

Environmental impact report



for

airborne preliminary surveys and airborne
geophysical operations

in South Australia

December 2011

Energy Resources Division

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CONTENTS

EXECUTIVE SUMMARY	4
INTRODUCTION	5
Purpose.....	5
Scope.....	5
Limitations.....	6
Definition	6
Environmental commitment	6
Assessment and Approval	6
AIRBORNE PRELIMINARY SURVEYS AND AIRBORNE GEOPHYSICAL OPERATIONS.....	7
OVERVIEW OF REGIONAL ENVIRONMENT	8
South East	9
Kangaroo Island.....	9
Mount Lofty Ranges.....	9
Eyre Peninsula.....	9
Mid North/Yorke Peninsula.....	10
Northern Rangelands.....	10
Murray-Darling Basin	10
ENVIRONMENTAL HAZARDS, POTENTIAL CONSEQUENCES AND MANAGEMENT STRATEGIES.....	12
Prediction of hazards and frequency and consequences.....	12
Mitigation strategies.....	14
Significance of consequences	15
CONSULTATION.....	16
ABBREVIATIONS	18
TABLES	
Table 1: Potential environmental hazards and consequences	12
Table 2: Environmental objectives and mitigation strategies.....	13
Table 3: Types of protected areas and relevant legislation	14
FIGURE	
Figure 1 Biodiversity regions of South Australia.....	8

EXECUTIVE SUMMARY

Airborne preliminary surveys and airborne geophysical operations are regulated activities under *the Petroleum and Geothermal Energy Act 2000* and as such must be carried out under an Environmental Impact Report (EIR) and approved Statement of Environmental Objectives (SEO).

As airborne preliminary surveys and airborne geophysical operations are generally short in duration and low in environmental impact, DMITRE is of the opinion that a generic EIR and SEO covering South Australia will streamline the approval process for the activity.

This document has been prepared to meet the specific requirements of Section 97, of the *Petroleum and Geothermal Energy Act 2000* and Regulation 10, of the *Petroleum and Geothermal Energy Regulations 2000*.

This document outlines the environmental hazards associated with preliminary survey and airborne geophysical operations and identifies the following potential consequences:

- Landowner disturbance;
- Disturbance to livestock;
- Disturbance to native fauna; and
- Waste management.

All impacts have been assessed as being of low significance, based on their general high degree of predictability and manageability. Mitigation strategies have been proposed for each activity.

The application of this document should extend to any licensee across South Australia intending to undertake airborne preliminary surveys and airborne geophysical operations using current industry practices and techniques.

INTRODUCTION

Purpose

Airborne preliminary surveys and airborne geophysical operations flown at less than 500 m above ground level are a regulated activity under the *Petroleum and Geothermal Energy Act 2000* and as such, require an Environmental Impact Report (EIR) and approved Statement of Environmental Objectives (SEO) to be in place.

The aircraft used in operations covered by this document are deemed to be light piston engine driven aircraft (single or twin engine).

As an airborne preliminary survey and an airborne geophysical operation is generally short in duration and of low impact, it is considered that preparation of an EIR for each program would result in unnecessary expense and delays for the operators of petroleum exploration licenses and the regulators. The Department of Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) have proposed that a State-wide EIR and SEO will streamline the assessment and approval processes for proposed surveys.

This document has been prepared to meet the specific requirements of Section 97, of the South Australian *Petroleum and Geothermal Energy Act 2000* and Regulations 10, of the *Petroleum and Geothermal Energy Regulations 2000*.

Scope

In order to conduct airborne preliminary surveys and airborne geophysical operations, aircraft are usually required to fly at altitudes less than 500 m above the surface of the earth. This State-wide EIR has been developed to apply to these operations.

This EIR:

- Identifies limitations of the application of the EIR/SEO (Section 1.3);
- Describes the airborne preliminary survey and the airborne geophysical operation (Section 2);
- Describes the regional characteristics of the South Australian environment over which the operations occur (section 3);
- Identifies potential environmental hazards and consequences (Section 4); and
- Proposes measures to mitigate potential consequences (Section 4.1).

This EIR also outlines the proposed environmental objectives that licensees shall commit to achieving. These objectives have been identified on the basis of the potential hazards and consequences identified in this risk assessment process.

A companion SEO which includes the objectives required to be achieved by any licensee operating in South Australia has been developed. This SEO also contains the criteria upon which the achievement of these objectives will be measured.

