Leigh Creek Energy

Statement of Environmental Objectives

Exploration Drilling Operations
Petroleum Exploration Licence 650

PGER 00319

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Revision History

Revision	Date	Purpose	Prepared	Reviewed	Authorised
0	29/10/18	Draft prepared	JC/ED (LCK)	AM	
1	23/11/18	Draft released for consultation	SM/BW (JBS&G)	AM	AM
2	24/10/19	Updated with additional feedback	DN/AM/SA	JC	AM
3	29/10/19	Draft released for consultation	AM/DN/SA	AM	AM
4	08/11/19	Issued for submission to DEM	JC	AM	AM
5	28/11/19	Updated with additional feedback	AM	JC	AM
6	07/02/20	Updated following government department reviews	AM/JC	JC	AM

Leigh Creek Energy acknowledge the Adnyamathanha people, the traditional owners of the land on which our operations occur and pay our respects to their Elders past and present.

Contents

Figures

1 Introduction

1.1 About Leigh Creek Energy

Leigh Creek Energy Ltd (LCK) is the owner and proposed operator of the Leigh Creek Energy Project, located at Leigh Creek in South Australia, 550 km north of Adelaide. The project is located within Petroleum Exploration Licence 650 (PEL 650), which overlies the Leigh Creek Coalfield, and will develop deep coal resources that are unable and uneconomic to be accessed by open-cut mining.

LCK plans to produce energy from coal using a process known as in situ gasification (ISG). The ISG process converts coal from its solid state into a gaseous form, resulting in the generation of synthesis gas (syngas) containing methane, hydrogen and other valuable components. The syngas can be either used to produce electricity directly or further refined into a variety of products including synthetic methane and ammonia.

1.2 Purpose

This Statement of Environmental Objectives (SEO) for exploratory drilling activities has been prepared to meet the requirements of Sections 99 and 100 of the *Petroleum and Geothermal Energy Act 2000* (the Act) and Regulations 12 and 13 of the *Petroleum and Geothermal Energy Regulations 2013* (the Regulations).

The intent of the SEO is to outline the environmental objectives to which the exploration drilling program in Petroleum Exploration Licence (PEL) 650 will conform, and the criteria upon which the achievement of these objectives will be assessed.

The objectives of this SEO have been developed on the basis of the information provided in the Environmental Impact Report (EIR) Exploration Drilling Operations (LCK 2019), and are in keeping with the objectives of the Petroleum and Geothermal Energy Act, which include:

- to avoid and minimise the environmental impact from exploration for, or recovery or commercial utilisation of, resources to which the Act applies;
- to establish appropriate consultative processes involving people directly affected by regulated activities and the public generally; and
- to protect the public from risks inherent in regulated activities.

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

1.3 Scope

This SEO applies to all of exploration drilling in Petroleum Exploration Licence (PEL) 650. These activities are described in the Exploration Drilling Operations EIR (LCK 2019).

This SEO covers:

- Access track and drill site construction
- Coal exploration drilling (using mineral exploration drill rigs or water boring drill rigs)
- Groundwater investigation drilling
- Access track and drill site rehabilitation
- Campsite construction and restoration (if required)

Activities that are not covered in this SEO and the associated Exploration Drilling Operations EIR (2019), are:

- Geophysical exploration activities
- Pre-commercial demonstration (PCD) plant
- Production Gasifier inlet and outlet well drilling
- Production water bore drilling.

Two separate SEOs cover LCK Geophysical Operations and LCK Pre-Commercial Demonstration operations within PEL 650. These are:

- Statement of Environmental Objectives: Geophysical Operations - Petroleum Exploration Licence 650 – LCK (2019)
- Statement of Environmental Objectives: ISG Demonstration Plant – LCK (2018).

