



**ECOLOGICALLY  
SUSTAINABLE  
DEVELOPMENT**

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## Appendix G Ecologically Sustainable Development

### G.1 Introduction

The key principles of ecologically sustainable development are integral to the Bowen Gas Project (the Project). This appendix describes how the Project has incorporated these key principles into project planning and design and into the assessment of impacts and proposed avoidance, mitigation and management measures, as demonstrated throughout the EIS.

### G.2 Background

The United Nations recognised the significance of the impact of development on the biosphere in 1983. There was increasing concern that continuing economic growth could not be sustained. It was recognised that a worldwide change in attitude was essential to create balance between economic growth, social development and the protection of the environment. In 1987, the World Commission on Environment and Development published *Our Common Future* (Brundtland, 1987) (also known as the Brundtland Report), which stated that environmental problems were a global concern and that it would be in the interest of all nations to develop policies for sustainable development. *Our Common Future* provides the most widely recognised definition of sustainable development (Brundtland, 1987):

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Australia has adopted and further refined this concept of sustainable development by accounting for the unique local environment and the values of the Australian people. This refinement resulted in development of the concept of 'ecologically sustainable development'.

The broad concept of ecologically sustainable development is incorporated into the National Strategy for Ecologically Sustainable Development (ESDSC, 1992). The strategy was authorised by the Council of Australian Governments in 1992 and defines the term ecologically sustainable development as:

*Ecologically sustainable development means using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.*

The goal of the strategy is (ESDSC, 1992):

*Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.*

The strategy underpins ecologically sustainable development processes in Australia by providing a strategic framework for governments to direct policy and decision making. It also recognises that private business plays a key role in continuing ecologically sustainable development (ESDSC, 1992):

*Private enterprise in Australia has a critical role to play in supporting the concept of ecologically sustainable development while taking decisions and actions which are aimed at helping to achieve the goal of this Strategy. Many have already been active participants in the ecologically sustainable development process, including taking significant individual steps to ensure that Australia's economy and production base are based on an ecologically sustainable footing.*

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### G.3 Legislative Context

Each level of government in Australia is required to implement strategies or develop policies consistent with the goals and core objectives of the national strategy. There are five key principles of ecologically sustainable development that are relevant to the Project and provide guidance for achieving ecologically sustainable development (Preston, 2006). These are summarised as follows:

- Integration of economic, social and environmental considerations;
- Application of the precautionary principle;
- The pursuit of intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improvement of valuation, pricing and incentive mechanisms.

The principles of ecologically sustainable development are incorporated into many acts of parliament including the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) and the *Environmental Protection Act 1994* (Qld) (EP Act). The Bowen Gas Project will be reviewed in accordance with the bilateral agreement between the Commonwealth and Queensland governments that enshrines both these pieces of legislation. The implementation of the principles of ecologically sustainable development is accordingly discussed below.

#### G.3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides for the protection of matters of national environmental significance and the promotion of ecologically sustainable development through the conservation and sustainable use of natural resources. Section 3A of the act outlines the applicable principles broadly as follows:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental and social considerations that are equitable.
- If there are threats of serious or irreversible environmental damage, scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation.
- The principle of inter-generational equity is considered such that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.
- Improved valuation, pricing and incentive mechanisms should be promoted.

#### G.3.2 Environmental Protection Act 1994

The objective of the EP Act is to protect Queensland's environment by promoting ecologically sustainable development. The act outlines a 'standard criteria', which includes the principles of ecologically sustainable development (from the National Strategy for Ecologically Sustainable Development) and other relevant policy instruments. Queensland's Department of Environment and Heritage Protection (EHP) must consider the standard criteria when assessing the EIS. A summary of the compatibility of the Project with the standard criteria is provided in Section G.6 of this report.

