

ENVIRONMENTAL PLAN

Beharra Springs Gas Facility

Review Record

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THE THREE WHATS

What can go wrong?

What could cause it to go wrong?

What can I do to prevent it?

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1. Introduction

1.1 Overview

Lattice Energy Resources (Perth Basin) Pty Limited (previously known as Origin Energy Developments Pty Limited or Origin) is the part owner of the Beharra Springs Gas Facility (the Facility). The Facility comprises of Production Licence L11, Exploration Permit EP320 and Pipeline Licence PL18 and is located within the North Perth Basin, Western Australia (WA).

The Facility incorporates the Gas Field, Gas Production Plant, Sales Gas Pipeline and associated infrastructure. The Gas Production Plant is located approximately 20 km south of Dongara and 350 km north of Perth. Refer to Figure 1-1 and Figure 1-2 for the regional context and layout of the Facility's infrastructure.

Development of the Facility is undertaken in accordance with an approved Field Management Plan (CDN/ID14896293), with first production commencing in 1991.

The Facility commercialises gas and condensate extracted from the Gas Field. Production from the Gas Fields is expected to occur until 2025 and is estimated to produce more than 36.3 billion cubic feet (bcf) of raw gas, equivalent to 34.5 petajoules (PJ) of sales gas, 24 kilobarrels (kbbbl) of condensate.

1.2 Instrument holder and nominated operator

The instrument holders for the Facility include:

- Lattice Energy Resources (Perth Basin) Pty Limited (previously known as Origin Energy Developments Pty Limited): approximately 67% share
- AWE (Beharra Springs) Pty Ltd: approximately 33% share.

Lattice Energy Limited (ACN 66 007 845 338) is the nominated operator for the Facility.

There may be references to Origin in some material relevant to this document however this is a result of material produced prior to Origin Energy Developments Pty Limited (ACN 008 432 479) changed its name to Lattice Energy Resources (Perth Basin) Pty Limited (ACN 008 432 479) on the 28 June 2017. Lattice Energy is a wholly owned subsidiary of Origin and this document will reference Origin and/or Lattice Energy as the company throughout.

Contact details for the operator's nominated liaison person are as follows:

Mr Scott Cornish

Operations Manager – WA

Email: compliance@latticeenergy.com

Phone: (08) 9933 6000

1.3 Purpose and Objectives

The purpose of this environmental plan (EP) is to identify and specify management requirements for the environmental impacts and risks associated with the operation and maintenance of the Facility. The document has been prepared in accordance with the Guideline for the Development of Petroleum and Geothermal Environment Plans in Western Australia (DMP 2016) and the HSE Policy (refer Appendix A).

The objectives of this EP are as follows:

- To provide detailed prevention, minimisation and mitigation measures to ensure environmental impacts and risks are of an acceptable level and As Low As Reasonably Practicable (ALARP);
- To pro-actively implement workable environmental controls and management strategies;
- To adopt environmental improvement initiatives where practical; and
- To achieve maximum cooperation from employees and contractors.

1.4 Scope

The scope of this EP covers the operational and maintenance aspects of the Facility, including the Gas Production Plant, Gas Field, Sales Gas Pipeline and associated infrastructure. Where non-routine operation and/or maintenance activities are required (e.g. well workovers, construction of a new flowline or gas well), a bridging document will be prepared to ensure the environmental impacts and risks associated with the specific activity have been identified.

The EP includes the following:

- Applicable legislation and triggers for referral to other Western Australian (WA) government agencies (Section 2);
- A description of the facility and the operations on site (Section 3);
- A description of the existing environment (Section 4);
- A description of the risk assessment methodology and results (Section 5);
- Environmental performance objectives, standards and criteria (Section 6);
- Implementation strategy including environmental monitoring, auditing and reporting processes (Section 7).

1.5 Definitions and acronyms

| Term | Definition |
|-------------------|--|
| °C | Degrees Celsius |
| µg | Microgram(s) |
| ALARP | As Low As Reasonably Practicable |
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| ANZECC guidelines | Australian and New Zealand Guidelines for Fresh and Marine Water Quality |
| APIA | Australian Pipeline Industry Association |
| APPEA | Australian Petroleum Production and Exploration Association |
| Bar(g) | Gauge pressure |
| BCF | Billion Standard Cubic Feet |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylenes |
| CCPS | Critical Control Performance Standard |
| CMMS | Computerised Maintenance Management System |
| CO ₂ | Carbon dioxide |
| CoEP | Code of Environmental Practice |
| CP | Cathodic Protection |
| d | Day |
| dB | Decibels |
| DN | Nominal diameter |
| DNV | Det Norske Veritas |
| DPIRD | Department of Primary Industries and Regional Development |
| DSEWPaC | Department of Sustainability, Environment, Water, Population and Communities |
| EIMS | Enterprise Incident Management System |

| Term | Definition |
|----------|---|
| EP | Environmental Plan |
| EP Act | Environmental Protection Act 1986 |
| EP320 | Exploration Permit EP320 |
| EPA | Environmental Protection Authority |
| EPBC Act | Commonwealth Environment Protection and Biodiversity Conservation Act |
| ERA | Environmental Risk Assessment |
| ERP | Emergency Response Plan |
| ESD | Emergency Shutdown |
| ESDV | Emergency Shutdown Valve |
| GEMT | Group Emergency Management Team |
| HAZID | Hazard Identification |
| HSE | Health Safety and Environment |
| HSEMS | Health, Safety and Environment Management System |
| HVAC | Heating, ventilation and air-conditioning |
| IBC | Intermediate Bulk Container |
| ICS | Integrated Control System |
| ID | Inside Diameter |
| kbbl | kilobarrels |
| kJ | Kilojoule(s) |
| kPa | Kilopascal(s) |
| KPI | Key Performance Indicator |
| L | Litre(s) |
| L11 | Production Licence L11 |
| LOPA | Layers of Protection Analysis |
| LPG | Liquefied Petroleum Gases |
| m | Metre(s) |
| mL | Millilitre(s) |
| MNES | Matter of National Environmental Significance |
| MOC | Management of Change |
| MPa | Megapascal(s) |
| MSDS | Material Safety Data Sheet |
| NDT | Non-destructive Testing |
| NORM | Naturally Occurring Radioactive Materials |
| OCIS | Origin Collective Intelligence System |
| OCNS | Offshore Chemical Notification Scheme |
| Origin | Origin Energy Resources Limited |
| OSCP | Oil Spill Contingency Plan |

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| Term | Definition |
|---------------|--|
| Petroleum Act | Petroleum and Geothermal Energy Resources Act 1967 |
| PIC | Person In Charge |
| PJ | Petajoules |
| PL | Pipeline licence |
| PMP | Primary Muster Point |
| ppb | Parts per billion |
| PPE | Personal Protective Equipment |
| ppm | Parts per million |
| PSV | Pressure Safety Valve |
| s | Second(s) |
| t | Tonne(s) |
| TA | Thylacine 'A' |
| UCL | Unallocated Crown Land |
| V | Volt(s) |
| WAOL | Western Australian Organism List |
| WIMP | Well integrity management plan |
| WOMP | Well Operations Management Plan |

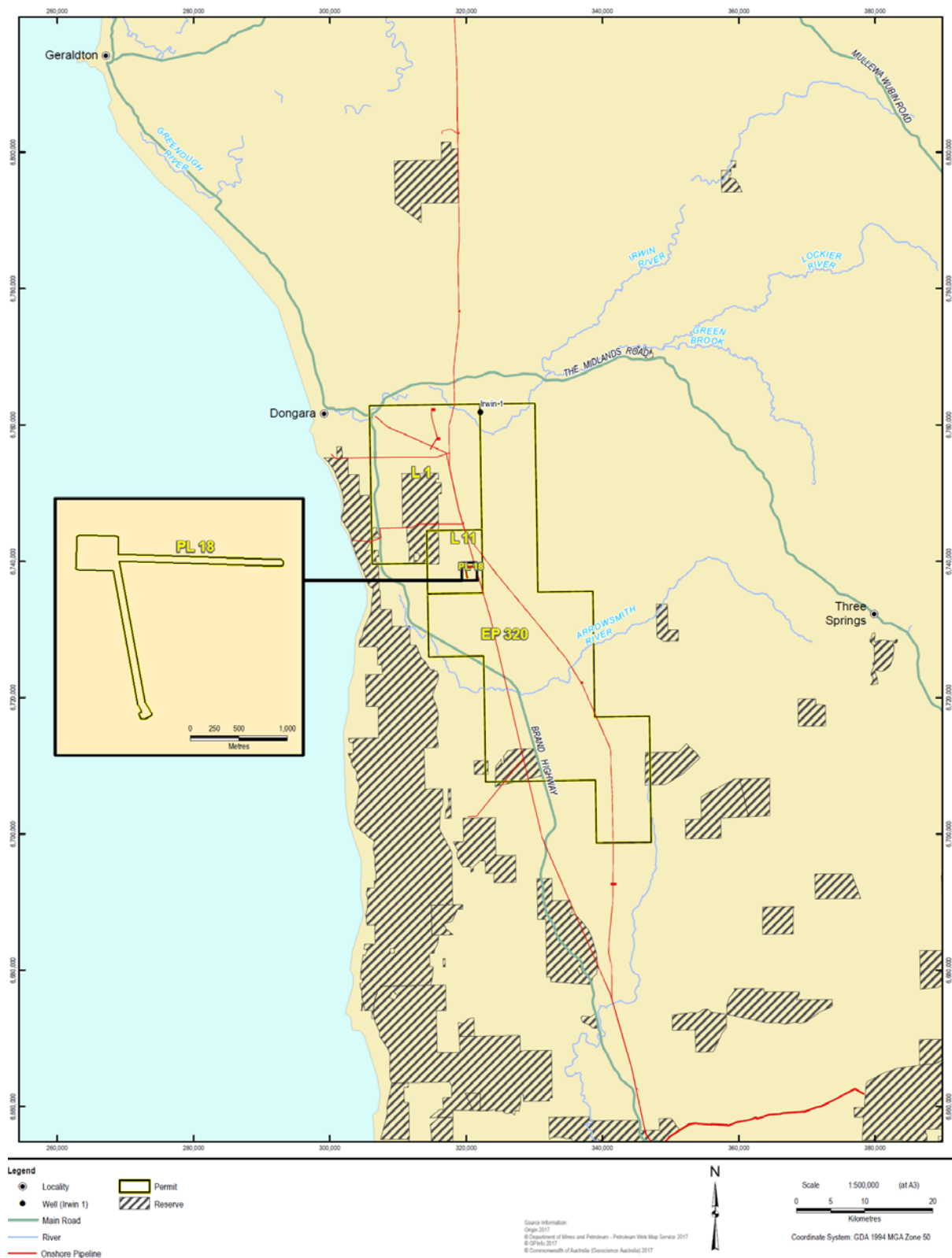


Figure 1-1: Regional Context of the Beharra Springs Gas Facility

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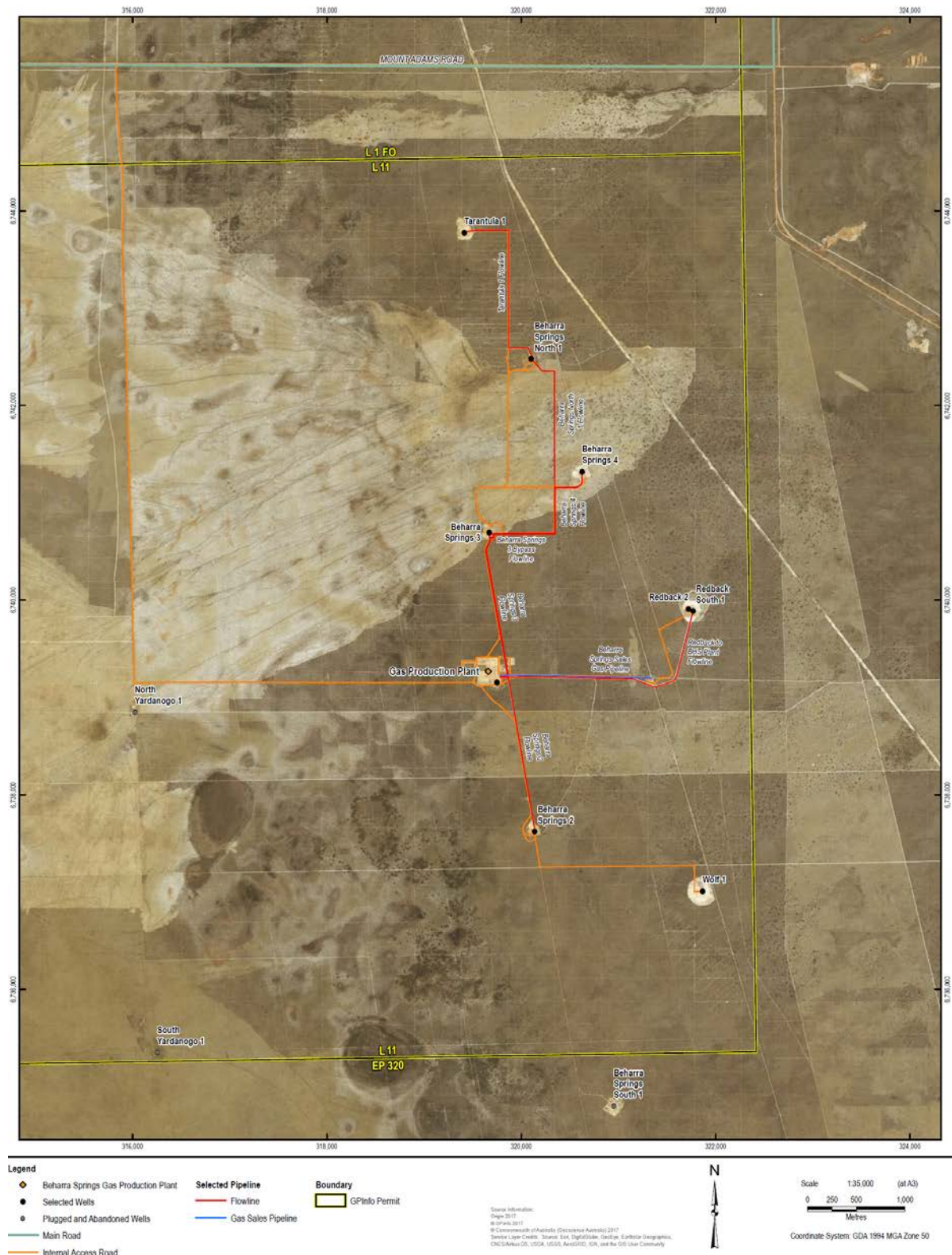


Figure 1-2: Infrastructure Layout Plan of the Beharra Springs Gas Facility

2. Legislation and Other Requirements

The WA state government, through the *Petroleum and Geothermal Energy Resources Act 1967*, formerly the *Petroleum Act 1967*, has regulatory jurisdiction for the exploration and development of all onshore petroleum resources. The *Petroleum and Geothermal Energy Resources Act 1967* (the Petroleum Act) requires that other state and federal environmental laws and regulations are met, including but not limited to the WA *Environmental Protection Act 1986* (EP Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). A brief description of the major legislation is included below, as well as a list of other relevant legislation that has been considered in the preparation of this EP.

Introduction of new legislation or change to existing legislation which has the potential to or does impact upon operation of the Facility will trigger review of this EP. Refer to section 7.5.4 for further information in relation to review and update of this EP.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act (EPBC Act)

Under the environmental assessment provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of National Environmental Significance (MNES) are subject to an assessment and approval process.

An action includes a project, development, undertaking, activity, or series of activities, or an alteration of any of these things.

There are currently nine MNES that can trigger the need for development assessment and approval under the EPBC Act. These are:

- World heritage properties
- National heritage places
- Wetlands of international significance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resources, in relation to coal seam gas development and large coal mining development.

A significant impact is one which is important, notable, or of consequence having regard to its context or intensity to one of the matters of national environmental significance. Each of the nine MNES is considered throughout this EP where relevant. A summary of the relevance of each matter of national environmental significance to operations at the Facility is summarised in Table 2-1 below.

Table 2-1: Summary of Matters of National Environmental Significance

| Matter | EP Reference | Summary |
|--|---|---|
| World Heritage properties | Not applicable. | No World Heritage properties within or adjacent to L11. |
| National heritage places | Section 4.10 | No national heritage places within L11. One national heritage place located within a 10 km radius of the Gas Production Plant |
| Wetlands of international importance | Not applicable. | No wetlands of international importance within or adjacent to L11. |
| Listed threatened species and ecological communities | Section 4.4, 4.5 and 4.7 | Fourteen threatened species likely to occur or possibly occurring within a 10 km radius of the Gas Production Plant. No ecological communities likely to occur. |
| Migratory species | Section 4.7 | Six migratory species likely to occur or possibly occurring within a 10 km radius of the Gas Production Plant. |
| Commonwealth marine areas | Not applicable as the Facility is located approximately 16 km east of the coastline. | |
| The Great Barrier Reef Marine Park | Not applicable as the Facility is on the west coast of Australia. | |
| Nuclear actions (including uranium mining) | Not applicable as operation of the Facility does not incorporate nuclear actions. | |
| Water resources impacted by a coal seam gas development or a large coal mining development | Not applicable as the operation of the Facility does not entail coal seam gas development or coal mining. | |

Operation of Facility to date is unlikely to have had significant impacts on the MNES and, therefore, has not been referred to the Department of the Environment and Energy (DoEE) formerly the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) under the EPBC Act.

Upon undertaking any non-routine activity associated with the operation of the Facility, consideration will be given to whether it is an action that is likely to have a significant impact on a matter of National Environmental Significance. If significant impacts are likely the non-routine activity will be referred to the DoEE for assessment under the EPBC Act.

2.1.2 Native Title

The *Native Title Act 1993* applies Native Title rights to Crown Land, but not to freehold, road reserves and forestry lands in WA. Native Title rights and interests may exist on Unallocated Crown Land (UCL). Native Title describes the rights and interests of Aboriginal and Torres Strait Islander people in land and waters, according to their traditional laws and customs, which are recognised under Australian law.

Current applications for Native Title which encompass or intersect the Facility are discussed in section 4.11. Correspondence with Native Title claimants to date has not revealed any comments or issues of concern in respect to the Facility (refer section 7.10). Lattice will continue to liaise with the Native Title Applicants in respect to operation of the Facility as appropriate.

2.2 State

2.2.1 Petroleum and Geothermal Energy Resources Act 1967

The *Petroleum and Geothermal Energy Resources Act 1967* (the Petroleum Act) legislates for the exploration and recovery of petroleum resources.

The Beharra Gas Field operates under Petroleum Production Licence L11 granted by the Minister for Mines on 15 May 1992. In addition to L11, Lattice is also the operator for Exploration Permit EP320

which was granted on the 23 June 1986. EP320 currently consists of one plugged and suspended well (Irwin 1).

Lattice is currently in the process of obtaining a new petroleum production licence (production licence application STP-PRA-0007) over two graticular blocks within EP320. Existing operational Redback 2 and Redback South 1 wells are physically located within L11 and are producing from the Redback Terrace. Once this new production licence (STP-PRA-007) is granted, this EP will apply to the new petroleum tenure. No revision or update of this EP is anticipated as the grant of the tenure will not result in any new activity or increased environmental impact and/or risk as it relates to existing infrastructure that has been operational since 2010 and the application area is wholly located within the current EP320 boundary (refer Figure 1-1).

The Department of Mines, Industry Regulation and Safety (DMIRS) is responsible for administration of the Petroleum Act and requires a proponent to submit an EP to carry out petroleum activities. The EP needs to identify any potential or actual impacts the proposed activity may have and the proponent's commitments to manage, monitor and mitigate these impacts to the satisfaction of the regulator, prior to permission to conduct the proposed activity being granted by DMIRS. An EP (this document) has been developed for operation of the Facility. Triggers for review and revision of this EP are described in section 7.5.4 of this EP.

2.2.1.1 Petroleum and Geothermal Energy Resources (Environment) Regulations 2012

Section 6 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* requires an approved EP for an activity. Under section 4, an activity 'means a petroleum activity or a geothermal activity'. Division 3 describes the content of the environment plan and this EP addresses these requirements. A concordance table has been prepared and is provided in Appendix I that demonstrates where each of the legislative EP content requirements are addressed in this document.

The *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* allows for a risk-based approach for managing the environmental performance of the Western Australian petroleum industry through EPs. The EP regime aims to reduce environmental risks and impacts of petroleum activities, to a level which is 'as low as reasonably practicable' (ALARP).

2.2.2 Petroleum Pipelines Act 1969

The Gas Production Plant and Sales Gas Pipeline were constructed and are operated under Pipeline Licence PL18 which was granted by the Minister for Mines on 23 April 1992. Approval to commence operations was granted on 8 May 1992. PL18 was varied on the 25 November 1993 to upgrade the production facility throughput from 19TJ per day to 25TJ/day.

2.2.2.1 Petroleum Pipelines (Environment) Regulations 2012

Section 6 of the *Petroleum Pipelines (Environment) Regulations 2012* requires an approved EP for a pipeline activity. Under section 4, a pipeline activity is defined as 'any operations or works carried out under a pipeline instrument'. Division 3 describes the content of the EP that is consistent with the environment plan content described within the same Division of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*.

This EP addresses the requirements for both the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and *Petroleum Pipelines (Environment) Regulations 2012*.

2.2.2.2 Petroleum Pipelines (Management of Safety of Pipeline Operations) Regulations 2010

Under the *Petroleum Pipelines (Management of Safety of Pipeline Operations) Regulations 2010* ("Management of Safety Regulations"), a licensee is required to prepare a safety case.

The safety case is a detailed document that outlines the types of safety studies undertaken, the results of those studies and the safety management arrangements to address the findings of those studies. The safety case provides advice to the safety regulator about the nature of the pipeline operation and demonstrates that all hazards with the potential to cause a major accident have been identified and assessed, and measures have been taken to ensure that the risks to people are eliminated or minimised to a level that is as low as reasonably practicable.

2.2.3 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act), and its regulations, legislates for the prevention, control and abatement of pollution and environmental harm, including clearing of native vegetation. Furthermore, it provides for the conservation, protection, enhancement and management of the environment in WA.

2.2.3.1 EPA Referral

All new proposals which are likely, if implemented, to have a significant effect on the environment, can be referred to the Environmental Protection Authority (EPA) for assessment under Part IV of the EP Act. Proposals are defined by the EP Act to include a project, plan, programme, policy, operation, undertaking or development or change in land use, or an amendment of any of these things.

Drilling of Redback 1A, Redback 1B and Tarantula 1 ST1 were referred to the EPA as the work involved clearing within a Nature Reserve proposed at that time (i.e. Red Book area). The EPA advertised on 8 September 2003 the level of assessment as "Not Assessed – Public Advice Given". Construction and operation of the Beharra Springs Gas Production Plant and remaining wells have not been referred to the EPA for assessment given the activities will not have a significant effect on the environment. The potential impacts and management measures adopted to mitigate and minimise the potential impacts have been described in detail throughout various construction environmental management plans and this EP.

2.2.3.2 Environmental Licence

The Facility operates under Environmental Licence (L8385/2009) issued under the EP Act to allow Category 10 – Oil or Gas Production from Wells with a nominal rated throughput of 218,000 tonnes per year. In accordance with the conditions of the Environmental Licence, approval must be obtained from the DWER for:

- An increase of more than 10 per cent above the nominal rated throughput; and
- Any significant alterations to the Facility which may affect air, water, or noise emissions from the Facility.

Further, notification must be made to the Director of the DWER, 24 hours prior to undertaking any planned, non-routine/non-standard operations which may have the potential to cause pollution.

All activities associated with operation of the Facility will be undertaken in accordance with the conditions of the Environmental Licence. An annual environmental report (which includes an annual audit compliance report) is submitted to DWER (refer section 7.8.2 for further details). A copy of the environmental licence is maintained at the gas production plant and within the document control system.

2.2.3.3 Permit to Clear

Under Part V of the EP Act, clearing of native vegetation in WA requires a permit. The DMIRS is responsible for the administration, assessment and approval of clearing permit applications relating to mineral and petroleum activities in WA.

Exemptions from the requirement to obtain a permit to clear are provided in Schedule 6 of the EP Act (Schedule 6 exemptions) and section 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (the Native Vegetation Regulations).

The Beharra Springs Gas Facility lies within Geraldton Sandplains Bioregion which is prescribed an ESA under section 51B of the EP Act. Therefore, all exemptions under the Native Vegetation Regulations do not apply to the Facility's activities.

Schedule 6 exemptions that could apply to activities associated with the Facility include clearing that is undertaken under the Bushfires Act 1954. This specifically relates to maintenance of firebreaks and cleared areas in accordance with the burning permits issued to operate the flares (refer to section 2.3.1).

Therefore, with the exception of clearing associated with compliance with burning permits or requirement of the Bush Fire Act 1954, any clearing associated with operation and maintenance of the Facility (i.e. within the currently cleared and maintained Production Plant, flowline right of ways, well lease pads, access road right of ways or the accommodation and workshop buildings) will be undertaken in accordance with the clearing permits summarised in Table 2-2 or in accordance with the DFES approval (refer section 2.3.1).

Appendix D shows the extent of the land clearing permits relevant to the Facility currently in place.

Where any new clearing is required (e.g. new wells, flowlines, buildings or other related Facility infrastructure and that is not a requirement of the DFES approval) that is outside of the permitted areas shown in Appendix D, a new clearing permit will be obtained prior to commencing work.

A summary of the clearing permits issued for the Facility, including status is provided in Table 2-2 below.

Table 2-2: Summary of Beharra Springs Gas Facility Clearing Permits

| Clearing Permit Reference | Associated Infrastructure | Duration of Permit | Status |
|---------------------------|--|---------------------------------------|---|
| CPS 6643 | Beharra Springs operational well lease areas (Beharra Springs 1, 2, 3, 4, Beharra Springs North 1, Tarantula 1, Redback South 1 and Redback 2); associated flowlines; sales gas pipeline and access road right of ways within L11, L1 and PL18 | 26 September 2015 – 30 September 2025 | Permit is current and valid. Permit allows up to 25 ha to be cleared within permitted area. |
| CPS4607 | Gas production plant and associated infrastructure including accommodation building, workshop and evaporation ponds | 10 December 2011 - 31 December 2026 | Permit is current and valid. Permit allows up to 14.15ha to be cleared within permitted area. |

In accordance with the conditions of clearing permit CPS4607 a targeted flora survey was undertaken for the possible future groundwater monitoring bores located to the west of the gas production plant by Matiske Consulting Pty Ltd (Matiske) in November 2016. The survey results (Matiske 2016) are summarised in Section 4.5.

2.2.4 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on the 3 December 2016 and will replace the *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929*. The BC Act aims to conserve and protect biodiversity and biodiversity components (i.e. native species, habitats, ecological communities, genes, ecosystems and ecological processes) and to promote ecologically sustainable use of biodiversity components.

Until the BC Act is completely enacted, parts of the WC Act are still in force. Those parts of the BC Act and WC Act applicable to the ongoing operation and maintenance of the Facility are discussed below.

The WC Act provides for taxa (species, subspecies and varieties) of native plants (flora) and native animals (fauna) to be specially protected because they are under identifiable threat of extinction, are rare, or otherwise in need of special protection. Such specially protected wildlife (fauna and flora) is "threatened". The Minister may also list ecological communities which are at risk of becoming destroyed.

Under the WC Act, written consent from the Department of Biodiversity Conservation and Attractions (DBCA) is required to take declared rare flora (DRF) and threatened fauna.

The WC Act defines *to take*:

- in relation to any fauna, "to kill or capture any fauna by any means or to disturb or molest any fauna by any means or to use any method whatsoever to hunt or kill any fauna whether this results in killing or capturing any fauna or not; and also, includes every attempt to take fauna and every act of assistance to another person to take fauna and derivatives and inflections have corresponding meaning"; and
- in relation to any flora, "to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means".

The State Minister for the Environment may declare any protected (native) flora to be DRF or protected fauna if it is likely to become extinct, is rare, or is otherwise in need of special protection. Details

regarding DRF and threatened fauna that have been recorded or have potential to occur within the Facility area are provided in section 4.5 and section 4.7.

2.2.5 Rights in Water and Irrigation Act 1914

The Department of Water regulates the use of water in WA under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Well licences are required, under section 26D of the RIWI Act, to construct or alter any artesian well and non-artesian wells in proclaimed areas (land covered by the RIWI Act). However, a section 26D well licence does not, on its own, give the right to take water.

Licences to take water (Section 5C Licence) allow holders to take water in proclaimed or prescribed areas. This includes taking water from artesian wells throughout the State, or from within proclaimed groundwater and surface water areas.

The Beharra Springs Facility is located within a proclaimed groundwater area (DoW 2009). Therefore, all wells must be licensed prior to installation and operation. A summary of the wells currently located in the Facility area is provided in Table 2-3. These wells are licensed under GWL155141, issued by the Department of Water on 17 September 2013. This licence provides an annual water entitlement of 20,600 kL for earthworks dust suppression, exploratory drilling, campsite supply and workover operations.

Table 2-3 : Summary of Beharra Springs Gas Facility Water Wells

| Well ID | Location and Use | Aquifer |
|--|---|--------------------------------|
| Beharra Springs 4 | Bore located on BS4 drill pad and utilised for BS4 drilling programme. | Yarrandee North |
| Beharra Springs 3 | Bore located to the east of BS3 drill pad. Bore utilised for BS3 drilling programme and temporary accommodation camp located to the north of BS3. | Yarrandee North |
| Redback | Bore located on Redback drill pad (Lot 12453 Plan 221090) | Superficial |
| Tarantula 1 ST1 | Bore located on Tarantula 1 ST1 drill pad (Lot 12453 Plan 221090) | Superficial |
| Beharra Springs Camp North 1 and South 1 | Bores adjacent to the gas processing facility used for camp purposes and dust suppression. | Arrowsmith Perth - Superficial |

2.2.6 Bush Fires Act 1954

The Department of Fire and Emergency Services (DFES) has a responsibility for controlling the risk of fire in the area. Due to the highly combustible nature of the vegetation surrounding the Facility, DFES requires vegetation to be cleared on land around flares to minimise the risk of fire.

Local governments are also vested with responsibilities under the *Bush Fires Act 1954*, in relation to bush fire prevention, control and extinguishment, including the establishment and running of volunteer bush fire brigades.

2.2.7 Contaminated Sites Act 2003

The *Contaminated Sites Act 2003* was introduced to identify, record, manage and clean up contamination. Under the Act known or suspected contaminated sites must be reported to the DWER, investigated and if necessary cleaned up or remediated.

The gas production plant was reported under the Act and subsequently classified by DWER as “possibly contaminated – investigation required” on the 20 July 2007. This was in response to the ongoing detection and presence of hydrocarbons in routine groundwater monitoring undertaken at the gas production plant.

In addition to the ongoing quarterly groundwater monitoring, an extensive soil and groundwater investigation was undertaken (Senversa 2017), which resulted in the site’s classification being changed to “Contaminated – restricted use” on 12 May 2017.

The current classification means that the land use is restricted to commercial / industrial use which excludes sensitive uses with accessible soil such as childcare centres, kindergartens, pre-schools and primary schools. Groundwater abstraction within the gas production facility is not recommended,

except for the ongoing abstraction from the camp north 1 and camp south 1 bores which are located up gradient of the impacted area. Both these bores will be continued to be monitored to ensure the water quality remains fit for purpose.

2.2.8 Other State Legislation

Operation of the Facility is required to comply with other relevant WA legislation including (but not necessarily limited to):

- *Aboriginal Heritage Act 1972*
- *Dangerous Goods Safety Act 2004*
- *Conservation and Land Management Act 1984*
- *Heritage of Western Australia Act 1990*
- *Health Act 1911.*

2.3 Local

2.3.1 Burning Permits and Firebreaks

The Shire of Irwin through the *Bush Fires Act 1954* provides advice on bushfire prevention, which includes requirements for firebreaks and issue of burning permits during seasonal periods when fire restrictions apply. These restricted periods are outlined in Table 2-4 below.

