South Australia Cooper Basin

Statement of Environmental Objectives:

Production and Processing Operations

Santos

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DOCUMENT CONTROL SHEET

Cooper Basin Production and Processing Operations SEO

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	1	2 Oct 2008	S.Milne	ZB	S.Milne	Draft for Santos internal review.
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	7	20 February 2014	MM (Santos)	LS/KJ (Santos)	CS (Santos)	Inclusion of DMITRE revised Incident Definitions (Table 2)

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1 Introduction

1.1 Purpose

This Statement of Environmental Objectives (SEO) has been prepared to meet the requirements of Sections 99 and 100 of the South Australian *Petroleum and Geothermal Energy Act 2000* (the Act) and Regulations 12 and 13 of the *Petroleum and Geothermal Energy Regulations 2000* (the Regulations).

The intent of this SEO is to outline the environmental objectives that the South Australia Cooper Basin parties' (SACBP[1]) production and processing operations (referred to throughout as operation/s) are required to achieve and the criteria upon which objectives are to be assessed. Environmental objectives have been developed on the basis of information provided in the Environmental Impact Report (EIR); Production and Processing Operations (Santos 2003); and the revised Addendum to the EIR (Santos 2010) prepared during the five-yearly SEO review (superseding the 2003 SEO (Santos 2003b)).

The Act broadly defines the environment to include natural, social, cultural and economic aspects. The environmental objectives outlined in the SEO incorporate all of these elements.

1.2 Scope

Santos operates the Moomba processing plant and associated facilities on behalf of the companies that comprise the SACBP. Santos is the designated Operator for all activities conducted pursuant to the Act and the *Cooper Basin (Ratification) Act 1975* within the SACBP's licence areas (including Petroleum Production Licences (PPLs) and Pipeline Licences (PLs)). Santos is responsible for undertaking all operations within these licence areas.

This SEO applies to all SACBP production and processing operations in the South Australian sector of the Cooper and Eromanga basins (Figure 1). Operations that are covered by this SEO are:

- pipeline, trunkline and flowline construction, operation and abandonment;
- plant and satellite construction, operation, maintenance and abandonment;
- produced formation water disposal operations;
- produced formation water waterflood for enhanced oil recovery;
- road construction, maintenance and restoration;
- waste management operations;
- water management
- Moomba airport operations; and
- fire training.

These operations are described in detail in the EIR (Santos 2003a) and the addendum to the EIR (Santos 2010).

Activities associated with operations in the South Australian section of the Cooper Basin that are not discussed in the Production and Processing EIR or SEO include:

- exploration activities;
- drilling activities;
- sub-surface well/reservoir activities (with the exception of the aspects relevant to produced formation water waterflood that are covered in this SEO);
- well site and access track construction;
- drilling;
- well completion;
- pre-wellhead production;
- down hole abandonment;
- restoration of well sites and access tracks; and

[1] The South Australia Cooper Basin parties are the parties to joint ventures in the Cooper Basin operated by Santos

- seismic operations.

These are covered in two separate SEOs, being:

- *South Australian Cooper Basin Operators Statement of Environmental Objectives: Geophysical Operations* (Santos 2006); and
- *South Australia Cooper Basin Statement of Environmental Objectives: Drilling and Well Operations* (Santos 2009).

In addition to the activities listed above, sales gas pipelines and the liquids pipeline to Port Bonython are also addressed in separate EIRs and SEOs.

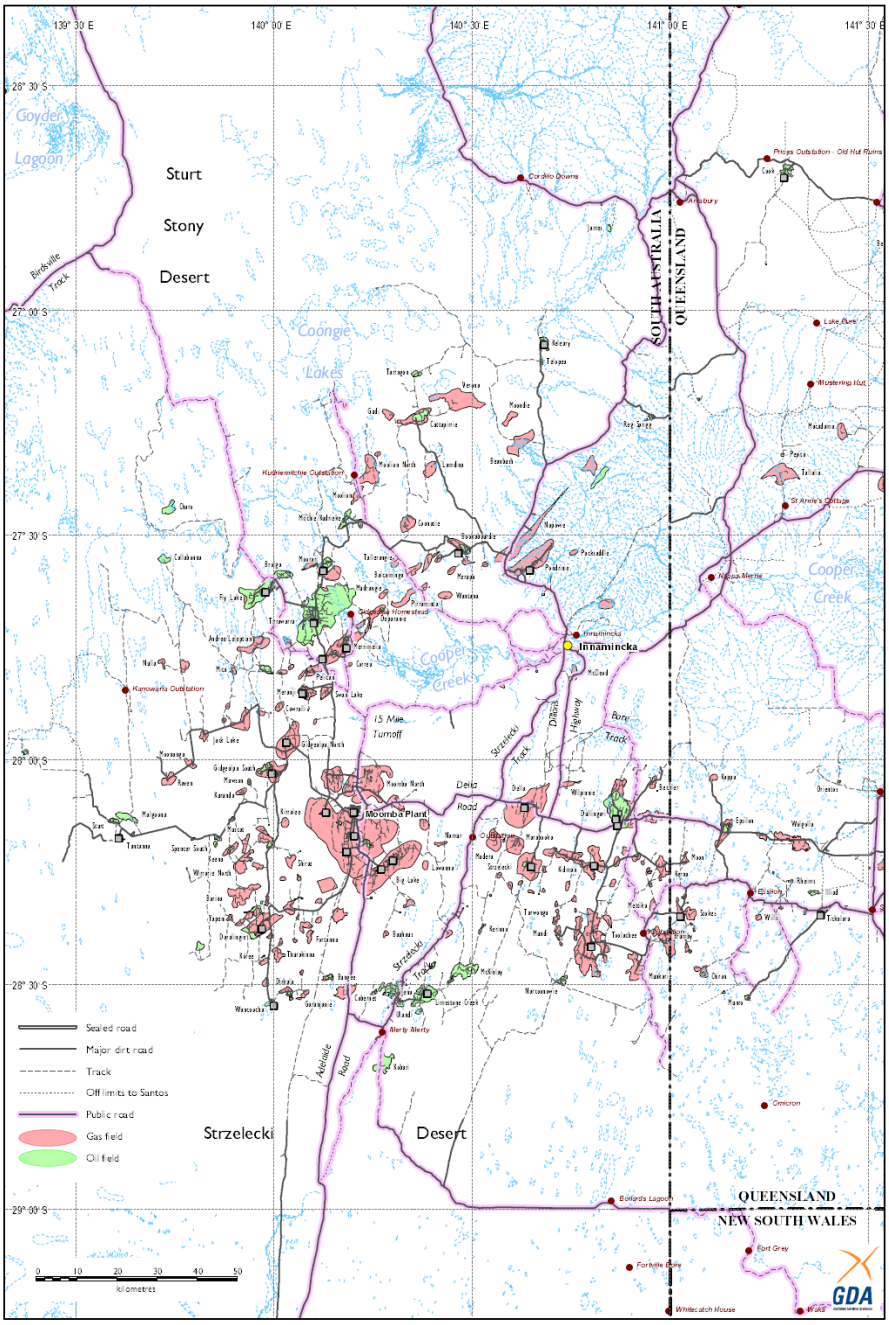

Figure 1: SACBP Production and Processing facilities, Cooper Basin (South Australian sector)

2 Environmental Objectives

2.1 Objectives

The objectives of the Act relevant to Production and Processing Operations include:

- to minimise environmental damage from activities involved in exploration for, or the recovery or commercial utilisation of petroleum and other resources; and
- to minimise environmental damage from activities involved in the construction or operation of transmission pipelines for transporting petroleum and other substances.

