where impacts occur.

5.4.5 AIR QUALITY

5.4.5.1 Project Impacts

The assessed high level cumulative impacts associated with the project are shown in **Table 18**.

Although it is acknowledge that in isolation, each of the project's elements may have minor impacts on local air quality, it is unlikely that a significant cumulative impact will occur when the project is considered as a whole. In general, all project associated impacts can be controlled using methods and measures described in the relevant EMP.

Table 15. Galilee Coal Project's impact: groundwater

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Regional Drawdown	V			2	2	4 (Low)	Manage as per EMP	2	1	3 (Low)
Impacts on neighbouring groundwater users	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Contamination of groundwater via chemical spills	V	V	V	3	3	6 (Medium)	Manage as per EMP	2	2	4 (Low)

Table 16. Mine cumulative impact: groundwater

IMPACT	WARATAH COAL	ALPHA COAL	KEVIN'S CORNER	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	IMPACT RATING			MITIGATION	MITIGATION RATING		
							L	C	R		L	C	R
Regional Drawdown	V	V	V	V			4	4	8 (High)	Manage as per EMP	2	3	4 (Low)
Impacts on neighbouring groundwater users	V	V	V	V			4	4	8 (High)	Manage as per EMP	2	3	4 (Low)
Contamination of groundwater via chemical spills	V	V	V	V			3	3	6 (Medium)	Manage as per EMP	2	1	3 (Low)

Table 17. Rail cumulative impact: groundwater

IMPACT	WARATAH COAL	ALPHA COAL	DRAKE COAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Impacts on neighbouring groundwater users	V	V	V	2	2	4 (Low)	Manage as per EMP	2	1	3 (Low)
Contamination of groundwater via chemical spills	V	V	V	2	2	4 (Low)	Manage as per EMP	2	1	3 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

5.4.5.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the project and assessed projects are shown in **Table 19**.

It is likely that the regional air shed will be impacted by the cumulative emissions from local mine sites during both short-term (construction) and long-term (operations) activities. However, in the absence of a regional model describing the impacts of the three proposals on air quality, it is difficult to determine to what extent this aspect will be impacted

Rail Alignment

The high level cumulative impacts associated with the project and projects potentially impacting the rail alignment are documented in **Table 20**.

It is likely that the regional air shed will be impacted by the cumulative emissions from rail activities during both short-term (construction) and long-term (operations) activities. However, in the absence of a regional model describing the impacts of the Waratah and Alpha Coal proposals on air quality, it is difficult to determine to what extent this aspect will be impacted.

5.4.5.3 Mitigation Measures

Waratah Coal will undertake all aspects of its operations in accordance with a dust and emissions management strategy as outlined in its EMP. It is expected that other proponent will adopt similar strategies in taking all opportunities to minimise emissions and therefore minimise impacts to regional air quality.

Further, Waratah Coal is committed to ongoing monitoring of air quality to ensure compliance with the project and APSDA EMPs.

5.4.6 NOISE AND VIBRATION

5.4.6.1 Project Impacts

The assessed high level cumulative impacts associated with the Waratah Coal project are shown in **Table 21**.

Broadly, it is not expect that cumulative impacts associated with construction and operations of the mine, rail and coal terminal will have a cumulative impact on sensitive receptors.

5.4.6.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal project and assessed projects are shown in **Table 22**.

As the Alpha Coal Mine and South Galilee Coal project are in close proximity to the Waratah mine site, noise sources from these mines may contribute to an overall low-level cumulative noise impact. Each of these projects would be predominantly constant sources of noise. These projects would then add to the overall noise environment, though assessment suggests that noise generated from these projects would have negligible effect at nearest residences.

Cumulative vibration impacts (relating to potential increased frequency of perceptible vibration but not increased magnitude of vibration) may potentially be associated with the development of the Alpha Coal Mine and South Galilee Coal projects. Similarly there may be some potential for cumulative impacts to occur associated with the more frequent use of the mine access road. It has been assessed that these impacts will relate to increased frequency of perceptible noise levels, rather than the increased magnitude of pass-by noise.

Rail Alignment

The high level cumulative impacts of noise and vibration associated with the Waratah Coal project are documented in **Table 23**.

Given that the proposed corridor is not co-located with other proposed railway projects or significant infrastructure, it is not expected that there will be cumulative noise and vibration impacts resulting from the construction and operation of the Waratah's rail corridor, resulting in a Low impact overall.