Limitations

This EIR is limited to the State of South Australia. This EIR also covers Spencer Gulf, St. Vincent Gulf, Investigator Strait and Backstairs Passage and waters to the territorial sea baseline (as defined in Section 7 of the Commonwealth's *Seas and Submerged Lands Act 1973*).

Proponents should be aware of the implications of proposing activities over areas identified as special management zones such the Adelaide Dolphin Sanctuary and State Marine Parks.

Once the SEO is developed on the basis of this document being established, approval for airborne preliminary surveys and geophysical activities will be given after demonstration of compliance with and subject to that SEO and other relevant regulatory requirements.

All limitations imposed by aviation legislation such as any restricted airspace and installation clearance requirements also apply to this EIR and are implicit in it.

Definition

In the *Petroleum and Geothermal Energy Act 2000*, the environment is broadly defined to include its natural, social and economic aspects. The environmental objectives contained in the SEO incorporate all these aspects.

This EIR relates to those airborne geophysical operations, which are deemed to be regulated activities as they are techniques used in the exploration for petroleum and other regulated resources. This EIR also relates to airborne preliminary survey activities that may be necessary for, and/or preparatory to, the carrying out of regulated activities. Such activities are generally undertaken within a Preliminary Survey Licence (PSL).

Environmental commitment

Petroleum and geothermal licensees shall be committed to the responsible environmental management of all phases of their operations and must commit to achieving the environmental objectives included in the SEO.

Assessment and Approval

This EIR and draft SEO are assessed by DMITRE to determine whether the activities are to be classified as low, medium or high environmental impact. This in turn determines the level of consultation DMITRE will be required to undertake prior to final approval of the SEO.

- 'Low Impact' activities are subjected to a process of internal government consultation on the EIR and draft SEO prior to approval.
- For 'Medium Impact' activities, the EIR and proposed SEO are subject to a public consultation process, with comment sought for a period of at least 30 business days.
- 'High Impact' activities are required to undergo an environmental impact assessment under the provisions of the *Development Act 1993*.

The level of impact of a particular activity is assessed on the basis of the predictability and manageability of the impacts on the environment. Where the environmental impacts are predictable and readily managed, the impact of the activity is considered low. Where the environmental impacts are less predictable and are difficult to manage, the impact of the activity is potentially high.

Once the approval process is complete, all documentation (including this EIR and its associated SEO) must be entered on an environmental register. This public register is available on the DMITRE internet so that community access is readily available.

AIRBORNE PRELIMINARY SURVEYS AND AIRBORNE GEOPHYSICAL OPERATIONS

As part of their exploration programs in their petroleum and geothermal exploration or production licenses, or in preparation for undertaking other regulated activities on land such as the construction of pipelines, access tracks and scouting for the locating of well sites licensees might undertake airborne preliminary surveys and airborne geophysical operations that could include such techniques as.

- Aeromagnetic surveys;
- Electromagnetic surveys;
- Airborne geochemical surveys;
- Radiometric surveys;
- Gravimetric surveys; and
- Low-level aerial photographic/video imagery surveys.

These surveys typically involve light piston-engine aircraft flying at altitudes between 90 to 500 m above ground level along a pre-determined course. Measurements are recorded in a digital format and processed to produce various images and maps of the target area.

OVERVIEW OF REGIONAL ENVIRONMENT

It is not the intention of this EIR to describe all the significant environmental characteristics of South Australia and its associated regions, but rather to provide a general overview of the regional environments (Figure 1).

The existing environmental description of this report has largely been derived from regional biodiversity plans and district soil management plans. Biodiversity regions, developed by the Department for Environment and Natural Resources, have been referred to in this document to ensure consistency with current strategic government conservation and land use planning policies (Ecos Consulting, 2001).

Licensees are advised to consult other available literature and relevant agencies for further site-specific information pertaining to the area covered by their surveys.