Potential hazards and consequences associated with production and processing operations in the Cooper Basin were identified in the EIR and the addendum to the EIR (Santos 2003, Santos 2010). Santos is committed to achieving a range of environmental objectives with respect to these potential hazards and consequences which are in keeping with the above objectives of the Act.

The environmental objectives for production and processing operations are:

1. Minimise any safety risk to the public and other third parties

2. Minimise disturbance and avoid contamination to soil

3. Avoid the introduction or spread of pest plants and animals and implement control measures as necessary

4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources

5. Avoid disturbance to sites of cultural and heritage significance

6. Minimise loss of aquifer pressure and avoid aquifer contamination

7. Minimise disturbance to native vegetation and native fauna

8. Minimise air pollution and greenhouse gas emissions

9. Maintain and enhance partnerships with the Cooper Basin community

10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure

11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal

12. Remediate and rehabilitate operational areas to agreed standards

13. Minimise as far as reasonably practicable interruptions to natural gas supply.

2.2 Assessment Criteria

The criteria for measuring achievement of the environmental objectives are detailed in Table 1 and take one of the following forms:

- **Defined conditions** – In some cases, the achievement of an objective can be assessed through ensuring defined conditions are met or carried out. Such conditions include:

- prohibitions to undertake a specific action (for example, to achieve the objective 'Minimise impacts to soil', during construction of a pipeline the assessment criteria may be to prevent ripping or grading of the right-of-way in gibber plain areas)

- requirements to carry out certain actions in accordance with approved procedures or industry accepted standards (for example, the design, construction, operation and maintenance of pipelines is in accordance with Santos procedures and Australian Standard AS 2885)

- **Goal Attainment Scaling (GAS) criteria** – Environmental objectives requiring visual assessment may be prone to uncertainties of subjective judgement. To minimise this, GAS is used to measure such objectives against a series of criteria described by a written and/or photographic description. GAS is applicable to measuring objectives related to minimising disturbances to natural vegetation, soil, and the rehabilitation of right-of-way (ROW), borrow pits and access tracks. Goal Attainment Scaling (GAS) criteria are referenced where available (see Table 1) and presented in Appendices 6.1 to 6.4.

- **Scientific studies/monitoring** – In some cases; the assessment of the environmental objectives may not be possible in the shorter term and may require longer term monitoring and scientific evaluation. In such cases, assessment criteria may be in the form of longer term data and information gathering, for example the objective 'avoid contamination of surface waters and shallow groundwater resources' may require a study to determine the potential impact of cumulative hydrocarbon leaks

Each objective for the production and processing operation will be assessed using a selection of the assessment options outlined above. This will enable Santos and others to determine whether the objectives are being achieved. Comments on any variances will be recorded and reported where required (Section 3).

Table 1 outlines in the “Guide to how objectives can be achieved” column, planned controls to ensure that environmental objectives are achieved. These controls are not intended to be mandatory criteria under the Act, but are provided to give an indication of the measures that can be implemented to achieve the objectives.

Table 1: Environmental Objectives and Assessment Criteria

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
1. Minimise any safety risk to the public and other third parties.	▪ Reasonable measures implemented to ensure no injuries or health risks to the public or third parties.	▪ All employees and contractor personnel complete a safety induction prior to commencement of work in the field. ▪ All employees and contractor personnel undertake a refresher induction every 2 years. ▪ Signage in place to warn third parties of access restrictions to operational areas, with particular warnings when potentially dangerous operations are being undertaken. ▪ Permit to Work systems in place for staff and contractors for appropriate work activities/tasks. ▪ Appropriate PPE (personnel protective equipment) is issued and available as required in accordance with company operating requirements and applicable standards. ▪ Pipelines are compliant with AS2885 pipeline standards. ▪ Emergency Response Plan (ERP) and procedures are in place. Annual exercise of ERP. ▪ Communication of rig movements and other potential hazards associated with drilling and well operations to potentially affected parties prior to commencement of operations. ▪ Compliance with relevant speed restrictions on access roads and tracks. ▪ Measures implemented to minimise visibility of pipeline ROW at access track crossings (e.g. ROW width reduced to 9m, ROW doglegged so that less than 100m is visible either side of track, some trees or shrubs left on ROW to break line of sight, verge of the track reinstated). ▪ Reporting systems for recording injuries and accidents in place and annual (at minimum) review of records to determine injury trends. ▪ Implementation of appropriate corrective actions. ▪ Ensuring safety management plans are updated and reviewed.	The criteria for assessing the achievement of this objective have been developed on the basis of current understanding of the risks associated with production and processing operations. The key to achieving this objective in relation to production and processing operations including pipelines and production facilities is to ensure that the visual prominence of these areas, including access track(s), is minimised to the extent where it is difficult for third parties to detect and therefore access them. In the case where a third party encounters a site, adequate signage needs to be displayed to hinder any third party interference with the infrastructure. Similarly, backfilling of excavations and removal of rubbish should be carried out. Fires or explosions at facilities could result in complications resulting in a spill of production fluids (formation water and hydrocarbon), atmospheric emissions, disturbance of native vegetation and wildlife habitat and risk to employees, contractors and the public. The movement of heavy equipment may present a risk to the safety of employees, contractors and third parties (i.e. tourists).

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		▪ Wastewater disposal in accordance with Objective 11.	

2. Minimise disturbance and avoid contamination to soil.	<u>Construction Activities (e.g. pipelines and roads)</u>
	▪ No evidence of significant subsoil on surface (colour) on the pipeline ROW following construction.
	▪ No subsidence is evident over pipeline trench.
	▪ At pipeline dune crossings, dune profiles have been restored consistent with surrounding dune profiles.
	▪ No visual evidence of soil compaction following remediation of the pipeline easement (e.g. hard soil, local water pooling).
	▪ The extent of erosion on the ROW is consistent with surrounding land.
	▪ No unauthorised off-road driving or creation of shortcuts.
	▪ No construction activities are carried out on salt lakes or steep tableland slopes (as defined in EIR).
	▪ 0, +1 or +2 GAS criteria are attained for goals related to this objective as listed in Appendix 6.1 and Appendix 6.4.
		<u>Construction Activities (e.g. pipelines and roads)</u>
		▪ Santos operational procedures and guidelines are in place and will be followed for construction activities, for example to conserve soil resources:
		  ▪ topsoil is stockpiled separately from subsoil and respread during reinstatement
		  ▪ no windrows remain after pipeline construction (except on dunes where some windrows are inevitable after reprofiling but will quickly disappear
		  ▪ if a crown over the pipeline trench is left to alleviate subsidence, periodic breaches are left to avoid channelling water flows down the ROW
		  ▪ areas of compacted soil are ripped
		▪ Consider alternate routes during planning phase to minimise environmental impacts.
		▪ Works are restricted to construction ROW.
		▪ The need to traverse sensitive land systems and the method of managing the impacts must be justified in accordance with company procedures, recorded and available for auditing.
		▪ Annual audit of construction practices.
		
		<u>Spill Response / Contingency Planning</u>
		▪ Results of emergency response procedures carried out in accordance with Regulation 31 show that an oil spill contingency plan in place in the event of a spill is adequate and any necessary remedial action needed to the plan is
			The impacts associated with soil disturbance can potentially include wind and water erosion and dust generation. The main sources of disturbance to soils are associated with pipeline, road and facility construction, creation of borrow pits, restoration activities, vehicle movement in off-road locations and sub-surface excavations (i.e. trenching, sumps and borrow pits).