Table 18. Galilee Coal Project's impact: air quality

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Air quality reductions during construction	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Air quality reductions during operation	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)

Table 19. Mine cumulative impact: air quality

IMPACT	WARATAH COAL	ALPHA COAL	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	KEVIN'S CORNER	IMPACT RATING			MITIGATION	MITIGATION RATING		
							L	C	R		L	C	R
Air quality reductions during construction	V	V	V	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Air quality reductions during construction	V	V	V	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)

Table 20. Rail cumulative impact: air quality

IMPACT	WARATAH COAL	ALPHA COAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
			L	C	R		L	C	R
Air quality reductions during construction	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Air quality reductions during construction	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

Table 21. Galilee Coal Project's impact: noise and vibration

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
				L	C	R		L	C	R
Noise nuisance to sensitive receptors	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Vibration nuisance to sensitive receptors	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)

Table 22. Mine cumulative impact: noise and vibration

IMPACT	WARATAH COAL	ALPHA COAL	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	KEVIN'S CORNER	IMPACT RATING			MITIGATION	MITIGATION RATING		
							L	C	R		L	C	R
Noise nuisance to sensitive receptors	V	V	V	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Vibration nuisance to sensitive receptors	V	V	V	V	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)

Table 23. Rail cumulative impact: noise and vibration

IMPACT	WARATAH COAL	ALPHA COAL	IMPACT RATING			MITIGATION	MITIGATION RATING		
			L	C	R		L	C	R
Noise nuisance to sensitive receptors	V	V	4	2	6 (Medium)	Manage as per EMP	2	2	4 (Low)
Vibration nuisance to sensitive receptors	V	V	4	2	4 (Low)	Manage as per EMP	2	2	4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

5.4.6.3 Mitigation Measures

To mitigate against potential noise or vibration issues associated with the project, Waratah Coal will:

- develop a best practice Noise and Vibration Management Plan for both construction and operation of its infrastructure;
- undertake final design such that the layout of removed overburden at the mine site may be modified to reduce cumulative noise impacts with other projects around the site;
- adhere to requirements outlined in the Ecoaccess Planning Guideline, which are specifically designed to mitigate cumulative noise impacts; and
- commit to ongoing monitoring of noise and vibration during the construction and operation of the coal terminal facilities to ensure compliance with the EMP.

5.4.7 WASTE

5.4.7.1 Project Impacts

The high level cumulative impacts of waste associated with the Waratah Coal project are documented in Table 24.

Assessment suggests that the project as a whole will not cause undue stress on the management of local council waste facilities. Along with a commitment by Waratah Coal to implement the waste management hierarchy across all project elements, the geographical nature of the project components, which traverses four separate council areas, means that no single council landfill will be impacted by waste streams resultant from either construction or operational activities. It is therefore anticipated that the cumulative impact of waste management for the project as a whole will be Low.

5.4.7.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal project and assessed projects are documented in Table 25.

Despite an overall increase in waste in the local region, the cumulative impacts of waste production are considered to be Low. This outcome is based primarily on an expectation that all projects will be required to commit to the implementation of best practice waste management protocols, adopt waste minimisation principles, commit to onsite recycling campaigns and engage licensed waste removal contractors. This will ensure that onsite waste is managed appropriately and that waste disposed of in local council depots is minimised and recycling opportunities are maximised.

Rail Alignment

The high level cumulative impacts of waste associated with the Waratah Coal project are shown in Table 26.

Given the nature of constructing and operating a railway, it is anticipated that the vast majority of waste generation will take place during the construction period. Therefore, any significant waste generation will be short-term. It is highly likely only very minor quantities of waste will be generated during the any of the proposed project's operational phase.

5.4.7.3 Mitigation Measures

Waratah Coal will implement processes such that the management, disposal and transportation of all waste material will be undertaken in accordance with the *Environment Protection (Waste Management) Regulation 2000* (EPP (Waste)) and the *Environment Protection (Waste Management) Policy 2000* (EPP (Waste)).

Cumulative impacts will further be minimised through cultural processes as it is anticipated that all projects will be required to commit to the implementation of best practice waste management protocols, adopt waste minimisation principles, and commit to onsite recycling campaigns and engage licensed waste removal contractors to manage the transportation and off-site containment of waste. This will ensure that onsite waste is managed appropriately and that waste disposed of in local council depots is minimised and recycling opportunities are maximised.