Table 2-4 : Shire of Irwin Requirements for Burning Permits and Firebreaks

| Burning Permits Required | Burning Prohibited | Firebreaks Required |
|--------------------------------------|--------------------|------------------------|
| 15 Oct to 30 Nov and 1 Feb to 31 Mar | 1 Dec to 31 Jan | Rural: 1 Oct to 31 Mar |

Permits have been issued by DFES to allow for continued operation of ground and vertical flares at the Gas Production Plant during these periods, as well as during total fire bans. These permits for the ground and vertical flares are:

- DFES correspondence No. 16/40252 - Total fire ban exemption for 8 June 2016 to 30 June 2018
- DFES correspondence No. 16/40252 - Lighting or using a fire during restricted or prohibited burning times for 8 June 2016 to 30 June 2018.

The conditions of approval specifically require firebreaks to be maintained as per the Shire of Irwin's fire break notice. Details of consultation with Shire of Irwin with respect to fire break maintenance is noted in section 7.9.4.

2.3.2 Treatment and Disposal of Waste

Amenities are designed in accordance with the *WA Health Act 1911*, *WA Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* and Shire of Irwin Health Local Laws 2002. The removal of waste from the site is required to be undertaken in accordance with Shire of Irwin Health Local Laws 2002.

2.3.3 Industry Codes of Practice and Guidelines

The petroleum exploration and production industry operates within industry codes of practice and individual member environmental policies, as follows:

- Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice (2008)
- Australian Pipelines and Gas Association (APGA) Environmental Code of Practice – Onshore Pipelines (2013).

3. Description of the Activity

3.1 Project Location, Land Tenure and Access

The Beharra Springs Gas Facility is located within Production Licence L11, Exploration Permit EP320 and Petroleum Pipeline Licence P18. The Facility is located on unallocated crown land, with much of the gas field (wells and flowlines) and sales gas pipeline located on Lot 12453 on Parcel P221090 and the gas production plant located on Lot 11945. The Facility is situated in the Shire of Irwin, in the northern Perth Basin, approximately 25 kilometres (km) southeast of Dongara and 350 km north of Perth, as shown in Figure 1-1.

The APA Parmelia Pipeline and Yardanogo Nature Reserve are located approximately 1.7 km east and 4 km west of the Gas Production Plant respectively.

Access to the Gas Production Plant is via Mt Adams Road and the Brand Highway and traverses Production Licence L1 for approximately 1 km. This section of the access road that traverses L1 is maintained by the Facility operations.

3.2 Facility Timeline

Development of the Facility is summarised in the following Table 3-1.

Table 3-1: Summary of the Development of the Beharra Springs Gas Facility

| Year | Phase |
|------|--|
| 1990 | North Yardanogo 1 and South Yardanogo 1 drilled. Wells were plugged and abandoned in 1991 upon completion of production testing. |
| 1991 | Gas Field discovered by Barrack Energy Limited with the drilling of Beharra Springs 1. |
| 1992 | Gas Plant constructed and commissioned to process reservoir fluids collected from Gas Field (i.e. Beharra Springs 1 and 2). Sales Gas Pipeline constructed and commissioned to deliver gas from the Gas Production Plant to the Parmelia Pipeline. |
| 1993 | Beharra Springs 3 drilled. Nameplate production capacity (PL18) was increased from 19TJ per day to 25TJ per day. |
| 1995 | The Gas Production Plant was modified with the provision of two identical gas compression units, together with other additions and modifications to enhance existing processing capabilities and to support the operation of the new compressors. |
| 2001 | Beharra Springs South 1 exploration well drilled. Plugged and abandoned in May 2002. |
| 2002 | Beharra Springs North 1 drilled. Flowline tied into the existing flowline at Beharra Springs 3. |
| 2004 | Tarantula 1 and Redback 1 exploration wells drilled. |
| 2005 | Tarantula 1 ST1 drilled. Flowline tied into existing flowline at Beharra Springs North 1. |
| 2007 | Beharra Springs 4 drilled. Flowline tied into existing flowline at Tarantula 1 ST1. |
| 2009 | Redback South 1 drilled as a sidetrack to Redback 1 during August and September 2009. |
| 2010 | Redback 2 was drilled to assess the prospectivity of the terrace adjacent to, and directly north of, the RBS-1 discovery. Flowline constructed to tie the Redback South 1 and Redback 2 wells into the Gas Production Plant. Wolf 1 well drilled to assess the prospectivity of the Redback Terrace. |
| 2015 | Irwin 1 exploration well drilled by AWE. Irwin 1 currently plugged and suspended. Well activities are currently managed by AWE under an approved EP (AWE 2016). Handover to Lattice from AWE is expected to occur during 2018. Prior to acceptance of handover, |

| Year | Phase |
|------|---|
| | Lattice will engage with the relevant regulatory authorities and follow the EP review and revision process provided in section 7.5.4. |
| 2016 | North Yordanogo 1 and South Yordanogo 1 rehabilitation completed. |
| 2017 | Evaporation pond 2 and separator system upgraded and commissioned. |

3.3 Description of the Facility

3.3.1 Overview

The Beharra Springs Gas Field collects reservoir fluids from a hydrocarbon column located in the Upper Permian Beekeeper Formation. The collected reservoir fluids are processed by the Gas Production Plant. The processed gas (Sales Gas) exiting the Gas Production Plant is then piped via the Sales Gas Pipeline to the Parmelia Pipeline for transmission to customers in the south-west of WA.

The Facility is comprised of:

- Gas Field, incorporating production wells Beharra Springs 1, Beharra Springs 2, Beharra Springs 3, Beharra Springs 4; Beharra Springs North 1, Tarantula 1 ST1, Redback South 1, Redback 2 and Wolf 1;
- Gas Production Plant (incorporating gas compression, gas pre-treatment, carbon dioxide removal and hydrogen sulphide removal facilities);
- Sales Gas Pipeline; and
- Associated infrastructure including (but not limited to) evaporation pond/s, Condensate Storage and Load Out Facility, Power Generation Plant and accommodation and workshop buildings.

Refer to Figure 1-2 and Appendix E for a copy of the Beharra Springs Gas Production Plant Site Layout Drawings. A more detailed description of the Facility can be viewed in the Beharra Springs Facility Safety Case (CDN 3677590).

A summary of the rehabilitation status for key infrastructure is provided in section 3.7.

3.3.2 Gas Field

The Beharra Springs Gas Field (refer Figure 1-2) consists of the following operational wells:

- Currently producing:
 - Beharra Springs 1 located within the Gas Production Plant fenced compound;
 - Beharra Springs 4 located approximately 2.0 km north east of the Gas Production Plant;
 - Beharra Springs North 1 located approximately 4.5 km north of the Gas Production Plant;
 - Tarantula 1 ST1 located approximately 6.5 km north of the Gas Production Plant;
 - Redback South 1 sidetrack of Redback 1, located approximately 1.5 km east of the Gas Production Plant; and,
 - Redback 2 located approximately 1.5 km east of the Gas Production Plant on the same well pad as Redback 1.
- Shut in
 - Beharra Springs 2 located approximately 1.5 km south of the Gas Production Plant.
- Suspended
 - Redback 1 located approximately 1.5 km east of the Gas Production Plant;
 - Wolf 1 located approximately 2.9 km south-east of the Gas Production Plant; and
 - Beharra Springs 3 located approximately 1.5 km north of the Gas Production Plant.

The operational well sites are fenced with locked entry and are accessed via existing unsealed roads. Refer to Figure 1-2 for the Facility infrastructure layout plan.

In addition to the above wells, the following have been drilled within EP320/L11 area (refer Section 3.2 for approximate dates) but as they have been plugged and abandoned are not considered to be part of the operational Gas Field:

- Beharra Springs South 1 (plugged and abandoned) located approximately 4 km south of the Gas Production Plant;
- North Yardanogo 1 (plugged, abandoned and rehabilitated) located approximately 3.6 km west of the Gas Production Plant;
- South Yardanogo 1 (plugged, abandoned and rehabilitated) located approximately 5.1 km south-west of the Gas Production Plant.

3.3.3 Flowlines

Well stream fluids from the producing wells are transported to the Gas Production Plant via six flowlines which are designed, constructed and maintained in accordance with relevant standards, including where appropriate AS2885. The buried sections of the flowlines are protected against corrosion through a cathodic protection system, external pipe coating and chemical injection. Monitoring of corrosion is facilitated through removable probes and regular checks of the cathodic protection system's integrity. During Q2 2017, upgrade of the flowline cathodic protection system was completed.

3.3.4 Gas Production Plant

The Gas Production Plant is in a 270 m x 380 m fenced compound.

The Gas Production Plant is comprised of:

- Natural gas treatment, condensate production and water removal (via three buried low pressure slug catchers, one high pressure slug catcher installed on the surface, gas compressor suction scrubbers, a two-phase inlet separator and a condensate flash drum);
- Gas compression;
- Electricity generation;
- Dehydration and hydrocarbon dew point control (via J-T Valve Low Temperature Separation Unit); and
- Carbon dioxide (CO₂) and hydrogen sulphide (H₂S) removal (via membrane unit and H₂S removal beds).

3.3.4.1 Natural Gas Treatment, Condensate Production and Water Removal

Each flowline delivering gas from the Gas Field to the Gas Production Plant are connected to a dedicated or shared slug catcher for the removal of free liquids from the well stream. The slug catchers are comprised of three buried low pressure slug catchers and one high pressure slug catcher installed on the surface which collect any free liquids (or condensate) retained in the reservoir fluid. The condensate collected by the slug catchers is then pumped out to the Low Pressure Flash Drum.

3.3.4.2 Gas Compression

As reservoir pressure has decreased with depletion of the Gas Field, two gas engine reciprocating compressors, have been installed to boost the reservoir fluid from wellhead pressure to the Gas Production Plant inlet operating pressure of approximately 12,500 kPag.

3.3.4.3 Gas Dehydration and Hydrocarbon Dew Point Control

Gas from the gas compressors passes to the low temperature separator skid where the gas is processed to meet the water and hydrocarbon dewpoint specifications for Sales Gas quality. The low temperature skid comprises:

- Gas-gas exchangers;
- Joules-Thompson pressure control valve;

- Inlet separator vessel;
- Low temperature separator vessel;
- High pressure and low pressure slug catchers; and
- Low pressure flash drum.

The gas-gas heat exchangers provide pre-cooling of the inlet gas stream to the low temperature separator vessel. Gas leaving the gas-gas exchangers enters the inlet separator vessel where any liquids that have condensed are collected.

The process gas stream exits the heat exchangers and passes through the pressure control valve into the low temperature separator. Methanol is injected into the gas upstream of the Joules-Thompson pressure control valve to prevent the formation of hydrates.

The gas pressure is lowered by the Joules-Thompson pressure control valve to approximately 7200 kPag and the temperature of the gas entering the low temperature separator is lowered to approximately -11°C. The low temperature separator separates the gas from the condensed liquids (i.e. water, condensate and methanol).

The low-pressure flash drum receives the condensate from the low temperature separator vessel. The pressure in the low-pressure flash drum is controlled at approximately 250 kPag (this can vary depending on liquids processing requirements) and gas is flashed off from the condensate and for use as fuel gas in the plant. Excess gas is directed to the flare system for disposal. The low-pressure flash drum is constructed from carbon steel and contains an internal weir plate for separation of water and condensate. Condensate is sent to the condensate storage tank.

Water separated in the Low Temperature Separator and Low-Pressure Flash Drum is passed through an "API gravity separator" which removes most remaining traces of condensate hydrocarbon, before discharging to evaporation ponds.

3.3.4.4 Gas Membrane Pre-treatment

The gas exiting the low temperature separator enters the gas membrane pre-treatment unit, which consists of:

- Coalescing filter;
- Carbon guard beds;
- Carbon dust filter; and
- Membrane pre-heater.

The pre-treatment unit conditions the process gas stream to remove contaminants (i.e. liquid and polycyclic aromatic compounds) that cause degradation of the gas membranes.

The purpose of the coalescing filter is to ensure there is no liquid carry-over into the gas membrane unit and contains a coalescing filter element. The vessel is constructed from carbon steel and has a quick opening/closure for filter changes.

The carbon guard beds are located downstream from the coalescing filter and remove any polycyclic aromatic compounds and mercury which may be present in the gas stream. The carbon guard beds are filled with activated carbon with a layer of ceramic balls at the bottom of the bed and a layer of silica gel at the top of the bed. The carbon dust filter receives the gas from the carbon guard beds and filters out any dust carryover using a filter element. The filter vessel is constructed from carbon steel and has a quick opening closure for filter changes.

After passing through the carbon dust filter the gas enters the membrane pre-heater for heating the gas stream into the gas membranes to a temperature of approximately 45°C. This final step of pre-treatment ensures degradation of the gas membranes by liquid contamination is significantly reduced. The pre-heater is a shell and tube heat exchanger, constructed from carbon steel, with heat provided from the hot water circulation system.

3.3.4.5 Carbon Dioxide Removal

The purpose of the gas membrane system is to remove CO₂ from the raw gas to below the Parmelia pipeline specification of 4 per cent CO₂. The gas membranes also remove some H₂S.

The gas membranes consist of a series of cylindrical elements inserted inside a steel pressure-containing pipe. The construction of the gas membrane elements consists of the membrane material surrounding a central tube, through which the permeate (or removed components) stream exits. Feed gas enters the membrane elements and passes laterally along the elements. The components to be removed, CO₂ and H₂S, pass through the membrane along with a small amount of methane and exit through the central permeate tube as the permeate stream. The gas exiting from the membrane system meets the specified sales gas CO₂ content but still requires further treating for H₂S. The permeate stream from the membrane skid can provide a source of fuel gas for the gas compressors and duty gas engine generator, the excess is directed to the vertical flare for disposal.

3.3.4.6 Hydrogen Sulphide Removal

Solid bed absorption is used to further remove H₂S, in addition to the partial H₂S removal by the membrane system, to meet sales gas specification. A zinc aluminium and copper oxide process is used, patented by Orica under the name 'Puraspec' 1030.

Puraspec consists of solid beads consisting mainly of zinc oxide which absorbs the H₂S by formation of zinc sulphate. Two beds operate in a lead lag arrangement. Layers of ceramic balls have also been placed in the very bottom and top of the vessels to ensure even distribution of gas flow through the beds. Uneven gas flow distribution may result in preferential flow or channelling through the bed and therefore inefficient treatment of the gas and premature H₂S break through.

3.3.5 Sales Gas Pipeline

The Sales Gas Pipeline is approximately 1.64 km long and runs from the Gas Production Plant to the Parmelia Pipeline. The check valve immediately downstream of pig receiver (1403) is the designated battery limit of Lattice's operation and maintenance responsibility for the Sales Gas Pipeline.

The Sales Gas Pipeline is 168.3 mm OD with a 4.8mm wall thickness. The pipeline is predominately buried with a minimum depth of cover of 750mm. The Pipeline steel grade is API 5LX 42. The Sales Gas Pipeline has been designed, constructed and is maintained in accordance with AS2885. The Sales Gas Pipeline is protected against corrosion through a cathodic protection system, external pipe coating and corrosion allowance on the pipe wall thickness. Monitoring of corrosion is facilitated through probes.

3.3.6 Condensate Storage and Loadout

Condensate from the low-pressure flash drum is stored in a condensate tank with a maximum fill capacity of 100.6kL. The condensate is transferred to road tankers via a condensate pump and through the tanker loading station. The condensate tank is located within a bunded area that also contains the methanol storage tank.

3.3.7 Produced Formation Water Management

3.3.7.1 Produced Formation Water Volume

The average daily produced formation water rate for 2015/2016 was approximately 18 kL per day. Reservoir modelling predicts a maximum forecast water production rate of approximately 32 kL/day over the next 5 years. The reservoir modelling is calibrated yearly with actual produced formation water flow rates. This information allows the current water management strategy to be reviewed considering any significant change to the predicted produced water production rate and allows the produced water management strategy to be amended to adapt to any changes.

3.3.7.2 Produced Water Management Strategy

All site bunds are self-draining into the gravity fed Gas Production Plant drainage system. Liquids make their way via a series of tundish collection points, into the separator system (refer to section 3.3.7.5 for a description of this system) and then into an operational evaporation pond (currently evaporation pond 2). Bunded areas draining into this system include:

- Compressor area
- Instrument air
- Methanol injection pump area
- Pig launcher area.

The site drainage system also collects liquids from process drain points on the dewpoint control skid, the pre-treatment skid, the compressors and generator packages and the hot water system vapour drain line.

The exception to this general drainage system is the chemical storage bund which has a standalone collection pit and the diesel fuel tank bund which are manually emptied and disposed directly into the separator system.

The operational evaporation pond is inspected daily to ensure water levels are managed below the 300mm freeboard limit and the operational pond is skimmed as required, depending on suitable wind direction, in accordance with a specific safe operating procedure. Skimming is undertaken using the Facility's skimmer (consisting of a pump and trailer mounted tank) or via dedicated waste removal vacuum truck. The skimmed material is predominantly condensate and a small quantity of scum (*Pseudomonas* bacteria). Skimmed water is drained from the tank/truck into the separator system, with the condensate transferred to the existing condensate tank or alternative suitable tank or transferred off site by a suitably licensed contractor.

To aid with collection of hydrocarbons from the operational evaporation pond, a floating boom is used.

Water levels within the operational evaporation pond are managed in accordance with the Facility's Pond water management – Beharra Springs SOP (CDN12157602). This procedure ensures that the site take early intervention to ensure the operational pond water levels remain below the freeboard limit by requiring the following actions:

1. Where more than 700mm freeboard available – no action required.
2. Where 700mm-500mm of freeboard available – operations to take action to optimise flow of water into evaporation pond (e.g. shutting in high water producing wells, diverting skimmed material offsite)
3. Where 500mm – 300mm of freeboard is available – operations to undertake risk assessment and review of site water balance model to determine contingency measures for intervention such as offsite removal (via trucking) or dewatering options.
4. Where 300mm of freeboard is available – operations to shut in the Facility until the evaporation pond water level can be reduced to a safe working level.

Historically, produced water existing in the separator system was discharged into evaporation pond 1 with overflows into evaporation pond 2. In 2017 a soil and groundwater investigation was undertaken within the gas production plant, to determine potential sources for ongoing detection of hydrocarbons in the groundwater monitoring bore GW5. A report on the soil and groundwater investigations undertaken in Q1 2017 was provided to DMIRS on the 5 April 2017 (Senversa 2017). The investigation included the collection and analysis of soil samples collected from fifteen soil bores from across the site and the collection and analysis of groundwater samples from twenty groundwater monitoring wells (eleven additional groundwater monitoring wells were installed during the investigation). Based on the results from the investigations, Lattice committed to continuing the quarterly groundwater monitoring program to further facilitate assessment of groundwater quality seasonal variability and monitored natural attenuation; commencing project planning for the temporary and long term replacement of the API separator; and replacing the current evaporation pond 2 liner by 31 December 2017.

These commitments have been met with a description of the current operational status and infrastructure (including any upgrade/repair/maintenance undertaken during 2017) summarised in the following sections.

3.3.7.3 Evaporation Pond 2

Currently evaporation pond 2 is the only operational pond. Water balance modelling shows that for the current forecast produced water profile (i.e. up to 32 kL per day), evaporation pond 2 has sufficient storage capacity to contain all water below the 300mm (approximately 10 ML) freeboard limit for the 90th percentile weather case.

Evaporation pond 2 consists of a dual liner system with leak detection and collection layer. The dual liners are constructed from black, 1.5 mm high-density polyethylene (HDPE) and have a permeability of less than 1×10^{-9} m/s.

Evaporation pond 2 has a top operating water level (TOWL) of approximately 10 ML. This equates to a 300 mm freeboard in accordance with the conditions of the environmental licence (L8385/2009).

3.3.7.4 Evaporation Pond 1

Evaporation pond 1 is offline and has been isolated from the produced formation water and site drain system. Evaporation pond 1 consists of a single liner constructed from black HDPE. The evaporation pond contains potentially contaminated soil/sand material which will be removed and remediated in accordance with section 3.6.4.3. Until the evaporation pond is remediated, the liner integrity will continue to be maintained and verified through routine operations visual inspections (quarterly) as well as independent third party verification (initially at 6 monthly intervals extending to 12 monthly intervals post Q2 2018 should no integrity issues be identified during the 6 monthly integrity testing).

Should additional water management capacity be required for the Facility, the evaporation pond 1 site will be considered for location of any future infrastructure (refer to section 3.3.7.7 for a description of the ongoing planning and optimisation of the water management strategy and infrastructure). The type of infrastructure to be used will be determined at the time and will involve a detailed options analysis and environmental risk assessment to determine the best solution.

Therefore, the timeframe for remediation of evaporation pond 1 will be driven by the facility's requirement for water management capacity, as well as ongoing demonstration of evaporation pond 1 liner integrity.

3.3.7.5 Separator System

All produced formation water and site drains pass through the separator system to minimise the potential for hydrocarbon carryover into the operational evaporation pond.

In 2017, an investigation into the necessary upgrade, repair or replacement of the separator system was instigated. As a result of this investigation and commissioning of the reconstructed evaporation pond 2, the system has been modified.

A simplified process flow diagram of the system is provided in Figure 3-1 below.

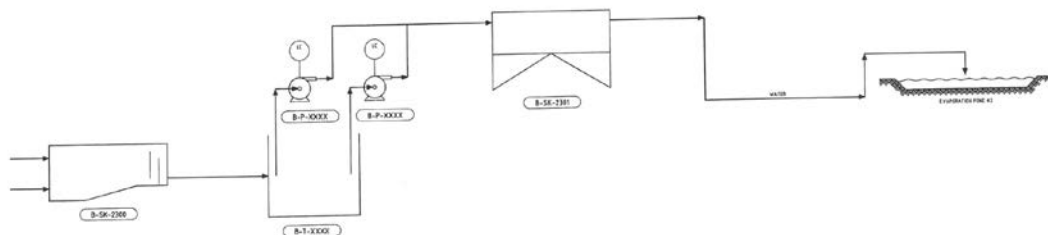


Figure 3-1 Simplified Process Flow Diagram of the Beharra Springs Water Management System

The upgraded system consists of:

- the existing API separator B-SK-2300 (which was repaired and recoated in September 2017)
- a new holding/buffer tank (B-T)
- a new CPI separator (B-SK-2301)
- transfer pumping and piping.

All produced formation water and site drains continue to drain under gravity into the existing API separator. In September 2017, the API separator was drained, cleaned and inspected. This inspection confirmed the structural integrity of the existing concrete structure. Prior to the API separator being returned to service it was recoated with a polyurethane membrane.

A pumped transfer system and piping has been installed to allow flows to be directed through the upgraded separator system and then into evaporation pond 2.

The pumped transfer system and piping consists of duplicate pumps, and appropriate control systems to prevent overflow of the system. Further a holding/buffer tank/pit has been located immediately downstream of the existing API separator to optimise the overall system hydraulic design and mitigate the risk of system overflow. In addition to the existing API separator a new CPI separator has been installed immediately adjacent to evaporation pond 2. This will ensure any hydrocarbon carryover from the existing API separator can be further treated and concentrations reduced to as low as reasonably practical before disposal into the operational evaporation pond.

All elements of the upgraded separator system have been designed in accordance with:

- Lattice's internal engineering specifications Technical Specification for Polyethylene (PE) Pipe Requirements A-100-55-TS-1004 and Technical Specification for High Density Polyethylene (HDPE) Pipeline Construction A-1000-55-TS-1003
- Australian Standard AS4041 Pressure Piping.

Any pumps and/or holding tanks necessary for the upgraded separator are located within suitably designed bunds or containment areas.

Ongoing inspection requirements for the separator system is provided in the facility's integrity management system.

3.3.7.6 Dewatering of Evaporation Ponds

Dewatering of evaporation ponds may be necessary during operation to:

- facilitate soil sampling within the evaporation pond footprint
- allow liner integrity testing and/or liner repair and/or replacement
- facilitate evaporation pond construction
- allow remediation of evaporation pond 1
- maintain sufficient freeboard within the pond.

Removed water will be stored within an operational evaporation pond (where there is sufficient ullage available). Where sufficient ullage is not available, offsite disposal by a suitable waste contractor may be implemented.

3.3.7.7 Optimisation and Continual Improvement of the Produced Water Management Strategy

The Facility commenced operation in 1992 and since this date has managed produced formation water by utilising the site drainage and evaporation pond system described above.

Operators will continue to monitor produced formation water volumes and the produced water management strategy and infrastructure necessary to support the strategy to ensure the continued safe and efficient disposal of produced formation water, in a manner that minimises impacts to environmental values whilst balancing social and economic considerations.

The long-term water infrastructure capacity is currently being reviewed, in conjunction with the long-term management and fate of evaporation pond 1. This review is currently planned for completion in mid-2018.

3.3.8 Associated Infrastructure

3.3.8.1 Power Generation

The Gas Production Plant is powered solely by on site generation. There are two main generators, one gas and one diesel, located in the purpose built container within the fenced Gas Production Plant compound. During normal operations, only one generator is running. Under normal operating conditions the gas generator is the 'duty' unit using permeate gas from the CO₂ removal system (i.e. gas membrane unit) for fuel.

3.3.8.2 Flare

A vertical and a horizontal flare are provided within the Gas Production Plant, in separate fenced compounds. Due to the highly combustible nature of the vegetation surrounding the Gas Production Plant, DFES requires vegetation to be cleared around the flares to minimise the risk of fire from the

flare. Temporary ground flares are set up for drilling of new gas wells or workovers as required at the well sites. Approval is obtained from DFES for any temporary flares.

3.3.8.3 Workshop

The Workshop is located immediately north of the Gas Production Plant's main gate entrance.

3.3.8.4 Chemical Storage

A Chemical Storage Shed has been designed and constructed to meet the Facility's storage and handling needs and consists of a sheltered enclosure, bunded containment area and suitably rated monorail for the safe unloading and movement of drums. The storage area has been located on the southern perimeter fence of the Gas Production Plant to accommodate inventory deliveries without the introduction of ignition sources into the restricted area of the plant.

3.3.8.5 Groundwater Monitoring Bores

Nine groundwater monitoring bores (GW1, GW2, GW3, GW4, GW5, GW6, GW7, GW8 and GW9) have been installed and are monitored at the Gas Production Plant in accordance with the Beharra Springs Environmental Licence L8385/2009.

During 2017, an additional eleven (11) groundwater monitoring bores were installed as part of the soil and groundwater investigation. The investigation was completed in April 2017 and a final report submitted to DMIRS and DWER. In the interim, all twenty (20) groundwater monitoring bores are continuing to be monitored quarterly post completion of the investigation until a review and consolidation of the groundwater monitoring program is undertaken in late 2017.

Details of the monitoring undertaken are provided in Section 7.5.1.

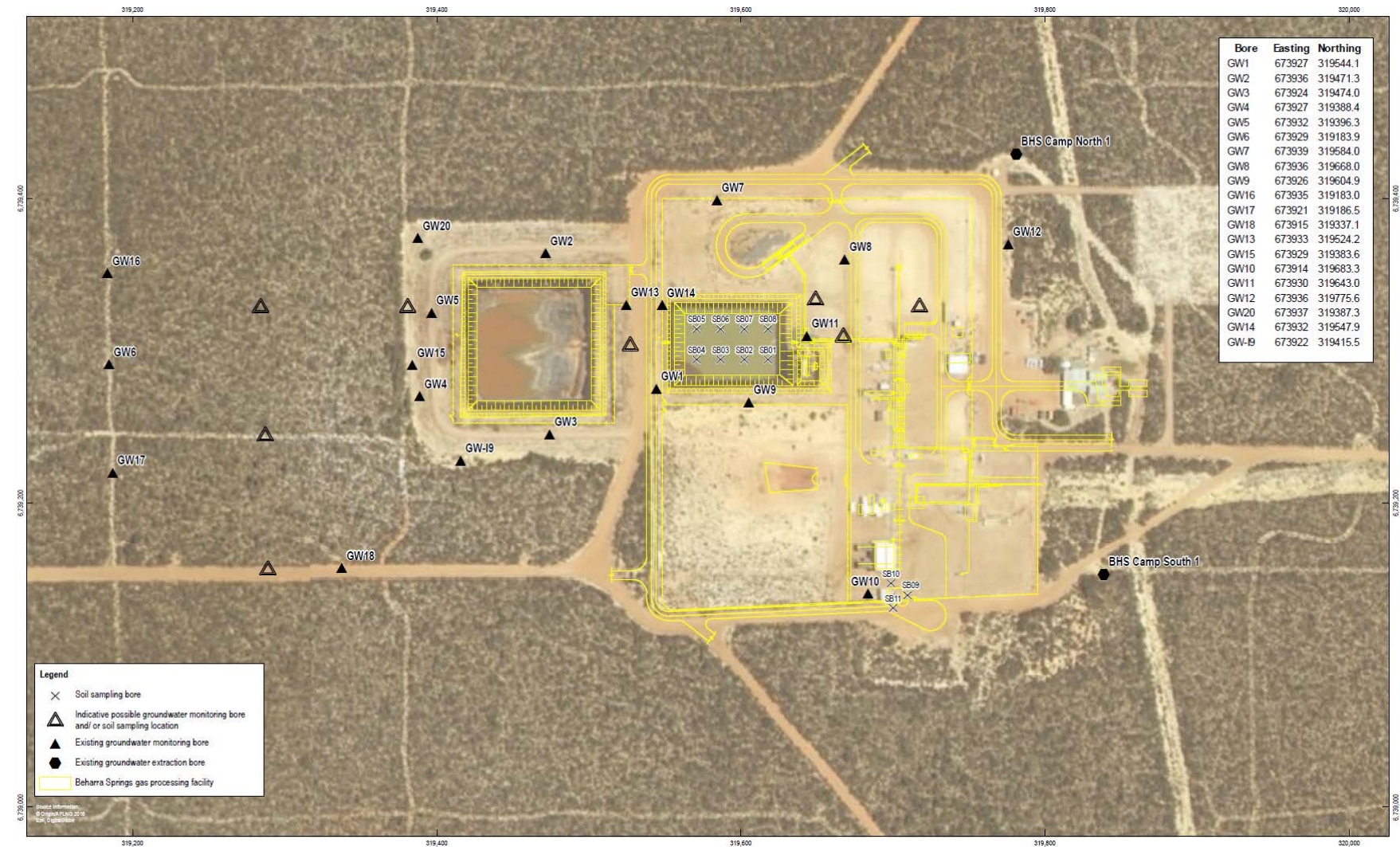


Figure 3-2: Location of Groundwater Monitoring Bores

3.3.9 Operations Accommodation

Permanent staff facilities with accommodation for up to 12 persons, are located on site approximately 100 m from the Gas Production Plant's eastern perimeter fence. These facilities, including the wastewater treatment system, were upgraded in late 2015 (previously accommodated up to 5 persons).

Staff live in a cared arrangement with an evening meal prepared by a contract cleaner / cook and self-prepare all meals during the weekend.

Refer to Appendix E for a layout plan of the Beharra Springs accommodation camp.

During routine and non-routine activities, contractors can be accommodated at (subject to availability and appropriateness of facilities available):

- the Beharra Springs permanent accommodation camp, or
- nearby township of Dongara, or
- at a third party's existing accommodation camp (such as Bonnie Rock's Pye Road Camp adjacent to the Hovea Production Facility).

3.3.10 Septic Systems

Sewage generated at the gas production plant and accommodation building is treated by a septic system designed for up to 12 people. The system consists of two in-ground concrete tanks (1500mm and 1200mm) and two 12m long leach drains, located immediately north of the administration building. The leach drains were installed as per manufacturer specifications by a licensed plumber in 2015.

In addition to this operational system, a decommissioned septic system is located at the Beharra Springs 3 well lease. The system was last operational in 2010 and was used to support the 2010 drilling campaign (in accordance with the approved 2010 Drilling EP). The system has since been decommissioned and consists of an in-ground concrete tank and leach drain that is linked to a 3-connection inlet manifold. The manifold ends are capped and disconnected. The decommissioned septic system will be left in-situ and may be made operational to accommodate possible future drilling/project activities.

3.4 Hazardous Substances, Chemicals and Inventories

A register of all hazardous materials, chemicals and dangerous goods stored at the Facility is maintained on site (Dangerous Goods Manifest CDN/ID 3677642). Storage, handling and disposal are undertaken in accordance with the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*.

