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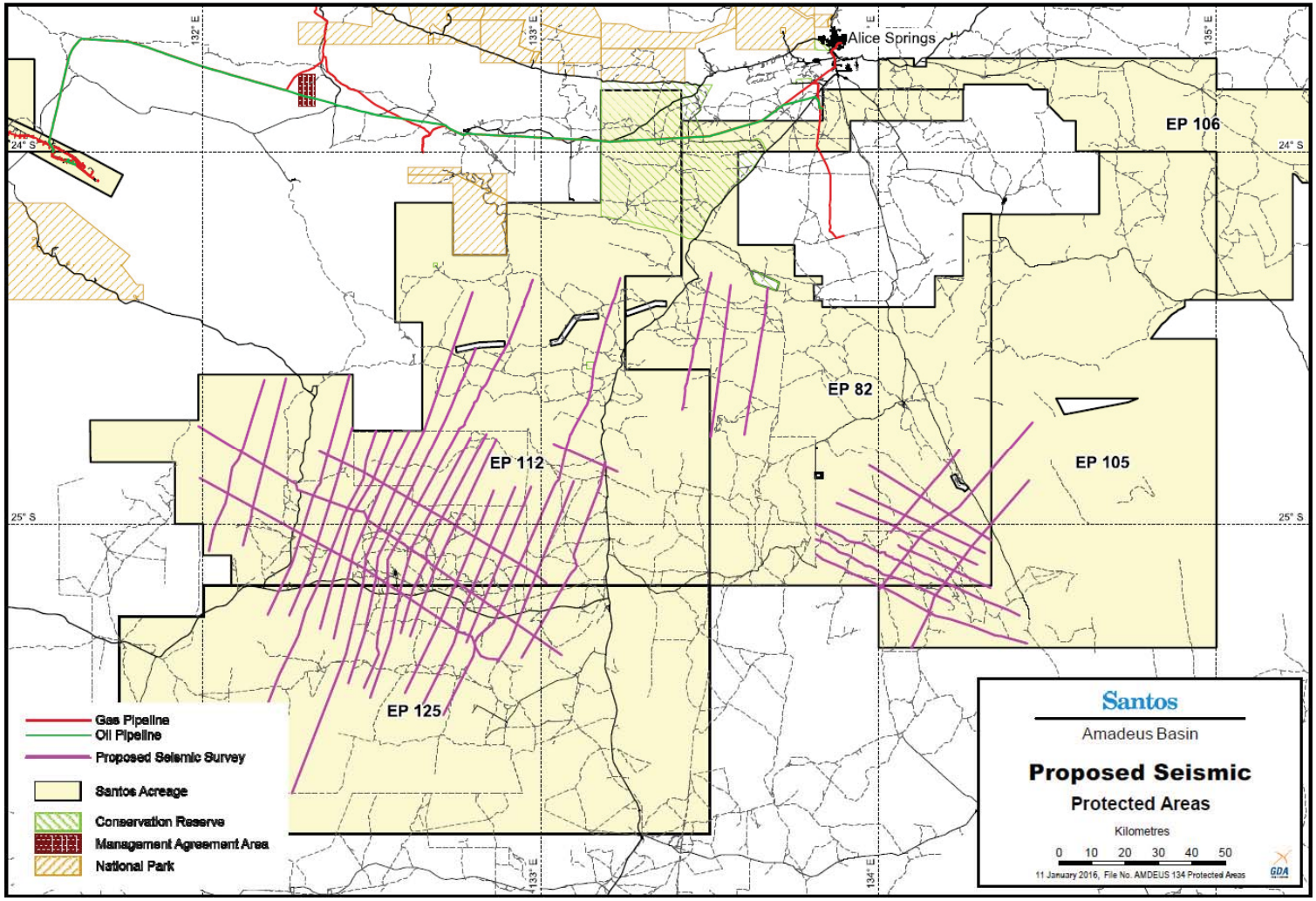

Figure 4-4: Protected and Conservation Areas

4.3.3 Threatened Flora and Fauna

Within the Arid Lands Region of the NT, there are 76 threatened species, 41 of which are listed as threatened nationally and 70 that are listed as threatened in the Territory. Bednall's Land Snail, listed as Critically Endangered in the NT, is the most severely threatened species that is still thought to occur in the region. The region has 47 species listed as migratory under international agreements.

Interrogation of databases and a review of published material indicate that a number of rare or threatened species have been recorded within the region. A search of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters database (DoE 2016) and a review of Northern Territory flora and fauna databases (DLRM 2014d) was undertaken to identify nationally listed threatened flora or fauna that may occur or are likely to occur. These searches identified 5 birds, 1 insect, 5 mammals, 3 reptiles, 9 plants, 1 cycad and 9 listed migratory species (all birds) and 10 listed marine species (also birds) that may or are likely to occur within the Project Area (Search results provided in Appendix A). The search did not identify any Threatened Ecological Communities in the area.

Due to the small nature and scale of the disturbance footprint associated with seismic activities no Matters of National Environmental Significance (MNES) relating to threatened flora or fauna will be significantly impacted by the proposed activities.

4.3.4 Significant Habitat

The EPBC Act matters search identified one nationally important wetland being the Karinga Creek Palaeodrainage System. This system is good example of a series of groundwater discharge lakes, of varied hydrological character, in a desert environment, which also function as episodic lakes. The lakes system will be avoided by the proposed activities.

No other significant habitat has been identified within the Project Area (DLRM 2014a). The habitat of the Project Area is consistent with and widespread within each Bioregion.

4.3.5 Fire Regime

Aboriginal people have traditionally used fire as a tool during hunting and gathering. These fires have shaped vegetation and faunal patterns across central Australia. The advent of pastoralism brought new approaches regarding fire use resulting in fewer but larger fires initiated during the warmer seasons.