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		undertaken promptly. ▪ Oil spill contingency plan (reviewed annually) is up to date with specific scenarios relating to spills to creeks and floodplain areas. ▪ Spill response equipment is audited annually. ▪ Annual spill response training exercise is undertaken. ▪ Refer to Section 3 "Reporting" for clarification of incident reporting requirements	
	<u>Fuel and Chemical Storage, Handling and Transportation</u> ▪ No spills/leaks outside of areas designed to contain them. ▪ Soils remediated to a level as determined by the SHI Decision Framework. ▪ Also refer to Objective 12.	<u>Fuel and Chemical Storage, Handling and Transportation</u> ▪ All fuel, oil and chemicals are stored, handled and transported in accordance with appropriate standards and guidelines e.g. Australian Standard AS 1940, Australian Dangerous Goods (ADG) Code, EPA guidelines *080/07 Bunding and Spill Management*. ▪ Fuel and chemical storage, handling and transport procedures are reviewed and monitored in audit process. ▪ Records of spill events and corrective actions are maintained in accordance with company procedures. ▪ Spills or leaks are immediately reported and clean up actions initiated. ▪ Logged incidents are reviewed annually to determine areas that may require corrective action to reduce spill volumes in subsequent years (and drive continual improvement). ▪ Audit against EHSMS standards for underground storage tanks and bunds on a four yearly minimum frequency.	Potential sources of contamination are associated with pipeline leaks/spills, spills of fuel or chemicals stored on site and disposal of waste waters and produced formation waters. Disposal of hydrostatic test water is also a potential source of contamination during pipeline construction if water is treated with chemicals prior to use.
	<u>Oil/Condensate Spills (Pipeline/Road Transport)</u> ▪ No spills/leaks outside of areas designed to contain them. ▪ Level of hydrocarbon continually decreasing for in situ remediation of spills. ▪ Soils remediated to a level as	<u>Oil/Condensate Spills (Pipeline/Road Transport)</u> ▪ Pipelines are compliant with AS2885 pipeline standards ▪ Pipeline Management System is reviewed annually. ▪ Pipelines are inspected and maintained in accordance with Pipeline Integrity Management System ▪ Spills or leaks are immediately reported and clean up actions initiated.	An approved SHI Decision Framework has been developed in consultation with the EPA and PIRSA. This incorporates a Screening Risk Assessment that aligns the framework with the EPA "Guidelines for the Assessment and Remediation of Ground water Contamination".

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	determined by the SHI Decision Framework. Produced Formation Water (PFW) ▪ 0, +1 or +2 GAS criteria are attained for goals related to produced formation water impacts on soil, as listed in Appendix 6.2. ▪ PFW EMP developed and objectives achieved. Waste Disposal (domestic, sewage and sludges) ▪ All domestic wastes are disposed of in accordance with EPA licensing requirements. ▪ No evidence of rubbish or litter on ROW or at campsites / facilities. ▪ No spills or leaks from sludge treatment process and sludge pits. ▪ No increase in contamination at LTUs designated treatment area. ▪ Refer to assessment criteria for Objective 11.	▪ Records of spill events and corrective actions are maintained in accordance with company procedures. Produced Formation Water (PFW) ▪ Develop (in consultation with PIRSA and the EPA) and implement Environmental Management Plan (EMP) following the PFW facility status review that has been conducted. Waste Disposal (domestic, sewage and sludges) ▪ Site activities to be audited against EPA licence for Waste Depot on a minimum two years schedule. ▪ EHS04 Waste Management is adhered to. ▪ Audit against EHS04 Waste Management – 4 yearly minimum. ▪ Covered bins are provided for the collection and storage of wastes. ▪ All loads of rubbish are covered during transport to the central waste facility. ▪ Disposal areas are not established in locations, which pose an unacceptable hazard to stock or wildlife. ▪ Sewage treatment facilities to be operated in accordance with design criteria. ▪ Refer to Objective 11.	
3. Avoid the introduction or spread of pest plants and animals, and implement control measures as necessary.	▪ No weeds or feral animals are introduced to, or spread in, operational areas as a consequence of activities. ▪ Weed management plans are implemented where priority weed species are identified.	▪ Where appropriate, weed and feral animal management strategy is in place (avoidance and control strategies). ▪ Vehicle and equipment wash downs to be initiated in accordance with the management strategy.	Activities associated with pipeline, road and access track construction, such as movement of vehicles and equipment, are a potential source of weed or disease introduction and spread. The most effective technique to prevent the introduction and spreading of weed species is to ensure that vehicles and

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
			equipment are appropriately cleaned prior to entering construction activities on a risk-based approach.
4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.	<u>Construction Activities (e.g. pipelines and roads)</u> ▪ 0, +1 or +2 GAS criteria are attained for goals related to this objective as listed in Appendix 6.1 and 6.2. ▪ Construction activities (e.g. access tracks or pipelines) are located and constructed to maintain pre-existing water flows (i.e. channel contours are maintained on floodplains and at creek crossings). ▪ No water (surface or groundwater) contamination as a result of construction activities.	<u>Construction Activities (e.g. pipelines and roads)</u> ▪ Constructed activities undertaken are designed and managed to avoid diversion of water flows. ▪ Sensitive land systems (e.g. wetlands) avoided wherever possible. Where activities are undertaken in or near these areas, appropriate review, assessment and mitigation measures are in place to ensure that surface water flows are maintained and contamination of surface water and groundwater is avoided.	The main threats to drainage patterns, surface waters and shallow ground waters are considered to be interruption of natural flows as a result of earthworks. Construction activities in the Cooper Basin should aim to minimise any impact to existing drainage systems. This may be achieved by avoiding sensitive areas and utilising appropriate construction methods to avoid windrows.
	<u>Produced Formation Water (PFW)</u> ▪ Refer to assessment criteria for Objective 2. ▪ No unlicensed discharge of water to a creek, river or lake.	<u>Produced Formation Water (PFW)</u> ▪ Refer to Objective 2. ▪ Water disposal ponds are located away from areas which are inundated during floods where possible (preferably above the 100-year flood level). ▪ Interceptor pits are not located in areas prone to inundation by flooding.	An approved SHI Decision Framework has been developed to determine acceptable levels of hydrocarbons and other contaminants associated with buried structures (see Objective 2).
	<u>PFW Waterflood</u> ▪ No significant change in surface or groundwater contamination as a result of waterflood activities.	<u>PFW Waterflood</u> ▪ Pumps and associated equipment installed within containment device with an adequately sized containment sump (e.g. at least $9m^3$). ▪ Refer to Objective 2.	The main impact associated with this objective is the potential contamination from fuels, chemicals (including the waterflood tracer) and produced formation water during the waterflood operations.
	<u>Fuel and Chemical Storage, Handling and Transportation</u>	<u>Fuel and Chemical Storage, Handling and Transportation</u> ▪ All fuel, oil and chemicals are stored, handled and	There is potential for contamination from chemical and fuel storage areas, from oil and gas systems at well heads, during

