CHAPTER 04

Assessment Methodology

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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4.1 Introduction

This chapter describes the methodology used to assess potential impacts and opportunities as a result of the Project, in accordance with the Terms of Reference (ToR). The methodology was designed to provide a structured and objective approach to identify environmental, social and economic impacts, benefits and opportunities, and develop effective mitigation and management measures.

During the alignment selection process, multi-criteria analyses (MCAs) and comparative cost estimates were used to assess potential impacts associated with a range of alignment options for the Project. The alignment selection methodology is discussed separately in Chapter 2: Project Rationale.

4.2 Approach

The first step in the impact assessment process was to prepare a Project description. Chapter 6: Project Description includes information on the scale, type, duration and location of project elements to be assessed.

Then, for each environmental aspect to be assessed (surface water, flora and fauna, air quality, etc.):

- The study area was defined. The study area is specific to the environmental aspect being assessed. The impact assessment area is defined based on the nature of the environmental aspect, and the scale, type and duration of Project elements that may impact on that aspect.
- The impact assessment method was selected (refer Section 4.4).
- A desktop review of existing reports, studies and spatial datasets was undertaken to establish existing conditions and sensitive receptors relevant to the environmental aspect being assessed.
- If the desktop review revealed significant data gaps, fieldwork was undertaken to identify and/or ground-truth existing environmental conditions and sensitive receptors. Further detail on desktop reviews and fieldwork is provided in Chapter 8 to Chapter 21.
- Potential impacts, benefits and opportunities were identified and assessed in accordance with the selected impact assessment method, using criteria set out in legislation, statutes, guidelines or policies. Where such criteria do not exist, the assessment was based on industry standards and professional judgement. In each instance, the impact assessment was conducted as follows:
  - The impact assessment considered the construction and operation phases
  - The impact assessment considered short-term, long-term and cumulative impacts
  - Mitigation measures inherent to the design (i.e. steps taken during the planning and design phases to avoid or minimise potential impacts) were factored into the initial impact assessment as part of the design
  - Mitigation and management measures were then proposed in addition to measures included at the design phase to further avoid or minimise impacts and enhance potential benefits (refer Section 4.4.4). These were factored into the assessment of residual impacts
  - The need for environmental offsets to compensate for adverse residual impacts was assessed.
- Mitigation and management measures are documented in Chapter 23: Draft Outline Environmental Management Plan (Draft Outline EMP) and in Chapter 8 to Chapter 21 (refer Section 4.4.5).
- Proponent commitments are documented in Appendix E: Proponent Commitments, which expand on those mitigation and management measures that have been recommended and proposed as part of the impact assessment process.

The Environmental Impact Statement (EIS) has taken a conservative approach to identifying the potential impacts of the Project, including cumulative impacts. Where environmental impacts have been identified through the assessment process, efforts have been made, where practicable, to avoid or minimise those impacts through development of the design. Where attempts to avoid or minimise impacts through design have been of limited effect, further mitigation measures have been nominated for implementation during future phases of the Project. Those measures will be implemented through the development of detailed design and the Construction Environmental Management Plan (CEMP) framework as the Project proceeds to construction.

Opportunities have also been identified in the assessment to maximise the potentially significant economic and social benefits of the Project, through local employment, local industry participation, and opportunities for complementary investment that provides for continued community benefit.

The approach to selecting impact assessment methods, identifying mitigation and management measures and compiling the Draft Outline EMP is discussed in the following sections. The role of community and stakeholder consultation in the impact assessment process is discussed in Section 4.5.

4.3 Study area

Depending on the discipline and the assessment methodology (refer Section 4.4), specific study areas were identified as being most appropriate to a discipline's impact assessment. These study areas are differentiated in Table 4.1. The study area of each discipline is visualised within each respective chapter.