Fire management or controlled burns within the region are a common occurrence. Controlled burns are undertaken to reduce the possibility of uncontrolled fires and to assist in land management (e.g. local Indigenous people in traditional hunting activities).

4.3.6 Pest Plant and Animal Control

Pest plant and animal control is considered to be a significant land management issue in the Northern Territory. The Amadeus Basin has three Weeds of National Significance (WoNS), which are also declared weeds in the Territory, and an additional 28 Territory declared weeds (DLRM 2014b). Thirteen introduced feral animal species are a problem in the region.

While the Amadeus Basin region is considered to be relatively free of pest plant species, weed distribution is more often related to environmental disturbances caused by the construction of roads and tracks, cattle grazing and feral animals. Weeds are most prevalent on land under pastoral lease with infestations generally concentrated around infrastructure such as water points, fence lines and tracks, and also along the banks of watercourses where cattle and feral animals tend to congregate.

Pest animals identified in the region include rabbits, feral cats, pigs, donkey and camels.

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5 ENVIRONMENTAL RISKS AND IMPACTS, DESCRIPTION AND ASSESSMENT

Activities (or elements of activities) that have the potential for environment impact[1] have been identified and assessed for the 2016 Southern Amadeus Seismic Program in accordance with *EHSMS 09 – Hazard Identification, Risk Assessment and Control*. The risk assessment process defined under EHSMS 09 includes:

- Identification of environmental hazards associated with the Program activities
- Consideration of the mode of impact upon the environment of each hazard and the potential maximum consequence if no control measures are implemented
- Consideration of controls that are appropriate and implemented to manage each hazard
- Consideration of the likelihood (probability) of the consequence occurring with these controls in place
- Re-consideration of the final maximum consequence that is credible
- Calculation of the environmental risk using the Santos Group Risk Matrix (see below)
- Assessment to determine if the risk is as-low-as-reasonably–practicable (ALARP). If it is not, then consideration of further risk control measures to be implemented to reduce the risk to ALARP, or to an otherwise acceptable risk level

The Santos Operations Risk Matrix is provided in Table 5-1.

Based on Santos' operational experience, the environmental hazards that have the potential to result in environmental consequences are identified as:

- Disposal of domestic and chemical wastes.
- Earthworks associated with seismic line and access track preparation and camps and rehabilitation.
- Operational induced bush fire.
- Seismic source activation.
- Spills or leaks associated with storage of oil, fuels and chemicals, refuelling operations and high pressure hydraulic systems.
- Vehicle movements.

Potential environmental consequences that may result from seismic operations include:

- Contamination of soil, groundwater and / or watercourses.
- Damage to landholder infrastructure.
- Damage to petroleum infrastructure.
- Damage to soil (erosion, contamination, compaction, generation of bulldust).
- Disturbance to natural drainage patterns.
- Disturbance to other cultural or environmentally sensitive sites.
- Disturbance to sites of sacred or cultural heritage significance to Aboriginal people.
- Disturbance, injury or death to livestock or native fauna.
- Introduction and or spread of weeds, pest plants, animals and pathogens.
- Loss of amenity (noise generation, airborne dust, visual impact).
- Loss of organic beef or cattle care certification.
- Loss of vegetation and habitat.
- Unauthorised third party access.

[1] An environmental impact is any change to the environment, whether adverse or beneficial, resulting from an activity.

- Uncontrolled discharge of artesian aquifer.

For each activity, the following information is summarised in Table 5-2:

- Environmental hazards
- Potential consequences
- Assessment of residual risk.

Table 6-1 shows the risk mitigation measures (operational controls) considered in the assessment of residual risk.

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Table 5-1: Santos Risk Matrix

CONSEQUENCE			I	II	III	IV	V	VI
	PEOPLE	P	**Minor injury** - first aid treatment or no effect. Process Safety Exception	Injury requiring **medical treatment** with no lost time. LOCI Tier 2 OR any loss of primary containment irrespective of the quantity	Medium term **reversible disability** to one or more persons. Significant medical treatment, disabling or lost time injury. LOCI Tier 1	Extensive injuries OR **irreversible disability** OR multiple lost time injuries. High Impact Process Safety Incident	**Single fatality** and/or severe irreversible disability to multiple people	**Multiple fatalities** or significant irreversible disability to 10's of people
	ENVIRONMENT	E	**Localised** and short term environmental or community impact – readily dealt with	**Localised and short term impact** to an area, plants or animals of environmental value. Readily treated.	**Localised and medium term impact** to areas, plants or animals of significant environmental value. Remediation may be difficult or expensive.	**Extensive and medium-term impact** to an area, plants or animals of recognised environmental value. Remediation possible but may be difficult or expensive.	**Destruction of an important population of plants or animals or of an area of significant environmental value.** Complete remediation not practical or possible.	**Regional and long term impact** on an area of significant environmental value. Destruction of an important population of plants and animals with recognised conservation value. Complete remediation impossible.
	FINANCIAL	A	< AUD 30K IMPACT	AUD 30K-300K IMPACT	AUD 300K-3M IMPACT	AUD 3-30 M IMPACT	AUD 30-300M IMPACT	> AUD 300M IMPACT
	REPUTATION	R	**Kept on site.** No media or community interest	**Local media coverage.** One or two community complaints.	**State media coverage.** Interest by regulator.	**State media coverage over several days.** Involvement by regulator and shareholders.	**National media coverage** over several days. Shareholders and Board exercise control. Potential for class action.	**Prominent international media coverage** over several days. Long term affect on share price Leads to changes at executive level management.
	LEGAL	L	Minor legal issues, non-compliances and breaches with regulation.	Breach of regulation with investigation or report to authority with possible prosecution and fine.	Major breach of regulation with punitive fine. Involvement of senior management.	Litigation or prosecution costing >$1M. Investigation by regulatory body. Litigation involving weeks of senior management time.	Major litigation or prosecution with damages or fines of >$10m+ plus significant costs.	Public inquiry taking up resources and executive time. Major litigation or prosecution with damages/fines of >$100m+ plus significant costs. Custodial sentence for a manager.