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	▪ Soils remediated to a level as determined by the SHI Decision Framework. Also refer to Objective 12. ▪ No water (surface or groundwater) contamination as a result of these activities.	transported in accordance with appropriate standards e.g. Australian Standard AS 1940, Australian Dangerous Goods (ADG) Code, EPA guideline *080/07 Bunding and Spill Management*. ▪ Fuel and chemical storage, handling and transport procedures are reviewed and monitored in an audit process. ▪ Records of spill events and corrective actions are maintained in accordance with company procedures. ▪ Spills or leaks are immediately reported and clean up actions initiated. ▪ Logged incidents are reviewed annually to determine areas that may require corrective action to reduce spill volumes in subsequent years (and drive continual improvement). ▪ Implementation of the SHI Decision Making Framework approved in January 2010.	transportation of fuel and chemicals and during transportation of wastes. Localised contamination may result from spills or leaks of well operations chemicals (e.g. corrosion inhibitors) during storage and handling.
	<u>Cooper Creek Water Extraction</u> ▪ No significant change in flow or contamination as a result of extraction activities.	<u>Cooper Creek Water Extraction</u> Approval to conduct surfacewater extraction from Cooper Creek is subject to the following conditions: ▪ An approvals request for any proposed extraction is raised internally. This request will include estimated total volume required. ▪ The above request must demonstrate that PFW and Borewater of an acceptable quality cannot be sourced within an economically viable haulage distance (maximum 2 hour return journey). ▪ Any approved extraction occurs where water flow at Callamurra is >= 2.15m (>= 0.1m flow at Innamincka Causeway) and rising, and **never** at permanent water refuges (e.g Callamurra). Maps of approved surfacewater extraction points at Innamincka, Kudrieke and Mitchie Crossings are included in Appendix 5.2 of the Addendum to the EIR (Santos, 2010). ▪ Cumulative extraction volume to be capped at **15 ML** per year.	Water extraction from the Cooper Creek (SA) for use in activities associated with the exploration and development of oil and gas reserves.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		▪ Cumulative extraction volumes to be recorded in monitoring database and included in annual PIRSA reporting. ▪ Non-conformance with the above is a reportable incident - see Section 3 "Reporting" for incident definitions.	
	<u>Waste Disposal (domestic, sewage and sludges)</u> ▪ Refer to assessment criteria for Waste Disposal for Objective 2. ▪ Refer to assessment criteria for Objective 11.	<u>Waste Disposal (domestic, sewage and sludges)</u> ▪ Site activities to be audited against EPA licence for waste depot on a minimum of every two years. ▪ Audit against EHS04 Waste Management – 4 yearly minimum. ▪ Covered bins are provided for the collection and storage of wastes. ▪ All loads of rubbish are covered during transport to the central waste facility. ▪ Pits are not established in locations which pose an unacceptable hazard to stock or wildlife. ▪ Sewage treatment facilities to be operated in accordance with design criteria.	
	<u>Oil/Condensate Spills (Pipeline/Road Transport)</u> ▪ No spills/leaks outside of areas designed to contain them. ▪ Level of hydrocarbon continually decreasing for in situ remediation of spills. ▪ Soils remediated to a level as determined by the SHI Decision Framework.	<u>Oil/Condensate Spills (Pipeline/Road Transport)</u> ▪ Pipelines are compliant with AS2885 pipeline standards. ▪ Pipeline Management System is reviewed annually. ▪ Pipelines are inspected and maintained in accordance with Pipeline Integrity Management System. ▪ Spills or leaks are immediately reported and clean up actions initiated. ▪ Records of spill events and corrective actions are maintained in accordance with company procedures. ▪ Refer to Section 3 "Reporting" for clarification of incident reporting requirements	The major threat of spills is to soil, vegetation and watercourses directly impacted by the spill. Therefore, the achievement of this objective also consequently contributes to the achievement of objectives 3 and 6 in relation to minimising the impacts on natural vegetation and soil respectively.
		<u>Spill Response / Contingency Planning</u> ▪ Results of emergency response procedures, carried out in accord with Regulation 31, show that the oil spill	Avoidance of spills will be paramount in areas where the spill can potentially spread beyond the immediate confines of the spill area into sensitive environments

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		contingency plan in place in the event of a spill is adequate and any necessary remedial action needed to the plan is undertaken promptly. ▪ Oil spill contingency plan (reviewed annually) is up to date with specific scenarios relating to spills to creeks and floodplain areas. ▪ Spill response equipment is audited annually. ▪ Annual spill response training exercise is undertaken.	such as creeks and wetlands.
5. Avoid disturbance to sites of cultural and heritage significance.	▪ Proposed construction sites and access tracks have been surveyed and any sites of Aboriginal and non-Aboriginal heritage identified. ▪ Any identified cultural and heritage sites have been avoided.	▪ Consultation with stakeholders (i.e. government agencies, stakeholders etc) in relation to the possible existence of heritage sites, as necessary. ▪ Heritage report forms completed for any sites or artefacts identified and completed forms forwarded to the Aboriginal Heritage Branch, Aboriginal Affairs and Reconciliation Division (AARD). ▪ Survey records are kept and are available for auditing. ▪ Areas requiring remediation which lie outside previously surveyed sites should be surveyed in accordance with company heritage clearance procedures. ▪ Induction for all employees and contractor addresses heritage site recognition and management. ▪ A procedure is in place for the appropriate response to any sites discovered during operations. Note: Where a negotiated agreement or determination for heritage clearance is in place, compliance with the negotiated agreement or determination takes precedence over the above criteria.	The objective is to ensure that any sites of cultural (Aboriginal or non-Aboriginal) heritage significance are identified and protected.
6. Minimise loss of aquifer pressure and avoid aquifer contamination.	▪ There is no uncontrolled flow to the surface (i.e. no free flowing bores).	▪ The volume/flow of water used by the Moomba Plant is continuously monitored to ensure appropriate management. ▪ Water usage is monitored, reviewed and management strategies implemented to minimise wastage. ▪ Review water licensing requirements and allocation plans.	This objective seeks to protect the water quality and water pressure of aquifers that may potentially be useful as water supplies and to maintain pressure in target aquifer. Note: The Drilling and Well Operations SEO specifies detailed requirements for

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
			aquifer protection.
	Produced Formation Water (PFW) Waterflood Injection Wells ▪ No significant change in water quality from the injection aquifer.	Produced Formation Water (PFW) Waterflood Injection Wells ▪ Aquifer water quality monitored where appropriate through testing carried out during Waterflood activities.	
7. Minimise disturbance to native vegetation and native fauna	Construction Activities ▪ Any sites of rare, vulnerable and endangered flora and fauna have been identified, flagged and subsequently avoided. ▪ No removal of trees / vegetation of priority 1, 2 or 3 in Field Guide[2] in areas where removal could have been avoided. ▪ No removal of trees at campsites. ▪ No evidence of tree removal where trimming appropriate. ▪ The type and density of vegetation on the rehabilitated ROW is consistent with the surrounding landscape, but less mature. Note: assessment will take into account that regrowth is a time and rainfall dependent process. ▪ 0, +1 or +2 GAS criteria are attained for goals related to this objective as listed in Appendix 6.1 and 6.2.	Construction Activities ▪ Proposed construction areas have been assessed for rare, vulnerable and endangered flora and fauna species before the commencement of construction. ▪ Consider alternate routes during planning phase to minimise environmental impacts. ▪ Sensitive land systems (e.g. wetlands) avoided wherever possible. Where activities are undertaken in these areas (i.e. no practicable alternative), appropriate review, assessment and mitigation measures are in place. ▪ Assessment records are kept and are available for auditing. ▪ Optimised ROW widths are identified and implemented. ▪ Trees are trimmed rather than cleared where possible. ▪ Root stock is not removed beyond 3m of trenchline and ROW is either only lightly graded or not graded. ▪ Where vegetation is removed, it is respread over the full width of the ROW (excluding the access track).	Primary risks to native fauna include clearing of habitat and obstruction of movement through cleared areas (for example the presence of borrow pits), entrapment in trenches or excavations, fuel and chemical storage and management and waste management activities.