Table 24. Galilee Coal Project's impact: Waste

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING		MITIGATION	MITIGATION RATING		
				L	C		L	C	R
Overloading local council waste management services	v	v	v	2	2	Manage as per EMP	2	2	4 (Low) 4 (Low)

Table 25. Mine cumulative impact: Waste

IMPACT	WARATAH COAL	ALPHA COAL	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	KEVIN'S CORNER	IMPACT RATING		MITIGATION	MITIGATION RATING		
							L	C		L	C	R
Overloading local council waste management services	v	v	v	v	v	v	2	2	Manage as per EMP	2	2	4 (Low)

Table 26. Rail cumulative impact: Waste

IMPACT	WARATAH COAL	ALPHA COAL	IMPACT RATING		MITIGATION	MITIGATION RATING		
			L	C		L	C	R
Overloading local council waste management services	v	v	2	2	Manage as per EMP	2	2	4 (Low) 4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

5.4.8 TRAFFIC AND TRANSPORT

5.4.8.1 Project Impacts

The assessed high level cumulative impacts associated with the Waratah Coal project are shown in **Table 27**.

The construction and operation of the mine, rail and coal terminal are not expected to compromise road capacity as existing road use volumes are low, and the significant containment of vehicular traffic on the mine site. The provision of a service road along the rail line will further reduce traffic volumes on all road types.

The mine is identified as having an acceptable impact on traffic within the context of the region. There is suitable spare capacity on the existing road network to accommodate higher traffic volumes, while the mine is expected to provide benefits to local trips by improving the road network north of the highway in the vicinity of the mine.

The use of rail for the bulk transportation of coal over such a large distance is the most appropriate solution with respect to traffic impact, particularly over the full life of the mine operation. The impacts of construction will be temporary, and these will be managed through the implementation of appropriate mitigation works. The ongoing traffic impacts due to the operation of the railway will also be addressed by providing appropriate crossing facilities for a range of existing transport needs.

The coal terminal is identified as having an acceptable impact on traffic within the context of the region. There is suitable spare capacity on the road network to accommodate higher traffic volumes and provide access to the coal terminal, which is essentially an extension of the predominant land use in the immediate area.

5.4.8.2 Cumulative impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal project and assessed projects are documented in **Table 28**.

A Medium level of impact on the transport infrastructure in this region indicates sustained high levels of traffic growth throughout the design period. While the Capricorn Highway has ample spare capacity to cater for these increases in the short term, design horizon planning may need to consider the following:

- long term provisions for overtaking lanes east and west of Alpha;
- increased maintenance budget;
- increased structural capacity for future pavements; and

Future detailed impact assessment for any major project in the Alpha region needs to consider these cumulative impacts and ultimate transport requirements in their planning.

Rail Alignment

The high level cumulative impacts associated with the Waratah Coal project and projects potentially impacting the rail alignment are shown in **Table 29**.

While construction of the rail line will increase traffic movements, this will only be temporary and is likely to cease prior too many nearby projects commencing

Once the rail line is operational, it will largely generate no additional traffic loading on roads along the line. While occasional maintenance and service vehicles may access the railway, virtually all vehicle access will be restricted to operations near the mine and coal terminal. This will include the major traffic generator for the rail, being the marshalling yards, which will be directly accessed from the Bruce Highway. However, even at peak operation, the rail line (independent of the mine and coal terminal) is likely to generate only a small number of vehicle movements per day.

Table 27. Galilee Coal Project's impact: traffic and transport

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING		MITIGATION	MITIGATION RATING	
				L	C		L	C
Reduction in road capacity	V	V	V	2	2	Manage as per EMP	2	2
					4 (Low)			4 (Low)

Table 28. Mine cumulative impact: traffic and transport

IMPACT	WARATAH COAL	ALPHA COAL	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	KEVIN'S CORNER	IMPACT RATING		MITIGATION	MITIGATION RATING	
							L	C		L	C
Reduction in road capacity	V	V				V	2	2	Manage as per EMP	2	2
								6 (Medium)			4 (Low)

Table 29. Rail cumulative impact: traffic and transport

IMPACT	WARATAH COAL	ALPHA COAL	DRAKE COAL	IMPACT RATING		MITIGATION	MITIGATION RATING	
				L	C		L	C
Noise nuisance to sensitive receptors	V	V	V	4	2	Manage as per EMP	2	2
					6 (Medium)			4 (Low)
Vibration nuisance to sensitive receptors	V	V	V	2	2	Manage as per EMP	2	2
					4 (Low)			4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

5.4.8.3 Mitigation Measures

Further to the EIS and subsequent more detailed transport and traffic assessments, Waratah Coal makes the following commitments to develop the following documents:

- Road Impact Assessment Report;
- Road Use Management Plan;
- Traffic Management Plans; and
- Traffic Control Plans.