A summary of hazardous substances held at the Facility is presented in Table 3-2 below.

During major maintenance campaigns and non-routine activities, volumes and storage of the hazardous substances may increase temporarily for the duration of the works. This has been noted in Table 3-2 below.

Table 3-2: Summary of Hazardous Substances held at the Beharra Springs Gas Facility

| Hazardous Substance / Chemical | Description and Use | Storage Quantity and Location |
|--------------------------------|--|---|
| Methanol | Flammable and toxic liquid. Approximately 400 L per day injected upstream of the Low Temperature Separator to prevent hydrate formation during processing. | Stored in a 16,500 L tank (which has a maximum fill level of 16,194 L) within a bunded area (co-located with the condensate tank). Refilled with approximately 11,000 L tanker loads as required. Redback well leases in a bunded 200L tank. |
| Lube oil and hydraulic fluid | Combustible liquid. General plant and equipment maintenance. | Stored in three 1000 L IBCs, 200 L drums and 20 L pails within the chemical storage area. |

| Hazardous Substance / Chemical | Description and Use | Storage Quantity and Location |
|--------------------------------------|---|--|
| Diesel | Combustible liquid. Fuel for backup generator and other plant/equipment. | 4,500 L day-tank adjacent to the generators. However a standing order that limits the maximum fill volume to 2450L has been put in place (refer section 5.4.4.2). During major maintenance campaigns, plant and equipment brought to site may contain self-bunded diesel storages for power generation e.g. trailer mounted nitrogen generator, truck mounted wireline unit, temporary accommodation/amenities. Typically, temporary diesel power generation tanks are self-bunded. |
| Condensate | Condensate is the lighter hydrocarbon liquids from the gas treatment process. Volatile and flammable liquid, which also has toxic properties. | Stored in 109 kL Condensate Tank (with a maximum fill level of 100.6kL) located in a bunded area (co-located with the methanol tank). Condensate is collected and removed off site by road tankers for further processing by BP. |
| Unleaded petrol | Flammable liquid. Used for primarily for site vehicles, plant and equipment. | Maximum 200 L storage in vendor supplied metal drums within the chemical storage area. |
| Compressed gases | Used during routine and non-routine maintenance activities such as purging and welding. | During normal operation and maintenance up to six manpacks; Acetylene – Six G size cylinder. Oxygen – Six G size cylinders. Stored in designated area adjacent to the Workshop. During major maintenance campaigns a dedicated nitrogen generator may be mobilised to site to avoid large cylinder storages. |
| Activated carbon | Inert material until contaminated with poly aromatic hydrocarbons (PAHs). Gas Membrane Pre-treatment unit. | 7m ³ of activated carbon is utilised in the carbon guard beds. A specialised waste contractor is responsible for collecting and disposing of spent activated carbon. |
| Corrosion inhibitor | CORTRON IRN-100. Flammable and toxic liquid. Approximately 30L per day is injected at the various points to protect flowlines and processing facilities. | Stored in up to fifteen 205 L drums in the chemical storage area. Stored at well leases approximately 200L bunded storage tanks. |
| Puraspec (Zinc Oxide Desiccant) | Proprietary substance manufactured by Johnson Matthey. It is an inert substance, used to remove H ₂ S from gas. When contaminated with H ₂ S it requires specialist handling. | Approximately 14 m ³ of Puraspec is utilised in hydrogen sulphide (H ₂ S) Removal unit. A specialised waste contractor is responsible for collecting and disposing of contaminated Puraspec. |
| H ₂ S - Hydrogen Sulphide | Toxic and flammable gas. Occurs in the raw gas stream at levels of 8-10 ppm. Reduced to <3.2 ppm in the | A specialised waste contractor is responsible for collecting and disposing of contaminated Puraspec. |

| Hazardous Substance / Chemical | Description and Use | Storage Quantity and Location |
|--------------------------------|---|---|
| | sales gas by membrane filters and Puraspec. | |
| Liquefied Petroleum Gas (LPG) | Used for start-up of the flares and water bath heater following shutdown. | Typically, four 45 kg bottles for onsite use. One is located at the accommodation camp BBQ. This could increase to twelve 45 kg bottles during major plant shutdowns and maintenance campaigns. |
| Grease | For use in equipment operation and maintenance. | Typically, two boxes of 12 cartridges increasing to a maximum 300 L during major plant shutdowns and maintenance campaigns stored in the chemical storage area. |
| Monoethylene glycol (MEG) | For use in the hot water system as a circulating fluid. | Typically, one self-bunded IBC stored near the hot water bath heater. |
| Biocide | For use in bacteria control in process water. | Typically, four 200 L drums or IBC located within the chemical storage area. |
| Engine coolant | For use in compressors and generator engines. | 200 L drums or an IBC located within the chemical storage area. |
| Radiator flush | Use in engine maintenance and cleaning activities. | 200 L drum stored in the chemical storage area. |
| Foam concentrate | Foam used for fire-fighting. | 20 L stored in the fire-fighting trailer. Foam extinguisher at the condensate load out bay. |
| Roundup | Glycosulphate used for general weeding/housekeeping activities. | 20 L stored in the chemical storage area. |
| Solvents and paints | Fabric maintenance, repair of/coating of pipe, plant and equipment | Up to 4 x 20 L containers stored in the chemical storage area. |

3.4.1.1 Chemical Disclosure

Under the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* operators of petroleum facilities are required to disclose products, additives, chemicals and other substances that may be used by the operator for drilling, hydraulic fracturing or other 'down-well' petroleum related activities.

No such products, additives, chemicals and other substances are currently used for down well activities at the Facility. If any such products, additives, chemicals and other substances are proposed for use in future drilling operations this will be disclosed in the relevant bridging document. Additionally if any changes to current operation of wells at the Facility requires the use down well use of products, additives, chemicals and other substances, these will be disclosed to the regulator prior to use occurring.

3.5 Waste Generation, Storage and Disposal

Waste management will be guided by the waste and resource management hierarchy – avoid, reuse, recover, recycle, dispose.

A summary of waste products generated at the Facility is provided in Table 3-3 below.

Table 3-3: Summary of Waste Storage and Disposal Requirements

| Waste Generated | Storage Conditions | Disposal Method |
|--|--|--|
| Used oil | 1000 L ICB and 205 L sealed storage drums stored within the Chemical Storage Shed or appropriately bunded area. | All stored used oil is manually transferred to Condensate Tank for collection by BP and processed at the Kwinana Facility or collected and disposed of by an appropriately licensed waste contractor to an authorised recycling / disposal facility. |
| Produced formation water and site drains | Evaporation ponds. | Interceptor pit and then Evaporation ponds. |
| Permeate gas | No storage required. | Excess gas (i.e. that which is not used to fuel gas compressors or generator) to be flared in vertical flare. |
| General waste (from control room, waste paper, food scraps etc.) | Dedicated sealed bins located within the site office and accommodation camp. Separate bins provided for recyclable materials. | Collected by and disposed of by an appropriately licensed contractor. Volumes tracked by waste contractor collection records and invoices. |
| Greywater (includes sewage from site office and camp accommodation) | No storage. | Onsite septic treatment system which discharges to leach drains located near workshop. During major maintenance campaigns (e.g. well workover, drilling, shutdowns) the decommissioned septic system at Beharra Springs 3 may be reinstated or temporary self-contained amenities may be mobilised to site. These temporary facilities will be operated and maintained in accordance with relevant health regulations and local council requirements and any waste generated collected and disposed offsite by a suitably licensed waste contractor. |
| Skimmed product from evaporation pond and interceptor pits | Within bunded condensate tank, interceptor pit, or other suitable storage tank, or taken directly off site by appropriately licensed waste contractor. | Collected and processed at the Kwinana Facility or other suitable processing facility (if stored in condensate tank) or collected and disposed of by an appropriately licensed waste contractor. |
| Abrasive blasting material | Clean material stored in drums and are then refilled with used material. | Collected by and disposed of by an appropriately licensed contractor. Volumes tracked by waste contractor collection records and invoices. |
| Major maintenance campaign pipeline inspection, cathodic protection upgrade, coating repairs | Pallets, packaging, old/replaced plant and equipment, pipe, tape and wrap cut offs stored in dedicated lay down area within the Gas Production Plant. | Collected by and disposed of by an appropriately licensed contractor. Volumes tracked by waste contractor collection records and invoices. |
| Hydrostatic test water or washdown water | To be contained within pipeline/flowline/plant or | To be disposed of to the interceptor pit and evaporation |

| Waste Generated | Storage Conditions | Disposal Method |
|---|--|---|
| | equipment, until suitably disposal identified. | pond if suitable ullage available or collected by and disposed of by an appropriately licensed waste contractor. Volumes tracked by waste contractor collection records and invoices. |
| Potentially contaminated soil/sand from (bored/cored/excavated during pipeline dig ups, soil sampling, spills, removed from evaporation pond/s) | Dedicated storage containers within the Chemical Storage Shed or appropriately lined storage area (e. g evaporation pond or lined skip bins) (depending on nature and volume of material). | Collected by and disposed of by an appropriately licensed contractor. Volumes tracked by waste contractor collection records and invoices. |
| Potentially contaminated water (e.g. groundwater extracted during monitoring bore development and purging, rainwater collected in evaporation pond footprint) | Dedicated storage containers within the Chemical Storage Shed or appropriate storage area (operational evaporation pond) (depending on nature and volume of material). | Collected by and disposed of by an appropriately licensed contractor. Volumes tracked by waste contractor collection records and invoices. |
| Used filter medium (spent activated carbon and puraspec) | Contained within process. Once removed from process stored temporarily in appropriately sealed containers. | Collected by and disposed of by any appropriately licensed waste contractor. Quantity tracked by waste contractor collection records and invoices. |

3.6 Operations and Maintenance

3.6.1 Operations Philosophy

The Facility is designed to operate 365 days per year, 24 hours per day. Operation of the Gas Production Plant is controlled locally and can be monitored at the:

- Office Control Room located immediately adjacent to the Gas Production Plant; and
- Compressor Control Room located in the Gas Production Plant area.

Overall management of the Facility is overseen from the Lattice offices, with visits to the site by the Operations Superintendent and support staff as required. Refer to Section 7.3 for a description of specific environmental responsibilities for operations and maintenance staff.

Onsite staff comprises one Superintendent assuming direct responsibility for the day to day operation of the plant and two Production Operator Maintainers. The Production Operator Maintainers' duties include site inspections, field maintenance and process optimisation / adjustment.

3.6.2 Routine Activities

Routine activities associated with the operation and maintenance of the Facility include (but not necessarily limited to):

- well site inspections and general maintenance such as replacing worn or malfunctioning equipment, painting and cleaning equipment;
- injection of methanol (at Redback wells) to control potential for hydrate formation and injection of cortron (at all operational wells) to provide corrosion protection of flowlines;
- Sales Gas Pipeline inspections, integrity testing and maintenance (refer section 3.6.3.2 and section 3.6.3.4 for planned major maintenance activities such as pipeline pigging and direct inspection);
- flowline inspection, integrity testing and general maintenance (refer section 3.6.3.5 for planned major maintenance activities such as direct inspection);
- Gas Production Plant inspections, integrity testing and maintenance (including replacing worn or malfunctioning equipment, painting and cleaning equipment);

- evaporation pond inspections, integrity testing and maintenance (including repair of small tears/defects);
- access road, pipeline/flowline right of way, well lease and production plant lease pad maintenance;
- progressive rehabilitation of construction areas and right of ways (refer section 3.7);
- firebreak and vegetation maintenance in accordance with site specific bushfire management plan, conditions of DFES approval (refer section 2.3.1) and Shire of Irwin requirements;
- environmental monitoring and emissions monitoring (Table 3-5 and section 7.5.1);
- flaring and venting;
- fabric maintenance (painting and insulation works);
- hydrostatic testing of flowlines and pipework (in accordance with relevant Australian Standards, regulatory guidelines and approvals);
- completing small modifications to plant and piping that are on a like for like basis.

3.6.3 Planned Major Maintenance Activities

In addition to routine activities, planned major maintenance activities are undertaken as required and include (but not necessarily limited to):

- well workovers, wirelining and intervention;
- pigging of the Sales Gas Pipeline;
- shutdown of the Facility for major maintenance campaigns;
- removal and replacement of filter and catalyst media within process vessels and equipment
- direct inspection of the Beharra Springs flowlines and sales gas pipeline;
- coating repair, maintenance and/or replacement of the Beharra Springs flowlines and sales gas pipeline; and
- catalyst change outs.

The risk assessment presented in section 5 and Appendix C has considered these activities. Prior to undertaking any major maintenance activity, the risk assessment will be reviewed. If any new risks or any existing risk level increases, Lattice will liaise with DMIRS to ensure any necessary approvals are sought prior to undertaking the activity.

During periods where part or all the Facility is shutdown, routine inspection and maintenance activities will still be undertaken as described in section 3.6.2.

All waste generated during major maintenance activities will be managed as described in section 3.5, Table 3-3 of this EP.

All hazardous substances likely to be stored, handled and transported are described in Table 3-2 of this EP.

Where possible, personnel will be accommodated at the existing operational camp or in nearby township of Dongara. Where possible, the number of vehicles accessing the site each day will be limited through car-pooling.

Detailed descriptions of the major maintenance activities covered by this EP are discussed in the sections below.

3.6.3.1 Well Workovers, Wirelining and Intervention

Well workovers, wirelining/slick lining and intervention may be required from time to time to ensure optimal and safe operation of the Gas Field. Such works could include any or all the following activities:

- extending the well operational lease hard stand area (typically 10 m x 10 m extending to 100 m x 100 m) to accommodate workover rig, crane setup and necessary laydown area. This would include removing existing fencing, stripping and stockpiling of topsoil and vegetation (to be

respread upon completion of the activity) and spreading imported fill/gravel material to form a suitable hardstand area. The current land clearing permits have an allowance for this larger area to be cleared (refer section 2.2.3.3 for further details). Imported material will be sourced from a suitable quarry.

- mobilising of plant and equipment required (i.e. earthmoving equipment, workover/wireline rig, crane, temporary site facilities such as temporary power generation, dangerous goods and hazardous material storage).
- installing piping (using flanged, hammer union or welded connections as required and appropriate). Any above ground piping will be constructed from certified piping and maintained in accordance with AS3788:2006 *Pressure equipment – In-service inspection*.
- undertaking a hydrostatic pressure test of above ground pipework in accordance with Lattice's Barriers Standard (INT-1000-35-TS-002). During slickline/wireline intervention, pressure testing equipment such as the housing for necessary wireline tool string involves small quantities of water (less than 100L). The resulting hydrostatic pressure test water is disposed of in the wellbore when the production tree valves are open prior to running the tool string in hole. No additives are introduced down hole. Should any chemicals be necessary the relevant approval documentation (in accordance with the EP Guidelines) will be prepared and approval will be sought from DMIRS as described in section 3.4.1.1
- taking of groundwater from an appropriately licensed water bore or Dongara township (from an appropriately licensed facility and then transferred to site by road tanker).
- setting up the wireline or workover rig, and crane at the well site.
- running wireline tools/workover rig.
- removing/installing casing, plugs, well head surface facilities.
- excavating drilling sump or installing temporary above ground tank to hold drilling fluid/cuttings during well workover.
- removing drilling waste to an appropriately licensed facility.
- pressure bleeding of well tubing and annulus. Any gas brought to the surface during pressure bleeding will be cold vented via the temporary above ground piping to the gas vent/waste liquid storage tank, which will then be transported and disposed of by an appropriately licensed waste disposal contractor at the end of the activity.
- circulating drilling fluid during workovers.
- topping up the well with inhibited water to prevent corrosion and microbial bacteria presence.
- performing pressure diagnostics and monitoring.
- disconnecting piping and the gas vent/liquid waste tank, all waste and materials associated with the activity taken away and appropriately disposed of, and the site returned to its current operational condition.
- respraying of stockpiled topsoil and vegetation.
- liaising with landholders and key stakeholders with respect to timing, duration and scope of works.

Well workover, wirelining and intervention activities are likely to involve shutdown of the relevant well and possibly associated flowlines for a period of one to ten days depending on the scale and nature of the works.

3.6.3.2 Pigging of the Sales Gas Pipeline

The Sales Gas Pipeline was designed and constructed to be piggable. Pigging facilities (launch and receive traps) are provided for maintenance pigging (removal of scale, debris and other build up), however these traps are not suitable for inspection tools due to their short length. New pig traps will be designed and fabricated in accordance with AS2885 Parts 1, 2 and 5 prior to the commencement of an inspection campaign. This work is expected to be completed in Q1 2018. This initial pigging activity will be used to determine the future ongoing requirement for pigging which will be undertaken in accordance with AS2885 but at intervals not greater than every 10 years.

The pig launcher station is permanently located within the Gas Production Plant and the pig receiver station is permanently located within the Sales Gas Pipeline export metering station.

Pigging of the Sales Gas Pipeline is typically undertaken to conduct an inspection of the line and involves the running of multiple cleaning and gauging tools before the inspection tool. Pigging is undertaken in accordance with relevant industry standards and Australian Standard AS2885 as relevant.

Pigging of the Sales Gas Pipeline can take less than two days or more than a week depending on various factors and will involve the following activities:

- mobilising plant and equipment (such as waste tank for expelled materials/nitrogen gas/pig pushing and pulling equipment);
- isolating the pipeline from Gas Production Plant and Parmelia Pipeline;
- installing the pigging tool;
- repressurising the sales gas pipeline to push the pig through the pipeline using nitrogen or sales gas (as deemed appropriate);
- venting of sales gas inventory within pipeline at metering station (worst case volume is 720 m³) where reverse flow back to the gas plant for flaring is not practical;
- removing the pigging tool, filters and any material collected in pig receiving station by an appropriately licensed waste contractor for disposal;
- removing pipeline isolations and re-pressurising the pipeline to resume normal operations; and
- liaising with landholders and key stakeholders with respect to timing, duration and scope of works.

During pigging activities, the Gas Field will be managed to limit as far as practical, gas flow to the Gas Production Plant, with all gas directed to the existing flare for disposal.

3.6.3.3 Shutdown of the Gas Production Plant for Major Maintenance Campaigns

Shutdown of the Gas Production Plant for major maintenance campaigns are planned and occur periodically. Typically, shutdown activities can span from less than one week to more than four weeks depending on the nature and scale of the works required.

During periods where the Gas Production Plant is shutdown, incoming gas from the Gas Field is directed to the existing flare. The Gas Field will be managed to minimise flow of gas to the plant to minimise flared volumes.

Typically, Gas Production Plant shutdowns are required to:

- replace or repair malfunctioning/ non-serviceable plant, equipment and piping
- undertake integrity inspections of plant, equipment and piping in accordance with legislative or normal industry practice
- test functionality of plant and equipment and/or
- install new plant, equipment or piping to ensure safe and efficient operation of the Facility.

Shutdown activities could include any or all the following activities:

- mobilising of plant and equipment required (i.e. crane, temporary site facilities such as temporary power generation, dangerous goods and hazardous material bonded storage, trailer mounted nitrogen gas generator, steam truck for cleaning of pipe and equipment).
- installing temporary office and kitchen/amenities within previously cleared and permitted area.
- installing temporary/new piping (using flanged, hammer union or welded connections as required and appropriate). Any above ground piping will be constructed from certified piping and maintained in accordance with AS3788:2006 *Pressure equipment – In-service inspection*.
- undertaking a hydrostatic pressure test of above ground pipework in accordance with Lattice's Barriers Standard (INT-1000-35-TS-002).

- taking of groundwater from an appropriately licensed water bore or Dongara township (from an appropriately licensed facility and then transferred to site by road tanker).
- setting up crane/scaffolding.
- removing, and then refurbishing (either on site or off site) and/or replacing plant, equipment and pipework.
- welding/cutting/excavation.
- steam cleaning of equipment to remove oil and grease.
- flaring and venting.
- performing pressure diagnostics and monitoring.
- removing and replacing filter or catalyst media from within process vessels or equipment
- overhauls, refurbishment or upgrade of major package mechanical equipment such as compressors, pumps and the like.

Where replacement plant, equipment or pipework is not like for like, or results in the change to or alteration of the process during normal operation as a result of completing the work, or new materials or waste not included in Section 3.4, Section 3.5, Table 3-2 and/or Table 3-3 then the management of change system (refer section 4.11 of Appendix A) will be implemented.

3.6.3.4 Hydrostatic Testing of Flowlines/Pipework/Plant and Equipment

From time to time (and on an as needed basis), hydrostatic testing may be necessary for flowlines, new piping or temporary piping, or plant and equipment installed and maintained within the Facility. Water will be sourced from either the existing licensed groundwater extraction bores located near the gas production plant or, if the quality is not suitable, from an offsite source that holds the relevant extraction approvals. All hydrostatic testing will be completed under Lattice's permit to work system and will be undertaken in accordance with the prevailing regulations, approvals and Australian Standards. Final water quality (after completion of the hydrostatic testing) is likely to contain small amounts of hydrocarbon, corrosion inhibitor, corrosion products, and biocide. Therefore, it will not be released to grade. Depending on the final water quality, it will either be transferred to the Facility's produced formation water management system (subject to suitable freeboard within the operational evaporation ponds) or taken off site by a suitably licensed waste contractor. Where practical, hydrostatic testing of new plant and equipment will be undertaken prior to being brought to site.

3.6.3.5 Direct Inspection and Coating of Flowlines/Sales Gas Pipeline

Direct inspection of the flowlines and sales gas pipeline are undertaken as deemed necessary, in accordance with the pipeline and flowline integrity management plan and / or relevant Australian Standard. In Q1 2017, three locations along the Redback to Beharra Springs Gas Plant flowline and at 2 locations along the Sales Gas Pipeline were directly inspected as a result of recommendations from the 2015 DCVG survey). Inspections involve excavation at each location to inspect the condition of the coating, conduct UT wall thickness measurements and repair any potential coating damage. Over the operational life of the Facility's flowlines and sales gas pipeline, direct inspections, repairs of the pipeline coating system and holiday detection may be necessary to ensure the integrity of the assets is maintained.

To undertake direct inspections, it will be necessary to:

1. Mobilise plant and equipment (such as trailer mounted hydro-vac, <5 tonne excavator, hand tools, inspection and testing equipment) to undertake excavation.
2. Locate and isolate (if appropriate) any services that could be accidentally exposed or damaged during excavation. The flowline and sales gas pipeline will remain in service during the Activity.
3. Positively identify the location of the flowline and sales gas pipeline by pot-holing using hydro-vac excavation method or hand digging in accordance with Lattice's procedure AUS-1000-ENG-PRO-9111421. During this process, high pressure water may be used to excavate pot holes/trenches. All material excavated using the hydro-vac will be stored within the hydro-vac unit and will be used during backfilling. The water used during the process will be sourced either from the existing licensed groundwater bores (GWL155141(5)) at the Gas Production Plant or an appropriately licensed facility offsite. Typically, 3 kL of water will be required.

4. Mark out the flowline and sales gas pipeline right of way extent and area for excavation to ensure works are limited to as small as area as possible and do not encroach outside of existing approved cleared areas (clearing permit CPS4607 and CPS6643). Should new clearing be necessary, a new clearing permit will be sought.
5. Excavate inspection pits (typically 1 m in length along the asset) that provide 360° visual access. Initially, the excavation will be undertaken using a <5 tonne excavator. Once the excavation is within 1 m of the flowline/pipeline, the remaining excavation will be completed using a non-mechanical method such as hand digging or hydro-vac excavation. The excavations are expected to be a maximum of 1.5 m deep.
6. Stockpile excavated material within the right of way easement at a height not greater than 1.5 m. Temporary stabilisation measures such as wetting down to prevent dust generation and erection of silt fencing or stormwater runoff diversion to prevent washing away during wet weather will be implemented as appropriate.
7. Inspect and record the condition of the flowline/pipeline coating both visually (evidenced by photographs) and using a holiday detector in accordance with Lattice's procedure AUS-1000-ENG-PRO-11532223.
8. Repair any identified defects (coating/pipe wall) identified using STOPAQ® system (or alternate suitable system) in accordance with Lattice's procedure AUS-1000-E55-PLN-9094242.
9. Verify coating repairs using a holiday detector in accordance with Lattice's procedure Q-1000-ENG-PRO-8057406 prior to backfilling.
10. Securely fence and implement a daily maintenance and inspection program for any inspection pits that need to remain open overnight. Daily maintenance and inspection checks will include confirming that no trapped fauna and the excavations remain stable and safe prior to re-entry. Any rainwater that enters the inspection pit will be pumped out to grade. It is likely that inspection pits could remain open for up to 2 nights.
11. Backfill inspection pits with soil stockpiled during excavation, taking care to ensure the soil is free from rocks that could damage the pipe. It is unlikely that any new material will be brought to site. However, should additional backfilling material be required, it will be sourced locally, from an appropriately licensed quarry. Backfilling will be undertaken in accordance with Lattice's procedure AUS-1000-ENG-PRO-9111421. Compaction of backfill will be undertaken using static methods (such as light hand operated rollers) and not vibrating /dynamic equipment to prevent damage to the flowline/pipeline.

In addition to the external visual and holiday testing detailed for the flowline and pipeline, the flowline/sales gas pipeline may also be inspected internally using an ultrasonic testing (UT) based non-intrusive scanning technology. Repair of any internal defects identified during the ultrasonic corrosion mapping of assets are not included in the scope of this EP. During 2018, it is planned to complete the recoating works on the final 40m of the sales gas pipeline, as well as undertake coating surveys of the flowlines. This work will be undertaken in accordance with the description provided above and in accordance with the requirements of this EP.

Should work be required to rectify internal defects to a flowline or sales gas pipeline, a bridging document will be submitted to DMIRS for approval.

3.6.4 Non-routine Activities

Non-routine activities associated with the operation and maintenance of the Facility may include:

- installation of new groundwater monitoring bores (refer section 3.6.4.1);
- soil sampling (refer section 3.6.4.2);
- remediation of contaminated soils (refer section 3.6.4.3);
- replacement of evaporation pond 1 liner (refer section 3.6.4.4);
- repair and validation of pond liner (refer section 3.6.4.4);
- installing new processes or plant/equipment that is not like for like or routine (refer section 4.11 of Appendix A for MOC process description) during plant maintenance and shutdowns; and
- removal of windblown sand from operational evaporation pond footprint and/or condensate/methanol tank bunded area.

Any non-routine activity, such as these (and including but not limited to) seismic surveys, drilling of new gas exploration or production wells, installation of new flowlines, plug and abandonment of wells, plant closure and decommissioning are not in the scope of this EP, with the necessary approvals being sought from DMIRS and other relevant regulators the appropriate time.

3.6.4.1 Groundwater Monitoring Bore Installation

Should the need arise, additional groundwater monitoring bores may be necessary. The exact location and number necessary will be assessed on a case by case basis. Possible future indicative locations are shown in Figure 3-2. Based on the soil and groundwater investigation undertaken in Q1 2017, groundwater monitoring wells were installed using hollow stem augers (therefore there is no requirement for drilling mud or fluid) to approximately 3 m below the water table. The 50 mm diameter PVC monitoring wells were screened across the water table approximately 1 m above and 3 m below groundwater level. Following installation, monitoring wells were developed to ensure representative groundwater samples can be obtained. Top of monitoring well elevations were surveyed to local datum to allow determination of groundwater flow direction and groundwater gradient.

3.6.4.2 Soil Sampling

From time to time, and as part of the recently completed soil and groundwater investigation, soil sampling may be required at the Facility. Soil sampling techniques that could be used include:

- drill rig sampling, including push tube, auger and sonic sampling
- hand augering
- grab sample from test pits, excavations and trenches
- surface sampling and stockpile sampling.

The sampling technique used will be dependent on several factors including:

- Anticipated soil geology and sampling depth
- Previous analytical results
- Location or presence of underground services and other site access constraints
- Other site specific health, safety and environment requirements.

It is likely that soil samples will be collected using several these techniques including:

- Drill rig/push tube/auger sampling (undertaken simultaneously with groundwater monitoring bore drilling)
- Hand augering

Grab sample from test pits and excavations.

All soil sampling will be undertaken in accordance with the relevant regulatory guidelines and Australian Standards including AS4482.1 (2005) *Guide to the investigation and sampling of sites with potentially contaminated soil – Part 1 Non-volatile and semi-volatile compounds*; and AS4482.2 (1999) *Guide to the sampling and investigation of potentially contaminated soil – Part 2 Volatile substances*.

On site activities associated with soil sampling will include:

- Mobilisation of personnel and soil sampling equipment
- Site preparation to allow soil sampling to be undertaken which may include:
 - dewatering for sampling undertaken within evaporation pond footprint (water will be managed in accordance with the water management strategy described in section 3.3.7.6).
 - preparing soil sample sites to ensure clear and stable surface. For soil sampling within the evaporation pond footprint this will include removing the protective sand layer to expose the liner and cutting an appropriately sized hole at the sample locations. The removed sand layer will be retained within the pond for respreading over the repaired liner.
 - confirming no existence of buried live services that could be damaged during sampling
- Collection of soil samples (using one of the techniques described above)

- Analysis of soil samples and reporting of soil quality in accordance with a soil sampling plan)
- Backfilling any soil sample sites where practicable with material bored/cored or excavated during soil sampling and compacted as far as practicable to return the soil to its original location. Where possible, new material will not be brought to site, however, should it be required, only clean fill sourced from a quarry with an appropriate extraction licence will be used.
- Site clean-up and decommissioning which may include:
 - liner repair and validation
 - respreading excess bored/excavated material locally or if potentially contaminated storing the material in suitable containers until it can be removed off site by an appropriately licensed waste contractor in accordance with Table 3-3.

3.6.4.3 Remediation of Contaminated Soils

Sources of potentially contaminated sand/soils include:

- Removal of unsuitable material as part of evaporation pond 2 upgrade project
- Removal of windblown sand from within the operational pond footprint
- Material currently contained within the evaporation pond 1 footprint.

Management of contaminated soils/sands will be through storage within suitably lined containment facilities (e.g. lined skip bins or purpose built storage areas) or within the lined evaporation pond 1 footprint (subject to ongoing independently verified liner integrity testing) to be transferred off site for disposal via an appropriately licensed waste contractor.

Alternatives to waste disposal, such as in-situ bioremediation of contaminated soil/sand within evaporation pond 1 are currently being considered. This is being considered along with the long-term optimisation and review of the facility's water management infrastructure and water capacity requirements.

Should additional water management capacity be required for the Facility, the evaporation pond 1 site will be considered for location of any future infrastructure. The type of infrastructure to be used will be determined at the time and will involve a detailed options analysis and environmental risk assessment to determine the best solution.

Therefore, the timeframe for remediation of evaporation pond 1 will be driven by the facility's requirement for water management capacity, as well as ongoing demonstration of evaporation pond 1 liner integrity.

3.6.4.4 Replacement of Pond Liner

Replacement of evaporation pond liner may be undertaken in the event remediation of evaporation pond 1 is necessary. In this case, the likely activities may include:

- Dewatering the evaporation pond with removed produced formation water to be stored in either an operational evaporation pond, or disposed offsite by a suitable waste contractor
- Pond preparation including:
 - preparation of the existing pond structure for installation of new lining system
 - visual inspection of existing pond floor and walls to ensure its suitability
 - preparation of pond floor and walls
 - disposal of waste liner
 - management of potentially contaminated rainwater, sand/soils
 - liner material, installation and validation in accordance with project specifications and/or International Association of Geosynthetic Installers (IAGI) HDPE Geomembrane Installation Specification and consideration of Department of Water Guideline *Water quality protection note 26 Liners for containing pollutants, using synthetic membranes*, (WQPN 26) where relevant and appropriate.
- All liner material, installation and repairs will be subject to quality assurance (QA) and quality control (QC) measures

- commissioning of evaporation pond
- mobilisation and demobilisation of plant, equipment and resources necessary to undertake the project.

All works will be undertaken by suitably qualified and experienced personnel and in accordance with industry accepted practices and standards.

3.7 Reinstatement and Rehabilitation

Progressive rehabilitation is undertaken at the Facility given its need to maintain safe access and plant integrity throughout its operational life. Disturbed areas are reinstated to as small as practicable operational areas.