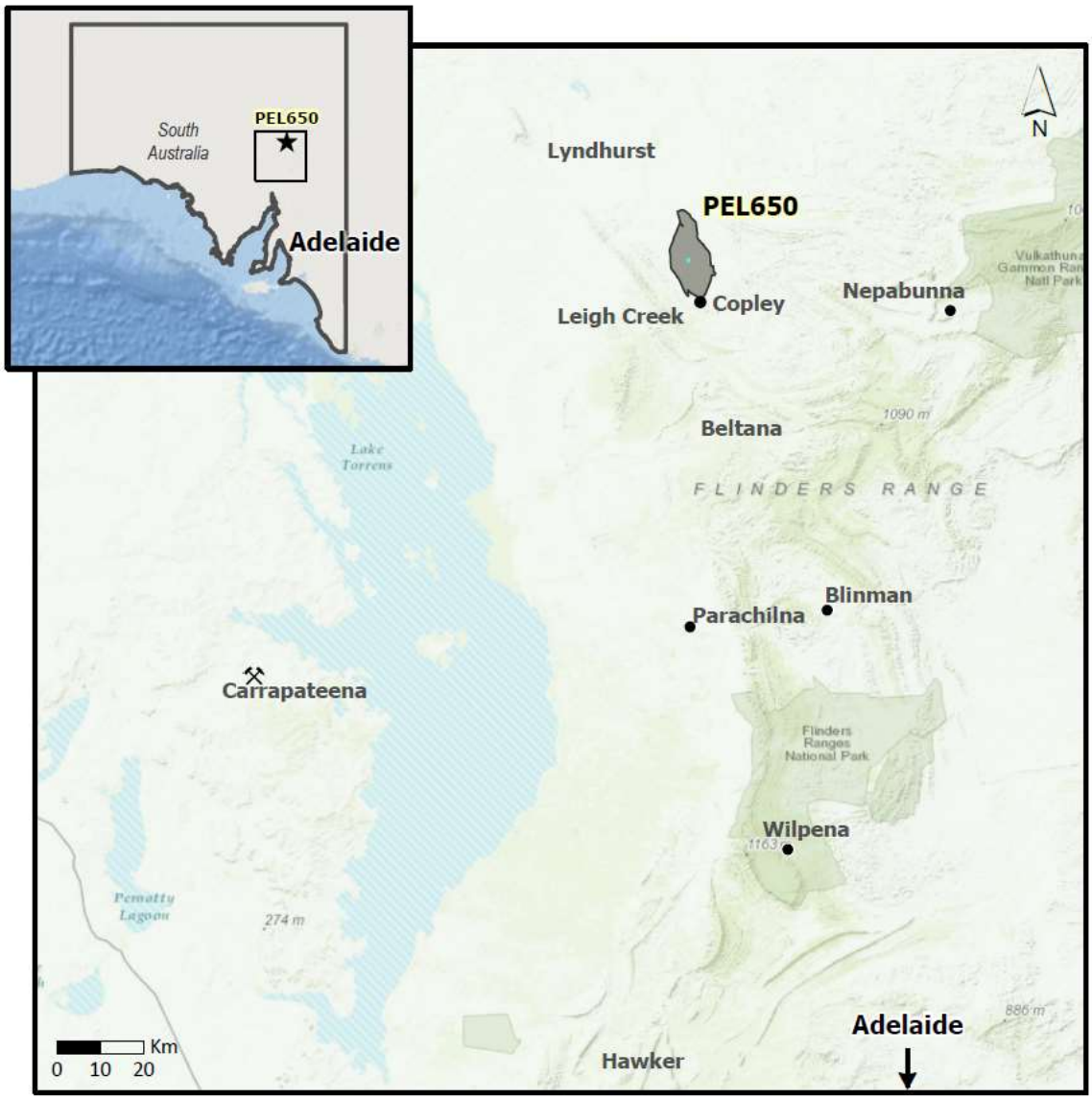

Figure 1-1: Project location

2 Environmental Objectives and Assessment Criteria

2.1 Objectives

The Act sets out important environmental objectives under which regulated activities such as exploration drilling must operate, these include:

- ensure that regulated activities that have (actually or potentially) adverse effects on the environment are properly managed to reduce environmental damage as far as reasonably practicable: and.
- elimination as far as reasonably practicable risk of significant long-term environmental damage; and
- ensure that land adversely affected by regulated activities is properly rehabilitated.

The environmental objectives for exploration activities as stipulated in the Act:

- must state environmental objectives that must be achieved in carrying out regulated activities to which the statement applies; and
- must state criteria to be applied to determine whether the stated environmental objectives have been achieved in a particular case; and
- may include conditions and requirements to be complied with in order to achieve the stated objectives; and
- must impose reporting obligations on a person carrying out regulated activities to which it relates.

Potential environmental hazards and consequences associated with the exploration drilling operations in PEL 650 have been identified in the Environmental Impact Report (LCK 2019).

LCK is committed to achieving a range of environmental objectives regarding these potential environmental hazards.

The environmental objectives for the Exploration Drilling Operations within the PEL 650 are:

1. Minimise risk of damage, disturbance or interference to Aboriginal heritage sites, objects and remains by undertaking risk mitigation strategies. Where damage, disturbance or interference cannot be avoided, or may occur inadvertently, seek authorisation under section 23 of the *Aboriginal Heritage Act 1988;*
2. Minimise soil disturbance and avoid contamination to soil;
3. Minimise disturbance including contamination to drainage patterns and surface waters;
4. Minimise loss of aquifer pressure and avoid aquifer contamination;
5. Minimise impacts to native flora and fauna;
6. Avoid the introduction or spread of weeds, plant pathogens or pests (including feral animals);
7. Avoid or minimise disturbance to stakeholders and / or associated infrastructure;
8. Minimise risks to the safety of the public, employees and other third parties;
9. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal; and
10. Remediate and rehabilitate operational areas to agreed standards.

2.2 Assessment Criteria

The environmental objectives identified above are subject to an assessment to measure the level of achievement. The assessment criteria for each objective are set out in Table 1 and will be one of the following:

1. **Defined conditions** – in some cases, the achievement of an objective can be assessed through ensuring defined conditions are met or carried out. Defined conditions are also interpreted as being the requirement to carry out certain actions in accordance with approved procedures, relevant legislation (such as the Environment Protection Act 1993, Aboriginal Heritage Act 1988 and Fire and Emergency Services Act 2005), and industry standards.

2. **Defined requirements** – the achievement of an objective can be assessed against the implementation of specific procedures or industry accepted standards required for an activity (e.g. 'All wastewater is disposed in accordance with the *South Australian Public Health (Wastewater) Regulations 2013* or to the satisfaction of the Department of Health'.