TABLE 4.1: DISCIPLINE STUDY AREA

Study area extent	Discipline/s
This study area adopts the EIS investigation corridor, being an approximately 2 km wide study area, 1 km either side of the proposed rail alignment. The study area includes the disturbance footprint, which encompasses all areas where works are proposed, including both permanent and temporary works. The study area is slightly wider around Chainage (Ch) 38 km to Ch 45 km to accommodate for the options analysis undertaken for the Teviot Range crossing.	Flora and fauna (including Matters of National Environmental Significance) Surface water quality Traffic, transport and access Land resources
Disturbance footprint, which includes: ▸ Permanent disturbance footprint: consists of the rail corridor, its rail tracks and associated infrastructure as well as other permanent works associated with the Project (e.g. where changes to the road network are required) ▸ Temporary disturbance footprint: consists of the construction areas required for the Project, including both the area of the permanent disturbance footprint, where the rail infrastructure is proposed to be constructed, and those areas beyond the permanent disturbance footprint, that are proposed for use as temporary storage, haulage and laydown areas. The land use assessment also considers the EIS investigation corridor for identification of notable land uses.	Land use and tenure
Disturbance footprint plus a 50 m buffer on each side. Register searches and historical mapping analysis were undertaken for the area within a 1 km buffer of the disturbance footprint.	Cultural heritage
Disturbance footprint plus a 2 km buffer on each side.	Non-operational noise and vibration
The study area adopts a 2 km wide study area, 1 km either side of the proposed rail alignment.	Groundwater
The study area adopts a 4 km wide study area, 2 km either side of the proposed rail alignment.	Air quality Operational railway noise and vibration
The study area adopts the following: ▸ The disturbance footprint ▸ Catchment extents relevant to the Project, including Bremer River, Warrill Creek, Purga Creek and Teviot Brook catchments.	Flooding and hydrology
The study area adopts a 20 km wide study area, 10 km either side of the proposed rail alignment.	Landscape and visual amenity
The study area adopts the following: ▸ The disturbance footprint ▸ Potentially affected communities, which include the village of Calvert, the towns of Rosewood and Peak Crossing, and the localities of Lanefield, Lower Mount Walker, Ebenezer, Willowbank, Mount Forbes, Purga, Washpool, Woolooman, Undullah, Mutdapilly, Goolman, Kagaru and Allenview. ▸ The Project region, which refers to the Ipswich City Council and Scenic Rim Regional Council local government areas.	Social
The study area includes the local government areas of Ipswich, Scenic Rim and Logan. For the regional impact analysis, the Greater Brisbane labour market region is used.	Economics
The study area adopts the following: ▸ The disturbance footprint ▸ Natural environment of which the Project may directly or indirectly impact.	Hazard and risk
The study area adopts the following: ▸ The disturbance footprint ▸ Environmental aspects and sensitive receptors (including existing waste management facilities) relevant to waste management of the Project.	Waste and resource management

4.4 Impact assessment

Three methods were used to assess potential impacts and opportunities: compliance assessment (quantitative); risk assessment (qualitative); and significance assessment (qualitative). A general explanation of each assessment method and how it was applied is provided in Section 4.4.1 to Section 4.4.3, with further details specific to each technical aspect included in Chapter 8 to Chapter 21.

For each environmental aspect, the decision tree shown in Figure 4.1 was used to select an appropriate impact assessment method.