These plans will cover key safety and logistical issues such as:

- signage and traffic control requirements, including requirements for bypasses if necessary;
- development of temporary access routes and intersections to DTMR standards;
- heavy vehicle movements and operating requirements, including appropriate routes, hours of operation, vehicle wash-down and operational restriction;
- mitigation works and monetary contributions to be made to road authorities to provide a safe and efficient road network;
- relevant contacts within the project;
- issue identification and responses;
- planning and permit requirements including those needed for over-dimensional vehicles and transport of dangerous goods; and
- processes for community information and responses.

5.4.9 INDIGENOUS CULTURAL HERITAGE

5.4.9.1 Project Impacts

The assessed high level cumulative impacts associated with the Waratah Coal project are shown in **Table 30**

No listed Indigenous cultural heritage will be impacted by the project. Items of unrecorded Indigenous cultural heritage may occur within or near the proposed project and without appropriate site management initiatives, may be threatened by construction impacts.

5.4.9.2 Cumulative Impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal project and projects potentially contributing to cumulative impacts are shown in **Table 31**.

The proposed mine site is adjacent to the proposed Alpha Coal project and other significant proposed coal mines and their associated infrastructure. Although there are no registered Indigenous cultural heritage sites within this area it is expected that indigenous cultural heritage material will be identified through site specific cultural heritage surveys. All projects that require an EIS are also required to prepare and implement a CHMP in accordance with Part 7 of the ACH Act. These CHMP's will consider the management of development impacts associated with indigenous cultural heritage and are also required to be approved by DERM. It is therefore likely that, while each project may impact some indigenous cultural heritage material, the development and implementation of agreed CHMP's will ensure that these impacts are limited as much as practicable. Based on the cumulative impact assessment methodology the significance of the overall cumulative impact on indigenous cultural heritage is assessed as medium. With the implementation of the below mitigation measures the overall cumulative impacts on Indigenous cultural heritage is assessed as low.

Rail Alignment

The high level cumulative impacts associated with the Waratah Coal project and projects potentially contributing to cumulative impacts are shown in **Table 32**.

The rail avoids all registered indigenous cultural heritage sites. However, during detailed site surveys, indigenous cultural heritage material may be identified. At the coal terminal and mine site, the rail corridor is adjacent to proposed projects where cumulative impacts may occur. In other areas, the rail is not collocated with other projects. It is expected that through the development and implementation of CHMPs for all projects of state significance and with the linear nature of the rail corridor there is assessed to be an overall low cumulative impact on indigenous cultural heritage.

Table 30. Galilee Coal Project's impact: Indigenous cultural heritage

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING		MITIGATION	MITIGATION RATING	
				L	C		L	C
Impacts to significant areas or items of Indigenous Heritage	v	v	v	4	2	Manage as per Project CHMP	L	R
				6 (Medium)	2		2	4 (Low)

Table 31. Mine cumulative impact: Indigenous cultural heritage

IMPACT	WARATAH COAL	ALPHA COAL	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	KEVIN'S CORNER	IMPACT RATING		MITIGATION	MITIGATION RATING	
							L	C		L	C
Impacts to significant areas or items of Indigenous Heritage	v	v	v	v	v	v	4	2	Manage as per Project CHMP	L	R
							6 (Medium)	2		2	4 (Low)

Table 32. Rail cumulative impact: Indigenous cultural heritage

IMPACT	WARATAH COAL	ALPHA COAL	DRAKE COAL	IMPACT RATING		MITIGATION	MITIGATION RATING	
				L	C		L	C
Impacts to significant areas or items of Indigenous Heritage	v	v	v	4	2	Manage as per Project CHMP	L	R
				6 (Medium)	2		2	4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

5.4.9.3 Mitigation Measures

Unrecorded indigenous heritage resources within impact areas will be identified during dedicated field surveys conducted by the relevant Aboriginal party as agreed in the CHMP. The conduct of the cultural heritage study and the implementation of site protection or remediation measures will be specified in approved CHMPs, either already agreed or still to be negotiated with each Aboriginal party.

Impact mitigation measures that may be required include avoiding certain highly sensitive areas, carrying out more field investigations including sub-surface testing, recovering datable occupation material, and collecting and relocating cultural heritage items

The mitigation measures included within the CHMPs will be comprehensive and entail a number of possible procedures that will include (but not be limited to):

- in the first instance, avoiding indigenous cultural heritage, wherever practical;
- carrying out further detailed field investigations; and
- collecting and relocating cultural heritage items, as agreed with the relevant aboriginal parties.

Management measures during construction will include:

- cultural heritage induction for the workforce and possible monitoring of specific construction activities
- procedure for the find of human remains
- procedures for unexpected finds; and
- a conflict resolution process.

Following completion of the project, cultural heritage items recovered prior to construction and objects identified and salvaged during construction may require management and safe-keeping.