Reinstatement activities are completed as soon as practical after disturbance activities and generally involve:

- removing all construction plant, equipment and materials (including wastes);
- resspreading of topsoil and stockpiled vegetation over non-operational areas;
- reinstating contours of non-operational areas;
- ripping of over compacted soils;
- maintaining soil and erosion control measures;
- weed management as required and/or
- erecting fencing, signage and security (as necessary).

Full rehabilitation is completed once infrastructure is no longer necessary to support operations and it has been safely decommissioned.

Rehabilitation activities generally involve:

- removing all waste, plant, equipment, materials and hard stand areas;
- resspreading any remaining topsoil and stockpiled vegetation;
- reinstating contours consistent with surrounding landform;
- ripping of over compacted soils;
- remediating contaminated soils;
- maintaining soil and erosion control measures; and
- weed management as required.

Reinstatement /rehabilitation objectives have been set for this plan based on the existing environment and the nature of the impacts and include:

- provide a stable soil profile that is similar to the pre-existing land surface and closely resembles the original landform. This includes ensuring that the newly created landform will not erode and will not impede surface water flows;
- provide a cover of native plant species that is consistent with the vegetation immediately adjacent to the clearing and that provides for stabilisation of the soil surface and provision of habitat for fauna and flora species; and
- ensure that weed species cover in the rehabilitated areas is minimised.

Progressive rehabilitation is undertaken to minimise the risk of unsuccessful rehabilitation at the end of the Facility's life.

A summary of the rehabilitation status and progress for the Facility is provided in Table 3-4 below.

Table 3-4: Summary of the Beharra Springs Gas Facility's Rehabilitation Status

| Infrastructure | Operational status | Rehabilitation Status / Progress |
|-------------------------------------|------------------------|---|
| Beharra Springs 1 | Online and producing | Reinstated to operational lease area. |
| Beharra Springs 4 | Online and producing | Reinstated to operational lease area. |
| Beharra Springs North 1 | Online and producing | Reinstated to operational lease area. |
| Tarantula 1 | Online and producing | Reinstated to operational lease area. |
| Redback South 1 | Online and producing | Reinstated to operational lease area. |
| Redback 2 | Online and producing | Reinstated to operational lease area. |
| Beharra Springs 2 | Shut in | Reinstated to operational lease area. |
| Redback 1 | Suspended | Reinstated to operational lease area. |
| Wolf 1 | Suspended | Reinstated to operational lease area. |
| Beharra Springs 3 | Suspended | Reinstated to operational lease area. |
| Beharra Springs South 1 | Plugged and abandoned | Rehabilitation completed. |
| North Yordanogo 1 | Plugged and abandoned | Full rehabilitation completed. Rehabilitation completion report (WAA 4120 ENV RPT) submitted to DMP on 29 July 2016. |
| South Yordanogo 1 | Plugged and abandoned | Full rehabilitation completed. Rehabilitation completion report (WAA 4120 ENV RPT) submitted to DMP on 29 July 2016. |
| Flowlines | Operational | Reinstated to operational area (6m wide right of way). |
| Gas Production Plant | Operational | Reinstated to fenced operational area of 250m x 250m. |
| Accommodation building and workshop | Operational | Reinstated to operational area (0.65ha) |
| Internal access roads | Operational | Reinstated to operational area (5m wide right of way). |
| Facility access road | Operational | Reinstated to operational area (7m wide right of way). |
| Sales Gas Pipeline | Operational | Reinstated to operational area. |
| Evaporation pond 1 | Offline | Remediation pending review of the facility's long term water management capacity requirements. |
| Evaporation pond 2 | Online and operational | Reinstated to fenced operational area. |

3.8 Emissions and Discharges

Routine emissions and discharges for activities addressed under this EP are summarised in Table 3-5 below. The atmospheric emissions and discharges are calculated given the low risk to environment (refer Section 5 and Appendix C). Calculated emissions are reported under the requirements of the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), the National Pollutant Inventory (NPI), the Environmental Licence (L8385/2009) and Section 7.5.1 of this EP.

Table 3-5: Summary of Emissions and Discharges and Monitoring Method

| Emission type | Emission source | Emission release point | Monitoring method |
|---|--|--------------------------|--|
| Flaring | Ground flare | Local airshed | Thermal dispersion meter FIT275 on vertical flare. Calibrated on a 4-year cycle, as per manufacturers recommendations. |
| | Vertical flare | | |
| Venting | Pressure release valves | | Calculations in accordance with NGER Act Method 1. Typically, these calculations use machinery run hours, machinery load, fuel (diesel or gas) energy content and composition factors and NGER Act emission factors. |
| | Fugitive emissions from process upsets | | |
| | Pigging of Sales Gas Pipeline | | |
| | Fugitive emissions during major maintenance campaigns, where piping, plant or equipment is isolated to allow repair, replacement or inspection | | |
| Other atmospheric emissions (generator, heaters and combustion engine exhausts) | Compressors | | |
| | Gas generator | | |
| | Diesel generator | | |
| | Light and heavy vehicles - diesel engines | | |
| | Water bath heater | | |
| Sewage and greywater | Septic system | Leach drains | Currently no volumetric monitoring of sewage and greywater production is undertaken. Routine visual inspections of the system are undertaken to ensure in good working order with no evidence of pooling, ponding or overflow. |
| Solid waste | Putrescible waste, packaging and pallets | Local landfill | Volumes tracked by waste contractor collection records and invoices. |
| | Contaminated Puraspec beads, oily rags | Hazardous waste facility | |

| Emission type | Emission source | Emission release point | Monitoring method |
|--------------------------------|---|--|--|
| | Maintenance/shutdown waste such as packaging, pallets, pipe, worn plant and equipment | Local landfill or where an appropriate recycling service provider exists | Volumes tracked by waste contractor collection records and invoices. |
| Liquid waste | Used oil | Hazardous waste facility or oil recycler | Volumes tracked by waste contractor collection records and invoices. |
| | Skimmed product from evaporation ponds/interceptor pit | Liquid waste facility or condensate tank | Volumes tracked by waste contractor collection records and invoices. |
| Produced water and site drains | Produced formation water and site drains | Operational evaporation pond or offsite waste disposal | Produced water volume recorded by flow meter (FIT-4100-0069) Site drain volume is estimated. Offsite disposal tracked by waste contractor collection records and invoices. |

Monitoring of any unplanned or non-routine emissions and/or discharges (e.g. release from evaporation pond) will be managed as part of the incident management or emergency response procedures (refer section 7.7), or if identified during the risk assessment process (either as a control measure or risk treatment plan) (refer to Section 5 and Appendix C).

3.9 Facility Life and Decommissioning

The estimated remaining operational life of the Facility at current production rates and with current reserves is approximately 10 years. Any changes to production rates or further hydrocarbon discoveries may reduce or extend the operational life of the Facility.

Given the Facility is still in production phase, with at least 10 years of operational life remaining, no detailed decommissioning or closure planning has been completed.

Regardless, a detailed decommissioning and closure plan will be submitted to DMIRS at least 6 months prior to closure of the Facility for approval.

The decommissioning and closure plan will address any relevant legislative requirements and will be prepared considering any relevant regulator guidelines. It is expected that the plan will describe (as a minimum):

- decommissioning activities including details of the removal of all equipment, infrastructure and waste;
- plug and abandonment of wells;
- the removal and management of any sumps, flare pits, water storage ponds and other infrastructure;
- monitoring and testing regimes to be undertaken prior to rehabilitation; and
- the risks associated with decommissioning and closure activities.

4. Existing Environment

4.1 Regional Landform and Climate

The Facility is in the coastal highlands of the Mid West region of WA within the Lesueur Sandplain subregion of the Geraldton Sandplains Bioregion. The Geraldton Sandplains Bioregion (Interim Biogeographic Regionalisation for Australia, Version 7) is composed mainly of proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. The region is typically low lying and gently undulating (ANRA 2008). The Facility relief ranges between 10 m and 50 m AHD.

The regional climate region is classified as dry Mediterranean with cool wet winters and hot dry summers. Mean monthly temperature and rainfall data from the Eneabba meteorological station (008225), which commenced observations during 1964, are presented in Figure 4-1. The average annual rainfall is around 500 mm with most rainfall occurring during the winter months. Summer is typically dry with scattered and irregular thunderstorms which approach from the north-west. The average daily relative humidity is between 40 per cent and 80 per cent with the most humid months being May to September (BOM 2017).

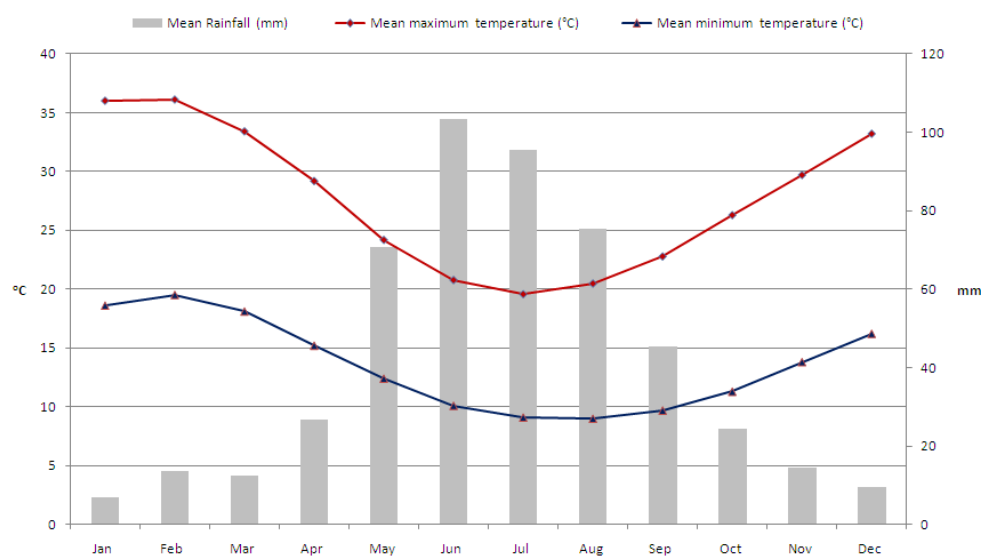


Figure 4-1: Summary of Meteorological Data for Eneabba

A strong south-west sea breeze is a part of summer weather conditions. The winds arrive between 10:00am and 12:00pm and can reach 30 knots. The winds during the winter months are more variable and influenced by the cold fronts coming in from the Indian Ocean (BOM 2017).

4.2 Geology and Soils

The Facility lies within the sedimentary Perth Basin. This basin lies onshore and offshore, and extends for about 700 km along the southern portion of the west coast of Western Australia. The basin is bounded to the east by the Darling Fault, which extends the full length of the basin. The onshore portion of the basin averages 65 km in width and extends from the southern coast to Geraldton in the north. The dominant feature in the northern section of the Perth Basin is the Dandaragan Trough, in which up to 20 km of sediments have been deposited.

The Beharra Springs-Mondarra-Yardarino trend forms a terrace along the western flank of the Dandaragan Trough, extending from the Allanooka Fault in the north to the Abrolhos Transfer Zone approximately 35 km south of the Facility.

The Facility is situated on the Beharra Springs Terrace and processes gas from the Upper Permian Wagina Sandstone reservoir. This formation is comprised of two units; an upper sandier unit overlying a siltier, less permeable unit.

The surface geology in the immediate vicinity of L11, as illustrated in Figure 4-2, consists of non-calcareous Quaternary sands (Qe) reworked by eolian processes, and Quaternary swamp and lacustrine clays, silts and diatomite (Qp).

4.2.1 Geomorphology

The Facility is situated in the geomorphic unit 'Eneabba Plain' (Playford *et al.* 1976). This unit is a low-lying area between the Spearwood Dune System and the Gingin Scarp. The Plain is restricted to the area north of Cockleshell Gully. The plain consists of a series of shoreline, lagoon and dune deposits of early Pleistocene to possibly late Tertiary age, which locally have high concentrations of heavy minerals. These deposits are associated with a series of low alluvial fans fronting the Gingin Scarp (Playford *et al.* 1976). The streams have ill-defined channels and form ephemeral lakes.

4.2.2 Soils

The Facility is situated in the northern Agricultural Region of West Midlands and the soil-landscape zone is 'Geraldton Coastal' code 221 (Schoknecht *et al.* 2004). This soil landscape zone is characterised by low hills of Tamala limestone and recent calcareous and siliceous dunes with alluvial plains and sand sheets. Soils are mainly shallow and deep sands with some Loamy and Sandy earths.

The soil systems within L11 (refer Figure 4-3) are classified as:

- Tamala South Subsystem 3 (221TA_3): Low hills with relict dunes and some limestone outcrop; Deep and shallow yellow sand over limestone;
- Correy 4 Subsystem (221Cy_4): Alluvial fans and dunes outwashed from scarp; pale and yellow deep sands; and
- Tamala South 7 Subsystem (221Ta_7): Level to gently undulating sandplain; Yellow deep sand.

The Tamala system of soils is developed upon a series of low shore-parallel dunes/hills located immediately inland of the Quindalup system. Soils comprise well drained calcareous black sands, neutral reddish brown sands and neutral yellow sands to a depth of 800 mm.

4.3 Hydrology

4.3.1 Surface Water and Drainage

The Facility is situated in the Arrowsmith River surface water sub-catchment of the West Midlands Region (DoA 2007; DoW 2017). This sub-catchment is 183,326 ha and predominately flows in east to west direction into the Dandaragan Plateau across the Urella Fault. The Arrowsmith Region has a well developed dendritic drainage system which discharges into swamps and lakes of the interdunal depressions of the Eneabba Plain (Earth Tech 2002).

The porous and permeable soil-landscape system tends to allow rainwater to infiltrate to the water table rather than running off the land surface giving rise to the lack of defined watercourses surrounding the Facility. Consequently, surface water movement is only apparent following the wet season (i.e. winter) when the swamps and lakes are filled.

The closest rivers to the Facility are the Irwin River and the Arrowsmith River. The Irwin River drains the Lockier River, Sand Plain Creek and numerous other smaller and intermittent drainage lines, prior to entering the Indian Ocean at Dongara. The poorly defined drainage lines of the Arrowsmith River flow in a westerly direction to the south of L11 prior to turning north-west to enter the terminal swamps and lakes of the Arrowsmith Lake area.

There are two springs within the Gas Field, being Beharra Spring approximately 8 km south and Mungenooka Spring approximately 12 km west of the Gas Production Plant. Additionally, imagery shows an area potentially associated with increase moisture approximately 600 m to the west (ERM 2016b).

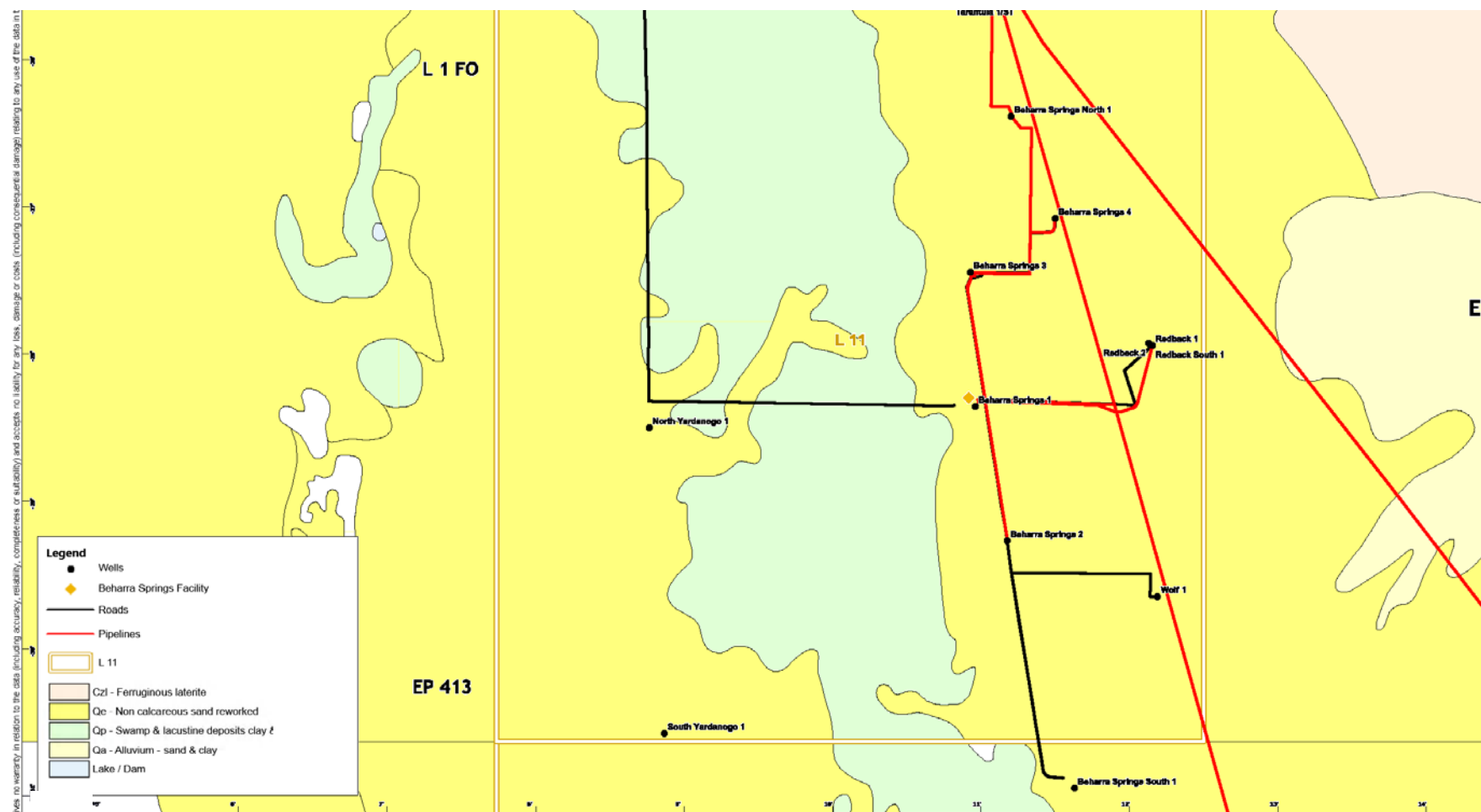


Figure 4-2: Beharra Springs Gas Facility Surface Geology

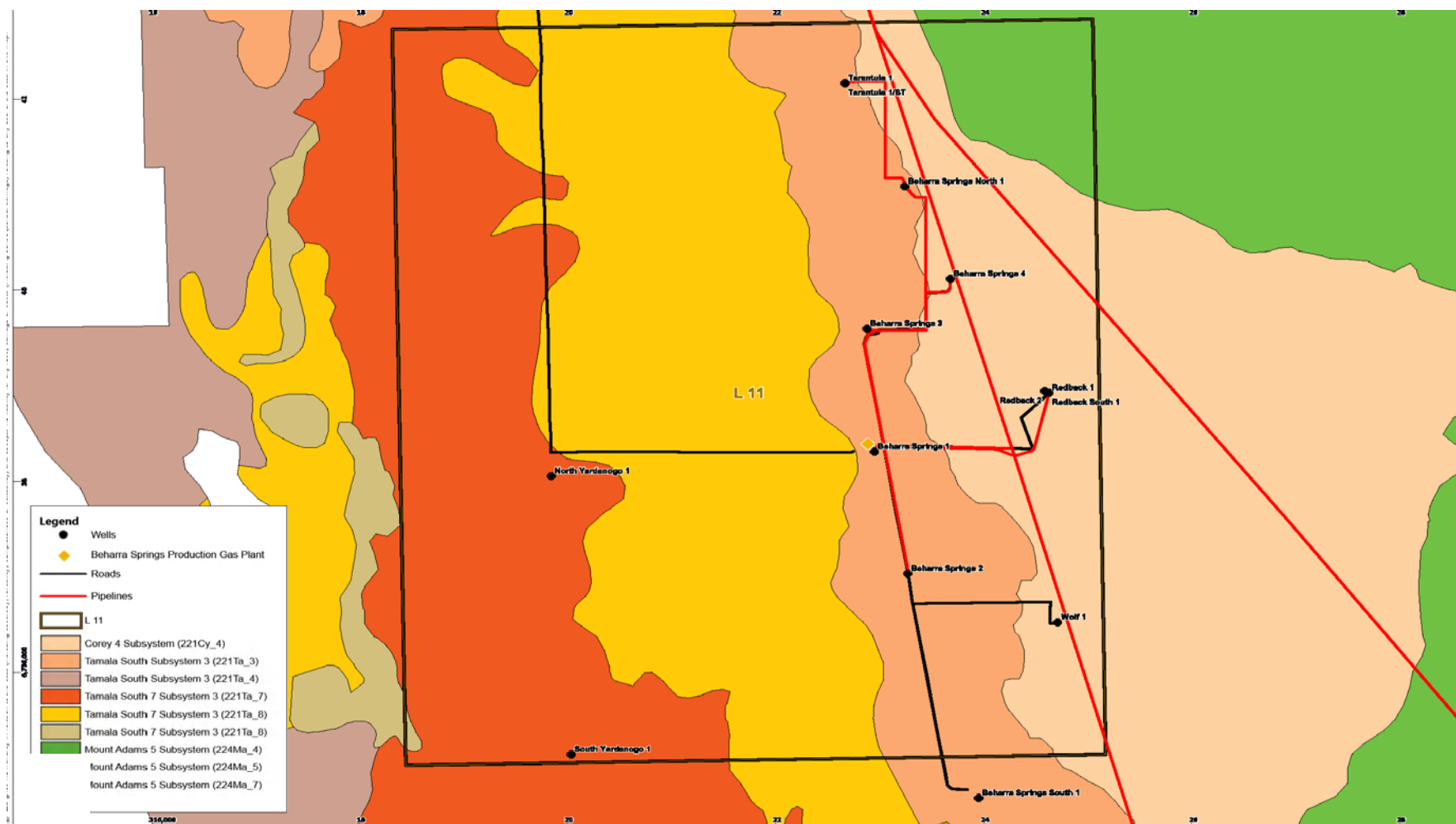


Figure 4-3: Beharra Springs Gas Facility Soils

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4.3.2 Groundwater

The larger aquifers located beneath the Arrowsmith Surface catchment Management Zone are the Leederville-Parmelia and Yarragadee Aquifers and the smaller aquifers include the Cattamarra and Eneabba-Lesueur Aquifers which are located west of the catchment (Earth Tech 2002).

4.3.3 Surficial Aquifer

The groundwater monitoring wells at the gas production plant are installed in the surficial aquifer which is predominately sand. Groundwater monitoring events conducted by ERM and Senversa show standing water levels ranging from 10.99 mbgs and 15.82 mbgs (ERM 2016b and Senversa 2017) equivalent to an elevation of between 26.34 to 26.9m AHD.

Aquifer testing conducted by KCB (2012) indicated hydraulic conductivity values ranging from 3.9×10^{-5} to 1.2×10^{-4} m/s.

The inferred groundwater flow direction is to the west. (Senvessa 2017)

Groundwater chemistry (Senvessa 2017) is summarised below:

- Electrical conductivity (EC) measurements ranged between 205.9 $\mu\text{S/cm}$ (GW8) and 1670 $\mu\text{S/cm}$ (GW9), suggesting the groundwater is fresh to mildly saline and consistent with expected regional groundwater salinity.
- pH measurements ranged between 5.93 (GW11) and 6.79 (GW8), suggesting slightly acidic to neutral groundwater conditions.
- Dissolved oxygen (DO) concentrations were 0.37 mg/L (GW5 and GW11) up to 7.34 mg/L (GW7), indicating that the aquifer is aerobic.
- Temperature was measured at 21.2°C (GW18) up to 26.6°C (GW9).
- Redox potential was measured at -91.1 mV (GW11) up to 171.6 mV (GW4), suggesting the aquifer is generally under oxidising conditions. GW11 and GW5 were the exceptions, with redox potential at these two wells indicating reducing conditions.

Historically, minor detectable concentrations of petroleum hydrocarbons have been recorded down gradient of the evaporation ponds (GW5). In April 2017, a detailed site investigation was completed at the facility (Senvessa 2017) and found:

- Groundwater impacts at the Site are limited to minor TRH concentrations represented by GW5 (in duplicate sample but not primary or triplicate sample), down gradient of Evaporation Pond 2 and GW11, immediately adjacent to the API infrastructure. TRH concentrations in groundwater are deemed unlikely to pose an unacceptable risk to ecological or human receptors at the Site based on (1) comparison with Tier 1 screening criteria, (2) spatial distribution of the monitoring well network confirming the absence of groundwater contamination and (3) broader weight of evidence including consideration of source-receptor pathways under current and ongoing use as an oil and gas plant.
- Silica gel clean up analysis has indicated that the hydrocarbons in groundwater at the two locations, comprises polar metabolites derived from the degradation/ weathering of fuels (via sequential oxidative reactions) and/or non-petroleum sources such as vegetable oils and fatty acids. In addition, there is evidence to suggest that natural attenuation of TRH is occurring at the Site via aerobic and anaerobic degradation processes. It is considered likely that nitrate detected above background levels but below Tier 1 screening criteria is contributing to hydrocarbon natural attenuation as a dominant electron acceptor.

4.3.4 Yarragadee Aquifer

The major aquifer which underlies the Facility is the Yarragadee Aquifer. The formation is multi-layered with groundwater occurring within beds of fine to coarse-grained sandstone confined between thick sequences of shale and siltstone. The water table is fairly deep ranging up to as much as 150 metres below the surface. The water table comes to the ground surface in the Hill River valley where the aquifer is artesian around Hill River Spring. Springs, swamps and lakes such as Beharra Spring are areas of evaporative discharge (Earth Tech 2002).

Groundwater salinity is lowest (500-700 mg/L) within the middle of the catchment and highest (1,000-1,500 mg/L) towards the east of the catchment along the boundary with the Urella Fault (Earth Tech 2002). Areas of higher salinity occur along the Arrowsmith River and the Irwin River due to recharge of

brackish runoff water. Groundwater salinity is also known to vary within the different sandstone beds and there is a general trend of increasing salinity with depth (Johnson and Commander 2006).

Potential bore yields are very large with up to 6000 kL/day achieved at Eneabba (Johnson and Commander 2006). The major bore fields are at Allanooka supplying Geraldton, and at Eneabba supplying mineral sands operations and town water. The aquifer is also used for town water supply at Badgingarra, Dongara and Denison (ANRA 2008, Johnson and Commander 2006).

The recharge for this aquifer occurs primarily to the west of the Dandaragan Scarp where the aquifer is unconfined and occurs by direct infiltration of rainfall, downward leakage from the Arrowsmith River and overlying formations. Nidagal (1994) noted that most groundwater discharges from the Yarragadee Formation into the Tamala Limestone with minor discharge in the Cattamarra Coal Measures across the Beagle Fault. Groundwater movement of the aquifer and overlying superficial aquifer is towards the coast (Earth Tech 2002).

4.3.5 Superficial Aquifer

The superficial aquifer on the Swan Coastal Plain consists of Quaternary and late Tertiary sediments which extend from Geraldton in the north to Busselton in the south. There are several principal formations within this aquifer including the Tamala Limestone. The aquifer consists mainly of quartz sands, calcareous sands and limestone in the Tamala Limestone. The groundwater level is close to the surface in the south and in the centre but may be as much as 60 m below the surface, below the crests of the Tamala Limestone dunes along the coast. The average salinity is 4,224 mg/L and is hypersaline underneath the coastal lakes in the Perth area. The aquifer is developed for the Perth water supply but it is not a significant aquifer in the Dongara to Geraldton area where the groundwater salinity is generally non-potable (ANRA 2008).

Shallow groundwater lenses are located within the Tamala Limestone forming an unconfined aquifer in which the groundwater is mainly recharged from local rainfall (IRC Environment 2004).

4.4 Vegetation

The vegetation system present in the Beharra Springs area is the Eridoon system. A vegetation system consists of a particular series of plant communities recurring in sequence and mosaic pattern linked to topographical, pedological and /or geological features (Beard 1976).

The Eridoon system occupies "a flat coastal plain between the coastal limestone deposits and the Pleistocene shoreline". On the plains and slopes of dunes the vegetation consists of scattered *Eucalyptus tottiana* and other small trees, an open layer of tall shrubs and a closed heath layer of small shrubs, usually dominated by *Conospermum spp.* On the sandhills the tree layer disappears and *Banksia hookeriana* and *Xylomelum angustifolium* become dominant. In winter wet depressions, the height of the heath reduces to 30 cm with scattered *Xanthorrhoea spp.*, while in wet areas *Melaleuca thyoides* and *Melaleuca lanceolata* to *Melaleuca raphiophylla* dominate. Occasionally these areas also have *Casuarina obesa* and *Eucalyptus camaldulensis* (Beard 1976).

4.4.1 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared under section 51B of the EP Act and protected under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. ESAs are selected for their environmental values at state or national levels and may include:

- Defined wetlands and riparian vegetation within 50 m;
- Areas covered by Threatened Ecological Communities;
- Area of vegetation within 50m of Declared Rare Flora;
- Declared World Heritage property sites.

The Facility is located within the Geraldton Sandplains Bioregion (listed under Schedule 1 of the Native Vegetation Regulations) and therefore is classed an ESA.

The nearest Declared Rare Flora species *Paracaleana dixonii* is approximately 2.6 km south east of the Redback South 1 well, as discussed in Section 4.5.1 below. Refer to Appendix F, which contains a copy of the NatureMap database search output.

4.4.2 Ecological Communities

The dominant vegetation communities within L11 are described below (WEC 2009a) and shown in Figure 4-4 and Figure 4-5. Several other woodland and thicket communities are also present:

- Floristic community type (FCT) 4a, Species rich Woodlands and Heaths on grey sand in the eastern portion of the Eneabba sandplain. Common species in FCT 4a include *Conospermum boreale* subsp. *boreale*, *Ecdeiocolea monostachya*, *Eremaea beaufortioides*, *Hakea polyanthema* (P3) and *Banksia candolleana*.
- FCT 3b - Low Woodland to Thicket of *Banksia attenuata* and *B. menziesii* over mixed shrubs dominated by myrtaceous species on brown or yellow sand on lower to mid slopes and plains.



Figure 4-4: Floristic Community Type (FCT) 4a South East of the Redback South1 Well Pad

Five threatened and two priority ecological communities occur in the Geraldton Sandplains Bioregion as listed below. None of these endangered ecological communities are known to occur within L11. No ecological communities listed under the EPBC Act occur within the region.

Table 4-1: Summary of Threatened and Priority Ecological Communities in the Geraldton Sandplains Bioregion

| Threatened or Priority Community identifier | Community name | Conservation Status ¹ |
|---|---|----------------------------------|
| Thetis-microbialite | Stromatolite community of stratified hypersaline coastal lakes | VU B) |
| Greenough River Flats | <i>Acacia rostellifera</i> low forest with scattered <i>Eucalyptus camaldulensis</i> on Greenough Alluvial Flats. | CR C) |
| Ferricrete | Ferricrete floristic community (Rocky Springs type) | VU B) |
| Lesueur Coomallo Floristic Community D1 | Lesueur-Coomallo Floristic Community D1 | CR B) i) CR B) ii) |
| Lesueur-Coomallo Floristic Community A1.2 | Lesueur-Coomallo Floristic Community A1.2 | EN B) ii) |

| Threatened or Priority Community identifier | Community name | Conservation Status ¹ |
|---|--|----------------------------------|
| Lesueur-Commallo Floristic Community M2 (<i>Melaleuca preissiana</i> woodland) | Woodland dominated by <i>Melaleuca preissiana</i> along sandy drainage lines | Priority1 |
| Lesueur-Coomallo Floristic Community DFGH | Mixed species-rich heath on lateritic gravel: a fine scale mixture of four floristically-defined communities occurring on lateritic slopes | Priority 1 |

¹ See Appendix H for details of conservation status codes

4.5 Flora

The Beharra Springs Gas Field has been subject to several detailed flora surveys, as summarised in Table 4-2. More recently, Matiske has completed surveys of the access routes (where seismic lines required widening) and well pads required for drilling programs in 2010, 2011 and 2012 and for the installation of groundwater monitoring bores in 2016. These surveys targeted DRF and EPBC listed species. During these surveys, no such species were located, although priority species were detected in the surveys and are listed in Table 4-3.