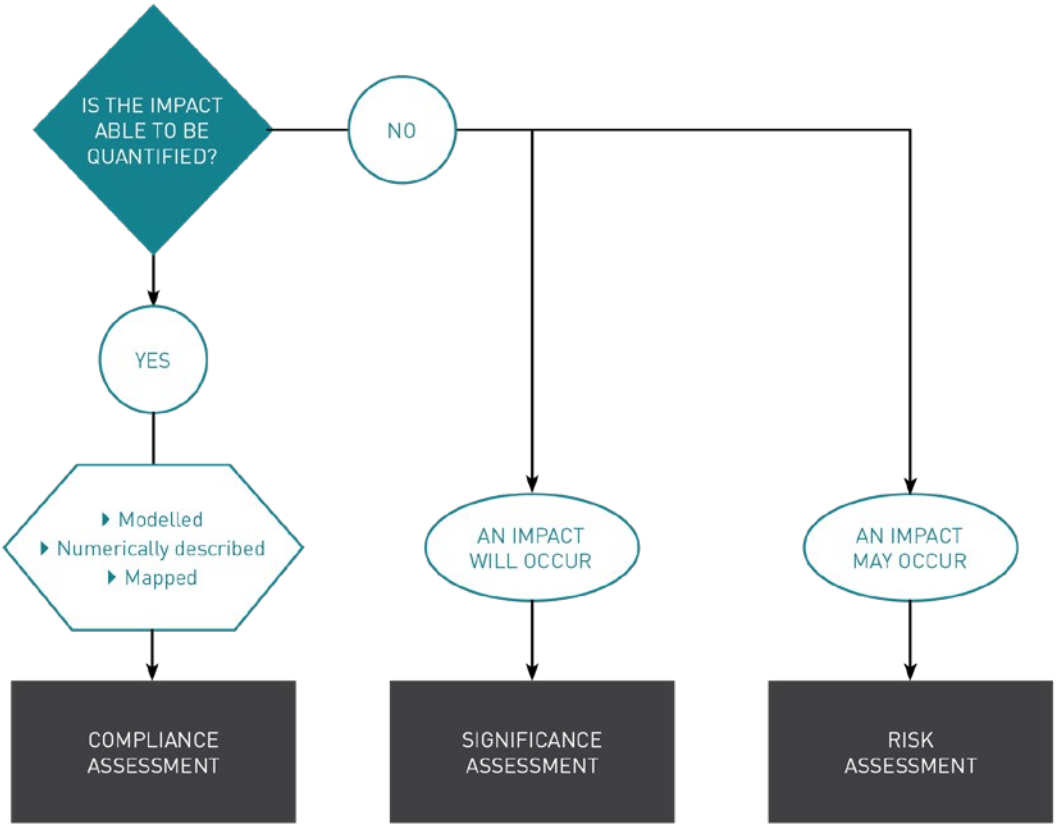

FIGURE 4.1: ASSESSMENT METHOD DECISION TREE

The assessment methods and the environmental aspects they have been applied to, are summarised in Table 4.2. The assessment method was adapted to meet the needs of a particular environmental aspect. For example, construction phase air quality impacts were assessed using the risk assessment method due to the complex, dynamic and multi-faceted nature of construction activities. On the other hand, air quality impacts during the operational phase were assessed using the compliance assessment method because confidence around operational parameters for the Project enabled emission sources to be modelled for comparison against adopted performance criteria.

TABLE 4.2: ASSESSMENT METHODS

Method	Type	Relevance	Environmental aspects
Compliance assessment	Quantitative	Used where compliance with a known guideline or standard (e.g. published limits or thresholds) can be quantitatively assessed	▸ Flora and fauna ▸ Land resources (soil properties) ▸ Land use and tenure ▸ Hydrology and flooding ▸ Economics ▸ Air quality (operation) ▸ Noise and vibration ▸ Traffic, transport and access ▸ Sustainability
Risk assessment	Qualitative	Used where an impact may occur	▸ Air quality (construction) ▸ Hazard and risk ▸ Land resources (contaminated land/erosion) ▸ Social ▸ Waste and resource management
Significance assessment	Qualitative	Used where an impact will occur to assess the sensitivity or the vulnerability of the environmental aspect to the impact	▸ Flora and fauna ▸ Groundwater ▸ Surface water quality ▸ Landscape and visual amenity ▸ Cultural heritage

This EIS also includes a cumulative impact assessment (CIA). The CIA considers the combined effects of the Project and relevant existing and proposed developments on environmental aspects. The CIA method is described separately in Chapter 22: Cumulative Impacts.

4.4.1 Compliance assessment

The compliance assessment method was applied to environmental aspects with quantifiable impacts (e.g. emissions and discharges from project infrastructure and activities). Mapping, modelling and data (publicly available and field verified) were used to assess compliance with performance criteria adopted from legislation, statutes, guidelines or policies.

Compliance with the adopted performance criteria was initially assessed based on the application of design phase mitigation measures. Additional mitigation and management measures were then proposed for implementation in future phases of the Project. These proposed mitigation and management measures were nominated to:

- Achieve compliance with the adopted performance criteria, if required
- Demonstrate ARTC's commitment to avoiding or minimising potential impacts, so far as is reasonably practicable.

Following the identification of appropriate mitigation and management measures, the need for environmental offsets to compensate for residual impacts was assessed.

4.4.2 Risk assessment

The risk assessment method was applied to environmental aspects that might be impacted by the Project, where impacts cannot be quantified. This includes unknown or unpredictable impacts. Potential impacts are assessed in terms of how likely they are to occur and the consequences if they do occur.

Likelihood and consequence criteria, and the resulting risk matrix are set out in Table 4.3, Table 4.4 and Table 4.5. Risk assessments have been documented in tabular form in the relevant EIS chapters.