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Under the EP Act, the standard criteria mean (EP Act):

- a) the principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development';
- b) any applicable environmental protection policy;
- c) any applicable Commonwealth, State or local government plans, standards, agreements or requirements;
- d) any applicable environmental impact study, assessment or report;
- e) the character, resilience and values of the receiving environment;
- f) all submissions made by the applicant and submitters;
- g) the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows -
  - (i) an environmental authority;
  - (ii) a transitional environmental program;
  - (iii) an environmental protection order;
  - (iv) a disposal permit; and
  - (v) a development approval
- h) the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument;
- i) the public interest;
- j) any applicable site management plan;
- k) any relevant integrated environmental management system or proposed integrated environmental management system; and
- l) any other matter prescribed under a regulation.

### G.4 Application of Ecologically Sustainable Development

The development and design of the Project has incorporated ecologically sustainable development as a fundamental consideration. The application of each of the key principles of ecologically sustainable development to the Project is provided below.

#### G.4.1 Integration of Economic, Social and Environmental Considerations

The principle of integration recognises that economic development without regard to the cost to the environment or the influence on social development can have long-term detrimental impacts. This principle requires that there is a mutual respect between the three components of sustainable development; economic development, social development and environmental protection.

Arrow has adopted an iterative approach to the development and design of the Project. The iterative approach has included research, consultation with stakeholders and the community, and the incorporation of expert technical advice to ensure that all environmental and socio-economic aspects have influenced the Project development and design.

Leading experts in specialist fields have undertaken comprehensive studies to determine the potential environmental and social impacts that may occur as a result of the construction, operation and decommissioning of the Project. The identification of potential environmental, social and economic

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impacts was the subject of a detailed scoping exercise lead by suitably experienced environmental impact assessment specialists and was based on a detailed understanding of the existing environment, and past experience with similar projects in the region. The technical specialist studies that were completed and have subsequently informed development of the Project are presented below.

**Table G-1 Specialist Technical Studies**

Climate	Surface Water	Economics
Air Quality	Aquatic Ecology	Social
Greenhouse Gas Emissions	Terrestrial Ecology	Indigenous Cultural Heritage
Contaminated Land	Landuse and Tenure	Non-Indigenous Cultural Heritage
Soils	Landscape and Visual Amenity	Preliminary Hazard and Risk
Geology	Roads and Transport	Waste Management
Groundwater	Noise and Vibration	Decommissioning and Rehabilitation

The outcomes of each of these studies, the potential impacts and the avoidance, mitigation and management measures are summarised in the relevant sections and appendices of the EIS.

The EIS demonstrates the process undertaken to give regard to the cost to the environment and the influence on social development, supporting the concept and objectives of ecologically sustainable development.

### G.4.2 Precautionary Principle

The precautionary principle states that scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation.

The application of the precautionary principle is triggered by two conditions:

- A threat of serious or irreversible environmental damage; and
- Scientific uncertainty as to the environmental damage (Preston, 2006).

If both conditions are satisfied, then the precautionary principle will apply.

The EIS itself is precautionary in nature, as it is a document that identifies and evaluates the potential for serious or irreversible environmental damage that may occur as a result of the Project.

To fulfil the requirements of the precautionary principle, Arrow has undertaken the following measures:

- A significance-based approach for assessing impacts. This method was used to assess the vulnerability of the environmental value (resource or sensitive receptor). The approach assumes that the identified impacts will occur, thus enabling the worst-case scenario to be identified and assessed. Further, the approach assumes that the proposed mitigation will be implemented and that it works, thus enabling the effectiveness of mitigation measures in avoiding or reducing the impact to be assessed. The significance of an impact is assessed by considering the vulnerability or sensitivity of the environmental value and the magnitude of the impact before and after the application of mitigation and management measures.