[2] Field Guide refers to the *Field Guide to the Common Plants of the Cooper Basin – South Australia and Queensland* (Wiltshire and Schmidt 2003)

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	Borrow Pits ▪ 0, +1 or +2 GAS criteria for goals related to this objective, as listed in Appendix 6.1 are attained during site selection and construction. Fuel and Chemical Storage and Management ▪ Refer to assessment criteria for objectives 2 and 4. Waste Management ▪ Refer to assessment criteria for objectives 2, 4 and 11.	Borrow Pits ▪ Pits are not established in locations which pose an unacceptable hazard to stock or wildlife (i.e. not within 50m of any roads or access tracks, well leases or other plant and equipment). ▪ Sensitive land systems (e.g. wetlands) avoided wherever possible. Where activities are undertaken in these areas (i.e. no practicable alternative), appropriate review, assessment and mitigation measures are in place. ▪ Borrow pits are restored as soon as practicable after material extraction is complete to a standard consistent with the surrounding land use. ▪ Borrow pits are restored to minimise water holding capacity, where agreements are not in place with stakeholders ▪ In recognised conservation reserves (i.e. Innamincka Regional Reserve) excavations are left in a state as agreed with the responsible statutory body. Fuel and Chemical Storage and Management ▪ Refer to Objectives 2 & 4. Waste Management ▪ Covered bins are provided for the collection and storage of putrescible wastes. ▪ All loads of rubbish are covered during transport to the central waste facility. ▪ Pits are not established in locations which pose an unacceptable hazard to stock or wildlife. ▪ Sewage treatment facilities to be operated in accordance with design criteria. ▪ PFW pits are fenced as appropriate to minimise wildlife access.	

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	Native Vegetation Act SEB ▪ Significant Environmental Benefit (SEB) for native vegetation clearance approved by PIRSA (where delegated authority applies) or Native Vegetation Council (NVC). ▪ Significant environmental benefit obligation is ultimately satisfied / implemented. Fauna Management ▪ Native fauna casualties associated with construction activities restricted to as low as reasonably practical (ALARP).	Native Vegetation Act SEB ▪ Work (or payment to Native Vegetation Fund) undertaken to achieve an SEB for native vegetation clearance. ▪ SEB requirement either: - determined using the Guidelines (DWLBC 2005) or - negotiated with PIRSA or the Native Vegetation Council where SEB calculation differs from the standard methodology in the Guidelines. Fauna Management ▪ No domestic pets allowed at camps or worksites. ▪ Feeding of wildlife (e.g. dingoes) is not permitted. ▪ Where possible, provision of fauna exit ramps every 500m in open trenches, with other mechanisms for fauna exit (branches, mesh etc.) at more regular intervals in between. ▪ Inspection of trenches and removal of trapped fauna, where appropriate. ▪ Minimise length of time trench is open where practicable.	Native Vegetation Act SEB Under the *Native Vegetation Regulations 2003* native vegetation clearance can occur for operations authorised under the Act, provided that it is in accordance with and as a result of work undertaken under an SEO, and there will be a SEB (Note: Petroleum exploration does not require a SEB under the Native Vegetation Regulations).
8. Minimise air pollution and greenhouse gas emissions.	Gathering Systems/Satellite Facilities/Moomba Plant ▪ Compliance with EPA requirements.	Gathering Systems/Satellite Facilities/Moomba Plant ▪ Conduct production operations in accordance with appropriate industry accepted standards. ▪ Continually review and improve operations. ▪ Appropriate Emergency Response Procedures are in place in case of a gas leak.	Atmospheric emissions occur as a result of standard production and processing operations, which the Moomba Plant Environment Improvement Plan (EIP) addresses through specific actions. Emissions of particular environmental significance are: ▪ combustion by-products (e.g. oxides of nitrogen, carbon monoxide and sulphur dioxide); ▪ organic carbon and carbon particulates (black smoke); and ▪ flared/vented hydrocarbons (gases).

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
9. Maintain and enhance partnerships with the Cooper Basin community.	▪ No reasonable stakeholder complaints left unresolved.	▪ Relevant affected parties are notified and consulted on proposed activities. ▪ Forward development plans are presented to the local community. ▪ Local community projects and events are sponsored and supported where appropriate. ▪ Industry membership of appropriate regional land management committees and boards.	The importance of liaison with and contribution to the local community is recognised by the South Australia Cooper Basin parties. Notification, consultation, contribution to community activities, projects and events and membership of relevant organisations are considered key strategies for ensuring partnerships with the local community are maintained.
10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure.	▪ No reasonable stakeholder complaints left unresolved.	▪ Induction for all employees and contractors covers pastoral, conservation, tourism, legislation and infrastructure issues. ▪ Relevant stakeholders are notified prior to survey and construction of well sites, camp sites and access tracks and undertaking of operations (pursuant to the Regulations). Borrow pits left open (unrestored) if requested by stakeholder and upon receipt of letter of transfer of responsibility to stakeholder. ▪ Gates or cattle grids are installed to a standard, consistent with pastoral infrastructure instead of fences where crossings are required for access. ▪ All gates left in the condition in which they were found (i.e. open/closed). ▪ Fences repaired to 'as before' standard following pipeline construction. ▪ Potential sources of contamination (e.g. formation water ponds) are fenced as appropriate to prevent stock access. ▪ Written evidence that stakeholder is satisfied with water disposal arrangements. ▪ System is in place for logging stakeholder complaints to ensure that issues are addressed as appropriate. ▪ Requirements of the Cattle Care and Organic Beef accreditation programs are complied with. ▪ In recognised conservation reserves (i.e. Innamincka Regional Reserve) excavations are left in a state as agreed	Limiting disturbance as much as practicably possible is fundamental to establishment and maintenance of good relations with stakeholders and community. Many pastoral properties are certified under the Organic Beef or CattleCare accreditation schemes and therefore may be affected by fuel and chemical storage, moving machinery and contaminated sites.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		with the responsible statutory body. Cooper Creek Water Extraction ▪ Refer to Objective 4.	Extraction to occur in consultation with applicable stakeholders, which can include, but are not limited to: ▪ Local landholders and pastoralists; ▪ District Rangers – DEH; and; ▪ Other petroleum operators.
	Cooper Creek Water Extraction ▪ No impacts on local stakeholders from the extraction of water from the creek system. ▪ Refer to Objective 4.		
11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal	▪ Domestic wastes are disposed of in accordance with EPA licensing requirements. ▪ Wastewater (sewage and grey water) disposed of in accordance with the *Public and Environmental Health (Waste Control) Regulations 1995* or to the Department of Health's satisfaction. ▪ No spills or leaks from sludge treatment process and sludge pits. ▪ No increase in contamination at LTUs designated treatment area.	▪ Chemicals and oil are purchased in bulk. 'Bulki bins' or other storage tanks are in place for large volume items. ▪ Fencing around waste disposal facility is regularly inspected and maintained. ▪ Waste streams are segregated on site to maximise opportunities for waste recovery, reuse and recycling. ▪ Evidence/records are maintained showing that recyclable material has been returned to Moomba Waste Management Depot. ▪ Production of waste is minimised by specifying reusable, biodegradable or recyclable materials in procurement, where practical. ▪ Waste audit conducted at 5 year minimum interval. ▪ Waste water (sewage) disposal is where possible in accordance with the *Public and Environmental Health (Waste Control) Regulations 1995* (which require that the waste water disposal system must either comply with the *Standard for the Construction, Installation and Operation of Septic Tank Systems in SA* or be operated to the satisfaction of the Department of Health) and the *Environment Protection (Water Quality) Policy 2003*. ▪ Evidence/records maintained to show that appropriately designed sewage facilities have been constructed.	Waste reduction requires continual improvements in purchasing, efficiency of use and reuse. Geographical isolation may limit the viability of some recycling opportunities. However, continual review of recycling options is conducted to ensure that emerging opportunities are evaluated and where possible implemented.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
12. Remediate and rehabilitate operational areas to agreed standards.	Contaminated Site Remediation ▪ Contaminated sites are remediated to a level as determined by the approved SHI Decision Framework. Construction Site and Access Track Restoration ▪ Refer to assessment criteria for Objectives 2, 4, 7 and 11. ▪ 0, +1 or +2 GAS criteria are attained for 'minimise the visual impact' and 'revegetation of indigenous species' as listed in Appendix 6.4. Borrow Pit Restoration ▪ The attainment of 0, +1 or +2 GAS criteria for 'Rehabilitation' as listed in Appendix 6.1. Production Facility Abandonment ▪ Surface structures are removed and the ground surface re-contoured to approximate pre-existing contours unless alternative agreement is reached with the regulator and stakeholders. ▪ 0, +1 or +2 GAS criteria are attained for 'minimise the visual impact' and 'revegetation of indigenous species' as listed in Appendix 6.4, unless alternative agreement is reached with the regulator and stakeholders. ▪ Refer to criteria for contaminated site remediation under this	▪ Rehabilitation/abandonment plans for regulated activities will be developed in consultation with relevant stakeholders. Construction Site and Access Track Restoration ▪ Compacted soil areas have been ripped (except on gibber and tablelands) and soil profile and contours are reinstated following completion of operations. Production Facility Abandonment The following steps will typically be undertaken unless otherwise agreed with the regulator and stakeholders: ▪ hydrocarbon and contaminants will be reduced to an acceptable level in buried structures (e.g. pipelines, tanks, pits) as determined by the approved SHI Decision Framework. ▪ hazardous materials will be stabilised or removed including ground decontamination. ▪ hazardous material dumps will be clearly marked and a monitoring plan developed and implemented. ▪ surface structures will be removed and re-used / recycled where appropriate ▪ waste will be removed and recycled where appropriate (refer to Objective 11).	