TABLE 4.3: LIKELIHOOD CRITERIA

Likelihood	Description	Frequency of occurrence
Almost certain	Is expected to occur in most circumstances	Once per month
Likely	Will probably occur in most circumstances	Between once a month and once a year
Possible	Might occur at some time	Between once a year and once in 5 years
Unlikely	Could occur at some time	Between once in 5 years and once in 20 years
Rare	May occur in exceptional circumstances	Once in more than 20 years

TABLE 4.4: CONSEQUENCE CRITERIA

		Consequence				
Risk category		**Not significant**	**Minor**	**Moderate**	**Major**	**Extreme**
Safety	Impact to people	No medical treatment required	Lost-time injury or medical treatment required	Serious injury	Single fatality	Multiple, but localised, fatalities
Assets	Engineering impacts and satisfying objectives	Up to 6 hours of track closure	>6 hrs to 24 hours of track closure	>24 to 48 hours of track closure	>48 hours to 5 days of track closure	>5 days of track closure
Financial	Total outturn cost impact	Up to 0.05% of program budget (i.e. up to $5m in $10b)	>0.05% to 0.5% of program budget (i.e. >$5m to $50m in $10b)	>0.5% to 1.5% of program budget (i.e. >$50m to $150m in $10b)	>1.5% to 5% of program budget (i.e. >$150m to $500m in $10b)	>5% of program budget (i.e. > $500m in $10b)
		Up to 0.1% of project budget (i.e. up to $100k in $100m)	>0.1% to 0.5% of project budget (e.g. >$100k–$500k in $100m)	>0.5% to 2.5% of project budget (e.g. >$500k–$2.5m in $100m)	>2.5% to 10% of project budget (e.g. >$2.5m–$10m in $100m)	>10% of project budget (e.g. >$10m in $100m)
Environment	Environmental impact, heritage impact, flora and fauna, impact on archaeology and Indigenous cultural heritage, pollution and amenity (public)	Contained environmental damage—fully recoverable, no cost or ARTC action required	Isolated environmental damage—minimal ARTC remediation required	Localised/clustered environmental damage—requiring remediation	Considerable environmental damage—requiring remediation	Widespread long-term or permanent environmental damage—remediation required
Regulatory	Regulatory/legislative exposure, non-compliance and our Licence to Operate	Minimal or no regulatory involvement	Notice to produce information	Improvement notice or threatened action	Prohibition notice or fines	Prosecution of the company and/or its office holders
Reputation	Reputational exposure, customer dissatisfaction, stakeholder support, service, quality and reliability, public image and stakeholder attitudes	Isolated event able to be resolved (up to 7 days)	Management intervention required (>7 days to 3 months)	Tactical (business unit/ divisional intervention required (>3 months to 18 months)	Strategic intervention required (>18 months to 3 years)	Corporate loss of shareholder and/or customer support—tangible business impact lasting > 3 years

		Consequence				
Risk category		**Not significant**	**Minor**	**Moderate**	**Major**	**Extreme**
Schedule	Time-based impacts	Influences schedule up to 1% of program-approved schedule period	Influences schedule >1% to 2.5% of program-approved schedule period	Influences schedule >2.5% to 5% of program-approved schedule period	Influences schedule >5% to 10% of program-approved schedule period	Influences schedule >10% of program-approved schedule period
		Influences schedule up to 2% of project-approved schedule period	Influences schedule >2% to 5% of project-approved schedule period	Influences schedule >5% to 10% of project-approved schedule period	Influences schedule >10% to 20% of project-approved schedule period	Influences schedule >20% of project-approved schedule period

TABLE 4.5: RISK MATRIX

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

4.4.3 Significance assessment

The significance assessment method was applied to environmental aspects that will be impacted by the Project, and impacts cannot be quantified. The significance of a potential impact is assessed in terms of the sensitivity or vulnerability of the environmental aspect, and the magnitude of the potential impact. The following sensitivity criteria (refer Table 4.6); magnitude criteria (refer Table 4.7); and significance criteria (refer Table 4.8) were adopted for significance assessments. Significance assessments have been documented in tabular form in the relevant EIS chapters.