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- A risk-based approach was applied to determine key project risks, including those that posed known or uncertain threats to the environment. A qualitative risk assessment was used to assess the likelihood of harm to the environment from construction, operation, and decommissioning activities, and the consequence of those impacts on the environment. Quantitative risk assessment was used to evaluate aspects of the hazards and risks associated with the proposed development.
- A compliance assessment method using statutory guidelines set out in environmental protection policies and other regulatory documents was applied to protect the relevant environmental values (i.e. those associated with parameters such as air quality and noise and vibration). The guidelines include an implicit assessment of the vulnerability of the environmental value through the setting of limits or thresholds. Limits and thresholds set out in the guidelines are based on established scientific knowledge and societal aspirations relating, in most instances, to the quality of life. Assessments using this method typically use modelling to predict emissions or discharges from project infrastructure and operations to inform design parameters that enable compliance with published limits or thresholds before and, if necessary, after the application of mitigation and management measures.
- Comprehensive specialist studies were conducted early in the assessment process, which allowed consideration of specialist findings to inform planning, evaluation and development. Project planning and environmental, social and economic assessment have comprised an iterative process, with the outcomes of studies and modelling being fed back into Project planning, design and the development of appropriate avoidance, mitigation and management measures.
- Avoidance, mitigation and management measures will be implemented to ensure that the potential for serious or irreversible damage to the environment and social development is minimised. These measures reflect the commitment to sound environmental management techniques. Mitigation measures are described throughout the EIS and have been consolidated into an overall commitments table (Appendix D) of the EIS.
- Extensive consultation has been undertaken with a range of individuals and organisations that may be affected by or may influence the Project. Stakeholder consultation has been designed to give stakeholders opportunities to provide feedback and raise issues of concern at various stages in the impact assessment process. Stakeholder consultation commenced in 2010 and will continue throughout the life of the Project.
- Inspection and monitoring will be conducted to demonstrate that environmental protection objectives have been met and that compliance with performance criteria has been achieved or maintained. Compliance will verify that the residual impacts associated with the Project remain low and manageable. Monitoring will also ensure that mitigation measures and environmental management procedures are correctly implemented and are adequate to minimise the potential environmental impacts during the life of the Project.

Technical advice and specialist studies have been used to increase scientific knowledge about the threat of serious or irreversible environmental damage.

The impact assessments within Sections 8 to 29 of the EIS provide information on the threat of potential impacts to cause environmental damage.

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### G.4.3 Intergenerational Equity

Intergenerational equity is a value concept that focuses on long-term consequences and the rights of future generations. The principle of intergenerational equity means that future generations have equal rights to the same standard of quality of life and environment as the present generation.

The Project has been developed to ensure environmental and socio-economic protection for future generations by undertaking comprehensive analyses of the type and extent of the potential Project impacts and proposing avoidance, mitigation and management measures that seek to address the identified potential impacts. This EIS has used multiple risk-based approaches to assess the nature and extent of likely environmental and social impacts and to address concerns of stakeholders.

The Project description and modelling (where this was applicable to particular environmental aspects) extends for the reasonably predictable life of the Project. In this regard, a number of the future impacts of the Project have also been assessed (e.g., economic impacts have been assessed to the year 2036 / 2037 and groundwater impacts have been assessed to the year 2122). All residual impacts of the Project have been deemed to be acceptable. With the exception of the diminishment of energy resources, future generations will not be affected to any greater extent than the current generation.

The main direct product of the Project is methane, which is the cleanest burning petroleum hydrocarbon fuel. As such, methane represents a transitional fuel from pollutant intensive fuels to the potentially cleaner burning fuels and energy sources of the future. The development of transitional energy sources facilitates an opportunity for future generations to ensure that clean energy sources can be developed to the point where they are comparably efficient and cost effective.

In addition to protecting the existing environment from potential adverse environmental impacts, Project initiatives may provide other benefits to current and future generations. Increased economic growth through the stimulation of the local, regional and national economy will contribute to the development of social and community infrastructure that is expected to remain in place for the benefit of future generations.

### G.4.4 Conservation of Biological Diversity and Ecological Integrity

Biological diversity incorporates genetic diversity (the variety of genes present within a population), species diversity (the variety of populations of different species present) and ecosystem diversity (the variety of communities and habitats present). Ecological integrity is generally referred to as the self-sustaining nature of a natural ecosystem, including ecological processes and biological communities. The maintenance of ecologically sustainable development requires that the preservation of biological diversity and ecological integrity be considered in the decision-making process of any project.