Prior to this, Woodman Environmental Consulting (WEC 2007, WEC 2009a) completed comprehensive structural mapping studies and quadrat based floristic studies within the former exploration tenements E70/1592, E70/2263, E70/2430 and E70/2347. These studies, which covered the central and southern sections of L11 were conducted during spring 2006 and spring 2007 over an area of approximately 35,930 ha.

These vegetation studies provide a quantitative description of floristic community types and their distribution (WEC 2007), and a qualitative assessment of the distribution and density of plants within each community type (WEC 2009a). A total of 513 native vascular plant taxa belonging to 68 plant families were recorded (WEC 2007, WEC 2009a), demonstrating a very high level of species richness.

Table 4-2: Summary of Vegetation, Flora and Fauna Surveys

| Date of Survey | Company | Survey Area |
|----------------|--|---|
| 2000 | Hart, Simpson and Associates Pty Ltd | Three Wells Beharra Gas Field Ecological Survey (November 2000) |
| 2003a | Hart, Simpson and Associates Pty Ltd | Proposed EP413 Denison 3D Seismic Survey Flora and Fauna Investigation |
| 2003b | Hart, Simpson & Associates Pty Ltd | Flora and Fauna Assessment of the Beharra Springs 4 drilling program (Beharra Springs 4 and Beharra Springs 4 Well Sites, EP413). |
| 2003c | Hart, Simpson and Associates Pty Ltd | Dongara Fine Scale Survey: Proposed Redback and Beharra Springs 4Wells |
| 2004a | Woodman Environmental Consulting Pty Ltd | Denison 3D Seismic Survey Flora and Vegetation Studies |
| 2004b | Woodman Environmental Consulting Pty Ltd | Proposed Tarantula Flowline Assessment |
| 2005 | Woodman Environmental Consulting Pty Ltd | Proposed Beharra Springs 04 Vegetation Assessment (July 2005) |
| 2006 | Woodman Environmental Consulting Pty Ltd | Proposed Beharra Springs 04 Drill Pad (revised location) Vegetation assessment. |
| 2007 2009 | Woodman Environmental Consulting Pty Ltd | Structural mapping studies and quadrat based floristic studies within former exploration tenements E70/1592, E70/2263, E70/2430 and E70/2347. |

| Date of Survey | Company | Survey Area |
|----------------|-----------------------------|--|
| 2010 | Mattiske Consulting Pty Ltd | Flora survey of three proposed exploration wells (Redback North 1, Wolf 1 and Dugite 1), the access tracks to these well sites, the easement for the Redback South 1 flowline and a proposed extension of an existing drill pad (Redback 2). |
| 2011 | Mattiske Consulting Pty Ltd | Flora survey of Beharra Springs Office Upgrade and Wolf Dwindip 1 Survey Areas. |
| 2012 | Mattiske Consulting Pty Ltd | Flora survey of two proposed wells (Trapdoor 1 and Beharra Springs Deep 1) and associated flow lines and access roads, and a firebreak around accommodation facilities. |
| 2016 | Mattiske Consulting Pty Ltd | Flora survey of potential groundwater well locations to the west of the Gas Production Plant. |

4.5.1 Declared Rare Flora

A search of previously conducted ecological surveys and the DPaW NatureMap database (accessed 25 October 2017) for a 10 km buffer around the gas production facility returned records for two Declared Rare Flora (DRF) species:

- *Calectasia cyanea* (Blue Tinsel Lily)
- *Paracaleana dixonii*

Both of these species have a conservation code of 'T' which indicates taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such on Schedule 1 of the Wildlife Conservation (Rare Flora) Notice under the WC Act.

The NatureMap database contains a single WA Herbarium record for *Calectasia cyanea* approximately 8.75 km north-west of the Gas Production Facility. This record is outside of the L11 tenement.

The NatureMap database contains 11 records for the orchid *Paracaleana dixonii*, all occurring to the east of the L11 boundary. This species was recorded by WEC (2009a) as 73 individuals within 6 populations to the east of the current operational area of the Facility. The nearest recorded population of this species is approximately 2.6 km south east of the Redback South 1 well (WEC 2009b), outside of the L11 tenement.

Recent rehabilitation inspections undertaken by Mattiske (2017) did not identify any DRF at sites undergoing rehabilitation.

4.5.2 Priority Flora

A search of previously conducted ecological surveys (refer to Table 4-2) and the NatureMap database (accessed 25 October 2017) for a 10 km buffer around the Gas Production Facility provided records for 28 priority flora, as listed in Table 4-3.

The botanical surveys previously conducted at the Facility have located several priority species within their survey areas. The results of these botanical surveys indicate many priority species are relatively common within appropriate habitat types throughout the region.

The EPBC Protected Matters search (Appendix G) for a 10 km buffer around the gas production facility identified an additional ten threatened plant species which may occur or are likely to occur. These species are also listed in Table 4-3.

Table 4-3: Significant Flora Species Known or with Potential to Occur within the Beharra Springs Gas Facility

| Species | Conservation Status ¹ | |
|---|----------------------------------|----|
| | Federal | WA |
| Recorded within a 10 km radius of the Gas Production Plant (NatureMap 2017 or site surveys) | | |
| <i>Calectasia cyanea</i> | CE | T |
| <i>Paracaleana dixonii</i> | E | T |
| <i>Lasiopetalum ogilvieanum</i> | | P1 |
| <i>Stylidium carnosum</i> subsp. narrow leaves (J.A. Wege 490) | | P1 |
| <i>Verticordia luteola</i> var. <i>rosea</i> | | P1 |
| <i>Acacia vittata</i> | | P2 |
| <i>Calectasia palustris</i> | | P2 |
| <i>Comesperma griffinii</i> | | P2 |
| <i>Comesperma rhadinocarpum</i> | | P2 |
| <i>Persoonia filiformis</i> | | P2 |
| <i>Schoenus</i> sp. <i>Eneabba</i> (F.Obbens & C. Godden 1154) | | P2 |
| <i>Banksia fraseri</i> var. <i>crebra</i> | | P3 |
| <i>Beyeria gardneri</i> | | P3 |
| <i>Eremaea acutifolia</i> | | P3 |
| <i>Guichenotia alba</i> | | P3 |
| <i>Hemiandra</i> sp. <i>Eneabba</i> (H. Demarz 3687) | | P3 |
| <i>Hypocalymma gardneri</i> | E | P3 |
| <i>Mesomelaena stygia</i> subsp. <i>deflexa</i> | | P3 |
| <i>Persoonia chapmaniana</i> | | P3 |
| <i>Persoonia rudis</i> | | P3 |
| <i>Stylidium drummondianum</i> | | P3 |
| <i>Verticordia luteola</i> var. <i>luteola</i> | | P3 |
| <i>Banksia elegans</i> | | P4 |
| <i>Banksia scabrella</i> | | P4 |
| <i>Calytrix chrysantha</i> | | P4 |
| <i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i> | | P4 |
| <i>Eucalyptus zopherophloia</i> | | P4 |
| <i>Stawellia dimorphantha</i> | | P4 |
| <i>Schoenus griffinianus</i> | | P4 |
| <i>Thysanotus glaucus</i> | | P4 |
| Potential to occur within a 10 km radius of the Gas Production Plant (EPBC protected matters search) | | |
| <i>Conostylis dielsii</i> subsp. <i>teres</i> | E | T |

| Species | Conservation Status ¹ | |
|-------------------------------|----------------------------------|----|
| | Federal | WA |
| <i>Conostylis micrantha</i> | E | T |
| <i>Daviesia speciosa</i> | E | T |
| <i>Eucalyptus x balanites</i> | E | T |
| <i>Eucalyptus crispate</i> | V | T |
| <i>Eucalyptus impensa</i> | E | T |
| <i>Eucalyptus leprophloia</i> | E | T |
| <i>Leucopogon obtectus</i> | E | T |
| <i>Thelymitra stellata</i> | E | T |
| <i>Wurmbea tubulosa</i> | E | T |

See Appendix H for details of conservation status codes



Based on template: AUS 1000 IMT TMP 14376462_Revision 0_Issued for use_27/06/2017_IG-Operations-Conv-Ops Integrity

4.6 Weeds and Pathogens

The surveys undertaken (Hart, Simpson and Associates 2000, Woodman 2004 and Mattiske 2017) have recorded four weeds within the Facility area being the South African marigold (*Ursinia anthemoides*), Capeweed (*Arctotheca calendula*), Paterson's curse (*Echium plantagineum*) and Smooth catsear (*Hypochaeris glabra*). Of these four weed species, only one, Paterson's curse, is a declared pest under the *Biosecurity and Agriculture Management Act 2007* (DPIRD 2017).

The PMST report (Appendix G) also identifies three weeds of national significance (WONS) as likely to occur within 10 km radius of the Gas Production Plant being: *Asparagus asparagoides* (Bridal creeper); *Lycium ferocissimum* (African Boxthorn, Boxthorn); and *Tamarix aphylla* (Athel Pine, Athel tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar).

Table 4-4 below provides information on the known and likely to occur declared weed species.

Dieback (*Phytophthora cinnamomi*) infestations, a soil borne pathogen, have been recorded in the wider area but not within the vicinity of the Gas Production Plant and Gas Field. One infestation is located on private property and the other is in a gravel pit at the end of Mt Adams Road (HSA 2003). The environmental conditions surrounding the Facility such as low rainfall, sandy calcareous soils which provide good water drainage and unsuitable pH reduces the risk of dieback infestation.

Table 4-4: Declared Weed Species Likely to Occur within the Beharra Springs Gas Facility

| Species Name | Control status | Description | Life Cycle | Dispersal Mode |
|--|------------------|--|---|--|
| Paterson's curse (<i>Echium plantagineum</i>) | C3 Management | An erect annual (occasionally biennial) herb to 1.5 m high, commonly 30-60 cm, reproducing by seed. Native to southern Europe. Widespread throughout the south-west of Western Australia, and the eastern Goldfields. | A winter growing annual that germinates in autumn, seeds and flowers in winter, with flowering continuing into spring. | Adherence to livestock, clothing and vehicles; digestion; water runoff |
| <i>Asparagus asparagoides</i> (Bridal creeper) | C3 Management | Bridal creeper is a serious, highly invasive environmental weed, destroying large areas of the native vegetation in southern Australia. Native to Ethiopia, Swaziland and the Cape Province, Natal, Orange Free State and Transvaal regions of South Africa. This plant, currently naturalised in Australia, was introduced into the country as a garden plant during the 1870s. It proved popular in floral arrangements, in particular bridal bouquets, giving rise to its common name, and also as a plant for hanging baskets. Bridal creeper is a Weed of National Significance. Bridal creeper grows in warm-temperate to tropical regions, preferring fertile, well-drained soils of light texture. It is often grown as an ornamental, and occurs as a weed along roadsides, in town allotments, orchards and citrus groves, waste places and disturbed scrubland close to habitation. Bridal creeper invades dry coastal vegetation, heath land and healthy woodland, mallee shrubland, lowland grassland and grassy woodland, dry sclerophyll forest and woodland, damp sclerophyll forest, riparian vegetation, rock outcrop vegetation, and warm temperate rainforest. Bridal creeper is frost tolerant and its perennial root system enables it to survive summer drought. | Bridal creeper is a climbing herb or vine to 3m. | Adherence to livestock, clothing and vehicles; digestion; water runoff |
| <i>Lycium ferocissimum</i> (African Boxthorn, Boxthorn) | Not applicable | African Boxthorn (<i>Lycium ferocissimum</i>) is a perennial, woody, hairless, semi deciduous shrub to 3-5 m high that is spiny and intricately branched. Native to South Africa Flowers can be found at most times of the year with a flush in April to May and August to December. | Seeds germinate at any time of the year with a flush in autumn and spring. Flower throughout the year with a flush in spring to summer. In winter they may drop most of their leaves and produce new ones in spring. | Adherence to livestock, clothing and vehicles; digestion; water runoff |

| Species Name | Control status | Description | Life Cycle | Dispersal Mode |
|---|----------------|--|--|--|
| <i>Tamari aphylla</i> (tamarisk, flowering cypress, athel tree, athel tamarisk, athel pine, athel) | C3 Management | Spreading tree up to 15m tall with pendulous, jointed branches. Immature trees have light grey trunks and stems. Mature trees have thick, rough, dark-grey to black bark, grey-brown stems, and can be up to 1m in diameter. Leaves are dull green and resemble pine needles. Flowers are small, pinkish-white, no stalks, grow on spikes 30-40mm long. Fruit is bell-shaped with a hairy tuft containing numerous small cylindrical seeds. Seeds have tuft of fine hairs to assist dispersal. Roots are strong, woody, and deep in soil. | Reproduces via seed or propagation of plant parts. Seeds germinate throughout the year. A single tree produces thousands of seeds each year. Flowering begins in the third year, then annually during summer. | Adherence to livestock, clothing and vehicles; digestion; water runoff |

NOTE 1:

The control status are as follows:

- C1 Exclusion: Plants which should be excluded from part or all of Western Australia
- C2 Eradication: Plants which should be eradicated from part or all of Western Australia
- C3 Management: Plants that should have some form of management applied that will alleviate the harmful impact of the plant reduce the numbers or distribution of the plant or prevent or contain the spread of the plant.

4.7 Fauna

A search of previously conducted fauna surveys and the DPaW Nature Map database (Appendix F - accessed 25 October 2017 for a 10 km buffer around the Gas Production Plant returned records for one threatened and one priority fauna species as listed in Table 4-5 below.

The EPBC Act Protected Matters search conducted for the Facility identified three listed threatened species (2 birds and 1 mammal) and two listed migratory species as known or likely to occur within a 10 km buffer around the Gas Production Plant. The results of this search are summarised in Table 4-5 below and the complete search is provided in Appendix G.

Table 4-5: Significant Fauna Species Known or Likely to Occur within 10 km of the Beharra Springs Gas Production Plant

| Species | Conservation Status | |
|---|---------------------|----|
| | Federal | WA |
| Recorded within a 10 km radius of the Gas Production Plant (NatureMap 2017) | | |
| <i>Calyptrorhynchus latirostris</i> (Carnaby's Black-Cockatoo) | E | E |
| <i>Macropus irma</i> (Western Brush Wallaby) | | P4 |
| Potential to occur within a 10 km radius of the Gas Production Plant (EPBC protected matters search) | | |
| <i>Listed Threatened Birds</i> | | |
| <i>Calyptrorhynchus latirostris</i> (Carnaby's Black-Cockatoo) | E | T |
| <i>Leipoa ocellata</i> (Malleefowl) | V, M | V |
| <i>Listed Threatened Mammals</i> | | |
| <i>Dasyurus geoffroii</i> (Western Quoll) | V | |
| <i>Listed Migratory Birds</i> | | |
| <i>Apus pacificus</i> (Fork-tailed Swift) | M | |
| <i>Padiion haliaetus</i> | M | |

Refer Appendix H for details of conservation status codes

The ecological survey undertaken by Hart, Simpson and Associates (2000) noted that the area provides a relatively simple fauna habitat of a low but dense and diverse heath dominated by shrubs of the Proteaceae, Myrtaceae and Epacridaceae and perennial herbs such as sedges. There are a few small emergent trees but due to frequent fires there are almost no logs or tree hollows.

4.8 Pest Vertebrate Fauna

There are known occurrences of pest vertebrate fauna species in the Facility area based on information provided by the operational staff. The pest species include foxes, rabbits and cats.

The Biosecurity and Agriculture Management Act 2007 allows pest animals that have a negative impact on agricultural production and the environment to be declared. The declared species are listed with a corresponding category which determines the level of management required to control this species.

The PMST (Appendix G) lists the following 10 pest species as likely to occur within 10 km radius of the Gas Production Plant:

- Domestic dog (*Canis lupus*);
- Goat (*Capra hircus*);
- Domestic cat (*Felis catus*);
- House mouse (*Mus musculus*);
- Rabbit (*Oryctolagus cuniculus*);

- Pig (*Sus scrofa*);
- Red fox (*Vulpes vulpes*);
- Rock pigeon (*Columba livia*);
- Eurasian tree sparrow (*Passer montanus*);
- Laughing turtle-dove (*Streptopelia senegalensis*).

All of these species have been declared under state legislation.

4.9 Socio-economic Environment

4.9.1 Land Use and Economic Environment

The major land uses in the region are grazing of native pastures in the north and in the south a mixture of grazing and cropping of cereals. The areas surrounding the Facility are favoured areas for honey production and wildflower picking. While commercial flower harvesting is not permitted within nature reserves and national parks, there are extensive areas surrounding the Yardanogo Nature Reserve where this occurs. The favoured species are the Acorn (or hookers) and Banksia (*Banksia hookeriana*), with picking taking place from late July to early September (DEC 2008).

Oil and gas exploration and production has occurred extensively in the area including the Cyclone Energy operated Jingemba Oil Production Facility located approximately 18 km to the north west. In addition to oil and gas, the industries contributing to the economic development of the Shire include mineral sands, Rock Lobster and aquaculture (abalone), olive growing and production and general farming.

4.9.2 Traffic and Infrastructure

The existing regional roads that service the Facility include the Brand Highway, Mt Adams Road and access tracks within the Facility area. The Brand Highway is the main road linking Perth to the central coastal towns of WA. The majority of Mt Adams Road is unsealed and generally used by local industry.

Infrastructure within the vicinity of the Facility includes:

- Above and below-ground power and telecommunication cables (which service the Facility);
- The Dampier to Bunbury Natural Gas Pipeline, owned by Australian Gas Infrastructure Corporation and operated by Dampier Bunbury Pipeline, approximately 1.8 km to the east; and
- The Parmelia Natural Gas Pipeline, owned and operated by APA, approximately 1.7 km west of the Gas Production Plant.

4.9.3 Visual Amenity

The Gas Production Plant and gas Field is situated on UCL and remotely located from residential developments, local tourist attractions and main roads.

The nearest dwelling is the accommodation associated with the Facility, located adjacent to the Gas Production Plant.

4.10 Natural Heritage

One nominated Natural Heritage Property, the Beekeepers-Lesueur-Coomallo Area and Nambung National Park, is within a 10 km radius of the Gas Production Plant, but outside of L11. The nominated status indicates that the Australian Government has prepared a nomination for the property and presented it to the World Heritage Committee for assessment. The property is under assessment by the World Heritage Committee and its associated professional organisations.

The basis of the nomination is that the complex sand plain or heath shrub vegetation within the property has plant species richness unequalled by most other vegetation types in the world, except the fynbos of southern Africa and some tropical rainforests.

One nature reserve listed on the Register of the National Estate, the Arrowsmith Lake Area, is within a 10 km radius of the Gas Production Plant.

The Yardanogo Nature Reserve, which is not listed on the Register of the National Estate, intersects L11.

4.11 Indigenous and Non-Indigenous Cultural Heritage

No cultural heritage sites listed on the Register of the National Estate occur within L11 (DPLH 2017). A number of cultural heritage sites within Dongara and Port Denison are listed on the register including the Anglican Rectory (former), Dongara Post Office and Quarters, Moreton Bay Fig Trees, Pearse House (former), Royal Steam Foller Flour Mill, School Masters House (former) and the St John the Baptist Church.

4.11.1 Native Title Applications

A search of the National Native Title Tribunal database (<http://www.ntv.nntt.gov.au/ntv.asp>) on 20 September 2017 reveals one registered Native Title application relevant to the Facility being the Southern Yamatiji People application (WC2004/002).

4.11.2 Ethnology

In April, May and November 2001, an ethnographic survey was completed for the area associated with the Hibbertia 3D and Ularino 2D seismic programs which included the Facility area.

The ethnographic survey involved searches of ethnographic databases, consultation with the relevant Aboriginal community and field survey. Consultation revealed that the Ejaroo Spring (10 km north north-west of the project area) and the chain of smaller springs stretching southward to the Beharra Spring are places of Aboriginal significance to the Moore River (Mogumber) group (O'Connor 2001).

4.11.3 Archaeology

Archaeological studies have been conducted throughout the Facility area and were conducted by Quartermaine Consultants (Corsini, 2001) as part of the Hibbertia 3D seismic program.

These studies involved searches of the state Aboriginal archaeological site register (maintained by the Department of Indigenous Affairs, DIA) and field surveys.

Numerous archaeological sites have been recorded in the Irwin River valley (which runs to the north of the Facility), however there were no Aboriginal archaeological sites recorded for the Facility area.

Archaeological research suggests that past Aboriginal occupants remained close to the water in summer and moved away from the river along the swamps and drainage lines in winter, with a preference for camping on the sandy dunes (Corsini 2001). Rivers, lakes and wetlands were important hunting and gathering sources. The chain of lakes from Geraldton south to Mandurah and associated river systems were major highways that offered rich food sources, reliable drinking water and good habitation sites. Food sources included reed rhizomes, zamia palms, by-yu nuts, yams, fish, waterfowl, tortoises, frogs and crayfish (Corsini 2001). Results of earlier archaeological studies in the Geraldton region (Schwede & von Bamberger 1996 in Corsini 2001) conclude that most Aboriginal archaeological sites are adjacent to, or within, 1 km of water. Large and extensive sites are normally positioned in high relief areas and in dune swales.

Extensive sites are found along the coast in association with adjacent offshore reefs and continuous artefact scatters are adjacent to major river systems. Such scatters are composed of quartz and granite, obtained from local rock outcrops and stream beds (Corsini 2001). While ethnohistoric sources suggest occupation was focused around river systems and wide alluvial valleys, there remains little archaeological evidence to support this information. Alternatively, the sites are located between river systems (not alongside them). Floodwaters may have redistributed many artefacts. Unstable sands, extensive horticulture and agriculture may have exposed and destroyed many Aboriginal archaeological artefacts (Corsini 2001).

Searches of the Aboriginal Heritage Inquiry System, maintained by the Department of Planning, Lands and Heritage (DPLH) were undertaken for the Facility on the 20 September 2017 (DPLH 2017). The searches show there are no known sites within L11 and two registered sites at the very northern end of EP320, close to the Irwin River.

5. Risk Assessment

5.1 Methodology

5.1.1 Risk Assessment Framework and Process

Lattice has in place a Risk Management Framework which applies to all business activities. The Framework includes the:

- Risk Management Directive (LAT-RISK-DIR-001); and
- Risk Toolkit (July 2017) (refer Appendix B).

The Health Safety and Environment Management System (HSEMS) requires that risk is managed in accordance with Standard 7 Hazard and Risk Management and the Risk Management Directive. The Risk Management Directive is based on the Australian Standard *AS/NZS ISO 31000:2009: Risk management – Principles and guidelines* and requires that risk is managed in accordance with the framework shown in Figure 5-1 below.

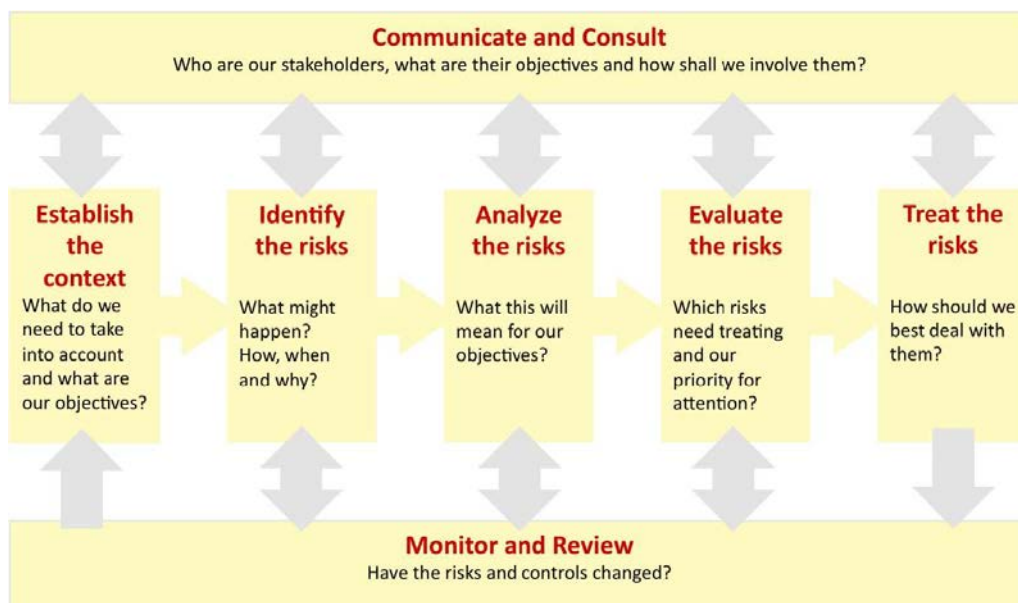


Figure 5-1: Risk Management Framework

A description of the risk assessment methodology that underpins this framework is shown in Figure 5-2 and following sections.

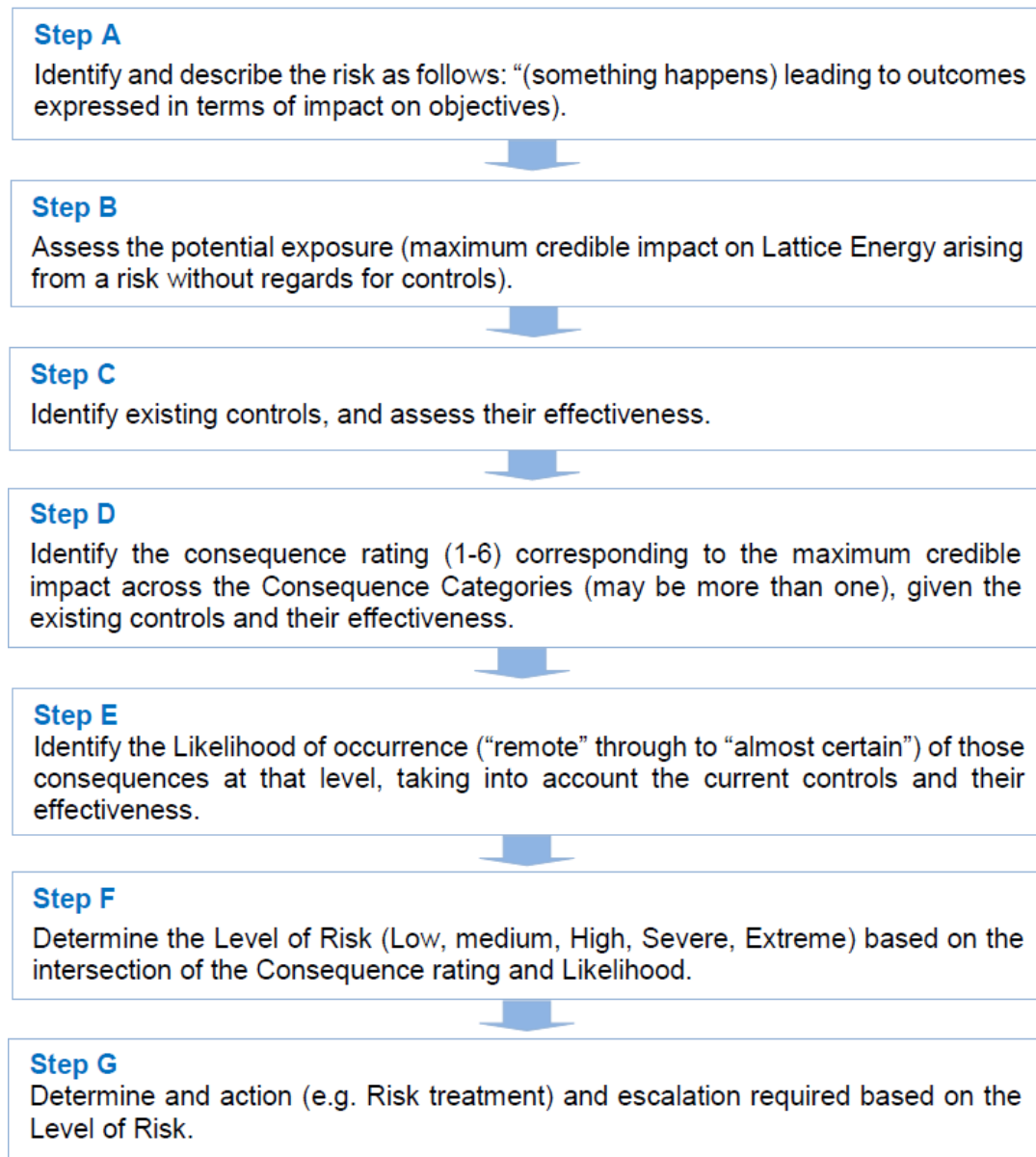


Figure 5-2: Risk Management Methodology

Step A is outlined in the definition of each hazard.

Step B involves determining the maximum credible impact (in the categories of impacts to the business or personnel, the natural environment, community/social/cultural heritage, financial, reputation and legal) arising from the impact or risk without regards for controls. This determination is provided in the impact and risk assessment throughout section 5.

In Step C, controls are identified for each impact or risk, and the effectiveness of controls is assigned a level in accordance with Table 5-1.

Table 5-1: Control effectiveness

| Rating | Explanation |
|---|---|
| Fully Effective (100%) | Controls are well designed for the risk, largely prevent the risk from eventuating, and address the root causes. The controls are operating effectively and are reliable at all times. Nothing more to be done except review and monitor the existing controls. |
| Substantially Effective (75%) | Most controls are designed correctly and are in place and effective. Some more work needs to be done to improve operating effectiveness of the controls, or there are doubts about operational effectiveness and reliability. |
| Partially Effective (50%) | While the design of controls may be largely correct in that they treat most of the root causes of the risk, they are not currently very effective. There may be an over reliance on reactive controls. |
| Largely ineffective (25%) | Significant control gaps. Either controls do not treat root cause or they do not operate effectively at all. Controls, if they exist, are just reactive. |
| None (0%) | Virtually no credible control. There is little to no confidence that any degree of control is being achieved due to poor control design and/or very limited operational effectiveness of controls. |

Once the controls are identified, Step D involves undertaking an assessment of the consequence of the impact or risk, corresponding to the maximum credible impact across the consequence categories (see Appendix B) taking into account the controls identified and their effectiveness.

Step E involves identifying the likelihood of occurrence of those consequences, taking into account the controls identified and their effectiveness.

In Step F, the consequence and likelihood are multiplied to determine the overall consequence rating, as outlined in Appendix B.

In Step G the level of escalation required for each impact or risk is dependent on the consequence rating and is shown in **Table 5-2**.

Table 5-2: Lattice's consequence ratings and management action matrix

| Level of risk | Action required | Escalation and Approval of Treatment Plans | Acceptance authority |
|----------------|---|---|--|
| EXTREME | Risk treatment Plan must be in place immediately Risk reviewed monthly by Risk owner | Managing Director (Origin) and CEO for review and approval of the treatment plan | Managing Director (Origin) and CEO |
| SEVERE | Risk treatment must be considered Risk reviewed monthly by Risk owner | Exco for review and approval of associated treatment plan (if applicable) | Exco |
| HIGH | Risk treatment must be considered Risk reviewed twice per year by Risk owner | Exco reports for review and approval of associated treatment plan (if applicable) | Exco |
| MEDIUM | Risk treatment may be considered Risk reviewed annually by Risk owner | Project / Operations Manager | Exco direct report (Exco -1) |
| LOW | No risk treatment required Risk reviewed annually by Risk owner | Facilities Manager / Operations Superintendent | Exco Direct report – reports (Exco -2) |

5.1.2 Demonstration of ALARP

This section describes the methodology for demonstrating that the impacts and risks identified are ALARP.

An iterative risk evaluation process is employed until such time as any further reduction in the residual risk ranking is not reasonably practicable to implement. At this point, the impact or risk is reduced to ALARP. The determination of ALARP for the consequence of risk events is outlined in Table 5-3.