5.4.10 NON-INDIGENOUS CULTURAL HERITAGE

5.4.10.1 Project Impacts

The assessed high level cumulative impacts associated with the Waratah Coal project are shown in **Table 33**.

The survey and assessment revealed that the project will only have a minimal impact on places of non-indigenous cultural heritage significance. The approach in the survey was to identify all cultural sites and assess for significance. The following sites will be impacted as a result of the project:

- **Monklands homestead** - which would potentially meet the threshold for local significance will require the demolition or removal. Monklands has local significance as a former sheep property with evidence of this use in the shearing shed and wire-netting fence;
- **Bowen Downs road and changing station** - Both places would meet the threshold for entry on the Queensland Heritage Register. The proposed rail project is located approximately 20 km from the changing station and therefore should not impact on this site. However, the proposed rail project will cross the alignment of the Old Bowen Downs road; and
- **Abbot Point Beach House** - The survey and assessment of the coal terminal facility revealed that the coal terminal will have only a minimal impact on places of cultural heritage significance. The beach house at Abbot Point would potentially meet the threshold for local significance and may be impacted as a result of the potential coal terminal development.

5.4.10.2 Cumulative Impacts associated with other projects

Mine Site

The high level cumulative impacts associated with the Waratah Coal project and projects potentially contributing to cumulative impacts are shown in **Table 34**.

The EIS has assessed that potential impacts to non-indigenous cultural heritage as a result of the project are considered low. The non-indigenous cultural heritage identified during the assessment was limited to discrete areas where specific management strategies have been recommended. It is expected that other projects in the area may also impact upon discrete sites as well as sites that may traverse various projects. It is expected that other projects will have undertaken a similar level of assessment to this project and will implement specific management strategies. With the management strategies implemented it is expected that the cumulative impact to non-indigenous cultural heritage will be low.

Rail Alignment

The high level cumulative impacts associated with the Waratah Coal project and projects potentially contributing to cumulative impacts are shown in **Table 35**.

Table 33. Galilee Coal Project's impact: non-indigenous cultural heritage

IMPACT	MINE	RAIL	COAL TERMINAL	IMPACT RATING		MITIGATION	MITIGATION RATING	
				L	C		L	C
Impacts to significant areas or items of Non-indigenous Heritage	v	v	v	4	2	Manage as per EMP	L	R
				6 (Medium)	2		2	4 (Low)

Table 34. Mine cumulative impact: non-indigenous cultural heritage

IMPACT	WARATAH COAL	ALPHA COAL	SGCP	ISALINK PTY LTD	GALILEE POWER STATION	KEVIN'S CORNER	IMPACT RATING		MITIGATION	MITIGATION RATING	
							L	C		L	C
Impacts to significant areas or items of Non-indigenous Heritage	v	v	v	v	v	v	4	2	Manage as per EMP	L	R
							6 (Medium)	2		2	4 (Low)

Table 35. Rail cumulative impact: non-indigenous cultural heritage

IMPACT	WARATAH COAL	ALPHA COAL	DRAKE COAL	IMPACT RATING		MITIGATION	MITIGATION RATING	
				L	C		L	C
Impacts to significant areas or items of Non-indigenous Heritage	v	v	v	4	2	Manage as per EMP	L	R
				6 (Medium)	2		2	4 (Low)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

The construction of the rail will result in a low impact on non-indigenous cultural heritage. Cumulative impacts may result at the coal terminal and mine site, where the rail corridor is adjacent to proposed projects. In other areas, the rail is not collocated with other projects. It is expected that through the development and implementation of management and mitigation measures such as is outlined below, and with other proponent developing similar mitigation strategies the overall cumulative impact on non-indigenous cultural heritage will be low.

5.4.10.3 Mitigation Measures

The following mitigation measures are proposed for the project:

Mine

- an archival recording will be undertaken to include photographs and plans as specified by the DERM for heritage places. The recording will be undertaken for Kiaora, Glen Innes and Monklands homesteads and surrounding landscape. Copies of the photographic record will be deposited with the State Library of Queensland and the local Alpha library. Significant objects associated with the pastoral industry that the owners may wish to dispose of will be assessed and consideration given to donating to a local or regional museum; and
- the history and significance of the properties will be incorporated in interpretative facilities associated with the mine or in the local area. This will be undertaken prior to the commencement of mine construction works.

Rail

- through access on the Bowen Downs road should be maintained where it will be crossed by the proposed rail; and
- remnants of the Bowen Downs road within a five km radius of the rail corridor should be identified and areas should be marked as an exclusion zone to ensure no disturbance occurs during construction.