The environment surrounding the Project area has important ecological values; in particular, there are significant flora and fauna species, vegetation communities and habitat features. In accordance with the principle of conservation of biological diversity and ecological integrity, comprehensive investigations of the extent and nature of ecological values were undertaken by specialists and are addressed in the EIS.

Results from the ecological studies have informed planning of the Project and the Project's environmental framework (refer to the Environmental Framework chapter – Section 7 of this EIS) that

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will be used to inform site selection decisions as the Project progresses. Arrow's preferred approach is to avoid areas of high environmental value. A key mitigation measure is to avoid clearing vegetation wherever practicable and to minimise the impact to the environment. Site-specific mitigation measures will aim to ensure ecological values and species diversity are conserved.

### G.4.5 Improved Valuation, Pricing and Incentive Mechanisms

The EIS has identified environmental values for each aspect of the Project, which can be referred to as the 'value of the natural resources'. The development of policy instruments associated with pricing and the incentive mechanisms for the pursuit of ecologically sustainable development are the responsibility of governments and their departments. The content of the EIS will, wherever applicable, inform governments in the development of policy that is applicable to the aspects of the Project.

## G.5 Commitment to Ecologically Sustainable Development

Arrow is committed to sustainable development and will balance social, environmental and economic considerations in all activities and projects to deliver sustainable outcomes. Arrow has developed a sustainable development policy that applies to all personnel, including contractors and suppliers, involved in Arrow's activities and projects.

The objectives of the sustainable development policy are stated as follows (Arrow, 2011):

- Ensure we operate at the leading industry standard of health and safety, environmental excellence, social performance, and economic management;
- Identify and act upon sustainable business opportunities;
- Optimise our management of risks;
- Demonstrate our commitment to ongoing stakeholder and community engagement;
- Improve capacity to deliver sound business and community outcomes and create shared value;
- Enhance our corporate reputation and maintain our licence to operate; and
- Attract and retain the best people.

The key policy elements are:

- **Health and Safety.** Arrow will operate a robust occupational health and safety system striving for zero harm to the community, staff and contractors.
- **Environment.** Arrow will establish programs to reduce environmental impacts, conserve and recycle resources, minimise waste and pollution, and improve processes to protect the natural environment.
- **Social Performance.** Arrow will build and maintain an ongoing and productive relationship with its stakeholders and the wider community.
- **Economic Management.** Arrow will contribute to the economic wealth of the communities in which it operates while returning value to its shareholders.

Arrow will monitor and evaluate the elements of the sustainable development policy to ensure continuous improvement. An annual sustainable development report will be prepared and will include, but not be limited to, the assessment of set targets and achievements of the policy elements.

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### G.6 Compatibility with the Standard Criteria

The final terms of reference for the Project require that a brief summary be presented on the Project's compatibility of the standard criteria as defined by the EP Act. This summary will assist EHP in assessing the EIS.

The definition of the standard criteria includes the principles of ecologically sustainable development as defined in the National Strategy for Ecologically Sustainable Development and other relevant policy instruments. The standard criteria are discussed within Table G-2 including a cross-reference to the EIS section that describes how the Project conforms to this during the life of the Project (construction, operation and decommissioning phases).