LIKELIHOOD	INCIDENT	THREAT		I	II	III	IV	V	VI
	Has occurred **three times or more during the last year**	**ALMOST CERTAIN** Occurs in almost all circumstances OR could occur within **days to weeks**	f	2	3	4	5	5	5
	Has occurred at least **once in the last year**	**LIKELY** Occurs in most circumstances OR could occur within **weeks to months**	e	2	3	4	4	5	5
	Has occurred **once in 3 years**	**OCCASIONAL** Has occurred before in Santos OR could occur within **months to years**	d	2	2	3	4	4	5
	Has occurred **once in 10 years**	**POSSIBLE** Has occurred before in the industry OR could occur within the **next few years**	c	1	2	2	3	4	5
	Has occurred **once in 30 years**	**UNLIKELY** Has occurred elsewhere OR could occur **within decades**	b	1	1	2	2	3	4
	Has occurred **once in 100 years**	**REMOTE** Requires exceptional circumstances and is unlikely even in the long term OR only occurs as a **"100 year event"**	a	1	1	1	2	3	3

RISK LEVEL	MITIGATION / INVESTIGATION FOCUS (ADD ADDITIONAL BUSINESS UNIT SPECIFIC REQUIREMENTS WHERE REQUIRED)	GOVERNANCE MECHANISM (ADD ADDITIONAL BUSINESS UNIT SPECIFIC REQUIREMENTS)	AUTHORITY FOR ACCEPTANCE OF PLAN TO ACHIEVE ALARP	AUTHORITY FOR ACCEPTANCE OF RESIDUAL RISK AT ALARP
5	- Intolerable risk level - Following verification of the residual risk at level 5, activity must stop - Activity cannot recommence until controls implemented to reduce residual risk to level 4 or lower - Dedicated multi-disciplinary incident investigation team - Management involvement in the investigation	- Top Level Operations Governance or EHS Forum/Committee - Sponsorship of incident investigation at Level 2 or 3 Manager level	Level 3 Manager (e.g. General Manager, Country President) Normally within 1 month	Intolerable Risk Level
4	- Assess risk to determine if ALARP - If ALARP, activities related to maintenance of controls/ barriers prioritised & managed - If not ALARP, Improve existing controls and/or implement new controls - Dedicated multi-disciplinary incident investigation team	- Value Stream level performance reviews or applicable EHS Forums - Sponsorship of incident investigation at level 3 Manager level	Level 3 Manager (e.g. General Manager, Country President) Normally within 1 month	Level 3 Manager (e.g. General Manager, Country President) Normally within 1 month
3	- Assess risk to determine if ALARP - If ALARP, activities related to maintenance of controls/ barriers prioritised & managed - If not ALARP, Improve existing controls and/or implement new controls - Full incident investigation	- Asset level performance reviews or applicable EHS forums - Sponsorship of incident investigation at Level 4 Manager Level	Level 4 Manager (e.g. Asset or Functional Manager) Normally within 3 months	Level 4 Manager (e.g. Asset or Functional Manager) Normally within 3 months
2	- Assess risk to determine if ALARP - If ALARP, activities related to maintenance of controls/ barriers prioritised & managed - If not ALARP, Improve existing controls and/or implement new controls - Incident investigations using simple tools	- Site level performance review or applicable EHS forums - Sponsorship for incident investigation at Level 5 Manager/Supervisor level	Level 5 Manager (e.g. Area Manager, Team Leader, Superintendent or equivalent)	Level 5 Manager (e.g. Area Manager, Team Leader, Superintendent or equivalent)
1	- Managed as stipulated by the related work processes - No incident investigation required	- Periodic reviews to identify patterns and underlying threats	Deemed ALARP	Deemed ALARP

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Table 5-2: Summary of residual risk for seismic operations

Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
Line and access track preparation	Earthworks	• Loss of vegetation and habitat	Negligible	Possible	1
		• Damage to soil (erosion, contamination, compaction, generation of bulldust).	Minor	Unlikely	1
		• Disturbance to natural drainage patterns.	Minor	Unlikely	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Introduction and or spread of weeds, pest plants, animals and pathogens.	Minor	Unlikely	1
		• Loss of amenity (noise generation, airborne dust, visual impact).	Negligible	Possible	1
		• Damage to landholder infrastructure.	Minor	Unlikely	1
		• Damage to petroleum infrastructure.	Minor	Remote	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people.	Major	Unlikely	2
		• Unauthorised third party access.	Minor	Unlikely	1
	Fire	• Damage to landholder infrastructure.	Minor	Unlikely	1
		• Damage to petroleum infrastructure.	Minor	Remote	1
		• Loss of vegetation and habitat.	Minor	Possible	2
	Vehicle movements	• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2

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Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
		• Loss of amenity (noise generation, airborne dust, visual impact)	Negligible	Possible	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people	Major	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Damage to petroleum infrastructure	Minor	Remote	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Unauthorised third party access.	Minor	Unlikely	1
	Spills and leaks	• Contamination of soil, groundwater and / or watercourses.	Minor	Unlikely	1
		• Loss of organic beef or cattle care certification.	Major	Remote	1
Line surveying	Vehicle movements	• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Loss of amenity (noise generation, airborne dust, visual impact)	Negligible	Possible	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people	Major	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Damage to petroleum infrastructure	Minor	Remote	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Unauthorised third party access.	Minor	Unlikely	1