Construction and Operation

This assessment has focused on assessing places that have potential heritage significance. During construction, it is possible that non-indigenous artifacts may be discovered. However, the history of land use suggests that significant archaeological finds are unlikely to be discovered.

The possibility of a find cannot be discounted. *The Queensland Heritage Act* (QH Act) contains provisions relating to the discovery of archaeological artefacts. Waratah Coal will develop a project specific EMP for the coal terminal. The EMP will:

- outline statutory obligations for all parties involved;
- provide for an induction for all construction personnel regarding non-indigenous cultural heritage management procedures;
- outline procedures to be implemented in the case of the find on non-indigenous heritage material during construction. This will include:
 - notification of heritage consultant to assess significance of find;
 - stop/redirection of-work requirements and establishment of buffer zone;
 - procedures for informing DERM;
 - documentation and recording of site conditions;
 - if required, removal and conservation of find if assessed as significant; and
 - management and deposition of find in an appropriate museum or interpretative facility.

5.4.11 SOCIAL

Given the geographically broad social impact that the Waratah Coal project and other development may bring, the following assessment considers cumulative impacts in association with other project impacts only. Refer to **Volume 5, Appendix 23 - Social Impact Assessment**.

Given the considerable number of projects proposed and currently being investigated within the project's Study area, the cumulative impact of these projects has the potential to provide benefits that would otherwise not be achievable as well as exacerbate some of the identified adverse impacts of the project (refer to **Table 36**).

Table 36. Summary of social impacts and significance

IMPACT	DESCRIPTION	MITIGATION		
		L	C	R
Employment and Training	The project will create an additional 1,975 jobs during construction and 1,252 jobs during operations (when including direct, indirect and induced employment) and provide training to many staff, including Indigenous employees.	4	5	Positive Effect
Contracting and business opportunities	The project will procure a range of local goods and services, with some contractors establishing a base and locating staff in Alpha.	4	4	Positive Effect
Personal Income	The project will increase average personal income levels in Alpha.	4	4	Positive Effect
Town Infrastructure and Services	The project will generate an additional \$300 million in revenue annually for the State Government. If government agrees to develop Alpha, the Alpha community will benefit from improved transport and communication infrastructure, expanded social services and a wider range of commercial enterprises.	3	4	Positive Effect
Rural Infrastructure	Farmers in the vicinity of the mine will benefit from improved telecommunications, power and water supply.	3	3	Positive Effect
Cost of Living	Housing prices, rental costs and the costs of local goods and services are expected to rise. Shortages in accommodation and trade services are likely. Higher living costs will disadvantage low income groups (although increased employment provides opportunities to reduce unemployment).	3	4	7 (Medium)
Cattle Operations	Two properties and part of a third property will be acquired by Waratah Coal, and other neighbouring properties will be impacted by the project, potentially reducing output.	3	3	6 (Medium)
Road Traffic	Traffic disruptions will occur during project construction along the Capricorn Highway. Increased traffic will occur on the Alpha-Emerald and Alpha-Clermont roads during operations, impacting local residents and tourists.	3	4	7 (Medium)
Public Infrastructure and Services	Population growth in Alpha will increase the demand for public infrastructure and services (e.g. power, water, garbage collection and processing, health, education, police, rural fire brigades, etc).	3	4	7 (Medium)
Welfare Services	Population increase, including mine employees/contractors and their families, will increase the demand on welfare agencies and potentially lead to a reduction in the coverage or quality of services provided.	3	4	7 (Medium)
Community Values	If Alpha is not developed as proposed, it will have a transient population and drug and alcohol related issues. In a town which aims to preserve its way of life, this may fuel resentment towards mining, and impact adversely on community values.	4	4	8 (High)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

The cumulative impact assessment has identified that the impacts of multiple large-scale resource projects being developed within a similar time frame across the broader project study area include:

- substantial growth in employment numbers and further reduction in unemployment levels;
- increased demand for those locally available goods and services required for project construction and subsequently operations (contributing to higher price rises that in other parts of Queensland);
- increased in-migration as a result of skill shortages in the construction and mining industries; and
- as a result of increased in-migration, further housing shortages (and higher house prices and rental costs), increased use of public infrastructure and increased demand for public and private services.

The key social impacts and their significance, resulting from both the project and from the development of multiple large-scale resource projects, are summarised in **Table 36**. The significance is based on an assessment of the likelihood and consequence of an impact occurring. Additional details, including scores for the likelihood and consequence, are provided in the SIA.