3. **Goal Attainment Scaling (GAS) criteria** – Some environmental objectives are prone to subjective judgement from one observer to another. Therefore, to minimise the discrepancy from one observer to another, Goal Attainment Scaling (GAS) is used to measure the degree to which such objectives are met (Jacobs SKM 2014 and Santos 2015). Goal Attainment Scaling criteria are presented in Appendix A.

4. **Scientific Studies / Monitoring** – in some cases 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.

Each objective for exploration drilling will be assessed using a selection of the assessment options outlined above. This will enable LCK to determine whether environmental objectives are being achieved. Comments on any variances will be recorded and reported where required as detailed in Section 3.

Table 1 also outlines the controls that are planned to be implemented to ensure that environmental objectives are achieved, in the "Guide to How Objectives Can be Achieved" column. These management measures provide a high-level overview of LCK's systems, activities and / or procedures to achieve the environmental objectives.

Table 1: Environmental Objectives and Assessment Criteria

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
1. Minimise risk of damage, disturbance or interference to Aboriginal heritage sites, objects and remains by undertaking risk mitigation strategies. Where required, seek authorisation under the *Aboriginal Heritage Act 1988*.	By way of risk mitigation, areas of proposed exploration activities will be subject to the request of a cultural heritage Work Area Clearance[1]. Requests will be made in accordance with the existing Work Area Clearance Agreement[2] between LCK and the Adnyamathanha Traditional Lands Association (ATLA) and exploration activities will then be undertaken in accordance with conditions of the Work Area Clearance. Any Aboriginal heritage sites, objects and remains discovered during operations have been appropriately reported and responded to, consistent with the *Aboriginal Heritage Act 1988.*	• All new land disturbance is contained within the cultural heritage Work Area Clearance area. • Areas of sensitivity (e.g. cultural heritage exclusion areas, if present) will be flagged and / or fenced off where necessary to prevent disturbance. • Training for all personnel on Aboriginal cultural heritage as well as their obligations under the Aboriginal Heritage Act 1988. • If suspected cultural heritage material is discovered during operations, immediately stop any further work in the area, secure the site and ensure no further ground disturbing activity takes place in the immediate area. • Contact the Adnyamathanha Traditional Lands Association (ATLA) or any legally recognised body to identify an appropriate course of action. Options include risk managing the area in accordance with the agreed WACA between LCK and ATLA. • If Aboriginal sites, objects and remains are discovered, the discovery is reported to the Department of the Premier and Cabinet – Aboriginal Affairs and Reconciliation (DPC-AAR) division. • Where possible, existing tracks, roads or seismic lines are used for access.
2. Minimise soil disturbance and avoid contamination to soil	Attainment of 0, +1 or +2 GAS criteria for 'Minimise impacts on soil' objective, as listed in Table A1 (Appendix A). The extent of soil erosion as a result of exploration drilling activities is consistent with or less than the surrounding land. Avoid highly sensitive landforms. Refer to Objective 9 for rehabilitation criteria.	• Access tracks and drill site activities confined to defined sites and areas of new disturbance minimised. • Topsoil stockpiled (where present) during access track and drill site construction for use in restoration. • Areas where there is potential for (or signs of) soil erosion or sedimentation occurring, area will be stabilised, and control measures implemented. • Training and induction for all personnel to educate them on the importance of remaining within designated / approved areas.

[1] It is important to note that the term 'clearance' is sometimes used in the conduct of Aboriginal heritage surveys. Note that the term 'clearance' is not in the Aboriginal Heritage Act and therefore has no legal standing under the Act.

[2] the Work Area Clearance Agreement is a confidential document between LCK and ATLA

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
	<u>Fuel and chemical storage handling</u> Any spill of chemicals or fuel to land is either immediately contained and removed or assessed in accordance with NEPM[3] guidelines and remediated (where required) in accordance with relevant guidelines in a timely manner.	• Disturbed areas reinstated once they are no longer required e.g. by backfilling excavations, restoring natural contours, ripping areas of compacted soil and respreading topsoil and stockpiled vegetation. • The drill sumps are designed and built large enough to ensure no overflow of drill fluids and muds. • Implementation of appropriate chemical and fuel storage and handling procedures, in accordance with Safety Data Sheets and relevant standards and guidelines, including AS 1940, EPA guidelines 080/16 Bunding and Spill Management and the Australian Dangerous Goods Code. • Appropriate spill capture methods implemented in refuelling areas (e.g. use of drip trays or liners). • Emergency / spill response procedures are established, and appropriate spill response equipment is available on site. • Spills or leaks are immediately reported, and clean-up actions initiated. • Personnel have received training in the use of spill response equipment. • No overflow, spill or seepage of completions fluids from temporary holding ponds • Solid wastes and foreign material to remain contained onsite within the well lease/operational area boundaries until disposed of at an EPA licensed facility, with the exception of drilling and completions benign solids to be disposed of in drilling sump. • Refer to Objective 9 for measures regarding assessment and management of site contamination.
3. Minimise disturbance including contamination to drainage patterns and surface waters	• No new water affecting activities as defined under the NRM Act undertaken unless relevant permits have been obtained. • No unauthorised discharge of water (or other liquids) or solid wastes to surface waters	• Activities associated with drilling, completions and groundwater investigations identified as having the potential to result in land and drainage channel disturbance and/or contamination of soils, surface waters or shallow groundwaters (if present) (including, but not limited to, drill pad, camp site and access track construction, borrow pit construction, construction and operation of drilling mud sumps, well head operations, groundwater airlift and/or drawdown testing, fuel and chemical storage and handling and waste