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Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
Recording	Vibrator operations	• Damage to soil (erosion, contamination, compaction, generation of bulldust).	Minor	Unlikely	1
		• Loss of amenity (noise generation, airborne dust, visual impact)	Negligible	Possible	1
		• Disturbance, injury or death to livestock or native fauna.	Negligible	Unlikely	1
		• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people	Major	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Damage to petroleum infrastructure	Minor	Remote	1
	Vehicle movements	• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Loss of amenity (noise generation, airborne dust, visual impact)	Negligible	Possible	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people	Major	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Damage to petroleum infrastructure	Minor	Remote	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Unauthorised third party access.	Minor	Unlikely	1
	Fire	• Damage to landholder infrastructure.	Minor	Unlikely	1

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Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
		• Damage to petroleum infrastructure.	Minor	Remote	1
		• Loss of vegetation and habitat.	Minor	Possible	2
	Spills and leaks	• Contamination of soil, groundwater and / or watercourses.	Minor	Unlikely	1
		• Loss of organic beef or cattle care certification.	Major	Remote	1
Camp sites and associated supply logistics	Vehicle movements	• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Loss of amenity (noise generation, airborne dust, visual impact)	Negligible	Possible	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people	Major	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Damage to petroleum infrastructure	Minor	Remote	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Unauthorised third party access.	Minor	Unlikely	1
	Earthworks	• Damage to soil (erosion, contamination, compaction, generation of bulldust).	Minor	Unlikely	1
		• Disturbance to natural drainage patterns.	Minor	Unlikely	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2

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Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
		• Loss of amenity (noise generation, airborne dust, visual impact).	Negligible	Possible	1
		• Damage to landholder infrastructure.	Minor	Unlikely	1
		• Damage to petroleum infrastructure.	Minor	Remote	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people.	Major	Unlikely	2
		• Unauthorised third party access.	Minor	Unlikely	1
	Fire	• Damage to landholder infrastructure.	Minor	Unlikely	1
		• Damage to petroleum infrastructure.	Minor	Remote	1
		• Loss of vegetation and habitat.	Minor	Possible	2
	Spills and leaks	• Contamination of soil, groundwater and / or watercourses.	Minor	Unlikely	1
		• Loss of organic beef or cattle care certification.	Major	Remote	1
	Disposal of domestic and chemical waste	• Contamination of soil, groundwater and / or watercourses.	Minor	Unlikely	1
		• Loss of organic beef or cattle care certification.	Major	Remote	1
Line and access track preparation	Earthworks	• Damage to soil (erosion, contamination, compaction, generation of bulldust).	Minor	Unlikely	1
		• Disturbance to natural drainage patterns.	Minor	Unlikely	1

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Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Loss of amenity (noise generation, airborne dust, visual impact).	Negligible	Possible	1
		• Damage to landholder infrastructure.	Minor	Unlikely	1
		• Damage to petroleum infrastructure.	Minor	Remote	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people.	Major	Unlikely	2
		• Unauthorised third party access.	Minor	Unlikely	1
	Vehicle movements	• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Loss of amenity (noise generation, airborne dust, visual impact)	Negligible	Possible	1
		• Disturbance to sites of sacred or cultural heritage significance to Aboriginal people	Major	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Damage to petroleum infrastructure	Minor	Remote	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Unauthorised third party access.	Minor	Unlikely	1
	Spills and leaks	• Contamination of soil, groundwater and / or watercourses.	Minor	Unlikely	1

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Activity	Hazard	Potential Consequence	Severity	Likelihood	Residual Risk
		• Loss of organic beef or cattle care certification.	Major	Remote	1
Post Survey Monitoring / Auditing	Vehicle movements	• Introduction and or spread of weeds, pest plants, animals and pathogens.	Moderate	Unlikely	2
		• Damage to landholder infrastructure	Minor	Unlikely	1
		• Disturbance, injury or death to livestock or native fauna.	Minor	Unlikely	1
		• Unauthorised third party access.	Minor	Unlikely	1

6 PERFORMANCE OBJECTIVES, STANDARDS AND MEASUREMENT CRITERIA

The objectives described in this EP are based on operational information detailed in the *South Australia Cooper Basin and Arid Regions, Environmental Impact Report: Geophysical Operations* (Santos, 2012a) (EIR), and while consistent with those contained in the *South Australia Cooper Basin and Arid Regions Statement of Performance objectives: Geophysical Operations* (Santos, 2012b), the objectives have, where appropriate, been amended to reflect the specific characteristics of the Southern Amadeus environment.

Table 6-1 details the performance objectives defined for this project; the measurement criteria that will be used to assess these objectives; the operational controls that will be implemented for the project; and the Santos Standards that apply to the project.

6.1 Performance Objectives

Santos has defined 10 performance objectives for all onshore seismic survey operations including the Southern Amadeus 2D seismic survey. The performance objectives are:

1. Minimise the visual impact of seismic operations;
2. Minimise disturbance to and contamination of soil resources;
3. Minimise disturbance to native vegetation and native fauna;
4. Avoid disturbance to sites of cultural, sacred and heritage significance;
5. Minimise disturbance to livestock, pastoral infrastructure and landholders;
6. Avoid the introduction or spread of exotic species and implement control measures as necessary;
7. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources;
8. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal;
9. Remediate and rehabilitate operational areas as necessary; and
10. To generate no fires from the Seismic Operations.

Appendix B provides a summary of the EP commitments.