Table 5-3: ALARP determination for consequence (planned events) and risk (unplanned events)

| | | | | | | |
|------------|--------------------|--------------------|---------|-------------|----------|--------------|
| Risk event | Minor | Moderate | Serious | Major | Critical | Catastrophic |
| | Low | Medium | High | Severe | Extreme | |
| | Broadly acceptable | Tolerable if ALARP | | Intolerable | | |

Lattice's approach to demonstration of ALARP is aligned with the methodology provided in the safety case and includes:

- Systematically identify and assess all the hazards associated with facility (refer to section 5.3 to section 5.10 and risk register provided in Appendix C)
- Assess the effectiveness of the controls in place and determine whether the controls are adequate (refer to the ALARP and acceptability assessment tables provided for each impact and risk discussed in section 5.3 to section 5.10). This considers the 'hierarchy of controls'.
- Implement risk treatment options if it is reasonable and practical to do so.

Hierarchy of controls

The 'Hierarchy of Controls' is a system used in industry to minimise or eliminate exposure to hazards. The hierarchy of controls is, in order of effectiveness:

- Elimination;
- Substitution;
- Engineering controls; and
- Administrative controls.

Risk treatment options

When deciding on whether to implement the proposed impact/risk treatment option, the following issues are considered:

- Does it provide a clear or measurable reduction in risk?
- Are the controls effective?
- Is it technically feasible and can it be implemented?
- Will it be supported and utilised by site personnel?
- Is it consistent with national or industry standards and practices?
- Does it introduce additional risk in other operational areas (e.g., will the implementation of an environmental risk reduction measure have an adverse impact on safety)?
- Will the change be effective taking into account the:
 - Current level of risk i.e. with the existing controls;
 - Amount of additional risk reduction that the control will deliver;
 - Level of confidence that the risk reduction impact will be achieved;
 - Resources, schedule and cost required to implement the control.

Reducing impacts and risks to ALARP is an ongoing process and new risk reduction measures may be identified at any time. Lattice actively encourages recording and review of observations through the

HSEMS. Incidents and lessons learned within Lattice and from the wider industry, are reviewed and utilised to identify hazards and controls.

This process was applied in the recent risk assessment review completed in October 2017. Risk events with a consequence rating of a medium risk rating or greater were further considered to ensure no additional or improvement of existing controls or risk treatment actions could be identified that could reasonably reduce the impact/risk. The findings of this assessment are incorporated in the ALARP and acceptability tables embedded in section 5.3 to section 5.10.

5.1.3 Demonstration of Acceptability

A range of factors when evaluating the acceptability of environmental impacts were considered. This evaluation works at several levels, as outlined in Table 5-4 below.

Table 5-4: Acceptability criteria

| Test | Question | Acceptability demonstrated |
|--|---|--|
| Policy compliance | Is the proposed management of the risk or impact aligned with the HSE Policy? | The impact or risk must be compliant with the objectives of the company policies. |
| Management System Compliance | Is the proposed management of the risk or impact aligned with the HSE Management System? | Where specific Lattice Energy procedures, guidelines, expectations are in place for management of the impact or risk in question, acceptability is demonstrated. |
| Stakeholder engagement | Have stakeholders raised any concerns about activity impacts or risks, and if so, are measures in place to manage those concerns? | Stakeholder concerns must have been adequately responded to and closed out. |
| Laws and standards | Is the risk or impact being managed in accordance with existing Australian or international laws or standards? | Compliance with specific laws or standards is demonstrated. |
| Industry practice | Is the risk being managed in line with industry practice, such as the APPEA CoEP? | Management of the risk complies with relevant industry practices. |
| Environmental context | Is the risk being managed pursuant to the nature of the receiving environment (e.g. sensitive or unique environmental features generally require more management measures to protect them than environments widely represented in a region)? | The proposed impact or risk controls, environmental performance objectives and standards are consistent with the nature of the receiving environment. |
| Environmentally Sustainable Development Principles | Does the proposed risk or impact comply with the APPEA Principles of Conduct (APPEA, 2003), which includes that environmentally sustainable development principles be integrated into company decision-making? Or ESD principals described in section 3A of the EPBC Act? | The overall operations are consistent with the APPEA Principles of Conduct and ESD principles described in section 3A of the EPBC Act |

5.2 Summary of Potential Risk Events

An environmental impact and risk assessment was conducted for the Facility following the framework shown in Figure 5-1 and methodology outlined in Figure 5-2. The impact and risk assessment was completed in October 2017 with relevant Origin and Lattice stakeholders from the facility and associated supporting functions. The assessment considered risks to the environment from the operation and maintenance of the Facility, including the Gas Field, Gas Production Plant, Sales Gas Pipeline and ancillary infrastructure. The assessment was based on the activities as described in Section 3, and summarised in Table 5-5 below, and the receiving environment detailed in Section 4. A

review of incidents reported in the incident management system was also undertaken in to ensure the risks assessed reflect actual site observation and experience.

This has resulted in the identification and assessment of 29 environmental impacts and risks, as tabulated in Appendix C.

Of the 29 environmental risks identified:

- None were assessed to have a high, severe or extreme rating;
- Twenty were assessed as having a medium rating;
- Nine were assessed as having a low rating;

Further review of the risk register has resulted in:

- provision of 14 risk treatment plans for managing potential risks to an acceptable level and (once the risk treatment plans have been completed) to ALARP;
- removal of project specific risks associated with the soil and groundwater investigation completed in April 2017;
- inclusion of 1 new risk (Risk ID Env29) associated with the ongoing operation and maintenance of the newly upgraded separator system. This risk was assessed to have a "medium" rating (and is included within the above count for twenty medium risk events).

Business risks that do not have an impact on the environmental values described in section 4 have not been included in the following sections or the risk register provided in Appendix C.

Each risk item has been assigned Environmental Performance Objectives, Standards and Measurement Criteria as detailed in section 6. The next scheduled risk register review is end of Q3 2018 (if not triggered beforehand in accordance with section 7.5.4).

Risk events have been grouped in accordance with the relevant aspect of the ongoing operation and maintenance of the Facility. Where more than one risk event has been identified for an aspect, the event with the greatest risk rating is discussed in further detail in sections 5.3 to section 5.10.

Table 5-5: Summary of Operational Aspects, Identified Risk Events and Maximum Risk Rating

| Aspect | Gasfield operation and maintenance (including workover and intervention) | Flowline operation and maintenance | Gas Production Facility & Associated Infrastructure Operation & Maintenance | Sales gas pipeline operation and maintenance | Risk Events (Highlighted risk event is that with greatest risk rating based on location on risk matrix) | Risk Assessment Result | | |
|--|--|------------------------------------|---|--|--|------------------------|--------------|-------------|
| | | | | | | Consequence | Likelihood | Risk Rating |
| Initiation / escalation of a bushfire | ✓ | ✓ | ✓ | ✓ | ENV15 Site activities initiate a fire that escalates off site or results in a bushfire | Serious (3) | Unlikely (3) | Medium |
| Storage and handling of hydrocarbons, fuels, chemicals and hazardous materials | ✓ | ✓ | ✓ | ✓ | ENV 01 Loss of containment (LOC) of hydrocarbon at wellsite (blow out at operational well, loss of well integrity, workover or well intervention) ; ENV 02 Loss of containment (LOC) of hydrocarbon from production flowline; ENV 03 Loss of containment (LOC) of hydrocarbon within gas processing facility; ENV 04 Loss of containment (LOC) of methanol during load-in operations; ENV 05 Loss of containment (LOC) during condensate load-out operations; ENV06 Loss of containment (LOC) of hydrocarbon from the Sales Gas Pipeline; ENV07 Loss of containment (LOC) of hydrocarbon at shut in wellsite (i.e. Isolated, suspended plug); ENV08 Loss of containment (LOC) from condensate and methanol storage tanks; ENV09 Loss of containment (LOC) of hazardous materials / waste ; ENV11 Loss of containment as a result of accident involving land transport / mobile plant and equipment; ENV14 Loss of | Serious (3) | Possible (4) | Medium |

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| Aspect | Gasfield operation and maintenance (including workover and intervention) | Flowline operation and maintenance | Gas Production Facility & Associated Infrastructure Operation & Maintenance | Sales gas pipeline operation and maintenance | Risk Events (Highlighted risk event is that with greatest risk rating based on location on risk matrix) | Risk Assessment Result | | |
|--|--|------------------------------------|---|--|---|------------------------|--------------|-------------|
| | | | | | | Consequence | Likelihood | Risk Rating |
| | | | | | containment from flexible hoses; ENV23 Site activities will result in the loss of containment of hydrocarbons, fuels, chemicals and hazardous materials | | | |
| Generation, storage, handling of liquid and solid wastes | ✓ | ✓ | ✓ | ✓ | <p>ENV11 Loss of containment as a result of an accident involving land transport / mobile plant and equipment</p> <p>ENV12 Flammable levels of hydrocarbons are ignited in the evaporation pond resulting in liner damage</p> <p>ENV13 Loss of containment from operational pond/s</p> <p>ENV14 Loss of containment from flexible hoses</p> <p>ENV24 Inappropriate management of sewage and domestic waste</p> <p>ENV27 Site activities cause fauna and/or stock injury or death</p> <p>ENV28 Separator system not performing as required</p> <p>ENV29 Loss of containment of produced/site drain water from upgraded separator system</p> | Serious (3) | Possible (4) | Medium |

| Aspect | Gasfield operation and maintenance (including workover and intervention) | Flowline operation and maintenance | Gas Production Facility & Associated Infrastructure Operation & Maintenance | Sales gas pipeline operation and maintenance | Risk Events (Highlighted risk event is that with greatest risk rating based on location on risk matrix) | Risk Assessment Result | | |
|---|--|------------------------------------|---|--|---|------------------------|---------------------|-------------|
| | | | | | | Consequence | Likelihood | Risk Rating |
| Extraction of groundwater | ✓ | ✓ | ✓ | ✓ | ENV22 Site activities will result in groundwater extraction that exceeds aquifer recharge | Moderate (2) | Remote (1) | Low |
| Vegetation clearing, earthworks and vegetation management | ✓ | ✓ | ✓ | ✓ | ENV10 Site activities result in excessive air emissions ENV16 Inappropriate/unauthorised clearing of vegetation ENV18 Site activities will cause disturbance to sites of cultural heritage ENV19 Site activities will cause the introduction or spread of weeds or pathogens ENV20 Vegetation clearing and earthworks activities will reduce local biodiversity values ENV27 Site activities cause fauna and/or stock injury or death | Serious (3) | Highly Unlikely (2) | Medium |
| Generation of air, noise, light, dust and odour emissions | ✓ | ✓ | ✓ | ✓ | ENV10 Site activities result in excessive air emissions ENV21 Site activities will cause amenity (air, noise, dust, light, odour emissions) impacts | Minor (1) | Unlikely (3) | Medium |
| Management of known contaminated | | | ✓ | | ENV25 Site activities will result in adverse impact to existing suitability of soils/land use offsite | Serious (3) | Unlikely (3) | Medium |

| Aspect | Gasfield operation and maintenance (including workover and intervention) | Flowline operation and maintenance | Gas Production Facility & Associated Infrastructure Operation & Maintenance | Sales gas pipeline operation and maintenance | Risk Events (Highlighted risk event is that with greatest risk rating based on location on risk matrix) | Risk Assessment Result | | |
|----------------------|--|------------------------------------|---|--|--|------------------------|--------------|-------------|
| | | | | | | Consequence | Likelihood | Risk Rating |
| soil and groundwater | | | | | ENV26 Site activities will result in adverse impact to existing suitability of groundwater use offsite | | | |
| Rehabilitation | ✓ | ✓ | ✓ | ✓ | ENV17 Rehabilitation activities are inadequate or unsuccessful | Serious (3) | Possible (4) | Medium |

5.3 Initiation / escalation of a bushfire

5.3.1 Hazards

Site activities that have the potential to result in a fire that escalates and/or initiates a bushfire include:

- Routine flaring at gas production plant
- Testing of new production wells / flowlines (ground flaring)
- Escalation of a process incident resulting in fire within the gas production plant
- Ignition of hydrocarbons at well site during a loss of well control
- Hot work
- Inadequate cigarette disposal
- Vehicle use including trucks (mufflers, exhausts, load in/out)
- Mechanical/electrical or operational failure of equipment on site
- Accumulation of combustibles - vegetation under/around process skids and admin building.

5.3.2 Known and Potential Impacts

Known and potential impacts associated with bushfire include:

- Degradation of local air quality (smoke).
- Disturbance to existing land use and amenity (destruction of vegetation, infrastructure).
- Disturbance or destruction of sites of cultural heritage significance.
- Disturbance of fauna through loss of habitat and food source.
- Destruction of rare and endangered flora and fauna, vegetation communities and fauna habitat.

5.3.3 Extent and Duration of Potential Impacts

The extent and duration of potential impacts from a bushfire range from short-term and localised (extinguished spot fire) to medium-term and extensive (large pasture grass or heathland fire).

5.3.4 Impact and Risk Evaluation

The Facility is located within an area that is dominated by heath scrub, which is ecologically susceptible to fire (and requires fire to regenerate). A fire in this vegetation type will have temporary negative consequences, such as the degradation of air quality, disturbance to existing land use and amenity, loss of fauna habitat, increased erosion due to exposed soil, together with a loss of visual amenity and possibly an associated reduction in tourist numbers. Longer-term, such fires generally kill environmental weeds and allow native pioneer species and others (such as orchids) to thrive in the absence of a dense canopy. Though a very hot fire may cause scorched earth, slowing the regeneration process.

In the summer months when the water content of pasture grasses is low, fire is likely to spread beyond the ignition site and travel quickly through the environment, which also risks destroying infrastructure such as houses, farm sheds and fences.

5.3.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|--|--|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV15 Site activities initiate a fire that escalates off site or results in a bushfire | Serious (3) | Unlikely (3) | Medium |
| Demonstration of ALARP | | | |

| | |
|--|---|
| A 'Medium' residual risk rating is acceptable if ALARP. The following analysis provides assurance that the ALARP Principal has been met. | |
| Elimination | The need to operate the Facility is essential to allow the ongoing reliable production and supply of gas into the domestic market. No alternative options were identified that would eliminate the need for the Facility. |
| Substitution | Flaring is a key process control to safely manage gas in the event the facility is shutdown / during well interventions and operations. Venting is not considered suitable given the significant safety risks associated with resulting gas plume. |
| Engineering | The facility has fire detection systems that if initiated will result in either a process or emergency shutdown of the Facility. |
| Administrative | <p>Key existing administrative controls include:</p> <ul style="list-style-type: none"> Regulatory approvals obtained and current for operation of flares (Performance Standard (PS1.1)) Firebreaks maintained in accordance with regulatory requirements and bushfire management plan (PS1.1) Inspection and maintenance of the gas production plant's fire detection systems and firefighting systems (e.g. fire extinguishers, fire trailer) undertaken in accordance with the Maintenance Management System (PS1.2) All hot work activities undertaken in accordance with the Permit To Work – Conventional Operations procedure (CDN/ID 3674860) (PS 1.3) Implementation of the incident management procedure (CDN/ID 3675128) and emergency response plan (CDN 3677589) which includes: <ul style="list-style-type: none"> Emergency Response Drill and Exercises Training and competency requirements for personnel (PS1.4 & PS 9.3) |
| ALARP overview | This risk event was assessed as having a "Medium" rating (October 2017). The risk is at an acceptable level and at ALARP particularly given the completion of the risk treatment option during 2017 being the development and implementation of a bushfire management plan (CDN/ID 12104502). This plan was developed in consultation with Shire of Irwin and has allowed firebreak maintenance requirements to be incorporated into the maintenance management system. |

5.4 Storage and Handling Hydrocarbons, Fuels, Chemicals and Hazardous Materials

5.4.1 Hazards

Twelve risk events have been identified that are associated with the loss of containment of hydrocarbons, fuels, chemicals and hazardous materials. These risk events could occur as a result of:

- Wellsite incident at operational or suspended well (e.g. blow out at operational well, loss of well integrity, workover or well intervention)
- Flowline incident (e.g. leak or rupture or unplanned release)
- Gas production plant incident
- Methanol load-in and storage
- Condensate lout-out and storage
- Accident involving land transport, mobile plant and / or equipment
- Flexible hose leak, rupture.

5.4.2 Known and Potential Impacts

Known and potential impacts associated with loss of containment events include degradation and/or loss of:

- local air quality leading to increased greenhouse gas emissions.
- soil quality which could lead to localised loss of vegetation and reduced suitability for land use.
- groundwater quality reducing its existing suitability for use.
- local amenity.
- fauna (because of reduced habitat and food sources).

5.4.3 Extent and Duration of Potential Impacts

The extent and duration of potential impacts from a loss of containment event range from negligible (for spills and leaks that are contained within banded areas), short-term and localised (for small spills and leaks that are clean up immediately with no offsite impact) to long-term and extensive (large spills, leaks that require mobilisation of external resources and materials and impacts offsite).

5.4.4 Impact and Risk Evaluation

5.4.4.1 Hydrocarbons

Risk events ENV01, ENV02, ENV06 and ENV07 are associated with a loss of gaseous hydrocarbons either at the well lease, flowline, or sales gas pipeline. The release of hydrocarbon gas is likely to have short term impact on air quality and local amenity.

Release of liquid hydrocarbons outside of an engineered containment system is only considered credible for a flowline incident (leak or rupture or other unplanned release). An incident that results in the release of liquid hydrocarbon from a flowline would be limited to small volumes (less than 2kL which is the maximum condensate production rate for the Facility) and over a short duration as the facility's process control system would initiate partial or complete shutdown of production in the event pressures lie outside of "normal operational envelope". A release of liquid hydrocarbons is likely to have an immediate and localised impact to groundwater and soil quality.

Oiled wildlife is not considered to be a credible consequence primarily due to:

- the facility is located within proximity to the coast which supports bird habitat, feeding and breeding grounds and therefore not likely to use the facility or immediate surrounding area
- there are alternative water sources available for birds within the vicinity of the Facility e.g. wetlands (Beharra Springs located approximately 8 km south and Mungenooka Spring located approximately 12 km west of the gas plant) as well as the Irwin and Arrowsmith River catchments
- no incidents of bird drownings at the Facility have been recorded, supporting the assumption that the surrounding areas provide more suitable habitat/water sources and do not attract birds
- should a loss of containment event occur, the activities associated with responding to the incident would provide further deterrent for birds).

5.4.4.2 Fuels

Diesel storage at the facility is necessary as a back-up fuel supply for power generation and short-term fuel supply during major shutdown campaigns and projects. Diesel is toxic to aquatic life with long lasting effects if exposed. It is a suspected carcinogen. Diesel will float on water and could form a film that prevents oxygen transfer. Major constituents are inherently biodegradable. It consists of volatile compounds that will oxidise in air, and partly evaporate from water and/or soil surfaces.

All diesel is stored in appropriately designed and sized containment facilities with potential releases to the environment limited.

As a result of the October 2017 risk review and development of the Facility's OSCP, it was identified that the above ground diesel storage tank bund is inadequately sized. The maximum storage volume of the tank is 4500L, with the bund capacity of approximately 2700L. Based on this, the risk event likelihood was changed from "2-Highly Unlikely" to "4-Possible". This has not resulted in an overall change in the risk rating which remains at "Medium".

Immediate actions taken have included:

1. Development and implementation of a standing order which limits the fill volume of the diesel tank to 2450L. All operators have been made aware of and are required to sign onto the standing

order. The standing order is a work instruction that allows communication of temporary changes to normal mode of operation.

2. Investigate options for long term operation of the diesel tank (including do nothing option, replacement of diesel tank with a double skinned or self-bunded tank solution or increase of diesel storage tank bund capacity to allow full tank storage inventory. This review is expected to be completed by Q1 2018, with a recommended long term solution implemented by Q4 2018.

Reducing the existing diesel storage tank inventory to ensure at least 110% of the tank inventory can be held by the current bund means that the risk is at an acceptable level and the risk of a loss of containment to the environment has been reduced to ALARP.

5.4.4.3 Chemicals and Hazardous Materials

Other significant storages of chemicals and hazardous materials at the facility include methanol tank (16kL), condensate (100kL), with smaller inventories of various chemicals also located within the chemical storage shed and at well leases (i.e. methanol Redback well leases and cortron at all well leases). Table 3-2 provides a comprehensive list of all chemicals, including their use, storage, handling and disposal methods. Hazardous waste is addressed in section 5.5.

Given the significant storage volumes of methanol and condensate these are considered to pose the greatest potential consequence of impact.

In air, methanol remains as a vapour for 18 days, eventually breaking down to other chemicals, with long term methanol exposure potentially affecting the fertility of biota and affecting appearance and / or behaviour. Methanol does not bind well to soil, so if released the environmental values likely to be impacted are groundwater and surface water quality. Storages of methanol are located within bunded area at the gas production plant and at well sites and are located away from surface waters.

Condensate is toxic to aquatic organisms and may cause long-term adverse effects particularly due to some minor constituents (e.g. benzene <1%) that have a high potential for bioaccumulation, are persistent and have low degradability. A release of condensate is likely to impact soil and groundwater quality with no surface waters within the vicinity of the condensate storage area.

Up to 3kL of cortron may be stored within the gas production plant's chemical store at any given time, with typically 200L stored at well leases for injection into flowline/s. Cortron is soluble in water and contained substances which are toxic to aquatic organisms.

As described in section 3.4.1.1 no down hole chemicals are currently used at the Facility. Should down hole chemicals be necessary a chemical disclosure document and update of the EP will be submitted to DMIRS prior to its use.

5.4.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|--|--|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV04 Loss of containment of methanol during load-in | Moderate (2) | Highly Unlikely (2) | Low |
| ENV05 Loss of containment of condensate during load-out | Moderate (2) | Highly Unlikely (2) | Low |
| ENV06 Loss of containment of sales gas pipeline | Serious (3) | Remote (1) | Low |
| ENV14 Loss of containment from flexible hoses | Moderate (2) | Unlikely (3) | Medium |
| ENV01 Loss of containment of hydrocarbons at wellsite | Serious (3) | Unlikely (3) | Medium |
| ENV02 Loss of containment of hydrocarbons from production flowline | Serious (3) | Highly Unlikely (2) | Medium |

| | | | |
|---|---|---------------------|---------------|
| ENV03 Loss of containment of hydrocarbons from gas production plant | Serious (3) | Highly Unlikely (2) | Medium |
| ENV07 Loss of containment at suspended wellsite | Serious (3) | Highly Unlikely (2) | Medium |
| ENV08 Loss of containment from condensate and methanol storage tanks | Serious (3) | Highly Unlikely (2) | Medium |
| ENV09 Loss of containment of hazardous materials/waste | Serious (3) | Possible (4) | Medium |
| ENV10 Loss of containment as a result of accident involving land transport / mobile plant and equipment | Minor (1) | Possible (4) | Medium |
| ENV23 Loss of containment hydrocarbons, fuels, chemicals, and hazardous materials | Serious (3) | Highly Unlikely (2) | Medium |
| Demonstration of ALARP | | | |
| A 'Medium' residual risk rating is considered to acceptable if ALARP. The following analysis provides assurance that the ALARP Principal has been met. | | | |
| Elimination | The need to operate the Facility is essential to the safe and reliable production of gas into the domestic market. No alternative options were identified that would eliminate the need for the Facility and hence the generation of hydrocarbon gas and liquids and use of chemicals such as methanol and fuels. | | |
| Substitution | Methanol is an essential part of the process that is used to manage potential hydrate formation. Without this chemical in the process, formation of hydrates has the potential to form blockages in the flowlines and process piping which in turn could lead to a loss of containment event. | | |
| Engineering | The gas production plant and sales gas pipeline has been designed and is operated and maintained in accordance with pipeline licence PL18 which specifies minimum design and operational standards. All storages of hydrocarbons, fuels, chemicals and hazardous materials are located within appropriately designed containment facilities in accordance with the relevant Australian Standards. (PS 2.1) | | |
| Administrative | <ul style="list-style-type: none"> Designated hydrocarbon and chemical storage areas are inspected to ensure appropriate storage, adequate containment capacity and no evidence of spills or leaks. (PS 2.1) The gasfield reliability and safety is managed through implementation of the well integrity management plan (CDN/ID 7726350) (PS 2.4) and flowline integrity management plan (CDN/ID12121215). (PS 2.5) The sales gas pipeline reliability and safety is managed through implementation of the pipeline integrity management plan (CDN/ID 11750246). (PS 2.5) Any identified spill and/or leaks are managed in accordance with the incident management procedure (CDN/ID 3675128) and reported in the incident management system. (PS 9.4) | | |
| ALARP overview | <p>At the most recent risk review (October 2017) it was confirmed that the potential impacts and risks are at an acceptable level and are at ALARP particularly given the completion of several risk treatment options during 2017. These included:</p> <ul style="list-style-type: none"> Development and implementation of a flowline and pipeline integrity management plan, including update of the site's inspection and maintenance system (CMMS) to capture all routine tasks | | |

| | |
|--|--|
| | <ul style="list-style-type: none"> • Upgrade of the facility's cathodic protection system • Completion of the flowline and pipeline direct inspection program • Completion of the gas production plant major shutdown • Development and implementation of a standing order which limits the fill volume of the diesel tank to 2450L. All operators have been made aware of and are required to sign onto the standing order. <p>Further, several risk treatment options have been identified and will be actioned during 2018/2019. These include:</p> <ul style="list-style-type: none"> • Implementing the approved oil spill contingency plan (OSCP). This will involve an awareness and training session to be rolled out to all operations staff as to its content and their roles and responsibilities under the plan (Q4 2017). • Reviewing and (if necessary) upgrading the methanol/condensate transfer pump bund to ensure it has sufficient integrity / capacity (Q4 2017). • Investigating options for long term operation of the diesel storage tank to allow full tank storage inventory. This review is expected to be completed by Q1 2018, with a recommended long term solution implemented by Q4 2018. • Reviewing methanol and condensate tank bund capacity and if necessary removing any windblown sand (Q4 2017). |
|--|--|

5.5 Generation, Storage, Handling of Liquid and Solid Wastes

5.5.1 Hazards

Eight risk events have been identified that are associated with the generation, storage and handling of liquid and solid wastes including:

- Management of produced formation water (Risk ID ENV11, ENV12, ENV13, ENV14 and ENV28)
- Management of sewage and domestic waste (Risk ID ENV24)
- Management of industrial hazardous waste from day to day operation and maintenance activities (Risk ID ENV09, ENV11, ENV28 and ENV29)
- Management of project specific wastes (Risk ID ENV09 and ENV11)
- Management of contaminated sand/soils (Risk ID ENV09).

These risk events primarily relate to a loss of containment incident and could occur as a result of:

- Personnel behaviour and health (e.g. fatigue, stress, speeding, drug and alcohol, lack of training/awareness)
- Poor site, road and/or vehicle conditions
- Unfamiliar conditions and location
- Collision with an animal, other road users / third party
- Multiple work teams within small area due to plant shutdown campaign and/or project activities
- Impact with process equipment and pipework
- Incorrect use of equipment.

5.5.2 Known and Potential Impacts

Inappropriate management of waste could result in the following potential impacts:

- Contamination of soil, surface water and groundwater reducing their existing suitability for use.
- Reduced local amenity.
- Injury/harm to fauna through loss of habitat, drowning, ingestion of contaminated surface water.

- Regulatory non-compliance and heightened stakeholder concerns.

5.5.3 Extent and Duration of Potential Impacts

The extent and duration of potential impacts from management of wastes range from negligible (for spills/leaks that are contained within bunded areas), short-term and localised (for small spills and leaks that are clean up immediately with no offsite impact) to long-term and extensive (large spills, leaks that require mobilisation of external resources and materials and impacts offsite).

5.5.4 Impact and Risk Evaluation

5.5.4.1 Management of Produced Formation Water and Site Drains

Five risk events have been identified associated with the management of produced formation water and site drains. The risk rating of these have been assessed as "Medium".

Produced formation water is produced incidentally as part of gas production and its quality reflects the reservoir characteristics from which it is produced. It primarily consists of water but also contains salts, hydrocarbons and some metals consistent with the natural reservoir. The hydrocarbon component is removed throughout the gas production process, principally via the slug catchers and separator systems described in section 3. All produced formation water and site drains are directed to an appropriately designed, maintained and operated evaporation pond for disposal.

During 2017, significant upgrade of the Facility's water management infrastructure was undertaken. In October 2017, the existing API separator was drained, cleaned and inspected and prior to returning to service was recoated to ensure the concrete pit's structural integrity. Further, because of the evaporation pond 2 upgrade, the separator system has been modified to include an additional CPI separator and transfer system. This new separator system consists of the existing API separator, a holding/buffer tank, transfer pumping and piping and a CPI separator which consist of weirs and filters (as described in section 3.3.7) and will ensure that any hydrocarbon carryover from the API separator is further reduced prior to transfer into an operational pond by increasing residence time and providing additional filtration.

Failure of the produced formation water and site drain management system could result in the release of produced formation water to the environment. The Facility typically generates up to 32kL per day of water. Failure or rupture of production plant process piping, transfer pipework or a flowline would have a short term and localised impact that would be limited to the operational footprint.

A catastrophic failure of an evaporation pond liner or wall is considered to have the potential to result in the potential to:

- impact groundwater and soil quality which in turn could affect its suitability for use (refer section 5.9 for discussion on these impacts) vegetation and fauna.
- loss of individual flora and fauna species through inundation (pond failure or overflow).

Further, individual fauna species could drown or ingest water through accessing operational ponds. These impacts would be limited to a few individuals with no long term impact to species diversity or abundance.

5.5.4.2 Management of Industrial Hazardous Waste

Sources of industrial hazardous waste are presented in section 3.4 and section 3.5.

Those that present the greatest risk due to either the volumes or constituents being managed include:

- Contaminated sand/soils are contained within evaporation pond 1 footprint and in suitably lined containment facilities
- Spent filtration media and membranes within the gas production plant.

The potential impacts of a loss of containment from these facilities, either due to integrity failure or inadequate storage is likely to be localised and contained within the operational footprint, with no long term impacts. The consequence of these risk events was assessed as "Serious".

5.5.4.3 Management of Project Specific Wastes

Project specific wastes are dependent on the nature and scale of the activities being undertaken. Wastes can range from general solid waste from packaging and materials delivered to site to hazardous materials (e.g. liner repair and replacement or excavation of contaminated soils or pipeline

pigging waste). Regardless all waste is stored, handled and disposed of in accordance with section 3.5, with no storage located outside of operational areas. Therefore, any impacts associated with management of project specific wastes will be limited to onsite with no long-term impacts to environmental values.

5.5.4.4 Management Sewage and Domestic Waste

The gas production plant has a dedicated septic system which has been designed to handle the maximum number of people onsite. Where project specific activities are expected to increase the number of personnel on site, temporary, pump out facilities may be mobilised to prevent the potential for overload and overflow.

The existing system and leach drains are located within the middle of the gas production plant, with any overflow or release unlikely to impact beyond the gas production plant boundary. Therefore, the consequence of the potential impacts has been assessed as "serious" given no long term or offsite impacts are expected.