5.4.11.1 Mitigation Measures

To mitigate potential cumulative impacts on regional economic factors, Waratah Coal has committed to undertake a suite of mitigation measures which will:

- aid in the development of Alpha;
- offer preferential employment to residents from the local region;
- offer preferential contracting opportunities during both the construction and operational phases of the project to local contractors and local suppliers whenever possible;
- implement measures to minimise disruptions and accidents caused by the increase in the number of heavy vehicles, particularly during the construction period; and
- engage in activities aimed at supporting local communities coordinating the building of project associated infrastructure in a manner that is coordination with local councils, local residents and other resource companies consistent and which meets the growing needs of the local community, and this infrastructure, and any subsequent local development

contributions, is planned in coordination with local councils, local residents and other resource companies.

It is anticipated that the adoption of these measures will significantly reduce impacts and in some cases contribute positively to regional social factors.

5.4.12 ECONOMIC

Given the geographically broad economic impact that the project and other development may bring, the following assessment considers cumulative impacts in association with other project impacts only.

Given the considerable number of projects proposed and currently being investigated within the project's Study area, the cumulative impact of these projects has the potential to provide benefits that would otherwise not be achievable as well as exacerbate some of the identified adverse impacts of the project (**Table 37** and **Table 38**, respectively).

While the potential beneficial impacts should be encouraged and facilitated by appropriate planning measures where appropriate, it is the adverse cumulative impacts that are of key concern for future development of the study area, in particular those assessed to have a high risk rating. In order to ensure these potential cumulative impacts are appropriately managed it will be important for local Council and State Government to collaborate with project proponents and develop coordinated plans to account for the anticipated increased population, business and industry growth throughout the study area.

5.4.12.1 Mitigation Measures

To mitigate potential cumulative impacts on regional economic factors, Waratah Coal has committed to undertake a suite of mitigation measures which will:

- address skills shortages;
- minimise draw down on labour from other sectors;
- develop the local supply chain;
- minimise disruption of agricultural practices;
- minimise adverse implications of higher property prices;
- develop supporting infrastructure; and
- minimise adverse impacts of increased traffic.

It is anticipated that the adoption of these measures will significantly reduce impacts and in some cases contribute positively to local economic factors.

5.5 CONCLUSION

5.5.1 ASSESSMENT OUTCOME SUMMARY

Cumulative impacts on environmental, social and economic values have been assessed at an individual project level and across eight proposed projects. A conservative approach to impact assessment has been adopted by Waratah Coal. For example, the Cumulative Impact Assessment has assumed that the timing of the construction of the assessed projects will be concurrent with the project. Whilst this is not necessarily the case in reality, the assumption of concurrence has allowed the proponent to apply a conservative approach to impact assessment.

Table 37. Potential beneficial cumulative impacts

IMPACT DESCRIPTION	L	C	R
<p>Provision of common user infrastructure:</p> <p>Rail, coal terminal and other support infrastructure developed for the project will be accessible by third parties, including other proposed coal mining projects in the region, while there are a number of coal terminal and utilities infrastructure projects proposed that will also provide important enabling infrastructure for industry development. Development of common user infrastructure will:</p> <ul style="list-style-type: none"> • reduce duplication of infrastructure development; • assist in realising economies of scale in service provision; and • support local business development. 	5	Positive	Positive Effect
<p>Industry clustering and value chain development:</p> <p>Development of a number of coal mining projects in the Galilee Basin may provide the ‘critical mass’ required to develop a local mining support sector value chain. This has the potential to:</p> <ul style="list-style-type: none"> • develop a strong and efficient local supply network; • assist local business realise economies of scale and scope; and • provide enhanced synergies between businesses through clustering of similar industries 	4	Positive	Positive Effect
<p>Increased business, consumer and investor confidence:</p> <p>Business, investor and consumer confidence is linked with investment and spending patterns. Development of a number of major projects would likely provide a boost in confidence for business, consumers and investors alike, support investment and consumption expenditure and, subsequently, economic growth.</p>	4	Positive	Positive Effect
<p>Economies of scale and scope for service provision:</p> <p>The combination of a number of projects being developed in the Study Area could provide a ‘critical mass’ in terms of delivery of a number of services provided by all levels of government as well as private industry.</p>	3	Positive	Positive Effect

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

The cumulative impact assessment was undertaken in two parts. First, the impacts associated with project components:

1. coal mine; and
2. rail alignment;

This was assessed to determine the overall impact of Waratah Coal’s project. Table 39 illustrates the overall results from this assessment. As for the Waratah Coal project components, collectively results of this assessment identified that the individual project components project would not result in significant impacts when other projects were taken into consideration.

Second, cumulative impacts associated with Waratah Coal’s project components and eight external regionally occurring projects were assessed. The results of this assessment identified that the individual project components project would not result in significant impacts when other projects were taken into consideration, see Table 40.