6.2 Measurement Criteria

One of the implications of objective based regulation is the need for a means of identifying and assessing the level of achievement of performance objectives. This EP contains the measurement criteria that have been developed to address this. The measurement criteria are given in specific terms and clearly define what acceptable practice is for the seismic survey.

Each objective identified will be assessed using a selection of the measurement criteria. This will enable Santos, regulatory agencies and stakeholders to determine the level of achievement of the objectives. Criteria relevant to each performance objective are presented in Table 6-1. Specific Goal Attainment Scaling (GAS) criteria are presented in Table 6-2.

The criteria for measuring the achievement of performance objectives covered in the EP will use one or more of the following methodologies:

- Defined conditions;
- Goal attainment scaling;
- Photo monitoring; and/or
- Other techniques as appropriate.

6.2.1 Defined conditions

In some cases the achievement of an objective can be assessed through ensuring defined conditions are met or acted upon. Such conditions include:

- Prohibitions on the undertaking of specific actions that can have long-term consequences and can only be adequately managed through the avoidance of defined unacceptable activities. For example, bulldozing of mature trees has a long-term impact that is not acceptable or warranted.
- Requirements to carry out certain actions in accordance with approved procedures or industry standards. For example, compliance with the Australian Petroleum Production and Exploration Association (APPEA) *Code of Environmental Practice*.

6.2.2 Goal attainment scaling (GAS)

Some performance objectives are likely to be subject to a certain degree of subjective judgement. To minimise the discrepancy from one observer to another in this situation, GAS is used to measure the degree to which such objectives are achieved. A series of criteria is used, which is described in writing and / or photographically. GAS is particularly useful in measuring the achievement of objectives relating to disturbances to natural vegetation and soil.

6.2.3 Photo monitoring

Photographic evidence can provide visual documentation on the extent and nature of an impact. Re-occupation of photo points over time can also provide visual evidence of the level of recovery of vegetation and soils from the initial impact arising from the seismic survey (see Section 3.3.5).

6.2.4 Other techniques as appropriate

Other techniques may exist, or could be developed in the future, which could be beneficial. Use of other techniques should be incorporated where they are considered to be appropriate and effective.

6.3 Operational Controls

Santos has specific operating procedures in place for its operations that, along with the EHSMS, form a system of operational control (as defined in *AZ/NZS ISO14001*). The operational controls in place for the Program are based on requirements set out in:

- Seismic Program;
- Santos EHSMS (including Environment Hazard Standards and Safety Hazard Standards);
- The Santos (2011a) South Australia Cooper Basin and Arid Regions: Statement of Performance objectives: Geophysical Operations and Santos (2011b) South Australia Cooper Basin and Arid Regions: Environmental Impact Report: Geophysical Operations; and
- Australian Petroleum Production and Exploration Association (APPEA) *Code of Environmental Practice*.

6.4 Santos Standards

The Santos Environment, Health and Safety Management System (EHSMS) has been developed by Santos to provide a company-wide approach to effectively manage Environment, Health and Safety (EHS) risks and to allow for continual EHS improvement. An EHS Committee has been established in order to ensure an established protocol in relation to EHS is maintained. The EHSMS is readily available to employees and contractors via the Santos intranet 'The Well'.

The EHSMS Framework provides structured, comprehensive and efficient EHS practices for Santos' activities and operations and is consistent with both *AS 4801:2000 Occupational Health and Safety Management Systems – Specification with Guidance for Use* and *AS/NZS ISO 14001:2004 Environmental Management Systems – Specification with Guidance for Use*.

The relevant Santos standard to each performance objective is included in Table 6-1.

- EHS01 – Biodiversity and Land
- EHS02 – Underground Storage Tanks and Bunds
- EHS03 – Produced Water Management
- EHS04 – Waste
- EHS05 – Air Emissions
- EHS06 – Environmental Impact Assessment and Approvals
- EHS07 – Energy Efficiency
- EHS08 – Contaminated Sites
- EHS09 – Pest Plants and Animals
- EHS10 – Water Resources
- EHS11 – Cultural Heritage
- EHS12 – Noise Emissions

Health and Safety Hazard Standards include:

- HSHS02 – Land Transportation
- HSHS08 – Chemical Management
- HSHS12 – Occupational Noise

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Table 6-1: Performance objectives, measurement criteria, Operational Controls and Performance Standards

Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
Objective 1: • Minimise the visual impact of seismic operations	• Pre-survey planning to minimise visibility of operations with the use of Santos' GIS. • Maximise use of vegetation or landforms to disguise operations. • Avoid extensive side cuts. • Lines are prepared to a single blade width only (approximately 4m to 5m). • Lines are weaved at least every 75m to 100m about the general line of traverse and stands of vegetation. • Lines are doglegged at road and track crossings preferably around vegetation. • Dozers are walked with blade up wherever possible. • All litter is to be managed and disposed of correctly.	• EHS01 – Biodiversity and Land • EHS04 – Waste	• Pre-survey planning has been undertaken to minimise visibility of operations and records are available for audit. • Seismic survey lines and campsites have been appropriately located and prepared to minimise the visual impact. • No litter remains at camps. • The attainment of 0, +1 or +2 GAS criteria for 'visual impact' objective as listed in Table 6-2. • EMPs are selected from photo points where additional monitoring is deemed appropriate.
Objective 2: • Minimise disturbance to and contamination of soil resource	• All windrows are removed either during or on completion of work. • Areas subject to inundation will be assessed for conduciveness to support vehicles. • Blade work is banned on naturally smooth surfaces or flat easy terrain. Minimal blade work is permitted elsewhere for access. • Camp sites are positioned close to existing roads where possible and are ripped, if necessary, on completion of work. • Creek bank vegetation is left intact and detours sought if too dense to pass through.	• EHS01 – Biodiversity and Land • EHS02 – Underground Storage Tanks and Bunds • EHS04 – Waste • EHS08 – Contaminated Sites • HSHS02 – Land Transportation	• Proposed survey lines and campsites have been appropriately located and prepared to minimise the disturbance to soil resources. • Survey planning has been undertaken to minimise impacts of operations and records are available for audit. • No refuelling occurred outside designated refuelling / servicing areas. • Spills or leaks were managed and clean up actions initiated.

Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	• Off line driving for the main crew is prohibited – no bush bashing or short cuts are permitted. • Operations are shut down during wet weather or flooding and only restarted once potential for extensive damage has passed. Unavoidable damage is reinstated on completion of work. • EMPs will be established to monitor and document soil disturbance and recovery. • Where required, access tracks will be watered and is reinstated after use. • The number of camp sites will be minimised with the aim being to share existing sites wherever reasonably practicable. • Unavoidable compaction in areas other than those susceptible to erosion, will be ripped on completion of work. • Where possible, existing tracks, roads or seismic lines will be used for access. • Use of road tanker fuel storage. • Use of drip trays for transfers. • Any spills have been contained and retrieved. • Oil spills areas will be ripped to an appropriate depth. • All fuel stored and used should be under the control of qualified or trained personnel. • Fuel and other lubricants will be appropriately stored and managed.	• HSHS08 – Chemical Management	• Records of spill events and corrective actions are maintained in accordance with company procedures. • Appropriate spill response equipment is available on site. • Fuel storage (>10,000L) contained within double skin tanker with safety valves. • Appropriate containment bunding for site drum storage (up to 200L) protection is implemented. • Attainment of 0, +1 or +2 GAS criteria for Disturbance to land surface' objective, as listed in Table 6-2. • EMPs are selected from photo points where additional monitoring is deemed appropriate.

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Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
Objective 3: • Minimise disturbance to native vegetation and fauna	• Terrain and vegetation is considered in planning stage when designing layout of the survey. • Camp sites are established in locations where the preparation of a new access track is not necessary or is minimal in length. • Off line driving is banned – no bush bashing or short cuts are permitted. • Vehicle access to survey lines is to be via existing access tracks or pre-existing survey lines, except where they have rehabilitated. Other temporary access tracks may be utilised where such use is likely to result in less environmental impact than other options. • Vegetation is removed only when absolutely necessary - avoided by weaving lines through vegetated areas. • Root stock, topsoil and seeds are left on line during line preparation. • Creek bank vegetation is left intact and detours located if dense. • All vehicles are thoroughly cleaned prior to entry into the survey area. • No heavy line preparation machinery is used in wetlands areas. • Natural drainage channels are left clear at line crossings.	• EHS01 – Biodiversity and Land • HSHS02 – Land Transportation	• No mature trees are removed. • The attainment of 0, +1 or +2 GAS criteria for 'Impact on vegetation' objective listed in Table 6-2. • EMPs are selected from photo points where additional monitoring is deemed appropriate.

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Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
Objective 4: • Avoid disturbance to sites of sacred or cultural and heritage significance	• Santos will obtain all necessary approvals and consents from CLC prior to commencement of line activities. • Santos will incorporate any sites identified by the Aboriginal Areas Protection Authority and the NT Heritage Council. • Santos and the Seismic Contractor will comply with approval conditions while undertaking all activities. • All line preparation personnel and crew supervisors will receive a project specific cultural heritage induction prior to commencing work. • All line preparation machinery operators are required to observe for cultural heritage sites that may have been missed during the Site Clearance process. • Known sites of sacred or cultural significance are identified, avoided and reported to a Cultural Heritage team member to ensure discoveries are managed in line with the relevant agreement and legislative requirements. • Any new sites identified during the survey operations will be reported to the Santos Cultural Heritage Team and avoided.	• EHS11 – Cultural Heritage	• No line preparation activities commence before receiving CLC SSCC, NT Heritage Council sites, AAPA Sites and assessment issued by Santos Cultural Heritage team. • Compliance with the conditions of the Cultural Heritage assessment issued by the Cultural Heritage team, this will include details of the SSCC. • All line preparation personnel and crew supervisors have completed the project specific induction before commencing work. • No known sites are disturbed by the operations. • Santos / Seismic Contractor has a mechanism in place to report and respond to any new sites discovered during survey operations. • Any new sites identified during operations were reported and avoided.
Objective 5: • Minimise disturbance to livestock, pastoral infrastructure and landholders	• Relevant landowners and occupiers are notified prior to survey of preparation of camp sites, preparation of survey lines and undertaking of operations.	• Landholder Agreements	• No reasonable concerns raised by stakeholders are left unresolved. • The attainment of 0, +1 or +2 GAS criteria for 'Impact on infrastructure' objective listed in Table 6-2.

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Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	• Relevant mineral and geothermal tenement holders shall be notified of survey of preparation of camp sites, preparation of survey lines and undertaking of operations. • Compliance with requirements of the Cattle Care and Organic Beef accreditation programmes or management as requested by the landholders, including full time monitoring by on field staff and inclusion in site inductions. • System is in place for logging landholder complaints to ensure that issues are addressed as appropriate. • Seismic sources are not to operate within the distance defined by Santos standards, of any pipeline, utility, installation or building. • Damage to station tracks is avoided. • All gates are left in the condition in which they were found (i.e. open / closed). • When necessary, all fences are restored to satisfaction of landowner / managers. • Inductions for all employees and contractors cover pastoral, conservation, legislation and infrastructure issues.		
Objective 6: • Avoid the introduction or spread of exotic species and implement control measures as necessary	• All vehicles, plant and equipment shall be cleaned and inspected prior to arrival at the project area. • A register of vehicle / equipment / machinery cleaning is kept.	• EHS09 – Pest Plants and Animals • HSHS02 – Land Transportation	• A register of machinery / vehicle wash down or cleanliness prior to arrival at the project site is available. • Weeds were not introduced into, or spread through project area as a result of seismic operations.