TABLE 4.6: SENSITIVITY CRITERIA

Sensitivity	Description
Major	▸ The environmental value is listed on a recognised or statutory State, national or international register as being of conservation significance ▸ The environmental value is entirely intact and wholly retains its intrinsic value ▸ The environmental value is unique to the environment in which it occurs. It is isolated to the affected system/area, which is poorly represented in the region, State, country or the world ▸ It has not been exposed to threatening processes, or they have not had a noticeable impact on the integrity of the environmental value ▸ Project activities would have an adverse effect on the value.
High	▸ The environmental value is listed on a recognised or statutory State, national or international register as being of conservation significance ▸ The environmental value is intact and retains its intrinsic value ▸ The environmental value is unique to the environment in which it occurs. It is isolated to the affected system/area, which is poorly represented in the region ▸ It has not been exposed to threatening processes, or they have not had a noticeable impact on the integrity of the environmental value ▸ Project activities would have an adverse effect on the value.
Moderate	▸ The environmental value is recorded as being important at a regional level, and may have been nominated for listing on recognised or statutory registers ▸ The environmental value is in a moderate to good condition despite it being exposed to threatening processes. It retains many of its intrinsic characteristics and structural elements ▸ It is relatively well represented in the systems/areas in which it occurs, but its abundance and distribution are exposed to threatening processes ▸ Threatening processes have reduced its resilience to change. Consequently, changes resulting from Project activities may lead to degradation of the prescribed value ▸ Replacement of unavoidable losses is possible due to its abundance and distribution.
Low	▸ The environmental value is not listed on any recognised or statutory register. It might be recognised locally by relevant suitably qualified experts or organisations (e.g. historical societies) ▸ The environmental value is in a poor to moderate condition as a result of threatening processes, which have degraded its intrinsic value ▸ It is not unique or rare and numerous representative examples exist throughout the system/area ▸ It is abundant and widely distributed throughout the host systems/areas ▸ There is no detectable response to change or change does not result in further degradation of the environmental value ▸ The abundance and wide distribution of the environmental value ensures replacement of unavoidable losses is achieved.
Negligible	▸ The environmental value is not listed on any recognised or statutory register and it is not recognised locally by relevant suitable qualified experts or organisations ▸ It is not unique or rare and numerous representative examples exist throughout the system/area ▸ There is no detectable response to change or change does not result in further degradation of the environmental value.

TABLE 4.7: MAGNITUDE CRITERIA

Magnitude	Description
Major	An impact that is widespread, permanent and results in substantial irreversible change to the environmental value. Avoidance through appropriate design responses or the implementation of environmental management controls are required to address the impact.
High	An impact that is widespread, long lasting and results in substantial and possibly irreversible change to the environmental value. Avoidance through appropriate design responses or the implementation of site-specific environmental management controls are required to address the impact.
Moderate	An impact that extends beyond the area of disturbance to the surrounding area but is contained within the region where the Project is being developed. The impacts are short term and result in changes that can be ameliorated with specific environmental management controls.
Low	A localised impact that is temporary or short term and either unlikely to be detectable or could be effectively mitigated through standard environmental management controls.
Negligible	An extremely localised impact that is barely discernible and is effectively mitigated through standard environmental management controls.

TABLE 4.8: SIGNIFICANCE MATRIX

Magnitude/sensitivity	Major	High	Moderate	Low	Negligible
Major	Major	Major	High	Moderate	Low
High	Major	Major	High	Moderate	Low
Moderate	High	High	Moderate	Low	Low
Low	Moderate	Moderate	Low	Negligible	Negligible
Negligible	Moderate	Low	Low	Negligible	Negligible

TABLE 4.9: SIGNIFICANCE CLASSIFICATIONS

Magnitude	Description
Major	Arises when an impact will potentially cause irreversible or widespread harm to an environmental value that is irreplaceable because of its uniqueness or rarity. Avoidance through appropriate design responses is the only effective mitigation.
High	Occurs when the proposed activities are likely to exacerbate threatening processes affecting the intrinsic characteristics and structural elements of the environmental value. While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status.
Moderate	Results in degradation of the environmental value due to the scale of the impact or its susceptibility to further change even though it may be reasonably resilient to change. The abundance of the environmental value ensures it is adequately represented in the region, and that replacement, if required, is achievable.
Low	Occurs where an environmental value is of local importance and temporary or transient changes will not adversely affect its viability provided standard environmental management controls are implemented.
Negligible	Does not result in any noticeable change and the proposed activities will have negligible effect on environmental aspects. This typically occurs where the activities are located in already disturbed areas.

4.4.4 Mitigation and management measures

Mitigation and management measures are designed to protect environmental aspects and sensitive receptors achieve established environmental performance objectives and enhance any positive impacts as a result of the Project. Initial and proposed mitigation measures have been incorporated into all three assessment methods, as summarised in Figure 4.2.