Table 38. Potential adverse cumulative impacts

IMPACT DESCRIPTION	L	C	R
<p>Crowding out of business due to competition for resources:</p> <p>The concurrent development of a number of major projects in the Study Area will result in additional demand and competition for labour and other inputs to supply these projects (e.g., land, capital, water, intermediate goods and services used in the production process). This will place upward pressure on input prices, and can result in “crowding out” of some businesses and industries due to:</p> <ul style="list-style-type: none"> • a draw of labour from some sectors, in particular lower income paying sectors; • reallocation of capital investment to those sectors providing higher returns; and • reduced profit margins for business due to higher costs of production, eroding the viability of some businesses, particularly smaller businesses already operating on or near the margin. 	5	4	9 (High)
<p>Availability of affordable housing:</p> <p>The experience of the Bowen Basin during the latest mining boom indicates that the concurrent development of a number of projects in the Study Area would be expected to place significant additional upward pressure on housing prices. The increase in housing prices would:</p> <ul style="list-style-type: none"> • reduce the affordability of housing for lower income earning households; • reduce disposable incomes of households that remain in the region, reducing consumer expenditure in the region, in particular for luxury items; and • exacerbate difficulties of local business in retaining and attracting workers. 	5	4	9 (High)
<p>Infrastructure and service capacity constraints:</p> <p>The development of a number of projects concurrently could result in capacity constraints and bottlenecks in service delivery, in particular for transport infrastructure where the delivery of goods and services to support the projects will result in increased traffic loads on local roads.</p>	3	2	5 (Medium)

L = Likelihood of impact occurring; C = Consequences if impact occurs; R = Rating of both L and C

Table 39. Summary of residual cumulative impacts – internal components

ASPECT	RESIDUAL CUMULATIVE IMPACT
Land	Low
Surface Water and Aquatic Ecology	Medium
Nature Conservation	Medium
Groundwater Resource	Low
Air Quality and Green House Gases	Low
Noise and Vibration	Low
Waste	Low
Traffic and Transport	Low
Cultural Heritage	Low
Social Impact Assessment	Medium
Economic Impact Assessment	Medium

Table 40. Summary of residual cumulative impacts – external projects

ASPECT	RESIDUAL CUMULATIVE IMPACT
Land	Low
Surface Water and Aquatic Ecology	Medium
Nature Conservation	Medium
Groundwater Resource	Low
Air Quality and Green House Gases	Low
Noise and Vibration	Low
Waste	Low
Traffic and Transport	Low
Cultural Heritage	Low
Social Impact Assessment	Medium
Economic Impact Assessment	Medium

Overall, the results of this assessment have identified that the most significant cumulative impacts associated with the development of the project relate to the following aspects:

- Surface Water and Aquatic Ecology – particularly as relates to:
 - changes to natural water flow paths and regimes associated with the construction of culverts, bridges and similar infrastructure; and
 - disturbance to the nationally important Caley Valley Wetlands.
- Nature Conservation – particularly :
 - adverse effects to sensitive areas and protected native flora; and
 - adverse effects on native and or migratory fauna
- Social Impact, including:
 - impacts associated with dilution of the community values of towns like Alpha caused by a transient population.
- Economic Impact such as:
 - crowding out of business due to competition for resources and in particular, labour;
 - reduction in the availability of affordable housing in the region.

To combat these potential impacts, Waratah Coal has developed and committed to implement multiple mitigation strategies. These include:

- developing and implementing appropriate methods for minimising impacts to regional water quality. Erosion and Sediment Control Plan, Acid Soil Sulfate Management Plan for surface waters, and Water Quality Monitoring Program during construction and operational phases of the rail corridor will be undertaken;
- offsetting impacts to the natural environment. Waratah Coal has committed to implementing off-sets for flora and fauna cumulative impacts, developing Species Management Plans and Weed Management Plans and undertaking targeted species monitoring programs. Collectively, these approaches will aid Waratah Coal in minimising it’s impacts to natural values;
- minimising Impact to social values. Waratah Coal has committed to implementing a suite of measures aimed at aiding the development of Alpha, developing opportunities for labour through preferential employment opportunities for local communities and engaging in a coordinated approach to infrastructure development in the local area; and
- maximising the economic benefits to local communities. Waratah Coal has committed to implement measures which will address labour skills shortages and, develop the local supply chain to ensure prosperity remains in the local regions and local businesses remain viable.

Waratah Coal is committed to minimising potential negative impacts and maximising social benefits and economic opportunities across all project phases. As an active participant in the region, Waratah Coal will undertake this project in a manner which does not result in additional cumulative impacts to environmental, social or economic values.