[3] *National Environment Protection (Assessment of Site Contamination) Measure (1999)* amended in 2013.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
	• The attainment of 0, +1 or +2 GAS criteria under well site construction for minimising disturbance to drainage patterns Table A1 (Appendix A).	management) must have environmental authorisation prior to proceeding and be undertaken in accordance with company and/or applicable regulatory requirements and guidelines. Any authorisation for the activity should consider the activity's potential to result in impacts. • Construction activities are designed, located and managed as far as reasonably practicable to maintain pre-existing water flows (regardless of if these are man-made from previous mining operations). • Construction and operational activities that result in disturbance to drainage channels, or contamination of soils, surface waters or groundwaters, either by their nature (e.g. authorised land clearance) or through abnormal or emergency events (e.g. spillages) will be rehabilitated (if required) to ensure that the current environmental receptors and activities associated with the identified end land use will not be negatively impacted. • To minimise potential impacts to surface waters the following controls should be considered: - Fuel, oil and chemicals are stored, handled and transported in accordance with applicable standards and guidelines e.g. Australian Standard AS 1940, Australian Dangerous Goods (ADG) Code, EPA guidelines *080/07 Bunding and Spill Management*. - Incidents resulting in loss of containment are immediately reported and clean-up actions initiated as soon as reasonably practicable. - Temporary camp facilities are constructed and managed in accordance with applicable regulatory and company standards of the day. - The drill sumps are designed and built large enough to ensure no overflow of drill fluids and muds. - Compliance with the *Environment Protection (Water Quality) Policy 2015*. - Erosion prevention measures implemented and monitored to ensure sedimentation of waterways is minimised. - Rehabilitation work carried out as soon as practicable after completion of all activities. • In the event of an environmental incident such as a loss of containment, the Hazardous Substance Management Procedure will be implemented.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
4. Minimise loss of aquifer pressure and avoid aquifer contamination.	No groundwater contamination as a result of drilling. Effective barriers exist to prevent crossflow between separate aquifer systems. No impact on other groundwater users or groundwater dependant ecosystems due to water extraction activities or contamination. No unauthorised discharge of water (or other liquids) or solid wastes to groundwater. No uncontrolled flow to the surface. Relevant government approval obtained for abandonment of radioactive tools if left downhole.	• Water sourced from SA Water on the mine site is the main preference for use as a water supply. • Other water extraction points are discussed with landholders prior to use to eliminate any potential impact issues. • Only biodegradable or natural products are used in drilling activities. • Only "overbalanced" mud drilling will be undertaken due to no plan for well control equipment • All drillholes are cased and casing is cemented in place to avoid crossflow between separate aquifers. • Casing pressure tests and running of Cement Bond Logs (CBL) will be used to prove barrier verification of the drillhole. • All water and drilling muds are contained within adequately designed drill sumps to avoid discharge onto the ground surface. • Sufficient contingency mud weighting stocks will be kept on site. • Relevant EPA and DEM approval will be sought if radioactive source becomes irretrievably stuck and cannot be retrieved.
5. Minimise impacts to native flora and fauna.	The attainment of either 0, +1 or +2 GAS criteria for 'Minimise impact on native vegetation and native fauna' objective for wellsite construction and for 'Minimise impacts on vegetation' objective for borrow pit construction and rehabilitation, as listed in Appendix A. The attainment of 0, +1 or +2 GAS criteria for 'Revegetation of indigenous species' objective listed in Table A1 (Appendix A). Any spill of petroleum, chemical or fuel is either immediately contained and removed or assessed in accordance with NEPM guidelines and remediated in accordance with relevant guidelines in a timely manner.	• Flora and Fauna assessment completed for designated work areas. • Activities confined to clearly defined designated approved work areas to minimise areas of new disturbance. • Areas of sensitivity (e.g. significant vegetation/ significant fauna habitats if present) flagged and / or fenced off where necessary to prevent disturbance. • Fencing installed where necessary to prevent access to hazardous areas by large native fauna species. • Excavations managed to minimise hazard to fauna (e.g. excavated areas left open for as little time as possible and regularly inspected for trapped fauna). • Water supply sources (e.g. artificial water storages constructed for mine-site use) reviewed to ensure that their use does not impact adversely on environmental values. • Water supply wells (if used) reviewed to ensure that their use does not impact adversely on existing groundwater dependent ecosystems. • All personnel have received environmental inductions. Driver behaviour and vehicle speed limits included in compulsory induction.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
	No impact to rare, vulnerable or endangered flora and/or fauna, or important vegetation due to a spill of petroleum, chemical or fuel. Rare, vulnerable or endangered flora are not removed without necessary permits or approvals. No overflow, spill or seepage of drill fluids and muds from temporary holding ponds. No native fauna casualties that could have been reasonably prevented. No uncontrolled fires resulting from regulated activities.	• Waste Disposal - Refer to Objective 8. • Storage and Handling of Fuel and Chemicals - Refer to Objective 2. • The drill sumps are designed and built large enough to ensure no overflow of drill fluids and muds.
6. No introduction or spread of weeds, plant pathogens or pests (including feral animals)	The presence of weeds, plant pathogens or pests is consistent with or better than pre-disturbance conditions and/or adjacent land or where this is not the case, a management plan is implemented immediately. Declared plants occurring as a result of regulated activities are reported and managed in accordance with the Natural Resources Management (NRM) Act and regional NRM plans.	• Pre-disturbance site inspection undertaken to document existing conditions. • Earth moving equipment and drilling rigs are cleaned and inspected before commencing work at site or after operating in areas of known weed infestations. • Imported material (e.g. gravel or road base) sourced from areas considered to be weed /disease free. • If project activities result in the introduction or increased densities of weeds, a weed control plan will be developed and implemented. • ***Note:*** Weeds are defined in this objective as any invasive plant that threatens native vegetation in the local area *or any species recognised as invasive in South Australia.*
7. Avoid or minimise disturbance to stakeholders and / or associated infrastructure;	Stakeholder complaints are documented, and reasonable steps taken to address them can be demonstrated. Where disturbance is unavoidable, infrastructure or land use is restored to the satisfaction of the owner or as near as practicable to undisturbed condition.	• Drill Site layout and access tracks designed to minimise adverse impacts to existing drainage patterns and secondary impacts to mine site operations. • Overland flows are diverted around the site where required. • Water supply sources reviewed to ensure that their use does not impact adversely on existing users. • Water supply wells (if used) reviewed to ensure that their use does not impact adversely on existing users of groundwater. • Existing water wells (if used) accessed in consultation with well owners. • Monitoring of water extraction volumes.