5.5.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|---|---|---|---------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV09 Loss of containment of hazardous materials/waste | Serious (3) | Possible (4) | Medium |
| ENV11 Loss of containment as a result of accident involving land transport / mobile plant and equipment | Minor (1) | Possible (4) | Medium |
| ENV12 Flammable levels of hydrocarbons are ignited in the evaporation pond resulting in liner damage | Moderate (2) | Unlikely (3) | Medium |
| ENV13 Loss of containment from operational pond/s | Serious (3) | Possible (4) | Medium |
| ENV14 Loss of containment from flexible hoses | Moderate (2) | Unlikely (3) | Medium |
| ENV24 Inappropriate management of sewage and domestic waste | Serious (3) | Highly Unlikely (2) | Medium |
| ENV28 Separator system not performing as required | Serious (3) | Possible (4) | Medium |
| ENV29 Loss of containment of produced/site drain water from upgraded separator system | Serious (3) | Possible (4) | Medium |
| Demonstration of ALARP | | | |
| A 'Medium' residual risk rating is considered to acceptable if ALARP. The following analysis provides assurance that the ALARP Principal has been met. | | | |
| Elimination | <ul style="list-style-type: none"> Generation, storage and handling of liquid and solid wastes is incidental to the operation and maintenance of the facility. No elimination controls have therefore been identified. | | |
| Substitution | <ul style="list-style-type: none"> No substitution controls have been identified. | | |
| Engineering | <ul style="list-style-type: none"> All waste stored and disposed of in accordance with relevant regulatory requirements (PS 2.6 & PS 2.8) Operational pond liner permeability equalled to or less than 1×10^{-9}m/s (PS 10.2) | | |

| | |
|----------------|--|
| Administrative | <ul style="list-style-type: none"> • Inspection and maintenance of the gas production plant septic system and leach drains are managed in accordance with the facility integrity management system. (PS 2.7) • Inspection and maintenance of evaporation ponds undertaken in accordance with the facility management system that shows: <ul style="list-style-type: none"> ○ Pond structural integrity is maintained ○ Pond liner integrity is maintained ○ 300mm freeboard maintained at all times (PS 2.8) • All site personnel are familiar with location of spill response kits, requirement to use secondary containment and how to raise an alarm for emergencies. (PS 9.1) |
| ALARP Overview | <p>At the most recent risk review (October 2017) it was confirmed that the potential impacts and risks are at an acceptable level and are at ALARP particularly given the completion of a number of risk treatment options during 2017. These included:</p> <ul style="list-style-type: none"> • Completion of the soil and groundwater investigation and submission of the final report to DMIRS and DWER on the 5 April 2017. • Ongoing independent validation of evaporation pond 1 liner integrity • Construction and commissioning of evaporation pond 2 upgrade project which includes a new dual lined, HDPE membrane and leak detection and collection system. • Construction and commissioning of the upgraded separator system • In October 2017, the existing API separator was drained, cleaned and inspected and prior to returning to service was recoated to facilitate the concrete pit's ongoing structural integrity • Development and implementation of inspection and maintenance regime for septic system • Development and implementation of the adaptive water management strategy which has resulted in clear pond operating rules (refer section 3.3.7.3) <p>Further, a number of risk treatment actions have been identified and will be actioned during 2018/2019. These include:</p> <ul style="list-style-type: none"> • Confirm septic system meets WA Department of Health and Shire of Irwin requirements • Investigate alternative options to offsite transport and disposal of contaminated sand/soil (Q2 2018) • Investigation requirement for additional long-term water management infrastructure (Q4 2018) • Investigate feasibility of short-term storage of produced water within condensate taken as part of adaptive water management strategy (Q4 2017) • Review and update pond 1 integrity and inspection requirements to allow for adaptive approach for independent validation (Q4 2017) • Implementation of soil and groundwater investigation recommendations (Q4 2017). |

5.6 Extraction of Groundwater

5.6.1 Hazards

Extraction of groundwater at the Facility is necessary for routine and non-routine activities such as:

- water supply for personnel amenities and emergency showers
- dust suppression during construction, earthworks and project specific campaigns

- washdown of plant and equipment
- drilling, well workovers and intervention activities
- rehabilitation and decommissioning.

5.6.2 Known and Potential Impacts

The known and potential impacts resulting from the extraction of groundwater include:

- Unsustainable drawdown of aquifer (in the event of excessive or unauthorised extraction)
- Damage to vegetation due to drawdown of shallow groundwater
- Harm/injury to personnel and sensitive users because of contaminated groundwater within the gas production plant. This impact (Risk ID ENV26) is discussed further in section 5.9 with the following sections focussed on unsustainable drawdown impacts only (Risk ID ENV22).

5.6.3 Extent and Duration of Potential Impacts

Given the low water demand for the Facility (typically less than 2000kL per year) and is not expected to significantly change over the life of the facility, impacts associated with groundwater drawdown are expected to be localised and short term.

5.6.4 Impact and Risk Evaluation

The Facility is licensed to extract up to 20,600kL per year of water from two existing bores at the gas production plant (Camp North 1 and Camp South 1) and a number of bores located at well sites (refer Table 2-3 for details). Annual water reporting to date has shown that less than 1,000kL is typically used. Given the low water demand of the Facility, it is unlikely that the extraction of water will result in any noticeable decline in groundwater levels. Therefore, the extent and duration of any potential impact is negligible.

5.6.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|--|---|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV22 Site activities will result in groundwater extraction that exceeds aquifer recharge | Moderate (2) | Remote (1) | Low |
| Demonstration of ALARP | | | |
| A 'Low' residual risk rating is broadly acceptable. The following analysis provides assurance that the ALARP Principal has been met. | | | |
| Elimination | <ul style="list-style-type: none"> • Use of water for operation and maintenance of the Facility is necessary. Water could be sourced from offsite sources, however, this only moves the extraction to an alternative location and does not eliminate the risk of aquifer drawdown. | | |
| Substitution | <ul style="list-style-type: none"> • No substitution controls were identified. | | |
| Engineering | <ul style="list-style-type: none"> • Water extraction meters are installed and calibrated in accordance with DoW guidelines. (PS 3.1) | | |
| Administrative | <ul style="list-style-type: none"> • Extraction of groundwater undertaken in accordance with a valid and current licence. (PS 3.1) • Extraction of groundwater is metered and monitored to ensure no exceedance of extraction entitlement. (PS 3.1) | | |
| ALARP Overview | At the most recent risk review (October 2017) it was confirmed that the potential impacts and risks are at an acceptable level and are at ALARP particularly given the confirmation of calibrated groundwater extraction meters in 2017. | | |

5.7 Vegetation Clearing, Earthworks and Vegetation Management

5.7.1 Hazards

Vegetation clearing, earthworks and vegetation management activities are necessary for:

- Installation and construction of new infrastructure (such as gas wells, flowlines, monitoring bores)
- Maintaining existing right of ways (flowlines, pipeline and access roads) and operational areas (well leases, gas production plant, groundwater monitoring bores and flare compound)
- Maintaining fire breaks around the gas production plant and accommodation buildings.

Hazards associated with these activities include:

- Transportation of staff and equipment during routine and non-routine activities
- Import of gravel/soil for road construction and maintenance, well lease establishment
- Clearing without a permit
- Inappropriate installation of temporary plant/facilities associated with major maintenance campaigns
- Evaporation ponds/drill sumps not fenced
- Inadequate stakeholder / landholder engagement
- Gates left open / unlocked
- Pond fencing removed or inadequate during pond repairs/intrusive soil sampling
- Fauna ladders removed and not replaced
- Tundish, sumps and pit grates/covers not replaced
- Excavation for repair/maintenance and/or direct inspection of sales gas pipeline, flowlines or buried pipework.

5.7.2 Known and Potential Impacts

Known and potential impacts associated with vegetation clearing, earthworks and vegetation management include:

- Removal of or damage to rare and endangered flora, vegetation communities and fauna habitat
- Injury or fatality of rare and endangered fauna
- Destruction or disturbance of sites of cultural heritage
- Introduction of weeds, pests and pathogens
- Loss of topsoil from erosion and sedimentation of surface waters.

5.7.3 Extent and Duration of Potential Impacts

Ongoing vegetation management requires the maintenance of up to 39.15 ha of operational areas and right of ways for the safe operation and maintenance of the Facility. Vegetation management is undertaken under two clearing permits (refer section 2.2.3.3) which are valid until end of 2025/ 2026. As described in section 3.7, progressive rehabilitation of cleared areas has been undertaken and recent monitoring has shown positive signs of rehabilitation success. Therefore, the potential impacts associated with vegetation clearing and management are expected to continue in the medium to long term but are not permanent.

A review of the incidents recorded to date for the facility have a number of fauna (predominantly kangaroo) fatalities and injury as a result of plant/equipment/vehicle strikes. To date no such incidents have been recorded for listed fauna species.

5.7.4 Impact and Risk Evaluation

Clearing permit CPS4607 currently permits the clearing of up to 14.15ha of native vegetation surrounding the gas production facility including ancillary infrastructure such as the existing accommodations camp, workshop, engineers' office, site laboratory, designated laydown area for major maintenance campaigns, evaporation ponds, flare compound and possible future groundwater monitoring bores. Clearing permit CPS6643 permits the clearing of up to 25ha of native vegetation associated with well leases. Access roads and flowline/pipeline right of ways.

A targeted flora survey (Mattiske 2016) was undertaken in November 2016 for the installation of possible future groundwater monitoring bores. The survey found two priority flora species, being Priority 3 *Hemiandra* sp. Eneabba (H.Demarz 3687) and Priority 4 *Banksia elegans*. Mattiske 2016 report concluded:

- both species are known to occur within the immediate vicinity of the gas production plant
- both species are not restricted in any way to the survey area
- clearing of these species will result in only minor changes in the population found within the Beharra Springs Gas Facility area.

The targeted flora report was provided to DMP on the 21 December 2016 and approval was subsequently granted on 16 January 2017 to undertake clearing of these species.

Any ongoing vegetation management activities will be undertaken in accordance with an approved and valid clearing permit (refer section 2.2.3.3 for existing permits) or where no valid permit exists a new permit will be sought prior to undertaking the clearing.

Recent rehabilitation monitoring (Mattiske 2017) has shown no presence of declared weeds. One medium ranked weed was identified at Redback well site being *Hypochaeris glabra*. This weed was recorded in the incident management system and has been subsequently treated in late winter/spring 2017.

Some erosion has been noted at the Beharra Springs 2 and Redback well sites and this is being monitored by site personnel. No evidence of it worsening over the recent wet season has been noted.

5.7.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|---|--|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV16 Inappropriate clearing of vegetation | Serious (3) | Highly Unlikely (2) | Medium |
| ENV18 Site activities will cause disturbance to sites of cultural heritage | Serious (3) | Remote (1) | Low |
| Env19 Site activities will cause the introduction or spread of weeds or pathogens | Moderate (2) | Highly Unlikely (2) | Low |
| ENV20 Vegetation clearing and earthworks activities will reduce local biodiversity values | Serious (3) | Highly Unlikely (2) | Medium |
| ENV27 Site activities cause fauna and/or stock injury of death | Serious (3) | Highly Unlikely (2) | Medium |
| Demonstration of ALARP | | | |
| <p>A 'Low' residual risk rating is considered to be broadly acceptable.</p> <p>A 'Medium' residual risk rating is considered to be acceptable if ALARP.</p> <p>The following analysis provides assurance that the ALARP Principal has been met.</p> | | | |

| | |
|----------------|---|
| Elimination | <ul style="list-style-type: none"> Where practical infrastructure is located to avoid clearing of native vegetation and sites of known cultural heritage. For the recent installation of GW6, GW16, GW17 and GW18 the groundwater bores were located within an area that was previously cleared for a seismic survey. |
| Substitution | <ul style="list-style-type: none"> No substitution controls were identified. |
| Engineering | <ul style="list-style-type: none"> No engineering controls were identified. |
| Administrative | <ul style="list-style-type: none"> Clearing of native vegetation is authorised under the WA Environmental Protection Act 1986 and complies with the relevant land clearing permit conditions. (PS 4.1) Incidents managed in accordance with the incident management procedure and recorded in incident management system. (PS 9.4) <ul style="list-style-type: none"> All site personnel are made aware of cultural heritage requirements including known sites and actions to be taken in the event an unknown site is found. (PS 5.1) Weeds are identified and treated/removed from operational areas (PS 6.1) Hygiene controls implemented in accordance with land clearing permit conditions (PS 4.1) |
| ALARP Overview | <p>At the most recent risk review (October 2017) it was confirmed that the potential impacts and risks are at an acceptable level and are at ALARP particularly given the completion of the risk treatment option during 2017 being:</p> <ul style="list-style-type: none"> Obtain approval to amend CPS4607 to include additional areas associated with groundwater monitoring bores and extend expiration date to 2025 in line with the current expected end of facility production. Ongoing inspection of soil erosion at Redback and Beharra Springs 2 well sites. <p>No further risk treatment actions have been identified.</p> |

5.8 Generation of Air, Noise, Light, Dust and Odour Emissions

5.8.1 Hazards

Site activities have the potential to cause amenity (air, noise, dust, light, odour emissions) impacts as a result of:

- Flaring and other production processes generating air, light and noise emissions
- Production well drilling, workovers and well intervention activities generating air, light, noise and dust emissions
- Shutdown campaigns generating air, light, noise and dust emissions
- Transportation of staff and equipment generating noise, dust emissions
- Odour from evaporation ponds
- Dust emissions due to pipeline pigging
- Stockpiling of sand/soil materials.

5.8.2 Known and Potential Impacts

Known and potential amenity impacts associated with site activities include:

- Reduced amenity for sensitive receptors.
- Reduction in habitat value.
- Reduction in land use capability.

- Increase in insects and pests.
- Reduced local air quality (through emission of combustion by-products and increased greenhouse gas emissions).

5.8.3 Extent and Duration of Potential Impacts

The facility is located on unallocated crown land with no sensitive receptors or sensitive users within close proximity. The facility is operated continuously, with non-routine maintenance scheduled during daylight hours where practical. Some activities such as well workovers and wireline or emergency repairs and maintenance may mean activities are undertaken at night. The closest residence to the gas production plant is approximately 7 km. Therefore, impacts due to noise, air, light, odour and dust emissions are considered to be localised to the immediate area. The facility has been operational since 1991 and no known complaints have been recorded in the incident management system.

5.8.4 Impact and Risk Evaluation

Given the facility is remote from sensitive receptors and users the potential impacts are considered to be moderate with impacts limited to site and only short term damage to areas of limited significance. This is evidenced by the continued presence and health of surrounding vegetation communities and presence of native fauna. Recent soil and groundwater investigations undertaken at the gas production plant has shown that impacts have occurred with respect to historical contamination of soil quality but this is limited and contained within the gas production plant. Refer to section 5.9 for detailed discussion of the gas production plant's soil contamination status.

5.8.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|---|---|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV10 Site activities result in excessive air emissions | Minor (1) | Unlikely (3) | Low |
| ENV21 Site activities will cause amenity (air, noise, dust, light, odour emissions) impacts | Moderate (2) | Remote (1) | Low |
| Demonstration of ALARP | | | |
| A 'Low' residual risk rating is considered to be broadly acceptable. | | | |
| Elimination | The need to operate the Facility is essential to allow the ongoing reliable production and supply of gas into the domestic market. No alternative options were identified that would eliminate the need for the Facility. | | |
| Substitution | Flaring is a key process control to safely manage gas in the event the facility is shutdown / during well interventions and operations. Venting is not considered suitable given the significant safety risks associated with resulting gas plume. Where practical, major maintenance campaigns will be scheduled during daylight hours. | | |
| Engineering | Existing engineering controls that are in place include: <ul style="list-style-type: none"> • Permanent power generation equipment located within enclosures • Progressive rehabilitation undertaken | | |
| Administrative | Existing administrative controls in place include: <ul style="list-style-type: none"> • All complaints received from external stakeholders, community or landholders with respect to amenity are recorded and investigated. (PS 7.1) • Ongoing stakeholder engagement undertaken (PS 7.1) • Inspection and maintenance undertaken and records maintained for combustion plant and equipment, and gas production plant lighting | | |

| | |
|----------------|---|
| | <p>undertaken in accordance with the facility integrity management system.</p> <ul style="list-style-type: none"> Project specific procedures in place that address where relevant: <ul style="list-style-type: none"> stockpile management and dust suppression pigging activities |
| ALARP overview | <p>At the most recent risk review (October 2017) it was confirmed that the potential impacts and risks are at an acceptable level and are at ALARP particularly given the completion of several risk treatment options during 2017 being:</p> <ul style="list-style-type: none"> Completion of the gas production plant major shutdown in September 2016 and 2017. Completion of the 2017 fugitive emissions survey. <p>No further risk treatment actions have been identified.</p> |

5.9 Contamination of soils, land and groundwater

5.9.1 Hazards

The soils and groundwater within the gas production plant is classed as “Contaminated – Restricted Use”. This is a result of historical site activities likely a result of inadequate management of produced formation water, site drains and hazardous material.

Ongoing use of the facility for gas production and the storage of hydrocarbons, chemicals, fuels, hazardous materials all have the potential to contribute to new areas of contamination or worsening of existing known area of contamination.

5.9.2 Known and potential impacts

Known and potential impacts associated with contaminated soils, land and groundwater include:

- Harm/injury to personnel, sensitive users and fauna
- Reduced water/soil quality leads to impacts to existing uses
- Reduced groundwater quality leads to loss of significant vegetation that is reliant on natural groundwater springs
- Reduced soil quality leads to loss of vegetation, fauna habitat and foods sources.

5.9.3 Extent and duration of impacts

The extent and duration of known impacts associated with the contaminated groundwater and soils within the gas production plant are localised and considered to be medium to long term until natural attenuation or remediation is completed.

5.9.4 Impact and risk evaluation

The risk event was assessed to have a medium risk ranking. This was deemed appropriate given the general direction of groundwater movement is to the south-west and the closest known downstream groundwater user approximately 7 km from the plant boundary. Further, in 2017 a soil and groundwater investigation was undertaken within the gas production plant, to determine potential sources for ongoing detection of hydrocarbons in groundwater monitoring bore (particularly GW5 and GW11). A report on the soil and groundwater investigations undertaken in Q1 2017 was provided to DMIRS on the 5 April 2017 (Senversa 2017). The investigation included the collection and analysis of soil samples collected from fifteen soil bores from across the site and the collection and analysis of groundwater samples from twenty groundwater monitoring wells (eleven additional groundwater monitoring wells were installed during the investigation). Based on the results from this investigation, the facility has been classified under the Contaminated Sites Act as “Contaminated – Restricted Use”. The assessment of this classification found (DER 2017):

- The groundwater impact has been laterally delineated and does not appear to be migrating
- Detail sample analysis indicated that a significant proportion of the hydrocarbon compounds detected are metabolites produced from the biodegradation of petroleum hydrocarbon

compounds indicating that natural attenuation processes are occurring and impacts are associated with an aged source

- The concentrations of hydrocarbons in groundwater near the existing API separator were equal to the corresponding assessment level of non-potable use as specified by DER guidelines (DER 2014)
- Chloride concentration which exceeded assessment level for non-potable use reflect background groundwater quality
- Arsenic concentration at one location exceeded drinking water guidelines but was likely to be associated with the release of naturally occurring arsenic in soils due to changes in groundwater conditions caused by the bacterial degradation of hydrocarbons.
- Continued abstraction from the existing bores (Camp North 1 and Camp South 1) is permitted given they are located up gradient of the identified location of contamination subject to ongoing water quality testing to ensure its quality is fit for purpose.

5.9.5 ALARP assessment

| Risk Assessment (October 2017) | | | |
|--|--|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV26 Site activities will result in adverse impacts to existing suitability of groundwater use offsite | Serious (3) | Highly Unlikely (2) | Medium |
| Demonstration of ALARP | | | |
| A 'Medium' residual risk rating is considered to be acceptable if ALARP. The following analysis provides assurance that the ALARP Principal has been met. | | | |
| Elimination | <ul style="list-style-type: none"> • Contaminated site classification prevents: <ul style="list-style-type: none"> ○ the abstraction of groundwater for potable use (except for the two exiting bores which are located upstream of the source of contamination) ○ Development of the site for sensitive uses. (PS 10.3) | | |
| Substitution | <ul style="list-style-type: none"> • No substitution controls were identified. | | |
| Engineering | <ul style="list-style-type: none"> • Dual HDPE liners • Leak detection and collection system. | | |
| Administrative | <ul style="list-style-type: none"> • Quarterly groundwater monitoring is undertaken in accordance with the groundwater monitoring plan and environmental licence conditions (PS 10.4) • Groundwater quality monitoring is undertaken for existing extraction bores Camp North 1 and Camp South 1 to show its quality is fit for use. (PS 10.3) • Compliance with "Restriction on Use" conditions of the DWER Notice of a classification of a known or suspected contaminated site (PS 10.4) • Contaminated soils/sands outside of suitably lined containment areas are cleaned up and/or remediated in accordance with incident management procedure. (PS 10.1) • Complaints are recorded and actions assigned in the incident management system. (PS 7.1) • Oil spill contingency plan is current and approved by regulator and provides for: <ul style="list-style-type: none"> ○ exercises and drills (PS 9.1 and PS 9.2) ○ personnel training and competency requirements. (PS 9.2) | | |

| | |
|----------------|---|
| ALARP Overview | <p>At the most recent risk review (October 2017) it was confirmed that the potential impacts and risks are at an acceptable level and are at ALARP particularly given the completion of several risk treatment options during 2017. These options were identified as part of the significant stakeholder consultation and engagement undertaken with respect to historical contamination issues identified at the gas production plant. The concerns, issues and requirements of these stakeholders, were considered in development and completion of several risk treatment options during 2017 and these have included:</p> <ul style="list-style-type: none"> • confirmation of calibrated groundwater extraction meters • ongoing completion of routine groundwater monitoring program • upgrade of the separator system • upgrade of evaporation pond 2 • completion and submission of the soil and groundwater investigation report to DMIRS and DWER in April 2017 • classification of the gas production plant site to "Contaminated – Restricted Use". <p>Further, several risk treatment actions have been identified and will be actioned during 2018/2019. These include:</p> <ul style="list-style-type: none"> • Adaptive groundwater monitoring program to be developed (Q4 2017) • Implemented adaptive groundwater monitoring program (Q1 2018). |
|----------------|---|

5.10 Rehabilitation

5.10.1 Hazards

Rehabilitation activities could be inadequate or unsuccessful due to:

- Inadequate knowledge of rehabilitation techniques
- Traffic disturbance to rehabilitating areas
- Delay in rehabilitation
- Availability of seed stock
- Natural disaster
- Tenure overlaps results in rehabilitated areas being disturbed
- Use of inappropriate soil quality.

5.10.2 Known and Potential Impacts

Known and potential impacts because of unsuccessful or inadequate rehabilitation include:

- Weed encroachment.
- Reduction in local biodiversity values due to weed encroachment, loss of diversity and abundance of flora and fauna.
- Failure to meet regulatory obligations.
- Soil instability and erosion.
- Reduction in local amenity.
- Loss of fauna habitat.

5.10.3 Extent and Duration of Potential Impacts

Should rehabilitation activities be unsuccessful or inadequate, the impacts are likely to be medium-term, with no long lasting or permanent damage. The impacts will be limited to the areas cleared for the Facility until rehabilitation is established.

5.10.4 Impact and Risk Evaluation

The rehabilitation activities for the site is passive and includes routine monitoring across the facility. The operational requirement for clearing is minimal and restricted to maintenance of well lease operational areas, fire breaks around the gas production plant (including ancillary infrastructure), the access road and right of ways for flowlines and sales gas pipeline. These maintained areas for the necessary operation of the facility produces an edge effect within the local vegetation causing localised disruption to vegetation and favouring the potential introduction of weeds and pests. If rehabilitation activities are inadequate or limited, the regeneration of vegetation may be reduced because of limited seed bank within the soil, change in soil suitability from exposure to weathering conditions including erosion or producing favourable conditions for weed or pathogen introduction.

The recent rehabilitation monitoring undertaken by Mattiske Consulting (2016) found positive rehabilitation progress with five sites meeting the completion criteria being Beharra Springs 2, Beharra Springs South 1, Accommodation building area, groundwater monitoring bore GW6 and South Yandanogo 1 meeting the completion criteria. A recent fire in 2011/2012 (not associated with the facility) is likely to have impacted foliage cover and species richness in parts of the gas field. However, it is expected that these areas over time will regenerate and recover.

5.10.5 ALARP Assessment

| Risk Assessment (October 2017) | | | |
|--|--|---|-------------|
| Risk event | Consequence of the maximum credible impact | Likelihood of occurrence of consequence | Risk rating |
| ENV17 Rehabilitation activities are inadequate or unsuccessful | Serious (3) | Possible (4) | Medium |
| Demonstration of ALARP | | | |
| A 'Medium' residual risk rating is considered to be acceptable if ALARP. The following analysis provides assurance that the ALARP Principal has been met. | | | |
| Elimination | <ul style="list-style-type: none"> Where practical infrastructure is located to avoid clearing of native vegetation and sites of known cultural heritage. For the recent installation of GW6, GW16, GW17 and GW18 the groundwater bores were located within an area that was previously cleared for a seismic survey. | | |
| Substitution | <ul style="list-style-type: none"> No substitution controls were identified. | | |
| Engineering | <ul style="list-style-type: none"> No engineering controls were identified. | | |
| Administrative | <p>Key existing administrative control in place include:</p> <ul style="list-style-type: none"> Disturbed areas reinstated to operational area in accordance with land clearing permit requirements. (PS 8.1) All project specific wastes, including drilling sumps removed to enable progressive rehabilitation. (PS 8.1) Photograph reference points have been established before any new clearing, and used to track progress of rehabilitation. (PS 4.1) Reinstated areas are monitored until rehabilitation completion criteria met. (PS 8.2) Quarterly rehabilitation inspections, with any corrective actions / issues recorded in the incident management system. (PS 8.2 & PS 9.4) Final rehabilitation reports prepared and submitted to regulator that demonstrate rehabilitation meets completion criteria. (PS 8.2) Decommissioning plan to be prepared and submitted at least 6 months prior to closure of the facility. (PS 8.3) | | |
| ALARP Overview | No change to the overall risk ranking, risk consequence or likelihood was made as a result of the October 2017 risk review. However, one risk treatment plan was identified being the preparation and submission of the | | |

| | |
|--|---|
| | <p>final rehabilitation report for Beharra Springs South 1. This is based on the recommendations from a recent inspection by Matiske Consulting Pty Ltd (Matiske 2017). It is anticipated that the rehabilitation completion report will be submitted to DMIRS during Q4 2017.</p> <p>Matiske's inspection and review of rehabilitation progress of the Facility, noted that the facility is showing positive signs for rehabilitation development.</p> <p>Of particular note, five sites, (Beharra Springs 2, Beharra Springs South 1, the accommodation area, GW6 groundwater monitoring bore and South Yandanogo 1) meet the rehabilitation completion criteria. Key indicators of rehabilitation success included, native species foliage cover and native species richness which were set at 50% of that in control areas.</p> <p>Five actions were identified and closed out as a result of the 2017 rehabilitation inspections being:</p> <ul style="list-style-type: none"> • Rehabilitation monitoring quadrates at sites continuing to undergo rehabilitation have been pegged and labelled for future ongoing monitoring and assessment • One medium ranked weed was identified at Redback well site being <i>Hypochaeris glabra</i>. This weed was recorded in the incident management system and has been subsequently treated in late winter/spring 2017. • Erosion at Beharra Springs 2 and Redback well sites was identified and this is currently being monitored and if evidence of worsening a stabilisation plan will be developed and implemented by Q4 2017. • Gravel stockpiles located at Beharra Springs 2 and Wolf have been reviewed and sediment control measures put in place to prevent loss of stored material. <p>The successful establishment of rehabilitation as evidenced by the Matiske inspections and closure of subsequent actions listed above, demonstrate that the risk is of an acceptable level and has been and is continuing to be managed to ALARP.</p> |
|--|---|

5.11 Demonstration of Acceptability

During the risk assessment review, the acceptability of each risk was considered with respect to the criteria presented in section 5.1.3. All risk events identified have been confirmed to be acceptable and a summary of the assessment against the criteria is presented in the table below.

| Demonstration of Acceptability (applicable to all risk events identified in Appendix C) | |
|---|---|
| Policy compliance | A copy of the HSE Policy is provided in Appendix A. All risk events meet the objectives of this policy. |
| Management system compliance | Throughout the ALARP assessment tables (section 5.3 to section 5.10), as well as the environmental performance standards and measurement criteria (section 6) references to HSEMS are provided. The implementation strategy (Section 7) provides a detailed description of the key elements of the HSEMS and how ongoing operation and maintenance will ensure compliance with the system. |
| Stakeholder engagement | Stakeholders have been identified and summarised in section 7.9, along with a summary of the engagement and consultation undertaken to date. Significant stakeholder consultation has been undertaken during 2017, particularly in reference to the ongoing groundwater and soil contamination issues associated with the gas production facility. All stakeholder concerns and issues raised have been considered throughout this EP and where necessary reflected in the control measures, environmental performance objectives, standards and measurement criteria. Lattice commits to |

| | |
|-----------------------|---|
| | continuing to engage with all stakeholders to ensure risks associated with the facility are continued to be ALARP and acceptable. |
| Laws and standards | The facility is operated in accordance with the laws and regulatory approvals described in section 2 of the EP. |
| Industry practice | The facility is operated and maintained in accordance with relevant industry codes of practice and regulatory guidance. Refer to section 2.3.3 for further details. |
| Environmental context | The existing environment is described in section 4 of this EP. |
| ESD principles | The EIA presented throughout this EP demonstrates compliance with the principles of ESD. |

6. Performance Objectives, Standards and Criteria

The overall environmental objective of the Facility is to plan and conduct operations in such a way that potential environmental impacts are identified and wherever necessary measures are developed and implemented to reduce adverse impacts to ALARP.

The environmental risks identified for the Facility are presented in Appendix C. The environmental controls for these risks form the basis of environmental performance standards to manage the identified risks. Table 6-1 below presents this information together with environmental performance objectives and measurement criteria for each identified environmental risk. The effect of the objectives, standards and criteria is to create an assessment loop whereby improvements can be identified and implemented.

Measurement criteria listed in Table 6-1 include records that demonstrate implementation of environmental performance standards. These records will be kept on site or at Lattice offices as appropriate.