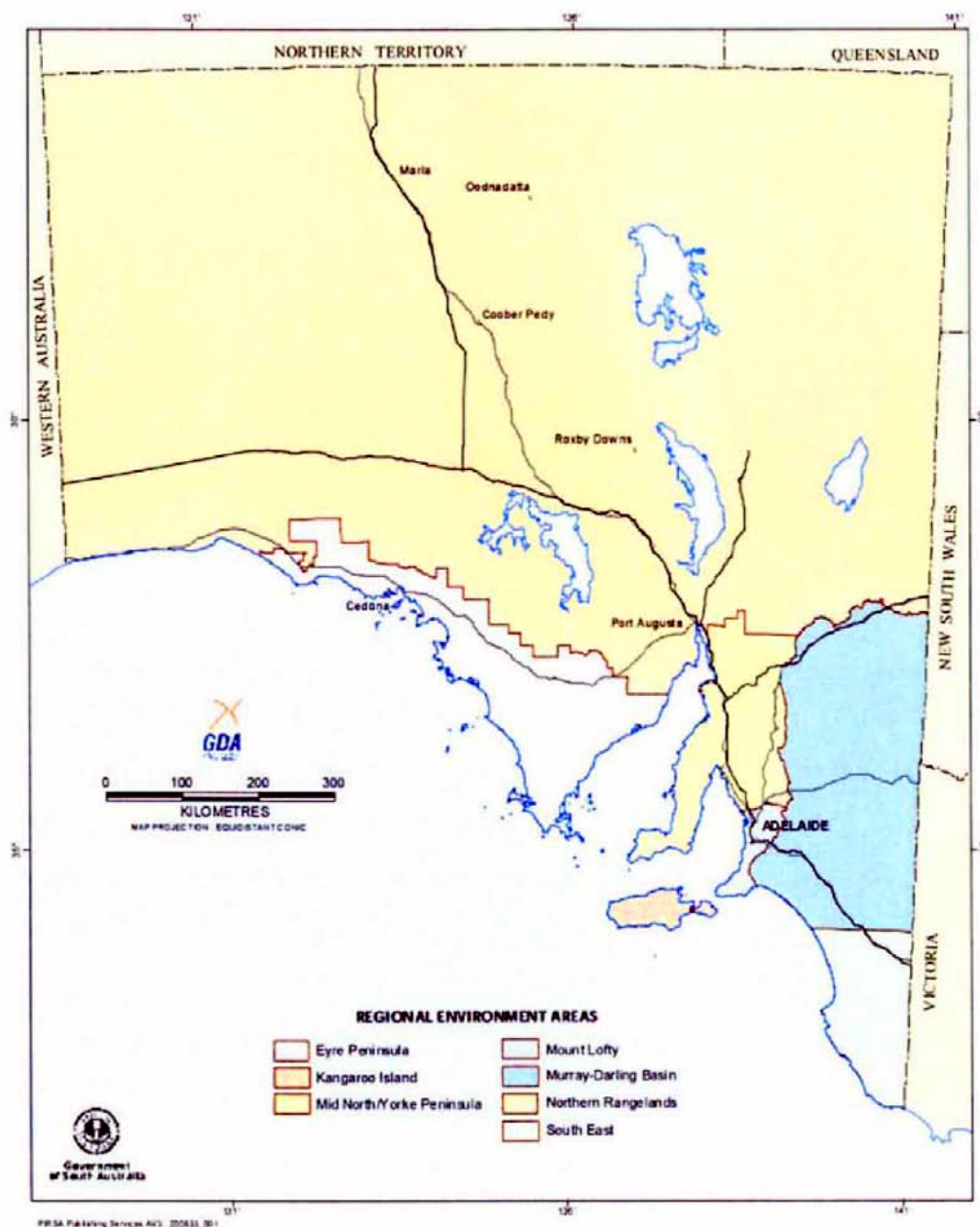


Figure 1 Biodiversity regions of South Australia

South East

The South East Region has a cool moist climate with cool wet winters and long mild dry summers. The general trend is for rainfall to decrease northwards and away from the coast (ie coastal rainfall recorded at a maximum of 850 mm and 450 mm to the north). Most rain falls in the winter months.

The South East Region has a low relief with unique landforms, originating from a long geological history. The region represents the limit of grassy woodland, forest and wetland plant communities more typical of southeastern Australia and the southern limit of the mallee plant communities found in the north. Most of the region comprises privately owned agricultural land. Most of the native vegetation has been cleared primarily for agriculture. The remaining native vegetation is not evenly distributed, but is concentrated in areas less suitable for agriculture. Most of the remaining areas of vegetation are located along roadsides, and in scattered woodland or as isolated trees within paddocks or is held in protected areas under the reserve system that is administrated by the Department for Environment and Natural Resources (DENR).

Kangaroo Island

Kangaroo Island lies approximately 15 km off the tip of Fleurieu Peninsula in southern South Australia and is ~4400 km² in size. The Island comprises high coastal cliffs at the northwestern end of the Island and a central plateau, which is tilted gently towards the more subdued topography of limestone plains and sand dunes along the southern coastline.