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	objective (above). ▪ Refer to the assessment criteria for Objective 11.	▪ foundations will be levelled and covered (the standard to which they will be restored will be defined as a result of stakeholder consultations). ▪ disturbed areas will be re-contoured to approximate pre-existing contours, natural drainage restored and compaction relieved (e.g. by scarification or ripping where appropriate) to promote rainwater infiltration and enhance seed capture and germination. ▪ contour banks and energy dissipating structures will be constructed where necessary to protect disturbed areas from erosion prior to stabilisation.	
	<u>Pipeline Abandonment</u> Attainment of the following (unless otherwise agreed with stakeholders and approved by the regulatory authority): ▪ No evidence of waste, redundant equipment / infrastructure or signs and markers on abandoned pipelines. ▪ Refer to criteria for contaminated site remediation under this objective (above). ▪ Refer to the assessment criteria for Objective 11.	<u>Pipeline Abandonment</u> The following steps will typically be undertaken unless otherwise agreed with the regulator and stakeholders: ▪ all aboveground pipes and supports will be assessed for the condition of the pipe for either salvage or for dismantling and re-use. ▪ all underground pipe work will be cut-off (at a minimum depth of 750mm below the natural surface or at pipeline depth, removed and blinded below the surface. ▪ all aboveground signs and markers will be removed. ▪ all pipeline protection systems will be removed to allow the pipeline to degrade in-situ. ▪ monitoring and auditing of abandoned pipelines will be undertaken. ▪ all pipelines which are partially or wholly left in-situ will be accurately mapped and recorded. Records will be prepared and submitted to the appropriate authority.	Abandonment of buried pipelines in-situ is environmentally preferable to the disturbance associated with their removal. The condition of surface pipelines will be assessed for either salvage or for dismantling and re-use. The overall objective is to leave the easement as near as practical to pre-existing environmental conditions, and decommission the pipeline in a manner that minimises impacts to the environment and stakeholders.
13. Minimise as far as reasonably practicable interruptions to natural gas supply.	▪ No interruptions to natural gas supply that cause significant social disruption.	▪ Adequate contingencies are in place which seek to address a prudent level of security of supply in the case of short and unforseen interruption events (e.g. adequate gas storage). ▪ Pipelines are designed, operated and maintained in accordance with AS 2885.	

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		▪ Plant and equipment are designed, operated and maintained in accordance with appropriate industry accepted standards. ▪ Emergency Response Plan (ERP) and associated procedures are in place and exercised. ▪ Results and recommendations of plant and facility hazard reviews, including the five (5) yearly Fitness for Purpose assessment, are appropriately addressed. ▪ Significant operations-specific hazards and risks are summarised in the Significant Hazard Risk Register (SHRR).	

3 Reporting

Petroleum Regulation 12(2) requires an SEO to identify events that could cause a serious incident or a reportable incident within the meaning of Section 85 of the Act.

3.1 Definitions

The following descriptions have been provided to help clarify and elaborate on the definitions given in Section 85(1) of the Act and Regulation 32(1) of the Regulations. These definitions were developed by PIRSA in consultation with industry and released in September 2009 (Table 2).

3.2 Reporting Requirements

Serious Incidents must be reported to the Minister as soon as practicable after the occurrence, as per Section 85 of the Act and Regulation 32 of the Regulations.

Reportable Incidents must be reported to PIRSA on a quarterly basis within 1 month of the end of the quarter, as per Regulation 32 of the Regulations.

3.3 Reporting to EPA

Where applicable, incidents causing or threatening serious or material environmental harm under the *Environment Protection Act 1993* must be reported to the EPA in accordance with section 83 of the *Environment Protection Act 1993.*

The reporting obligation under the Environment Protection Act does not apply to:

1) petroleum exploration activity undertaken under the Act, or;
2) wastes produced in the course of an activity authorised by a licence under the Act when disposed of to land within the area of the licence.

3.4 Rectification period

In the event of a serious incident occurring, in addition to satisfying the reporting requirements set out in above, the SACBP may also provide to PIRSA a rectification plan setting out the rectification objectives for the incident and a reasonable timeframe (the Rectification Period) in which the rectification objectives will be achieved.

During the Rectification Period, the SACBP will achieve compliance with this SEO through implementation of the rectification plan.