**Table G-2** Compatibility with the Standard Criteria

Standard Criteria	Compatibility
The principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'.	A detailed description is provided in Section G.5 - Commitment to Ecologically Sustainable Development, of this report.  The EIS provides details of Community Consultation in Section 5 and Sections 8 to 29 cover the assessment of environmental and social impacts.
Any applicable environmental protection policy.	All applicable environmental protection policies are summarised in the Project Approvals chapter (Section 2) of the EIS and are discussed in detail within the impact assessment chapters (Section 8 through 29).
Any applicable Commonwealth, state or local government plans, standards, agreements or requirements.	All applicable Commonwealth, state or local government plans, standards, agreements or requirements are covered in the Project Approvals chapter (Section 2) of the EIS.
Any applicable environmental impact study, assessment or report.	Any environmental impact study that is relevant to the Project has been referenced within the Introduction chapter (Section 1) and the impact assessment chapters (Sections 8 through 29) of the EIS.
The character, resilience and values of the receiving environment.	A detailed description of the existing environment and the sensitivity of values (which includes an assessment of resilience) are provided within the impact assessment chapters (Sections 8 through 29) of the EIS.
All submissions made by the applicant and submitters.	The draft EIS will be submitted to EHP; placed on public display and referred to relevant state government agencies for comment. Arrow will publish a notice in state and local newspapers and advise interested and affected persons of the period in which the public can lodge formal submissions with the Chief Executive of EHP. Public display will extend for a minimum of 30 business days.  The requirements for making a submission are set out in Introduction chapter (Section 1) of the EIS.

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Standard Criteria	Compatibility
	EHP will provide copies of any submissions to Arrow. Arrow will then address the issues raised in a supplementary report. The supplementary report must also respond to any additional matters identified by EHP.
<p>The best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows:</p> <ul style="list-style-type: none"> <li>(i) an environmental authority.</li> <li>(ii) a transitional environmental program.</li> <li>(iii) an environmental protection order.</li> <li>(iv) a disposal permit.</li> <li>(v) a development approval.</li> </ul>	<p>Environmental management commitments and mitigation measures are provided within the impact assessment chapters (Sections 8 through 29) and in the environmental management plan (Appendix Z) of the EIS.</p> <p>It is assumed that these commitments will influence conditions that are applied through the Project environmental authority and other relevant licence to operate instruments.</p>
<p>The financial implications of the requirements under an instrument, or proposed instrument, mentioned in the paragraph above as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument.</p>	<p>Arrow has fully accounted for the cost of operation in accordance with the environmental authority and other relevant licence to operate instruments. Through the preferential avoidance of development in areas of high environmental value and the implementation of industry standards in the development of the Project design, undue financial impact will be avoided.</p>
<p>The public interest.</p>	<p>The interests of the public were sought during the community consultation sessions for the EIS. The results of consultation are provided in the Community Consultation chapter (Section 5) of the EIS.</p> <p>The interests of the public were also considered through consultation completed as part of the social impact assessment, the results of which are summarised in the Social chapter (Section 24) of the EIS.</p>
<p>Any applicable site management plan.</p>	<p>The EP Act defines a site management plan as 'a plan used to manage land for which particulars are recorded in the environmental management register because the land is contaminated land'.</p> <p>Arrow will implement a strategy for the management of contaminated land. The strategy includes the preferential avoidance of development on contaminated land. Wherever this cannot be avoided, the strategy ensures alignment with the Guidelines for the Assessment and Management of Contaminated Land in Queensland. Details on the management of contaminated land are found in the Contaminated Land chapter (Section 11) and the environmental management plan (Appendix Z) of the EIS.</p>
<p>Any relevant integrated environmental management system or proposed integrated environmental management system.</p>	<p>The EP Act defines an integrated environmental management system for an environmentally relevant activity or activities, as 'a system for the management of the environmental impacts of the</p>

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Standard Criteria	Compatibility
	carrying out of the activity or activities. <sup>1</sup> The environmental management plan (Appendix Z) of the EIS provides details of Arrow's health, safety and environmental management system.
Any other matter prescribed under a regulation.	All applicable regulations and how they apply to the Project are covered in the Project Approvals chapter (Section 2) of the EIS.

### G.7 Conclusion

The planning phase of the Project has considered the principles of ecologically sustainable development. During the construction, operation and decommissioning of the Project the principles will be applied through commitments made within the EIS and the environmental management plan (Appendix Z of the EIS) and through Arrow's health, safety and environmental management system and sustainable development policy.