The Island has a reliable moderate to high rainfall ranging from 470 mm a year on the eastern and southern plains to 900 mm a year in the higher areas in the northwest.

Most of the land within the region is used for dry land agriculture. A significant amount is designated as protected areas under the reserve system administrated by DENR or covered by native vegetation heritage agreements. These agreements are covenants entered into between the landowner and the Minister administering the *Native Vegetation Act 1991*. Farming mainly involves sheep for wool and meat production.

Mount Lofty Ranges

Mount Lofty is the single most important topographical feature causing the capital city of Adelaide to experience a different climate in contrast to areas of similar latitude. The Mount Lofty Region experiences a Mediterranean climate of warm dry summers and cool wet winters. Mean annual rainfall in the Range varies from 400 to 1100 mm, to 250–350 mm elsewhere. The region is also susceptible to high intensity storms, which can cause serious erosion to unprotected land. Wind erosion may also occur on the lighter soils of the western plains when vegetation cover is not present.

The region comprises a well-defined zone of uplands, which extends from the Flinders Ranges through to the Fleurieu Peninsula. The major soil groups of the district are red-brown earths in the broad valleys to the east, loamy mallee soils to the west, and sandy mallee soils in the northern areas.

Much of the native vegetation has been cleared for agriculture and urban expansion. A large proportion of remnant vegetation occurs on private land with a significant amount confined to protected areas under the reserve system administrated by DENR. However, the latter represents just small percentage of the total region. Most of the land in region is used for cropping and or grazing.

Eyre Peninsula

Being bounded by the sea to the east and west, the Eyre Peninsula Region has a predominantly mild climate. Droughts are infrequent, especially in those areas receiving more than 400 mm per annum. Most rainfall occurs in the winter season. Although rare, intense rainfall events and strong winds with a potential to cause severe soil erosion can occur at any time of the year.

Most of the region is cleared, and most of this is deemed to be arable. The main land use is cereal and grain legume cropping in rotation with grazed pastures. Other minor land uses include livestock production (sheep and cattle). Semi-arable cleared land, and areas with scattered vegetation are used mainly for grazing.

Native vegetation in the region is generally restricted to lakes, coastal dunes and scattered remnant native vegetation communities, much of which is non-arable or semi-arable land. Of this, a high proportion is located within protected areas under the reserve system administered by DENR. In addition, a significant area of native vegetation is held under the native vegetation heritage agreement scheme. Strips of remnant vegetation have also been retained, or restored using native vegetation species, along fence lines as windbreaks and shelterbelts for stock and crops.

Mid North/Yorke Peninsula

This region experiences hot dry summers and mild winters. The Yorke Peninsula has a lower annual rainfall than the Mid North with an average yearly rainfall of approximately 480 mm near Maitland. This contrasts markedly with coastal areas where it is as low as 280 mm per annum. In the Mid North, the period from April to October receives the most rain with approximately yearly average of 650 mm rainfall on the ranges and 325 mm in coastal areas.

Much of the Mid North consists of a broad flat highland plateau in the east, which is flanked by a coastal plain in the west. On the Yorke Peninsula, the topography is gently undulating, with an average elevation of ~90 m above sea level.

The major land use throughout the region is barley and wheat production. Sheep grazing for wool production is also a significant land use throughout the area.

Much of the native vegetation has been removed as a result of extensive cultivation and grazing. However, many roads were surveyed as stock routes and as a consequence, significant tracts of vegetation remains along road corridors. Few conservation reserves exist throughout the region, with Mount Remarkable National Park and Innes National Park being the only substantial areas of native vegetation held within reserves. Dominant vegetation types include and forest in inland areas and coastal dune vegetation along the coastline.

Northern Rangelands

The climate of the northern arid zone of South Australia is characterised by hot, usually dry summers and mild dry summers. Rainfall variability in the region is amongst the highest in Australia, while average annual totals are amongst the lowest. Mean annual rainfall ranges from less than 150 mm in the northeast to around 225 mm in the far northwest. No seasonality of rainfall is apparent.

Land use in the region consists primarily of stock grazing, mining, tourism, defence industry operations and oil and gas exploration and production. Sixty percent of the land is used for pastoral production and the majority of the remainder is either Aboriginal land or in protected areas under the reserve system administered by DENR.

Claypans, dune fields, gibber plains and tablelands are all features of the region. The topography is relatively flat and throughout much of the region the vegetation comprises low open woodlands, grasslands and chenopod shrub lands.