Serious Incidents	Reportable Incidents
1. A person is seriously injured[3] or killed. 2. An imminent risk to public health or safety arises. 3. Serious environmental damage occurs or an imminent risk of serious environmental damage arises. For example: a) Disturbance to sites of cultural and/or heritage significance without appropriate permits and approvals[4]. b) An escape of petroleum, process substance, a chemical or a fuel to a water body, or to land in a place where it is reasonably likely to enter a water body by seepage or infiltration, or onto land that affects the health of native flora and fauna species. c) Detection of a declared weed, animal/plant pathogen or plant pest species that has been introduced or spread as a direct result of activities. d) Any removal of rare, vulnerable or endangered flora and fauna without appropriate permits and approvals[5]. 4. Security of natural gas supply is prejudiced or an imminent risk of prejudice to security of natural gas supply arises[6]. 5. An event that results in a rupture of a pressure containing asset or facility. 6. A regulated activity[7] being undertaken in manner that involved or will involve a serious risk to the health or safety of a person emanating from an immediate or imminent exposure to a hazard[8]. 7. Activity on a pipeline easement where the pipeline is contacted and repair action is required[9]. 8. An uncontrolled gas release resulting in the activation of emergency response and/or evacuation procedures of an area in or adjacent to the gas release, and/or fire or explosion.	1. An escape of petroleum[10], processed substance, a chemical or a fuel that affects an area that has not been specifically designed to contain such an escape[11] (other than a serious incident). 2. An event that has the potential to compromise the physical integrity of an asset or facility. For example: a) Activity on a pipeline easement with equipment that has been identified9 as exceeding the pipeline's penetration resistance, determined in accordance with Australian Standard (AS) 2885. b) Identification of a through-wall defect on a pipeline[12] or plant component (other than a serious incident). c) Identification[13] of a partial through-wall defect (e.g. through visual inspection, inline inspection, non-destructive testing) that requires repair or replacement action, or a reduction of the Maximum Allowable Operating Pressure, to maintain safe operation (other than a serious incident). d) Activity on a pipeline easement with equipment or vehicles that have been identified9 as exceeding allowable stress limits, determined in accordance with AS2885. e) An unapproved[14] excursion outside of critical design or operating conditions/parameters. f) Failure of a critical procedural control in place to reduce a credible threat to low or as low as reasonably practicable (ALARP).[15] 3. Unauthorised activity on a pipeline easement where the pipeline is contacted but repair action is not required. 4. Malfunction or failure of critical plant or equipment that had (or still has) potential to cause a serious incident. 5. Any non-compliance with SEO objectives.

Table 2: Incident definitions for operation (facility and pipeline) activities

[3] As per the definition in Section 36 of the *Work Health and Safety Act 2012*.

[4] Pursuant to *Aboriginal Heritage Act 1988* and *Heritage Places Act 1993*

[5] Pursuant to *Native Vegetation Act 1991* (flora) and *National Parks and Wildlife Act 1972* (fauna).

[6] That is, after taking into account relevant factors on a day and rights and obligations under contracts, a significant curtailment of firm service that detrimentally impacts or is likely to impact upon the security of electricity supply to South Australia or to gas supplies to a significant number of commercial and/or domestic gas users in SA

[7] Regulated activity as defined in Section 10 of the *Petroleum and Geothermal Energy Act 2000*.

[8] Resulting in the issuing of a prohibition notice by SafeWork SA pursuant to Section 195 the *Work Health and Safety Act 2012*.

[9] For the case where a detailed assessment is required to determine this, DMITRE recommends the incident be reported initially and amended at a later date if required.

[10] In gaseous, liquid or solid state, as per *Petroleum and Geothermal Energy Act 2000* definition.

[11] An area assigned during a Hazard and Operability Process (HAZOP) study as a hazardous area for the purpose of gas venting, and designed as such, is considered to be an area specifically designed to contain a gas escape.

[12] As per *Petroleum and Geothermal Energy Act 2000* definition, the term 'pipeline' includes tanks, machinery and equipment necessary for, or associated with, operation of the pipeline.

[13] For reporting purposes, the incident is considered to have occurred at the time that a decision is made to repair or replace the defect, or reduce the Maximum Allowable Operating Pressure.

[14] "Approval" as per AS2885 definition. Note that there may be situations where excursions are allowable under AS2885.

[15] As per the Safety Management System process articulated in AS 2885.1-2012, or similar risk assessment process.

List of Abbreviations

AARD	Aboriginal Affairs and Reconciliation Division, Department of the Premier and Cabinet
DEH	Department for Environment and Heritage (South Australia)
DWLBC	Department of Water, Land and Biodiversity Conservation
EHSMS	Environment, Health and Safety Management System
EIR	Environmental Impact Report prepared in accordance with Section 97 of the Act and Regulation 10.
EPA	Environment Protection Authority
EPBC	*Environment Protection and Biodiversity Conservation (Act 1999)*
ERP	Emergency Response Plan
GAB	Great Artesian Basin
GAS	Goal attainment scaling
LTU	Licensed Treatment Unit
NEPM	National Environment Protection Measure
NRM	Natural Resources Management (Act or Board)
NVC	Native Vegetation Council
PEL	Petroleum exploration licence
PFW	Produced formation water
PIRSA	Primary Industries and Resources South Australia
PPE	Personal protective equipment
PPL	Petroleum production licence
ROW	Right-of-way
SACB	South Australia Cooper Basin
SACBP	South Australia Cooper Basin Parties
SEO	Statement of Environmental Objectives prepared in accordance with Section 99 and 100 of the Act and Regulations 12 and 13.
SHI	Soil Health Index (SHI Decision Framework)
TDS	Total dissolved solids
TPH	Total petroleum hydrocarbons

4 References and Further Reading

DWLBC (2005). *Guidelines for a Native Vegetation Significant Environmental Benefit Policy for the clearance of native vegetation associated with the minerals and petroleum industry.* Prepared for the Native Vegetation Council, September 2005. Department of Water, Land & Biodiversity Conservation

Malavazos, M. and Dobrzinski, I. (1995). '*Goal Attainment Scaling Applied to Assessing Environmental Impact of Petroleum Operations in the Cooper Basin*,' in SA Department of Mines and Energy Report DME 16/90 May 1995

PIRSA (2009). *Field Guide for the Environmental Assessment of Abandoned Petroleum Well Sites in the Cooper Basin, South Australia.* Prepared by the Petroleum and Geothermal Group, Division of Minerals and Energy Resources, Primary Industries and Resources South Australia

Santos (1999). *Code of Environmental Practice, Production and Processing*, September 1999

Santos (2003a). *South Australian Cooper Basin Joint Venture, Environmental Impact Report: Production and Processing Operations*. Santos Ltd, Adelaide

Santos Ltd (2003b). *South Australia Cooper Basin Joint Venture Statement of Environmental Objectives: Production and Processing Operations*. Santos Ltd, Adelaide

Santos Ltd (2006). *South Australian Cooper Basin Operators Statement of Environmental Objectives: Geophysical Operations*. Santos Ltd, Adelaide

Santos (2010). *South Australia Cooper Basin - Addendum to the Environmental Impact Report: Production and Processing Operations - Five Year Review of the Statement of Environmental Objectives.* Santos Ltd, Adelaide

Wiltshire, D. and Schmidt, M. (2003). *Field Guide to the Common Plants of the Cooper Basin (South Australia and Queensland)*. Santos Ltd, Adelaide.