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
		• All plant and equipment operated and maintained in accordance with design parameters and manufacturer specifications. • Relevant stakeholders notified prior to undertaking exploration drilling operations, pursuant to Petroleum and Geothermal Energy Regulations. • Liaison with Flinders Power regarding notification / management of works, traffic and site issues. • Liaison with local community regarding exploration drilling operations. • System in place for logging complaints to ensure that issues are recorded, addressed as appropriate and resolved in a timely manner. • High standard of 'housekeeping' maintained. • Induction for all employees and contractors covers stakeholder matters. • Emergency services and potentially affected landholders / local community will be informed of significant activities (e.g. movement of large items of equipment) on public roads.
8. Minimise risks to the safety of the public, employees and other third parties	Reasonable measures implemented to ensure no injuries or health risks to the public, employees and other third parties (e.g. Flinders Power) as a result of activities. No injuries, incidents or adverse health impacts involving the public, employees or other third parties (e.g. Flinders Power) from exploration drilling activities that could have been reasonably prevented by the operator. No uncontrolled fires as a result of activities.	• Exploration drilling and access track construction, designed, constructed and maintained in accordance with relevant standards and best practice. • Safety, testing, maintenance and inspection procedures are implemented. • Recognised risk management processes implemented in planning through to demobilisation to identify threats and controls to mitigate risks. • Site management protocols implemented as agreed with third parties (e.g. Flinders Power, landowners, etc.) documenting health and safety management systems. • Emergency response plan (scenario based) in place and drills conducted. • Continuous (24/7) operational presence on site including regular equipment inspections. • Signage and site access control measures in place to warn of hazards and restrict access to the work site. • Safe work permits be obtained to ensure only individuals with proper clearance can conduct works. • Appropriate fire-fighting equipment on site. • Designated no smoking site. • Fire and Emergency Services Act requirements complied with (e.g. permits for 'hot work' on total fire ban days).

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
		• Appropriate firebreaks are maintained. • Compliance with relevant speed limits and restrictions. • Driver behaviour and vehicle speed limits included in compulsory induction. • Traffic and journey management procedures followed. • All required authorisations (e.g. DPTI, police) obtained where required for significant activities (e.g. movement of large items of equipment) on public roads. • Emergency services and potentially affected landholders / local community will be informed of significant activities (e.g. movement of large items of equipment) on public roads. • All drill sites, sumps and access tracks are rehabilitated after completion, if no longer required.
9. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal	Wastes are segregated and transported to an EPA licensed facility for recycling or disposal in accordance with the facility's EPA licence conditions, except drill cuttings and muds that will be disposed of in the drill sump. Drilling fluids, cuttings, and muds contained within the drill sumps. Reasonable steps are taken to securely contain waste prior to removal from site. All wastewater is disposed in accordance with the *South Australian Public Health (Wastewater) Regulations 2013* or to the satisfaction of the Department of Health.	• Waste management to be undertaken with regard to the key elements of the Environment Protection (Waste to Resources) Policy (EP (Waste) Policy) for waste produced and disposed of within the licence area and in compliance with the EPA (Waste) Policy if transported and disposed of outside of the licence area. • Waste transported outside of the licence undertaken by an EPA licenced transport company and relevant waste transport certificates obtained. • Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. • Secure systems used for storage and transport of waste (e.g. covered bins in designated area for waste collection and storage prior to transport). • High standards of 'housekeeping' implemented. • Hazardous wastes handled in accordance with relevant legislation and standards. • Licensed contractors used for waste transport. • Liquid waste (e.g. waste oil) stored in appropriate tanks and transported off site to an EPA licensed facility.
10. Remediate and rehabilitate exploration areas to agreed standards	The attainment of 0, +1 or +2 GAS criteria for 'Minimise visual impact' objectives for wellsite rehabilitation and abandonment and borrow pits listed in Table A1 and A3 (Appendix A).	• Drill site rehabilitated following the completion of all activities. The drill mud sump will be allowed to dry out and then backfilled to the level with the surrounding landscape. • If the drill mud sump does not dry out enough to be backfilled, then the contents of the sump will be removed using a backhoe and truck and the contents disposed of at a licenced