Murray-Darling Basin

The rainfall of the Murray-Darling Basin is low, ranging from 250 mm per year in the north to 400 mm per year in the south. In the north, the rainfall is unreliable and droughts are common.

The major land use is cereal/sheep farming, with crops grown in rotation with annual medic pastures.

The district consists of a vast low lying plain, with sand dunes and gently undulating sandy rises interspersed by flats, depressions and low rises. Most of the sand dunes are parallel ridges that lie in an east-west direction but large, disordered and crescent shaped dunes also occur.

The soils are generally sandy in texture and highly erosive. Exceptions include very stony land and uncleared land. Shallow soils over limestone are common in the western portion of the region but virtually absent in the east. The low and unreliable rainfall in the north and water repellence in the south also increases the potential for wind erosion.

Much of the region was originally covered by thick mallee scrub. But most this has been cleared or degraded by agricultural development. Most of the remaining vegetation is designated as protected areas under the reserve system administrated by DENR. The uncleared land is primarily sand dunes and limestone outcrops that were deemed to be unsuitable for agriculture.

ENVIRONMENTAL HAZARDS, POTENTIAL CONSEQUENCES AND MANAGEMENT STRATEGIES

The environmental hazards associated with airborne preliminary surveys and airborne geophysical operations and their potential consequences are outlined in Table 1. Strategies to mitigate potential consequences and the proposed environment objectives to be achieved are outlined in Table 2.

The content of these tables has been compiled to meet the requirements of Regulation 10(1). In particular, the tables:

- List the activities that have the potential to result in environmental impact;
- Identify the hazards associated with these activities including atypical hazards;
- Provide an indication of the frequency of hazards; and
- Outline mitigation measures.

In addition, Regulation 10(1) requires:

- An explanation of the basis on which the hazards and their frequency and consequence have been predicted; and
- An assessment of the extent to which consequences can be addressed.

These requirements are addressed below.

Prediction of hazards and frequency and consequences

Records of potential hazards and consequences associated with airborne preliminary surveys and airborne geophysical operations are not well documented. However the hazards and consequences have been well identified by pilots and aerial surveying operators who have first-hand experience gained over many years of carrying out these and similar low altitude activities such as:

- aerial crop spraying;
- stock mustering;
- faunal censuses (e.g. camels and kangaroos); and
- high-tension power line maintenance inspection flights.

Airborne preliminary surveys and airborne geophysical operations are usually conducted over a short period. The frequency with which hazards can occur can be confidently estimated based on the number of times that airborne preliminary surveys and airborne geophysical activities are conducted. (Refer Table 1).

Table 1: Potential environmental hazards and consequences

Hazard	Frequency	Potential consequence
Low-Level Flying Aircraft	Rare	Landowner Disturbance Disturbance to Stock Disturbance to Native Fauna/avifauna Death of native fauna and of avifauna species of conservation significance
Aircraft Refuelling outside areas designed to contain spills	Rare	Fuel and Oil Spill causing local soil contamination

Table 2: Environmental objectives and mitigation strategies

Potential Consequence	Environmental Objectives	Issue Specific Mitigation Strategies	Extent to which consequence can be addressed	Significance of Consequence
Landowner Disturbance	1. To minimise disturbance to landowners	Where practical, advise landowners of scope, schedule and duration of survey Flight planning includes noting of location of landowner infrastructure and operations When-ever practical accommodate landowners' specific requirements	Adverse consequences can be managed in the short term	LOW
Disturbance to Stock	2. To minimise disturbance to stock	Where practical, advise landowners of scope, schedule and duration of survey Where practical, avoid flying over livestock watering points or concentrations of livestock (eg mustering operations)	Adverse consequences can be managed in the short term	LOW
Minimise disturbance to native fauna and avifauna	3. To prevent disturbance to native fauna and avifauna	Planning should identify issues specific to the region which might be impacted by the flying activity, such as breeding times and migration periods. Low flying Aircraft will avoid these areas or periods of aggregation/breeding	Adverse consequences can be managed in the short term	LOW
Disturbance to the environment from waste handling and disposal	4. To minimise the impact on the environment of waste handling and disposal	All fuel oil and chemicals are stored, handled and transported in accordance with appropriate standards and guidelines e.g. EPA guidelines 080/07 Bunding and Spill Management, Australian Standard AS 1940 and Australian Dangerous Goods (ADG) Code..	Adverse consequences can be managed in the short term	LOW

Mitigation strategies

In addition to the issue specific mitigation strategies outlined in Table 2, proponents shall implement the following general management procedure.