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Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	• Records of detection, monitoring or eradication of exotic weed or other pest or noxious species introduced by activities are.		
Objective 7: • Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources	• All access through watercourses are carefully assessed to determine the locations of least impact to channels and creek banks. • Any remediation work should be undertaken immediately upon completion of all activities. • If any contamination from spillage of oils or fuel occurs during vehicular operations, immediate effective clean-up procedures must be employed. • Storage and handling of hazardous substances shall be in accordance with HSHS08 – Chemical Management. • Supervisors shall ensure that all personnel are familiar with spill prevention measures including refuelling techniques (e.g. use of spill mats) and chemical storage and handling requirements. • Refuelling will not occur within 1km from major watercourses or sensitive ecological environments (wetlands). • Fuel and oil spills are reported, treated and or remediated and the ground ripped. • If any contamination from spillage of oils or fuel occurs during vehicular operations, immediate effective clean-up procedures must be employed. • All chemical and fuel storage areas shall be bunded.	• EHS01 – Biodiversity and Land • EHS02 – Underground Storage Tanks and Bunds • EHS04 – Waste • EHS08 – Contaminated Sites • EHS10 – Water Resources • HSHS02 – Land Transportation • HSHS08 – Chemical Management	• Camp sites and survey lines / traverses are located and constructed to avoid diversion of water flows. • The attainment of 0, +1 or +2 GAS criteria for 'disturbance to land surface' objective listed in Table 6-2. • There is no unnecessary interference with natural drainage features. • Fuel storage contained within double skin tanker with safety valves. • Appropriate containment bunding for site drum storage protection is implemented. • No spills occur outside designated refuelling/servicing areas. • Refuelling occurs at least 1km from watercourses or sensitive ecological environments (wetlands). • Appropriate spill response equipment is available on site. • Spills or leaks are cleaned up.

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Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	• Safety Data Sheets shall be obtained upon purchase of chemicals and kept on-site for all chemicals stored and handled. • Chemical use will be minimised where practicable and the minimum practicable volume will be kept on site. • Appropriate spill response equipment available on site. • Protective clothing, appropriate to the materials in use, will be provided. • Fuels, lubricants and chemicals shall be stored and handled within containment facilities away from the vicinity of watercourses and water storage areas. • Absorbent and containment material (e.g. absorbent matting) will be available where hazardous materials are used and stored and personnel trained in correct use. • Fuel storage contained within double skin tanker with safety valves.		
<u>Objective 8:</u> • Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal	• All empty drums will be stored on impervious areas with their closures in place, or transported immediately off-site. • All generated waste (including consumable rubbish such as lunch wrappers) shall be returned to the camp and placed in the appropriately waste receptacle. • All loads of rubbish are covered during transport.	• EHS04 – Waste	• Wastes are stored and transported to an approved waste disposal facility. • Waste register documents waste type, transportation contractor and disposal facility. • Waste register and transfer receipts to be provided to DME on completion of operations.

Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	• Covered bins are provided for the collection and storage of wastes. • No incineration or open burning of waste materials shall occur on-site. • No liquid wastes will be released accidentally or routinely discharged to surface waters. • Refuse containers/bags will be available with each crew. • Waste shall be removed from the camp by an appropriately licensed contractor and disposed at an approved facility. Records shall be kept of disposal of waste oils and fluids and hazardous wastes.		• 0, +1 or +2 GAS criteria are attained for 'Pollution or litter objective listed in Table 6-2.
<u>Objective 9:</u> • Remediate and rehabilitate operational areas as necessary	• All access will be clearly identified and all vehicles and machinery shall remain within the designated access ways and surveyed seismic lines. • Proper use of access tracks involves travel at safe speeds, utilisation of designated parking areas, sensible use during wet weather, gates being left as found. • During rehabilitation operations, work will cease if weather conditions inhibit access. • All earthworks shall be confined to the survey lines, access tracks and camp sites. • All marking, flagging and signage not required will be removed.	• EHS01 – Biodiversity and Land	• Refer to assessment criteria for Objectives 2, 3, 7 and 8. • 0, +1 or +2 GAS criteria are attained for 'visual impact' and 'impact on vegetation' as listed in Table 6-2.

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Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	• If contamination from spillage of oils or fuel occurs during vehicular operations, immediate effective clean-up procedures will be employed. • All gates are left in the condition in which they were found (i.e. open / closed). • Fences will be reinstated after all access is completed. • All windrows are removed either during or on completion of work. • Camp site areas are ripped, if necessary, on completion of work. • Operations are shut down during wet weather or flooding and only restarted once potential for extensive damage has passed. Unavoidable damage is reinstated on completion of work. • Unavoidable compaction in areas other than those susceptible to erosion, will be ripped on completion of work. • No heavy machinery is used in wetlands areas for rehabilitation. • Public access along survey lines will be discouraged by the use of signs at public roads. • Windrows/shoulders on public tracks are reinstated on completion of work. • Lines adjacent to public roads may also be blocked with timber as an access deterrent. • Photopoint monitoring incorporates post-survey re-visits with emphasis on sensitive areas and areas		

Performance Objective	Operational Controls	Performance Standards	Measurement Criteria
	subject to erosion such that additional restoration work can be implemented if required.		
Objective 10: •To generate no fires from the Seismic Operations.	•Include Fire Season education as part of the induction. •Appropriate fire prevention procedures in place. •Appropriate fire fighting gear available to the crew. •All vehicles will be equipped with portable fire extinguishers. •Machinery and vehicles should be parked in areas of low fire risk and be free of any combustible material, for example in the case of dry grass build up. •Open fires, including open barbecues, billy fires, and brush burning, are banned on the Project.	•EHS01 – Biodiversity and Land	•No fires were started due to operations. •All personnel were informed on the fire danger season and associated restrictions.