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can be Achieved
	Exploration drilling areas are rehabilitated to be reasonably consistent with the surrounding area (as per the following criteria) unless alternative agreement is reached with the regulator and stakeholders: - Any surface structures are removed - no evidence of waste on site - site contours are consistent with the surroundings - there has been appropriate preparation of the ground surface to promote revegetation. Any areas of contamination are assessed and managed using a risk-based approach, consistent with the principles of the NEPM[2]. Drillholes decommissioned in accordance with recognised industry standards and to the satisfaction of Energy Resources Division of the Department for Energy and Mining (DEM-ERD) when no longer required.	facility. The drill mud sump will then be backfilled with the material originally excavated when the sumps were constructed. • Disturbed areas reinstated once they are no longer required e.g. by backfilling excavations, restoring natural contours, ripping areas of compacted soil and respreading topsoil and stockpiled vegetation. Existing drainage patterns will be restored. • Any areas of contamination are assessed and managed consistent with the principles of the NEPM4 and relevant EPA guidelines, in consultation with DPC-ERD and EPA where appropriate.

[4] *National Environment Protection (Assessment of Site Contamination) Measure (1999)* amended in 2013

3 Reporting

It is a requirement under Section 85 of the Act that 'serious' and 'reportable' incidents must be reported to the Minister.

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

3.1 Incident Definitions

Regulation 12 (2) requires an SEO to identify events that could, if not properly managed or avoided, cause a serious incident or a reportable incident within the meaning of Section 85 of the Act.

In accordance with Section 85 of the Act and Regulation 32(1):

Serious incident means an incident arising from activities conducted under the licence in which:

a. a person is seriously injured or killed; or
b. an imminent risk to public health or safety arises; or
c. serious environmental damage occurs, or an imminent risk of serious environmental damage arises; or
d. security of natural gas supply is prejudiced or an imminent risk of prejudice to security of natural gas supply arises.
e. some other event or circumstance occurs or arises that results in the incident falling within a classification of serious incidents under the regulations or a relevant statement of environmental objectives.

Reportable incident is defined in Section 85(1) of the Act as incidents (other than a serious incident) arising from activities conducted under a licence that are classified under the Regulations as a reportable incident. Regulation 32(1) classifies the following as reportable incidents:

a. an escape of petroleum, a processed substance, a chemical or a fuel that affects an area that has not been specifically designed to contain such an escape; and
b. an incident identified as a reportable incident under the relevant statement of environmental objectives.

Table 2~~Table 2~~ identifies the potential serious and reportable incidents relevant to operation activities. These definitions are based on standard definitions for facilities and pipelines developed by Department for Energy and Mining (DEM)[5] and updated in recently approved SEOs (e.g. Santos 2015), which are intended to expand on definitions provided in Section 85(1) of the Act and Regulation 32(1) and provide consistency for Licensee reporting.

[5] DEM was Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) when the document was published.

Table 2: Potential Serious and Reportable Incidents

Serious Incidents	Reportable Incidents
1. A person is seriously injured[6] 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: • Damage, disturbance or interference to sites of cultural and / or heritage significance without appropriate clearances, permits or approvals[7]. • 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 or fauna species. • Detection of a declared weed, animal / plant pathogen or plant pest species that has been introduced or spread as a direct result of activities. • Any removal of rare, vulnerable or endangered flora and fauna without appropriate permits and approvals[8]. • Any well incident or failure that threatens or poses an imminent risk to safety or a risk of serious damage to environmental values whether or not those values are referred to in State or Commonwealth legislation. 4. An event that results in a rupture of a pressure containing asset or facility. 5. A regulated activity[9] 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[10]. 6. An uncontrolled release resulting in the activation of emergency response and/or evacuation procedures of an area in or adjacent to the release, and/or fire or explosion.	1. An escape of petroleum[11], processed substance, a chemical or a fuel that affects an area that has not been specifically designed to contain such an escape (other than a serious incident). 2. An event that has the potential to compromise the physical integrity of an asset or facility. Examples include a) An unapproved excursion outside of critical design or operating conditions/parameters or b) Failure of a critical procedural control in place to reduce a credible threat to low or as low as reasonably practicable (ALARP). 3. Malfunction or failure of critical plant or equipment that had (or still has) potential to cause a serious incident. 4. Any failure to install and verify a critical well barrier that may compromise the protection of groundwater resources or may lead to a serious incident. 5. Any event where an incursion outside a culturally cleared area has occurred or the conditions of a cultural heritage clearance have not been complied with (other than a serious incident). 6. Any wastewater (sewage) spills are a reportable incident to SA Health[12].

3.2 Reporting on Exploration Drilling Activity

LCK will report any serious incidents to DEM as soon as practicable after the event, as per Section 85 of the PGE Act and Regulation 32 of the PGE Regulations.