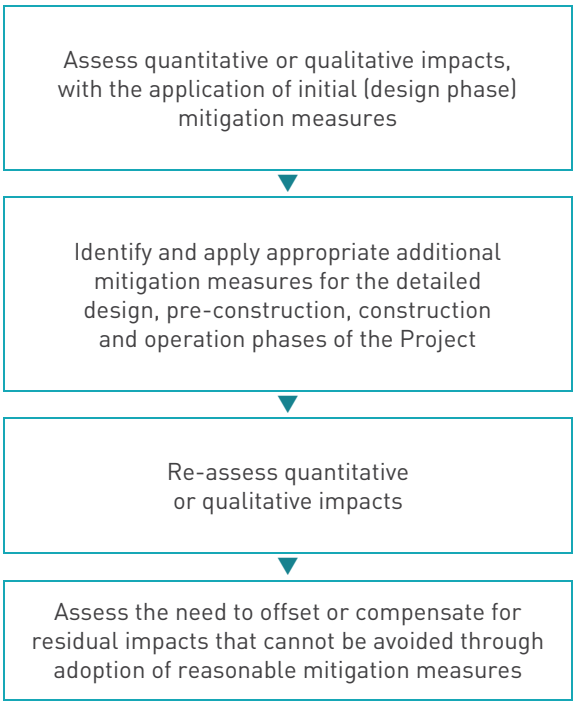

FIGURE 4.2: PROCESS FOR THE ASSESSMENT OF IMPACTS AND THE STAGED APPLICATION OF MITIGATION MEASURES

Initial mitigation measures are steps taken during the planning and design phases to avoid or minimise potential impacts.

Proposed mitigation measures are in addition to initial measures considered during design to further avoid or minimise impacts through future Project phases, being:

- Detailed design
- Pre-construction
- Construction and commissioning
- Operation.

In some instances, significant residual impacts are anticipated after the application of additional mitigation and management measures. In these cases, the need for environmental offsets to compensate for significant adverse residual impacts have been assessed.

Mitigation and management measures (initial and proposed) have been documented in tabular form in the relevant EIS chapters. These measures have also been documented in the Draft Outline EMP.

4.4.5 Draft Outline Environmental Management Plan

Chapter 23: Draft Outline Environmental Management Plan addresses the requirements of the ToR, and applicable legislation, statutes, guidelines and policies.

The Draft Outline EMP establishes how any adverse impacts as a result of the Project will be managed during the detailed design, pre-construction and construction phases. It also establishes environmental objectives, performance criteria, and a framework for continuous management, monitoring, reporting and training of site personnel. Management measures, including monitoring programs established in the Draft Outline EMP, will be implemented and delivered as a proponent commitment (refer Appendix E: Proponent Commitments).

Mitigation measures proposed for each environmental aspect identified in Chapter 8 to Chapter 21 are documented in the Draft Outline EMP.

4.6 Community and stakeholder consultation

The assessment methodologies adopted for the purpose of this EIS have been presented to, and discussed with, relevant regulatory agencies. A project of this size and significance requires a far-reaching communication and stakeholder engagement approach to provide opportunities for involvement at all levels. Furthermore, input from a variety of key stakeholders and community members is required to understand constraints, values and impacts.

The overarching purpose of the community and stakeholder engagement program is to:

- Raise awareness about the Project, including the need for the Project, its benefits and the process undertaken to develop the design and EIS
- Verify the appropriateness of assessment methodologies adopted for the EIS (refer Section 4.4)
- Provide stakeholders with opportunities to inform investigations being undertaken for the design and EIS about local values and issues
- Inform government agencies, stakeholders and the community about the progress of the Project and to seek their input into the development of the design and EIS
- Understand stakeholder and community issues and where possible, address any issues raised.

Stakeholder and community feedback and comments received from the consultation process has informed the preparation of the EIS including:

- Identification of community values and local conditions in proximity to the Project
- Assessment of potential benefits and impacts of the Project's construction and operation
- Identification of strategies to minimise or avoid potential impacts and maximise or enhance potential Project benefits.

The consultation program was structured to inform individuals and groups directly and indirectly affected by the Project. The process was also structured to allow input from:

- Stakeholder groups with specific interests in the Project, such as Traditional Owners, community groups (via Community Consultative Committee meetings (members and observers), and ARTC's online Social PinPoint and CollabMap tools) and industry associations
- Queensland Government agencies, local governments, including those with either a regulatory or an advisory role in the design, construction or operation of the Project.

Stakeholder and community engagement activities undertaken during development of the EIS are discussed in Chapter 5: Stakeholder Engagement.