Awareness program

All personnel involved with airborne preliminary surveys and airborne geophysical operations will be provided with a copy of Table 1 and 2 of this EIR. Operators shall ensure that all personnel are adequately aware of the relevant impact mitigation strategies. In undertaking activities proponents need to be mindful of their obligations under legislation relevant to airborne operations.

Implementation strategies

Licensees and their contractors shall develop site (i.e. area) specific mitigation strategies. In undertaking activities, operators and their contractors need to be mindful of their obligations under relevant legislation including but not limited to:

- *Petroleum and Geothermal Energy Act 2000;*
- *Civil Aviation Act 1988;*
- *Environment Protection Act 1993;*
- *Aboriginal Heritage Act 1988;*
- *Native Vegetation Act 1991;*
- *National Parks and Wildlife Act 1972;* (Table 3); and
- *Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth);
- *Adelaide Dolphin Sanctuary Act 2005;* and
- *Marine Parks Act 2007.*

Table 3: Types of protected areas and relevant legislation

Reserve Type	Legislation
National Park	<i>National Parks and Wildlife Act 1972</i>
Conservation Park	<i>National Parks and Wildlife Act 1972</i>
Wilderness Protection Area	<i>Wilderness Protection Act 1992</i>
Game reserve	<i>National Parks and Wildlife Act 1972</i>
Marine Parks	<i>Marine Parks Act 2007</i>
Regional Reserve	<i>National Parks and Wildlife Act 1972</i>
Recreation Park	<i>National Parks and Wildlife Act 1972</i>
Conservation Reserve	<i>Crown Lands Act 1929</i>

Contractual obligations

All contracts with companies undertaking airborne preliminary surveys and airborne geophysical operations shall include a requirement to:

- Operate in a manner consistent with the proponent's Environmental Policy; and
- To follow the mitigation strategies outlined in this EIR.

Reporting

Any complaint from landowner/occupiers arising as a direct result of airborne operations shall be reported to the proponent.

Significance of consequences

A qualitative assessment has been made of the significance of the potential environmental consequences using the methodology outlined in PIRSA (2000), which proposes an assessment based on the following criteria:

- The **predictability (or certainty)** of hazards and consequences, with regard to their size, scope duration, likelihood and stakeholder concerns; and
- The degree to which consequences can be **managed** in relation to being avoided, likelihood of occurring, duration, size and scope, cumulative effects and stakeholder concerns.

The result of the assessment was that all potential impacts were of **LOW** significance on the basis that:

- All hazards and consequences can be accurately **predicted** to a high level of confidence; and
- Either adverse consequences can be **avoided** or it is **highly unlikely** that they will occur or adverse consequences can be **managed** in the short term.

CONSULTATION

Consultation with external stakeholders must be conducted during the planning and implementation phases of the operation. Records of all consultations must be kept. Proponents will consult, **as appropriate** with:

- State Government Departments (in particular DMITRE, and DENR);
- Local Government; and
- Landowner/occupiers.

Regulation 10(1) (e) of the *Petroleum and Geothermal Energy Act 2000* requires the identification and listing of all landowners who may be affected by airborne preliminary surveys and geophysical operations. As this EIR applies to the whole State, this requirement is considered to be impractical.

REFERENCES

The following reference was reviewed as part of the preparation of this document:

PIRSA, (2001). *Criteria for Classifying the Level of Environmental Impact of Regulated Activities: Requirements under Part 12 Petroleum Act Petroleum and Geothermal Energy Act 2000.*

PIRSA, (2006), *Environmental impact report for airborne geophysical operation in South Australia.* PIRSA, Adelaide SA.

PIRSA, (2006), *Statement of environmental objectives for airborne geophysical operations in South Australia.* PIRSA, Adelaide SA.

Much of the material used in preparing these documents was sourced from the document prepared by Ecos Consulting for PIRSA:

Ecos Consulting, 2001. *Environmental Impact Report for Pipeline Preliminary Survey Activities in South Australia.* (Prepared for PIRSA)

ABBREVIATIONS

DMITRE	Department for Manufacturing, Innovation, Trade, Resources and Energy
EIR	Environmental impact report
PIRSA	Primary Industries and Resources, South Australia
DENR	Department of Environment and Natural Resources
mm	millimetre
SEO	Statement of environmental objectives prepared in accordance with section 99 and 100 of the <i>Petroleum and Geothermal Energy Act 2000</i> and Regulations 12 and 13.