Table 6-2: Goal Attainment Scaling (GAS) criteria for assessing seismic lines on completion of survey in the Northern Territory[2]

[2] Based on the Santos (2011a) South Australia Cooper Basin and Arid Regions: Statement of Performance objectives: Geophysical Operations and Santos (2011b) South Australia Cooper Basin and Arid Regions: Environmental Impact Report: Geophysical Operations.

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LAND SYSTEM	MEASURE Associated goals	SCORE +2(b and d)	+1(b and d)	0(b and d)	-1(a and d)	-2(a, c and d)
Non land system specific	• Visual impact • (Obj 1)	• No evidence of survey operations	• Only wheel tracks are evident. • Line of sight is significantly impaired.	• Established roads and tracks have been reshouldered. • Doglegs have been placed at established roads and tracks in vegetated areas. • Dozer or grader has been walked 40m either side of established road or track. • Line weaves through vegetated areas at least every 100m. • Line of sight is impaired. • Line follows route that is most conducive to access by utilising naturally clear areas through vegetation.	• No doglegs at established roads or tracks in vegetated areas. • Weaving is not appropriate to terrain traversed. • Line of sight is unimpaired.	• Line is clearly evident and dominates the landscape

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LAND SYSTEM	MEASURE Associated goals	SCORE +2(b and d)	+1(b and d)	0(b and d)	-1(a and d)	-2(a, c and d)
Non land system specific	• Impact on infrastructure • (Obj 5)	• No impact to any pastoral, tourist or production infrastructure	• No observable repair or damage to infrastructure	• Any impact to infrastructure has been reported and reinstated or repaired.	• Repair to damaged infrastructure is incomplete or inappropriate. • Damage has not been reported	• Damage to any infrastructure has been left un-repaired and not reported.
Non land system specific	• Pollution or litter • (All Objectives)	• No pollution or litter	• No evidence of water or oil pollution. • Maximum of 1 pin flag/km	• Wastewater and vehicle oil spills have been managed appropriately • Maximum of 2 pin flags/km • No other litter	• Wastewater forms ponds or extensive boggy ground • Vehicle oil spills have not been remedied • Maximum of 9 pin flags/km • Maximum of 4 items of other litter/km	• Extensive waste water ponding • Oil spills of more than 20L have not been remedied • Ten or more pin flags/km. • Five or more items of other litter/km
	• Impact on vegetation • (Obj 1,2,3,5)	• No removal of vegetation	• Only grasses, herbs and shrubs less than 0.5m high removed where unavoidable	• No removal of large mature trees of Priority 1 • No removal of listed threatened species • No removal of Priority 2 vegetation or small immature	• Priority 1 vegetation <2m high has been removed where avoidable • Priority 2 vegetation has been removed where avoidable • More than the minimum possible	• Large / mature trees of Priority 1 or listed species have been removed • All rootstock has been removed

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LAND SYSTEM	MEASURE Associated goals	SCORE +2(b and d)	+1(b and d)	0(b and d)	-1(a and d)	-2(a, c and d)
				Priority 1 vegetation unless unavoidable • Minimum possible Priority 3 vegetation has been removed • Less than 30% of tree branches have been removed from individual trees • Rootstock is intact	Priority 3 vegetation has been removed	
Floodplain and wetlands	• Disturbance to land surface • (Obj 1-5 and 7)	• No windrows. • No interference with drainage channels.	• No windrows >0.1m high for more than 50% of line length • Only creek banks <0.5m high have been cut.	• Windrows are <0.1m high • Creek banks <1m high have been cut • Creeks are not blocked • Wheel tracks are <0.1m deep	• Windrows are <0.3m high • Windrows are generally continuous • Creek banks 1-2m high have been cut and not restored • Creeks are blocked by material <1m deep • Wheel tracks are >0.1m deep	• Windrows are >0.3m high • Windrows are continuous • Creek banks >2m have been cut • Creeks are blocked by material >1m deep.

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Notes for GAS criteria for assessing seismic lines on completion of survey:

- If any criterion (dot point) within a -1 or -2 cell occurs, then a score of -1 or -2 will be allocated.
- For 0, +1 and +2 cells, all relevant criteria (dot point) within the cell must be satisfied to score at that level.
- Some criteria at -2 level may also be subject to defined conditions, but are included in this table to ensure that they are clearly identified.
- All vertical measurements to be measured from normal ground surface.
- Priority classification refers to definitions in Table 6-3.

Table 6-3: Priority vegetation definitions

Priority	Typical Characteristics	Clearance
Priority 1	•Long time to reach maturity •Slow growth rate •Poor regeneration from seed or rootstock •Significant habitat value (e.g. numerous hollows)	•Avoid clearance of mature trees
Priority 2	•Long time to reach maturity •Slow growth rate •May regenerate from seed and/or rootstock	•Avoid clearance wherever possible
Priority 3	•Short to moderate time to maturity •Moderate growth rate •Regenerates from seed and/or rootstock •Relatively abundant	•Clear only the minimum necessary
Priority 4	•Short time to maturity •Fast growth rate •Good regeneration from seed and/or rootstock •Abundant •Short-lived annuals and ephemerals generally fall in this category	•May be cleared if necessary