5 Appendix

5.1 Criteria for Assessing Borrow Pit Construction and Rehabilitation

Ref.	Goal	EXPECTED GOAL EXCEEDED +2	+1	EXPECTED GOAL ATTAINED 0	MINOR SHORTFALL -1	SIGNIFICANT SHORTFALL -2
CONSTRUCTION						
1.	Perennial vegetation and tree clearance minimised	No trees or vegetation removed.	No trees removed, only vegetation of priority 4 in Field Guide cleared.	Trees and vegetation removed in area where could not have been avoided.	Trees of priority 2 or 3 in Field Guide removed in area where could have been avoided.	Trees of priority 1 in Field Guide[16] removed in area where could have been avoided
2.	Site location appropriate	Borrow pit not visible from road.	Borrow pit shielded from road by utilising screening vegetation or landform.	Borrow pit more than 50m from road. Visible from road due to lack of screening vegetation.	Borrow pit less than 50m from road.	Borrow pit less than 20m from road.
3.	Protect and avoid site of natural, scientific, or heritage significance	Sites identified, flagged and avoided by 100m.		Sites identified, flagged and avoided.		Sites disturbed.
REHABILITATION						
4.	Minimise impact on vegetation	Vegetation type and density indistinguishable from surrounding landscape.		Perennial grasses and shrubs revegetated and type consistent with surroundings. Some bare patches still present. Vegetation cover is uniform over base and sides of pit.	Revegetation localised on the base of the pit but none or very little on the sides of the pit.	No revegetation evident.
5.	Minimise impact on soil	No erosion anywhere on the pit.		Minor erosion along the sides of the pit.	Moderate erosion.	Severe erosion evident.
6.	Minimise visual impacts	Pit contours indistinguishable from surrounding landscape. Access ripped.	Pit contours blend well into surrounding landscape, although still evident.	Pit sides battered and ripped along the contour, but are still highly visible. Topsoil and vegetation respread over disturbed area.	Pit sides battered but not ripped.	No recontouring of pit has occurred – pit sides are very steep. Topsoil and vegetation not respread.

[16] Field Guide refers to the *Field Guide to the Common Plants of the Cooper Basin – South Australia and Queensland* (Wiltshire and Schmidt 2003)

5.2 Criteria for Assessing Produced Formation Water Disposal - Field Inspections

Ref.	Goal	EXPECTED GOAL EXCEEDED +2	+1	EXPECTED GOAL ATTAINED 0	MINOR SHORTFALL -1	SIGNIFICANT SHORTFALL -2
MINIMISE ADVERSE IMPACTS ON SOIL, VEGETATION, NATIVE FAUNA AND LIVESTOCK						
1.	Minimise oil discharge into environment	No oil visible in either the evaporation, holding or interceptor ponds.	No oil visible in either the evaporation, holding or interceptor ponds, only some stains on the banks of the interceptor pit.	Oil visible in interceptor pits but not in any holding and evaporation pond(s).	Oil visible on water in holding ponds but not in evaporation pond.	Oil visible on water in evaporation pond.
2.	Minimise salination of soil	No salination evident anywhere.		Salination only evident within designated area.	No salination evident outside designated area. However more than 75% of the unflooded soil area in the designated area has evidence of salination.	Salination and seepage evident outside designated pond area, such as adjacent dune corridor.
MINIMISE IMPACT ON VEGETATION.						
3.	Perennial vegetation clearance minimised	As above.	No trees removed, only vegetation of priority 4 in Field Guide cleared.	Trees and vegetation removed in area where could not have been avoided.	Vegetation of priority 2 or 3 in Field Guide removed in area where could have been avoided.	Trees of priority 1 in Field Guide[17] removed in area where could have been avoided.
4.	Vegetation impact by water inundation minimised	No observed impacts to local vegetation.		No observed change to local vegetation.	Local vegetation dying.	Local vegetation dead.
MINIMISE IMPACT ON NATIVE FAUNA AND LIVESTOCK						
5.	Water quality acceptable for native fauna consumption	No contaminants in water.	Guidelines are yet to be set based on the PFW studies			
6.	Water quality tolerable for livestock consumption	No contaminants in water.				

[17][17] Field Guide refers to the *Field Guide to the Common Plants of the Cooper Basin – South Australia and Queensland* (Wiltshire and Schmidt 2003)

5.3 Criteria for Assessing Oil Spill Remediation/Rehabilitation

Ref.	Goal	EXPECTED GOAL EXCEEDED +2	+1	EXPECTED GOAL ATTAINED 0	MINOR SHORTFALL -1	SIGNIFICANT SHORTFALL -2
1.	Minimise impacts on vegetation (5 years after spill)	Vegetation type, density and maturity indistinguishable from surrounding landscape.	Vegetation type and density the same as surrounding landscape, but less mature.	Vegetation re-established, but some bare patches still evident.	Very little revegetation; site mostly bare compared to surrounding landscape.	No revegetation evident.
2.	Minimise soil contamination (12 months after spill)	No evidence of soil discoloration or hydrocarbon odour in soil.	Very faint soil discoloration evident, and no hydrocarbon odour in soil.	Faint evidence of soil discoloration and slight hydrocarbon odour in the soil.	Areas of significant staining and very strong hydrocarbon odour in the soil.	More than 50% of the spill site has significant soil discoloration and a strong hydrocarbon odour in the soil
3.	Response speed to minimise hazard (48 hours after spill detected)	Area restored to original state.	Site recontoured with earthworks evident, no free oil or evidence of spill.	Free oil removed. Spill staining still evident and hydrocarbon odour only slightly detectable.	Hydrocarbon fumes very strong and overpowering.	Free oil visible.

5.4 Criteria for Assessing the Rehabilitation of Abandoned Production Facilities

Objectives	Measure	EXPECTED GOAL EXCEEDED +2	+1	EXPECTED GOAL ATTAINED 0	MINOR SHORTFALL -1	SIGNIFICANT SHORTFALL -2
To minimise the visual impact	Access tracks	The track contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	The track contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The track contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).	The track surface has been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.	The track is prominent because of a scraped surface, windrows along its edges or gully erosion.
	Interdune and floodplain sites	The site contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	The site contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The site contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).	The site surface and edge have been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.	The site remains as a prominent consolidated surface with a distinct edge.
	Dune sites	The edge and colour of the site blend with the surroundings. The site contours are indistinguishable whether viewed from the top or base of the dune.	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. There are no erosion gullies down the face of the dune.	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. Erosion gullies are present down the face of the dune, but they are not extensive or prominent.	The site has been restored into the natural contour of the dune; but the colour of foreign material contrasts with the surroundings.	Extensive gully erosion down the face of the dune and/or a steep site edge are prominent.
	Gibber sites	Site is indistinguishable from the surrounds.	Site matches adjacent contours and the gibber is uniformly spread with no imported material evident.	Site matches adjacent contours with some imported material still evident within gibber spread.	Site matches adjacent colours, but is visible due to inconsistent spreading of the gibber and some bare areas.	Site is poorly formed and predominantly bare due to incomplete spreading or loss of the gibber.
The revegetation of indigenous species	Predictive rehabilitation on abandonment	N/A	N/A	There has been appropriate preparation of the ground surface to promote revegetation.	The restored surface is inconsistent with the surroundings.	No attempt has been made to restore the site.
	Less than five years since abandonment*	The revegetation is extensive and mostly consists of annuals and biennials; perennials are beginning to establish which is consistent with the surroundings.	The revegetation is extensive and consists of annuals and biennials; in contrast to the surroundings there are no perennials.	Colonisation of the original species is starting to occur.	Revegetation with inappropriate species.	No revegetation is occurring.
	At least five years since abandonment*	The revegetation type, density and maturity is indistinguishable from the surroundings.	The revegetation, mostly perennials, is consistent with the surroundings; but there is a contrast in maturity between them.	The revegetation consists of annuals, biennials and perennials; but there are some bare patches which are inconsistent with the surroundings.	The revegetation mostly consists of annuals and biennials; in contrast to the surroundings there are few perennials	There is no revegetation.

These criteria are consistent with PIRSA (2009) *Field Guide for the Environmental Assessment of Abandoned Petroleum Wellsites.*
* Note: Assessment will take into account that revegetation is a time and rainfall dependent process.