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

[6] Includes an immediately notifiable incident pursuant to section 38(2) of the *Work Health and Safety Act 2012.*

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

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

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

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

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

[12] Pursuant to the *Public Health Act 2011.*

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:

- petroleum exploration activity undertaken under the PGE Act; or
- wastes produced in the course of an activity (not being a prescribed activity of environmental significance) authorised by a licence under the PGE Act when produced and disposed of to land and contained within the area of the licence.

4 List of Abbreviations

AS 1940	Australian Standard *AS 1940 Storage and Handling of Flammable and Combustible Liquids*
DEM-ERD	Department for Energy and Mining, Energy Resources Division
DPTI	Department of Planning, Transport and Infrastructure
EIR	Environmental Impact Report prepared in accordance with Section 97 of the *Petroleum and Geothermal Energy Act 2000* and Regulation 10.
EPA	Environment Protection Authority
GAS	Goal Attainment Scaling
HAZOP	Hazard and Operability Process
ISG	In situ gasification. In situ (underground) conversion of coal into an energy-rich product gas.
LCK	Leigh Creek Energy Ltd
NEPM	*National Environment Protection (Assessment of Site Contamination) Measure (1999)* amended in 2013
NRM	Natural Resources Management
PEL	Petroleum Exploration Licence
SEO	Statement of Environmental Objectives

5 References

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Appendix A: Goal Attainment Assessment Criteria

Table A1: Goal Attainment Scaling (GAS) Criteria for assessing well site construction

Measures and associated goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor shortfall -1	Significant shortfall -2
Minimize impacts on soil					
Minimise erosion in stony /gibber pavement			Stony/gibber pavement rolled		Blading has occurred in gibber and stony plains where erosion risk is high or unmanageable, or with no drainage or erosion control structures in other areas.
Top soil stockpiling			Topsoil and any cleared vegetation stockpiled at well lease and campsite. Stockpiled material is separated and easily identified.	Topsoil and spoil stockpile mixing evident.	No stockpiled topsoil evident.
Minimise impact on native vegetation and native fauna					
Minimise native vegetation clearance and impacts to fauna and/or fauna habitat	Well site is located to avoid clearance of or significant disturbance to trees and other native vegetation, fauna and/or fauna habitat.	Well site is located to avoid clearance of or significant disturbance to native vegetation.	Native vegetation removed in area where could not have been avoided.	Moderate trees or shrubs removed where clearance could have been avoided.	Extensive removal of vegetation in area where could have been avoided.
Minimise disturbance to drainage patterns					
No obstruction of water flows	No obstruction of channels of any dimension		No obstruction of water flows or flows diverted around the well lease if required	Construction impacts natural water flows	Water flows obstructed

Table A2: Goal Attainment Scaling (GAS) Criteria: Rehabilitation and abandonment

Measures and associated goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor shortfall -1	Significant shortfall -2
Minimize 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.
Gibber wellsite	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[13]					
Predictive rehabilitation on decommissioning	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 wellsite.
Less than five years since wellsite decommissioning	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 decommissioning	The revegetation type, density and maturity are 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.
Site to be left in a clean, tidy and safe condition					
Rubbish removed			No evidence of litter on site	Small items of litter spread over more than 50% of the site, e.g. tin cans, nuts and bolts, rags, small pieces of cable and wood etc.	Large items of litter present across site, e.g. drums, pieces of casing and cables etc.

[13] These criteria are consistent with PIRSA (2009) *Field Guide for the Environmental Assessment of Abandoned Petroleum Wellsites* which also contains photographic examples of these outcomes

Table A3: GAS Criteria for Borrow Pits

Measures and associated goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor shortfall -1	Significant shortfall -2
Construction					
Minimize impacts on soil					
Pit sited and designed to minimise erosion and facilitate rehabilitation	Stony/gibber plain				
		Pit located on flat terrain	Pit located on low sloping terrain but constructed with erosion control measures evident (e.g. contour banks or bunds above the batter slope) Gibber mantle around pit intact (rolling only) No wind rows on tracks	Pit located on low sloping terrain and constructed with no erosion control measures evident Gibber mantle around pit intact (rolling only) No wind rows on tracks	Pit located on sloping terrain or: Pit located in any terrain where gibber mantle around pit removed and/or wind rows on tracks
	Floodplain				
			Pit located a suitable distance away from any creek channel, waterhole, terrace or levee so as not likely to cause erosion or flow impediment	Pit located within a distance from any creek channel, waterhole, terrace or levee that is potentially likely to cause erosion or flow impediment	Pit located within a distance form any creek channel, waterhole, terrace or levee that is likely cause erosion or flow impediment
Minimise impacts on vegetation					
Perennial vegetation clearance minimised	Pit located in bare (including previously disturbed) area – no clearance required	No trees or shrubs removed	Trees or shrubs removed where clearance could not have been avoided No trees or shrubs with hollows removed	Medium trees or shrubs (between 15 and 30cm diameter) removed where clearance could have been avoided	Large trees (over 30 cm diameter) removed and/or Trees or shrubs with hollows remove
Measures and associated goals	**Goal Exceeded +2**	**Goal Exceeded +1**	**Goal Attained 0**	**Minor shortfall -1**	**Significant shortfall -2**
Topsoils and seed source retained			Topsoil and vegetative material stockpiled and stable (i.e. unlikely to present erosion issues)		No topsoil and vegetative material stockpile evident
Minimise visual impacts					

Pits sited appropriately	Pit not visible from public road	Pit not clearly visible from public road due to some screening by vegetation or other landform	Pit more than 50m from public road	Pit less than 50m from public road	Pit less than 20m from public road
Management					
Minimise water retention in pit					
Minimal or no water retention in pit footprint	No evidence of water retention		Minor retention - pit retains water for less than 1 month following rainfall event or drawdown of floodwaters (as a guide - max. water depth up to 0.2 metres) Or; Water retention in pit consistent with surrounding land	Pit retains water for up to 3 months following rainfall event or drawdown of floodwaters (as a guide - max. water depth < 1 metre) And; Water retention in pit inconsistent with surrounding land	Pit holds water for more than 3 months following rainfall event or drawdown of floodwaters (as a guide - max water depth > 1.0 metre) And; Water retention in pit inconsistent with surrounding land
Minimise impacts on soil					
Minimise soil erosion	Stony/gibber plain				
	Gibber layer in situ (apart from pit base and sides) Pit footprint soil surfaces stable No accelerated erosion on pit footprint		Gibber layer in situ Run-off controlled (e.g. contour banks or bunds above the batter slope) Localised minor erosion (typically pit sides)	Gibber layer disturbed or removed in areas Run-off uncontrolled Minor gullying around pit and/or access tracks	Widespread disturbance of gibber layer Run-off uncontrolled Moderate to severe gullying around pit and/or access tracks
	Other land units				

Measures and associated goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor shortfall -1	Significant shortfall -2
	Soil surfaces stable No accelerated erosion on pit footprint		Run-off controlled (e.g. contour banks or bunds above the batter slope) Minor erosion of pit sides or up-slope from pit	Areas of pit footprint unstable with some uncontrolled runoff Moderate erosion	Uncontrolled run-off Large areas of pit footprint unstable Active severe erosion
Minimise impacts on vegetation					
No weed infestations on pit footprint	No weeds on pit footprint	No trees or shrubs removed	Presence of weeds* on pit footprint consistent with pre-disturbance conditions and adjacent land	Weeds present on pit footprint which is inconsistent with pre-disturbance conditions and adjacent land	Declared weeds** present on pit footprint which is inconsistent with pre-disturbance conditions and adjacent land
Rehabilitation					
Minimise water retention in pit					
<u>Predictive</u> Minimal or no water retention in pit footprint			Measures to minimise water retention implemented (e.g. upslope runoff diverted by contour banks or bunds, rip base, etc.)		No measures to minimise water retention evident
<u>Ongoing</u> Minimal or no water retention in pit footprint	No evidence of water retention		Minor retention - pit retains water for less than 1 month following rainfall event or drawdown of floodwaters (as a guide - max. water depth up to 0.2 metres) Or Water retention in pit consistent with surrounding land	Pit retains water for up to 3 months following rainfall event or drawdown of floodwaters (as a guide - max. water depth < 1 metre) And; Water retention in pit inconsistent with surrounding land	Pit holds water for more than 3 months following rainfall event or drawdown of floodwaters (as a guide - max water depth > 1.0 metre) And; Water retention in pit inconsistent with surrounding land
Minimise impacts on soil					
<u>Predictive</u> Minimise soil erosion			Measures to minimise erosion implemented (e.g. upslope runoff diverted by contour banks or bunds)		No measures to minimise erosion evident
<u>Ongoing</u> Minimise soil erosion	Soil surfaces stable No accelerated erosion		Minor erosion of pit sides or up-slope from pit	Moderate erosion Areas of pit footprint unstable with some uncontrolled runoff	Active severe erosion Large areas of pit footprint unstable Uncontrolled run-off

Measures and associated goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor shortfall -1	Significant shortfall -2
Minimise impacts on vegetation					
Pit footprint revegetated with indigenous species (subject to time and preceding climatic conditions)	Vegetation community re-established with species and cover typical for land unit	Pit footprint revegetated with perennial species mix and cover levels typical for land unit	Pit footprint revegetated with species mix similar to surrounding area, some bare patches still present	Revegetation confined to base of pit, pit sides bare, species mix differs from surrounding area, annual species dominate	No vegetation evident
No weed** infestations on pit footprint	No weeds on pit footprint		Presence of weeds* on pit footprint consistent with pre-disturbance conditions and adjacent land	Weeds** present on pit footprint which is inconsistent with pre-disturbance conditions and adjacent land	Declared weeds** present on pit footprint which is inconsistent with pre-disturbance conditions and adjacent land
Minimise visual impacts					
Borrow pit effectively contoured and ripped	Pit contours indistinguishable from surrounding landscape Access tracks ripped	Pit contours blend in with surrounding landscape, although still evident	Pit sides battered and ripped along contours but pit still highly visible Topsoil and vegetative material re-spread over disturbed area	Pit sides battered but not ripped	No re-contouring of pit has occurred – pit sides very steep Topsoil and vegetative material not respread
Site to be left in a clean and tidy condition					
Litter and other foreign materials removed			No litter and other foreign materials on pit footprint or surrounds	Scattered litter and/or other foreign materials on pit footprint or surrounds	Litter and/or other foreign materials common on pit footprint or surrounds

*Weeds are defined in these tables as any invasive plant that threatens native vegetation in the local area or any species recognised as invasive in South Australia.

**Declared weeds are defined in these tables as any exotic plant species that are currently declared under the Natural Resources Management Act 2004