Table 6-1: Environmental Performance Objectives, Standards and Criteria

| Risk ID | Environmental Performance Objective (preventing, avoiding and minimising impacts and protecting the environment) | Environmental Performance Standard (state performance required of persons, equipment, procedures) | Measurement Criteria (provide for direct measurement of performance through monitoring, data analysis, inspections or audits) | Record kept / storage location |
|--|--|--|---|--|
| Env15 Site activities initiate a fire that escalates off site (beyond plant boundary, right of way or well lease) or results in a bushfire | EPO 1 Prevent initiation of a bushfire | 1.1 Operation of flares during restricted / prohibited periods is authorised under the WA <i>Bush Fires Act 1954</i> and complies with the conditions of the issued exemption notices. | 1.1.1 Firebreaks established and maintained in accordance with the conditions of exemption notices which requires compliance with the Shire of Irwin's firebreak notice. | Completed workorder/s within CMMS |
| | | 1.2 Inspection and maintenance of the gas production plant's fire detection system and fire-fighting equipment undertaken in accordance with the facility integrity management system. | 1.2.1 Fire detection system functionality testing is undertaken once every year. 1.2.2 Fire-fighting equipment inspections are undertaken once in every 6 months. | Completed workorder/s within CMMS |
| | | 1.3 All hot work activities are undertaken in accordance with the permit to work procedure (CDN/ID 3674860). | 1.3.1 Incident management system shows no non-compliance with issued hot work permit conditions that would initiate a bushfire. | Incident reports within incident management system |
| | | 1.4 All site personnel are familiar with location of designated smoking area and how to raise an alarm for emergencies. | 1.4.1 All site personnel have completed HSE inductions in accordance with the HSE induction procedure (CDN/ID 3675129) which includes site familiarisation of designated smoking areas and raising alarms for emergencies. | Training and induction registers are located within document management system including: <ul style="list-style-type: none"> Employee training and induction records - Beharra Springs Workforce Capability Matrix (ID 11043657) Contractor/visitor induction records – Induction register (ID 10844260) Site Familiarisation Register (ID 10988236) Completion records/evidence is scanned and held on a secure network drive and hard copy records are filed on site |
| Env01, Env02, Env03, Env04, Env05, Env06, Env07, Env08, Env09, Env11, Env13, Env14, Env23 Loss of containment events Env10 Site activities result in excessive air emissions Env12 Flammable levels of hydrocarbons are ignited in the evaporation pond resulting in liner Env24 Inappropriate management of sewage and domestic waste Env28 Separator system not | EPO 2 Prevent the contamination of air, land/soil and groundwater from unplanned emissions and discharges to the environment | 2.1 Inspection and maintenance of hydrocarbon, fuel, chemicals and hazardous material storage areas is undertaken in accordance with the facility integrity management system. | 2.1.1 All storage areas for hydrocarbons, fuels, chemicals and hazardous materials are inspected quarterly to confirm: <ul style="list-style-type: none"> integrity bunded areas (i.e. no visible damage or cracks within concrete) bunded areas are capable of holding maximum volume storage volume of tanks/containers/packaging does not exceed design storage capacity | Quarterly inspections – Completed bund audit checklist (OEUP-1000-PRO-ENV-031) and associated workorder within CMMS Quarterly inspection – Completed SAMS checklist (CDN/ID 7475370) and associated workorder within CMMS |
| | | | 2.1.2 Ten yearly integrity inspection completed for the condensate and methanol tanks | Completed workorder within CMMS |
| | | 2.2 Load out of condensate is undertaken in accordance with Condensate Load Out Procedure (CDN/ID 3677645). | 2.2.1 Condensate load out sheets and completed for each load out event which confirm <ul style="list-style-type: none"> Drivers and tankers are appropriately licensed Drives have completed site inductions | Condensate load out check sheet Daily operations records |
| | | 2.3 Load-in of methanol is undertaken in accordance with Methanol Load-In procedure (CDN/ID 3677646). | 2.3.1 Methanol load in sheet completed which confirms <ul style="list-style-type: none"> Drivers and tankers are appropriately licensed Volume to be transferred based on initial and final dip of methanol tank | Methanol load-in sheets (CDN/ID 14358408) |
| | | 2.4 Inspection and maintenance of wells is undertaken in accordance with the well integrity management plan (CDN/ID 772635). | 2.4.1 Annual review demonstrates compliance with the well integrity management plan. | Annual WIMS report |

| Risk ID | Environmental Performance Objective (preventing, avoiding and minimising impacts and protecting the environment) | Environmental Performance Standard (state performance required of persons, equipment, procedures) | Measurement Criteria (provide for direct measurement of performance through monitoring, data analysis, inspections or audits) | Record kept / storage location |
|---|--|--|--|--|
| performing as required | | 2.5 Maintenance of flowlines and SGP is undertaken in accordance with flowline integrity management plan (CDN 12121215) and pipeline integrity management plan (CDN 11750246). | 2.5.1 Six monthly cathodic protection system inspections demonstrate system is operated in accordance with AS2832.1. 2.5.2 Six monthly visual inspection of right of way shows no evidence of leaks (dying or dead vegetation on the surface) and threats to flowline integrity (e.g. growth of vegetation, unauthorised installation of plant/equipment/fencing along right of way). 2.5.3 Five yearly direct inspections undertaken and shows no issues with flowline/pipeline integrity. 2.5.4 Annual valve servicing and testing records demonstrate flowline / pipeline can be isolated as necessary during emergency/process shutdown. 2.5.5 Pigging of the sales gas pipeline is undertaken in Q2 2018 and then at no greater than 10 year intervals. | Cathodic protection, visual ROW inspections, direct inspections, valve service and function testing and pigging records and completed workorders within CMMS Completed workorders for control and emergency shutdown initiation |
| | | 2.6 All waste stored and disposed of in accordance with Table 3-4 of the EP and HSEMS Standard 19 Product Stewardship, Conservation and Waste Management which requires: <ul style="list-style-type: none"> Waste to be stored in suitably sealed containers to prevent windblown litter and scavenging Segregation of wastes to allow recycling where opportunity exists | 2.6.1 Quarterly visual inspections confirm that wastes are suitably stored and segregated. 2.6.2 All wastes taken off site are recorded in waste register which tracks volume, type and disposal location. | Quarterly inspections – Completed SAMS checklist (CDN/ID 7475370) and associated workorder within CMMS Waste register located on secure network drive |
| | | 2.7 Gas production plant septic system and leach drains are managed in accordance with the facility integrity management system. | 2.7.1 Quarterly visual inspection of septic tank and leach drain area to ensure fencing and signage in place, no unauthorised access and no ponding or pooling. 2.7.2 Septic tank solids level monitored and if necessary pumped out once every 3 years. | Quarterly inspections – Completed SAMS checklist (CDN/ID 7475370) and associated workorder within CMMS |
| | | 2.8 Operational evaporation pond/s inspected and maintained in accordance with the facility integrity management system. | 2.8.1 Water level records show that a freeboard at or greater than 300mm is maintained at all times for operational evaporation pond. | Daily operations log kept on secure network drive |
| | | | 2.8.2 Quarterly inspection of evaporation pond 2 primary liner leak detection system show no evidence of leaks. | Quarterly evaporation pond 2 leak detection system check and completed workorder within CMMS. |
| | | 2.9 Fuel burning plant and equipment (horizontal and vertical flares, gas and diesel generators and reciprocating compressors) emissions are minimised by undertaking maintenance in accordance with the facility integrity management system. | 2.9.1 Completed workorders within CMMS show fuel burning plant and equipment are regularly serviced. | Completed workorders within CMMS |
| Env22 Site activities will result in groundwater extraction that exceeds aquifer recharge | EPO 3 Prevent unsustainable drawdown of groundwater aquifers | 3.1 Extraction of groundwater is authorised under the <i>WA Rights in Water and Irrigation Act 1914</i> and complies with relevant groundwater extraction licence conditions. | 3.1.1 Annual water reports are submitted to the regulator and demonstrate compliance with groundwater extraction licence conditions. | Annual water report stored within document management system |

| Risk ID | Environmental Performance Objective (preventing, avoiding and minimising impacts and protecting the environment) | Environmental Performance Standard (state performance required of persons, equipment, procedures) | Measurement Criteria (provide for direct measurement of performance through monitoring, data analysis, inspections or audits) | Record kept / storage location |
|---|---|---|--|--|
| Env16 Inappropriate clearing of vegetation Env20 Vegetation clearing and earthworks activities will reduce local biodiversity values Env27 Site activities cause fauna and/or stock injury or death | EPO 4 Minimise impacts to rare and endangered flora and fauna, significant vegetation communities and fauna habitat | 4.1 Clearing of native vegetation is authorised under the WA <i>Environmental Protection Act 1986</i> and complies with the relevant land clearing permit conditions. | 4.1.1 Annual land clearing permit reports are submitted to the regulator and demonstrate compliance with land clearing permit/s. | Annual land clearing permit report located within document management system |
| | | 4.2 Operational evaporation ponds are fenced and contain fauna ladders. | 4.2.1 Visual inspections demonstrate that operational evaporation ponds are fenced and contain fauna ladders. | Quarterly SAMS checklist (CDN/ID 7475370) and completed workorder within CMMS. |
| Env18 Site activities will cause disturbance to sites of cultural heritage | EPO 5 Avoid, or if avoidance is not practicable, minimise disturbance to sites of cultural heritage. | 5.1 All site personnel are familiar with cultural heritage management requirements including the location of known sites of cultural heritage and actions to be taken in the event an unknown site/artefact is found. | 5.1.1 Site induction provides information on known cultural heritage sites and actions to be taken in the event of an unexpected find. | Training and induction registers are located within document management system including: <ul style="list-style-type: none"> Employee training and induction records - Beharra Springs Workforce Capability Matrix (ID 11043657) Contractor/visitor induction records – Induction register (ID 10844260) Site Familiarisation Register (ID 10988236) Completion records/evidence is scanned and held on a secure network drive and hard copy records are filed on site. |
| Env19 Site activities will cause the introduction or spread of weeds or pathogens | EPO 6 Minimise potential for introduction or spread of weeds, pest animals or soil-based pathogens | 6.1 Weeds are identified and treated/removed from operational areas. | 6.1.1 Quarterly inspection of operational areas are undertaken to identify presence of weeds. | Quarterly SAMS checklist (CDN/ID 7475370) and completed workorders within CMMS. |
| | | | 6.1.2 Weeds identified are treated/removed. | |
| Env21 Site activities will cause amenity (noise, dust, light, odour emissions) impacts | EPO 7 Minimise amenity impacts due to noise, dust or light emissions | 7.1 Any complaints received from external stakeholders, community or landholders with respect to amenity are recorded and appropriate actions undertaken. | 7.1.1 Any complaints received are recorded and actions assigned in the incident management system. | Incident reports within incident management system |
| Env17 Rehabilitation activities are inadequate or unsuccessful | EPO 8 Progressively and successfully rehabilitate disturbed areas | 8.1 Disturbed areas are reinstated to operational area in accordance with land clearing permit requirements. | 8.1.1 Annual land clearing permit reports prepared and submitted to regulator demonstrate compliance with land clearing permit. | Annual land clearing permit report located within document management system |
| | | 8.2 Reinstated areas are monitored until rehabilitation completion criteria met. | 8.2.1 Annual rehabilitation inspections undertaken to record rehabilitation progress. | Rehabilitation inspection checklists (OEUP-W100-FRM-ENV-001) and completed workorders within CMMS |
| | | | 8.2.2 Biannual review of rehabilitation inspections to determine rehabilitation progress against completion criteria. | Rehabilitation progress report located within document management system |
| | | | 8.2.3 Final rehabilitation report prepared and submitted to regulator that demonstrates completion of rehabilitation in accordance with the land clearing permit conditions. | Final rehabilitation completion report located within document management system |
| | | 8.3 Decommissioning plan is prepared and submitted to the regulator at least 6 months prior to closure of the facility. | 8.3.1 Decommissioning plan submitted at least 6 months prior to closure of the Facility. | Decommissioning plan submitted to regulator located within document management system |

| Risk ID | Environmental Performance Objective (preventing, avoiding and minimising impacts and protecting the environment) | Environmental Performance Standard (state performance required of persons, equipment, procedures) | Measurement Criteria (provide for direct measurement of performance through monitoring, data analysis, inspections or audits) | Record kept / storage location |
|--|---|--|---|---|
| | | 9.1 All site personnel are familiar with location of spill response kits, requirement to use secondary containment and how to raise an alarm for emergencies. | 9.1.1 All site personnel have completed HSE inductions in accordance with the HSE induction procedure (CDN/ID 3675129) which includes site familiarization of location of spill response kits, requirement to use secondary containment and raising alarms for emergencies. | Training and induction registers are located within document management system including: <ul style="list-style-type: none"> Employee training and induction records - Beharra Springs Workforce Capability Matrix (ID 11043657) Contractor/visitor induction records – Induction register (ID 10844260) Site Familiarisation Register (ID 10988236) Completion records/evidence is scanned and held on a secure network drive and hard copy records are filed on site |
| | | 9.2 Personnel responsible for responding to an incident/emergency are trained and competent in accordance with the site emergency response plan (CDN/ID 3677589) and oil spill contingency plan (CDN/ID 12707383). | 9.2.1 Site superintendent is trained and competent to fulfil site emergency response team leader role. 9.2.2 All site personnel have completed emergency response plan awareness training in accordance with the site Emergency Response Plan (CDN/ID 3677589). | |
| | | 9.3 Site emergency response team complete two environment based emergency response activities each year in accordance with emergency response planning procedure (CDN/ID 14749814). | 9.3.1 Emergency response activity reports show at least two emergency response activities completed were environment based each year. | Emergency response activity reports are stored within document management system |
| | | 9.4 Incidents are managed in accordance with HSEMS standard 8 and are reported externally in accordance with the regulatory notification procedure (CDN/ID 3852562). | 9.4.1 Incident records in incident management system show details recorded and actions assigned. 9.4.2 Monthly recordable incident reports submitted to regulator. 9.4.3 Reportable incidents are notified to regulator as soon as practicable but no later than two hours of incident occurring or becoming aware of the incident. | Incidents reports within incident management system. Regulatory notifications located within document management system. |
| Env25 Site activities will result in adverse impacts to existing suitability of soils/land use Env26 Site activities will result in adverse impact to existing suitability of groundwater use | EPO 10 Prevent harm to sensitive receptors and the environment from known groundwater and soil contamination at the gas production plant. | 10.1 Excavated contaminated soils/sand are stored in suitably lined containment areas. | 10.1.1 Evaporation pond 1 liner integrity independently validated annually. | Liner integrity report and associated completed workorder |
| | | 10.2 Evaporation pond 2 successfully commissioned and handover to operations. | 10.2.1 Evaporation pond 2 commissioning handover demonstrates liner has a permeability of greater than 1x10 ⁻⁹ m/s. | Commissioning and operations handover records located within document management system. |
| | | 10.3 No non-compliance with “Restriction on Use” conditions of the DWER Notice of a classification of a known or suspected contaminated site | 10.3.1 No new downstream groundwater extraction bores installed within gas production plant site. 10.3.2 No sensitive uses established at the gas production plant. 10.3.3 Six monthly water quality testing of groundwater extracted from existing Camp North and Camp South demonstrates quality is fit for purpose. | GPS location of new groundwater extraction bores located outside of restricted area Annual environmental report shows no new sensitive uses established on site Groundwater quality monitoring results and completed workorder within CMMS |
| | | 10.4 Quarterly groundwater monitoring is undertaken in accordance with the Environmental Licence (L8385/2009) and the approved GMP. | 10.4.1 Annual environmental report submitted to regulator demonstrates compliance with groundwater monitoring conditions within the Environmental Licence (L8385/2009) and approved GMP. | Quarterly groundwater monitoring results located within document management system Annual groundwater monitoring report located within document management system |
| | | 10.5 Options analysis for evaporation pond 1 remediation / long term strategy completed by 31 December 2018 | 10.5.1 Report findings and selected option for long term strategy/remediation of evaporation pond 1 completed by 31 December 2018. | Options analysis report submitted to DWER / DMIRS |

7. Implementation Strategy

7.1 Health, Safety and Environment Management System

The Lattice Energy companywide Health, Safety Environment Management System (HSEMS) and is comprised of three tiers of documentation as follows:

- **HSE Policy** - defines the strategic objectives for the effective control of and continuing improvement to health, safety, and environmental issues throughout operations
- **HSE Management Standards** – 20 standards which interpret support and detail the intent and performance requirements of the HSE Policy and form the basis for development and application of HSE Plans within the organisation
- **HSE Directives** - detail minimum requirements, the responsibilities and the business guidance that is needed to implement the HSE Policy and HSE Management Standards. A Directive document is either implemented as the guiding document or (where further information about the implementation process is required at a Divisional or Business level) a procedure is developed to detail application of the Directive.

A HSEMS manual (CDN/ID 3974195) has been developed that links these tiers of documentation and site specific procedures that are in place to manage potential impacts and risks for the facility to ALARP. A copy of the HSEMS manual is provided in Appendix A.

References to the specific components of the HSEMS and site specific procedures are included throughout the ALARP and acceptability assessments in section 5, the environmental performance standards provided in section 6 and implementation strategy of this EP.

Specific components of the HSEMS relevant to the environmental management of identified potential impacts and risk events include:

- Standard 18 Environmental Effects and Management (refer section 4.18 of Appendix A)
- Standard 19 Product Stewardship, Conservation and Waste Management (refer section 4.19 of Appendix A)

7.2 Health, Safety and Environment Policy

The Health & Safety and Environmental (HSE) Policy is provided in Appendix A of the HSE Manual and defines the way in which the Company conducts its business 'that causes no unforeseen impacts to the environment'. The Policy provides for understanding and managing risk, and continuous learning. The Policy is approved by the Board and signed by the Lattice Energy CEO.

7.3 Roles and Responsibilities

Section 4.2 of the HSEMS manual identifies the organisational structure, including the roles and responsibilities for personnel, in place for the implementation, management and review of the EP.

Roles and responsibilities are based on the organisational positions and are described in Table 4.1 of the HSEMS manual. The descriptions include where relevant:

- References to specific tasks, systems, practices and procedures assigned to each role
- Authority given to each role for environmental management tasks
- The resources assigned or where not assigned the responsibility for assigning resources

7.4 Training and Competency

Training and competency requirements are mandated through HSEMS standard 5 Personnel, Competence, Training and Behaviour with section 4.5 of the HSEMS manual describing:

- the induction and training programs in place (refer section 4.5.2 and section 4.5.4 of the HSEMS manual),
- a summary of their content and how these relate to the responsibilities of personnel (refer to section 4.5.1 and Table 4.1 of the HSEMS manual)

- assessment, review, tracking and recording of training and competency for personnel (refer to section 4.5.1 and section 4.5.3 of the HSEMS manual).

The Chief Operating Officer has the overall responsibility for ensuring systems are in place to define requirements for personnel (including contractor) HSE competencies to carry out their work.

7.5 Monitoring, Auditing, Management of Non Conformance and Review

7.5.1 Monitoring

This section describes the key monitoring and inspections undertaken at the facility to ensure effective environmental management and early detection of any detrimental impacts to environmental values.

- Groundwater monitoring of twenty bores located at the Facility, in accordance with the Environmental Licence L8385/2009 and the Groundwater Licence GWL155141 issued by DWER;
- Rehabilitation monitoring of disturbed areas in accordance with relevant clearing permits; and
- Area based routine inspections (Self Area Management – SAM - checklists).

Table 7-1 summarises the design, location, parameters, frequency, and methodology for each of the ongoing programs. It should be noted that the groundwater monitoring program is currently being rationalised based on the results of the soil and groundwater investigation (Senversa 2017). The revised program will be prepared by a suitably qualified consultant and will meet the *Guideline for Groundwater Monitoring in the Onshore Petroleum and Geothermal Industry* (DMP 2016). Development of the groundwater monitoring program will be undertaken in consultation with key regulatory stakeholder including DMIRS and DWER.

Table 7-1: Summary of Beharra Springs Gas Facility Environmental Monitoring and Inspection Programs

| Monitoring Program | Program Design | Monitoring Location/s | Parameters | Frequency | Training, competency and methodology | Reporting |
|--|--|---|--|---|--|---|
| Groundwater Monitoring Program | Currently being undertaken in accordance with the approved DSI methodology. Rationalised groundwater monitoring program is being prepared (expected completion date is Q1 2018) to meet the requirements (where applicable) of: <ul style="list-style-type: none"> Environmental Licence (L8385/2009) AS5667 (1998): Water quality – Sampling Guideline for Groundwater Monitoring in the Onshore Petroleum and Geothermal Industry (DMP 2016) | GW1 to GW20 | Total dissolved solids (mg/L) Total petroleum hydrocarbons (mg/L) Standing water level (mAHD) pH (pH units) | Quarterly | Sampling to be completed by a suitably qualified and competent person. Analysis of samples to be completed by a current NATA accredited laboratory in accordance with current "Standard Methods for Examination of Water and Wastewater – APHA-AWWA-WEF". | Results to be provided to DMIRS and DWER annually. |
| Groundwater Extraction | Volume extracted is via calibrated meters. Quality is sampled and analysed in accordance with the Beharra Springs Potable Water Sampling procedure (CDN/ID 3677655). | Camp North 1 and Camp South 1 groundwater bores | Cumulative extraction volume (L) E.coli, Total coliforms, hydrocarbons, pesticides | Volume – daily Quality – 6 monthly | | DWER annually. |
| Rehabilitation and Revegetation Monitoring Program | Rehabilitation and Revegetation Completion Criteria Checklist (WA) OEUP-W1000-FRM-ENV-001 | All operational areas that have not undergone full rehabilitation (refer Table 3-4) | Landform ErosionWeeds Pests and diseases Ground cover/vegetation | Annually | Visual inspection and photographs at established photographic reference points to be completed by operator. | Results to be provided to DMIRS in accordance with clearing permit. |

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| Monitoring Program | Program Design | Monitoring Location/s | Parameters | Frequency | Training, competency and methodology | Reporting |
|--|---|--|--|--|---|--|
| | | | establishment, Waste | | | |
| Emissions and discharges | Emissions and discharges in accordance with Table 3-5. | Operational areas as relevant | Products of combustion Fugitive emissions Waste generation | At least quarterly | Site operations site trained in accordance with the Beharra Springs Training and Capability Matrix. | Results to be provide to DMIRS through the quarterly emissions report (refer to section 7.8.3). |
| Routine Site Environmental Inspections | <ul style="list-style-type: none"> Operator lead visual inspections, including: Annual rehabilitation inspections (weeds, erosion and rehabilitation success) Annual firebreak inspections Quarterly SAMS inspections for hazardous materials, chemicals, hydrocarbons and fuel storage areas and bunds, septic system, waste storage, evaporation ponds Six monthly flowline and sales gas pipeline right of way inspections (threats to pipeline integrity) Groundwater extraction meter reads | Inspections are undertaken for Facility areas being: Gas production plant Well Sites Flowlines and pipeline Site access roads, and amenities | House keeping Spills and leaks Spill kits Waste management Weed identification Security/threats to integrity of plant and equipment Hazardous materials, chemicals and dangerous goods storage Firebreak maintenance Presence of trapped fauna | As described under the program design column | Site operations site trained in accordance with the Beharra Springs Training and Capability Matrix | All items requiring action are either raised as a workorder within CMMS or if they are an incident, hazard or non-compliance with this EP are reported and recorded in the incident management system. . |
| 6 monthly review of overdue workorders | Workorders that relate to an environmental performance standard/measurement criteria are identified in section 6 of this EP. | CMMS reports | Overdue environment flagged workorders | 6 monthly review | NA | 6 monthly internal reporting; Annual summary report to DMIRS. |

7.5.2 Auditing

Environmental performance will be reviewed in several ways in line with HSEMS Standard 20 (Audits, assessment and review). These reviews are undertaken to ensure that:

- Environmental performance standards to achieve the environmental performance objectives are being implemented, reviewed and where necessary amended.
- Potential non-compliances and opportunities for continuous improvement are identified
- All environmental monitoring requirements have been met.

An annual HSE audit to determine compliance of the facility against the HSEMS and an annual review against the EP's environmental performance objectives, standards and measurement criteria will be undertaken. The annual HSE audit process and scope are provided within the Assurance Plan – Lattice Energy Assets (CDN/ID 3675079). The results of this audit and the EP review will form part of the annual environmental report submitted to the DMIRS (refer Section 7.8).

7.5.3 Management of Non-Conformance

Any non-compliance with the environmental performance objective and standards outlined in this EP will be subject to follow-up action/s will be assigned as appropriate.

The findings and recommendations of inspections and audits will be documented and distributed to relevant personnel for comments. Any opportunities for improvement or non-conformances noted will be communicated to the personnel at the time of the audit to ensure adequate time to implement corrective actions.

Tracking of non-conformances and audit actions will be undertaken using the incident management system.

Where required, non-conformances are communicated to site personnel during daily toolbox meetings before each shift. Lattice will carry forward any non-conformances identified for consideration in future activities to assist with continuous improvement in environmental management controls and performance objectives.

All personnel have the authority to stop work at any time. Operations will be suspended if there is a non-conformance that increases the risk of significant negative impacts to the environment and the Operations Manager (or other authorised person) is not satisfied that measures are in place to avoid a repeat of the incident. Operations may also be stopped where there is a legitimate risk of a HSE incident or a breach of the EP or legislative commitments occurring because of site practices or conditions.

7.5.4 Review

7.5.4.1 Ongoing Risk Management

An impact and risk assessment was completed for this revision of the EP and is documented in Section 5. Risk registers are reviewed in accordance with the Risk Management Plan. Certain changes to the impact and risk profile will require a revised EP to be submitted to the Regulators.

A new impact or risk is one that has not been assessed in Section 5 or included in the current risk register (refer Appendix C). An increased impact or risk is one with greater extent, severity, duration or uncertainty than is detailed in Section 5. When determining what constitutes a 'significant' change, from the impacts and risks detailed in Section 5 the following matters will be considered:

- Comparisons to the acceptable levels of impact and risk defined in this EP and the assumptions made when establishing the acceptable levels
- Current legislative requirements relevant to the activity or environmental feature being considered
- Changes that may have occurred to the environment affected by the activity.

A change in the activities, knowledge, or requirements applicable to operations are considered to result in a significant new or significant increased impact or risk if any of the following criteria apply:

- The change results in the identification of a new impact or risk and the assessed level of risk is not Low (Lattice Risk Matrix), acceptable and ALARP.
- The change results in an increase to the assessed level of risk for an existing impact or risk described in Section 5

- There is both scientific uncertainty and the potential for significant or irreversible environmental damage associated with the change.

Specific processes and systems that are in place to monitor existing HSE impacts and risks and control effectiveness, and to identify new HSE impacts and risks, include the following:

- Daily review of new HSE observations and incidents by the Operations team at the morning tool box and production meeting.
- Daily review of HSE notices and safety alerts by the Operations team at the morning tool box and production meeting.
- Monthly shift crew HSE meetings, which includes review of the monthly HSE performance dashboard.
- Implementation of Level 1 and Level 2 Assurance Plans.
- Asset risk register reviews conducted in accordance with the Risk Management Plan, which requires annual review of all Low and Medium risks.
- Annual environmental performance reporting, investigation of any non-compliances and raising of corrective actions.
- Review of internal and external audit reports and raising of corrective actions to address audit findings.
- Management of change process.

In addition to the above, a key forum for the review of HSE performance is the monthly Operations HSE meeting. The standing agenda includes review of a range of performance dashboards (HSE, Process Safety, MOC, and CCPS), HSE alerts and notices, as well as site HSE action plans. This forum enables identification of any trends and variances that may further reduce impacts and risks to ALARP across the Lattice Energy portfolio.

7.5.4.2 Revision and Approval of the EP

The Facility EP is a controlled document. Update of the EP will be in accordance with Lattice's document control procedures. All regulator accepted revisions of the EP and OSCP will be issued as a major revision.

The *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012* requires that a revision of the EP is submitted for approval:

- before the commencement of (Regulation 18(1)):
 - any new activity or
 - any significant modification of, significant change in, or significant new stage of, an existing activity that is not provided for in the EP
- before or as soon as practicable after (Regulation 18(2)):
 - a change in the instrument holder for, or operator of the activity or
 - the occurrence of any (or series of) new or significant increase in an existing environmental impact or risk.
- At the direction of the Minister (Regulation 19)
- At least 14 days before the end of each 5 year period (Regulation 20).

The most appropriate form for a revision (e.g. revised EP, bridging document or written notification) will be chosen based on consultation with key regulatory stakeholders (e.g. DMIRS) and DMIRS guidance.

7.5.4.3 Review of the EP

In addition to the minimum regulatory review period, the Operations Manager may determine that an internal review of the EP is necessary when one of the following occurs and the criteria for submission of a revised EP to the Regulators are not triggered (e.g. administrative changes). These reviews may occur due to:

- Changes to hazards and/or controls identified in the annual revision of the Environmental Risk Register.
- Revision of the OSCP results in changes that need to be reflected in the EP.
- Annual environmental performance reporting identifies issues in the EP that require review and/or updating.
- Implementation of corrective actions to address internal or external audit findings.
- An environmental incident and subsequent investigation identifies issues in the EP that require review and/or updating.
- A modification of the activity is proposed that is not significant but needs to be documented in the EP.
- Changes identified through the MOC process, such as hazards or controls, organisational changes affecting personnel in safety critical roles or HSE management systems.
- Changes to any of the legislation relevant to operations.
- Publication of any new relevant information or data that relates to any identified or potential impact and or risk relevant to the scope of the EP.

The HSE team provides advice to the Operations Manager on the material impact of the items listed above and whether or not a review of the EP should be undertaken. The scope of a review will be determined by the factors that trigger the review and an appropriate team will be selected by the Operations Manager to conduct the review. The team may consist of representatives from the Community, Engineering, HSE, Operations, or Supply Chain teams as required by the scope.

Where a revision to the EP is determined to not trigger a resubmission to the regulator, the changes will be recorded and the document updated to the next minor revision to reflect the amendment.

7.6 Record Keeping

Minimum storage and management requirements for record keeping are addressed by HSEMS Standard 4 Legal Requirements, Document Control and Information Management and are described in section 4.4 of the HSEMS manual. The HSEMS manual requires any record associated with the revision of this EP, reportable incidents and audit reports to be kept for a minimum of five years (either from the revision date or date the record is made).

In addition to these records, those associated with an environmental performance objective, standard or measurement criteria (as described in Section 6 of this EP) will also be maintained in the system referenced for at least 5 years.

7.7 Environmental Emergency Planning and Response

Section 4.14 of the HSEMS manual describes the emergency planning and response framework in place for Lattice. A site specific Emergency Response Plan (CDN/ID 3677589) (the site ERP) has been developed for the Beharra Spring Gas Facility. In the event of an environmental emergency, the response will follow the procedures set out in the site ERP.

In addition to the ERP, and in accordance with the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*, Lattice has developed and implemented the stand alone Oil Spill Contingency Plan (CDN/ID 12707383) (OSCP). The OSCP was approved by DMIRS on 29/09/2017.

Details on potential sources of onsite spills, environmental sensitivities and that may be affected by a spill and equipment and contacts available to respond to spills are described in the OSCP, with the following spill sources addressed:

- Rupture of condensate, diesel or methanol tanks in conjunction with bund failure
- Rupture of condensate, diesel or methanol road tanker
- Loss of control during condensate load out operations
- Loss of control during diesel or methanol load in operations
- Well blowout
- Flowline rupture

- Rupture or failure of evaporation pond/s.

A significant liquid hydrocarbon spill is defined as a release in excess of 500 L (outside of a containment structure) or where more than 100m² area is impacted outside of operational areas.

7.8 Reporting

This section outlines internal and external reporting to be undertaken by the Facility. All written reports to the DMIRS are to be copied to the following email address in addition to the relevant DMIRS officer.

- petroleum.environment@dmirs.wa.gov.au

7.8.1 Annual Reporting - DMIRS

An annual environmental report will be compiled and submitted to DMIRS by the 30 March of each year (AER – DMIRS). The AER - DMIRS will be prepared in accordance with Regulation 16 of the *Petroleum Pipelines (Environment) Regulations 2012* and the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*. The annual environmental report will include (but not necessarily limited to):

- Summary of activities conducted throughout the reporting period;
- Statement for each environmental performance objective and environmental performance standard included in the EP describing whether the objective or standard has been met;
- For any objective or standard that has not been met, the annual report should describe actions taken/planned to ensure the objective or standard is met in a timely manner;
- Summary and outcomes of audits of environmental performance;
- Summary of environmental incidents (including unplanned emissions and discharges) that occurred during the reporting period;
- Planned emissions and discharges and strategies for continuously reducing the impacts of planned emission and discharges to as low as practical (ALARP);
- Environmental and rehabilitation monitoring results and review;
- Risk assessment review with resultant risks to be included in the annual report identifying new or increased risks and status of accepted or planned EP revisions;
- Summary of training and competencies provided, refreshed or upgraded during the reporting period;
- Summary of emergency response exercises undertaken on site during the reporting period; and
- Summary of consultations conducted throughout the reporting period.

7.8.2 Annual Reporting – DWER

An annual environmental report will be compiled and submitted to DWER by 31 January of each year (AER – DWER). The AER – DWER will be prepared in accordance with environmental licence condition 4.2.1 and will include (where relevant) for the reporting period:

- A summary of any failure of malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken
- Monthly consumption of chemical treatment agents added
- Produced water disposal volumes
- Summary of point source to air monitoring
- Summary of ambient groundwater monitoring
- Annual audit compliance report indicating the extent of compliance with the environmental licence
- Summary of complaints received.

In addition, an annual water monitoring report is prepared to satisfy the condition 7 of the Groundwater Licence (GWL155141) and submitted to DWER as appropriate.

7.8.3 Quarterly Emissions Reporting

Section 34 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* requires that the operator of an activity must monitor all emissions and discharges to any land, air, groundwater, subsurface or inland waters environment. The operator must submit to DMIRS a written report of emissions and discharges three months after the approval of an EP and a period of every three months thereafter.

As per these requirements, Lattice will submit to the DMIRS, quarterly, a written report of emissions and discharges. Emissions and discharges will be measured in accordance with the methodology presented in Table 3-5.

7.8.4 Incidents

HSEMS Standard 8 – Incident Management is described in section 4.8 of the HSEMS manual which describes the systems and procedures for managing, recording and investigating incidents (section 4.8.1 and section 4.8.2 of the HSEMS manual)

Triggers for external reporting of incidents specific to the facility are described in section 7.8.4.1 and section 7.8.4.2 below. These triggers are also included in Lattice's procedure (Regulatory Notification CDN/ID 13852562) which provides detailed guidance on the triggers for and responsibilities of reporting incidents externally.

7.8.4.1 Recordable Incidents

Section 4 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012* defines a recordable incident as an incident arising from an activity that 'breaches an environmental performance objective or environmental performance standard in the Environment Plan' and 'is not a reportable incident'. Section 30 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012* requires the operator of an activity to submit a written report to DMIRS of all recordable incidents occurring within a calendar month no later than 15 days after the end of that calendar month.

Section 30(5) requires that, 'if no recordable incidents occurred during the month, a report is provided to DMIRS which includes a statement to that effect'.

Recordable incidents include:

- For loss of containment events, those which result in:
 - Spills of hydrocarbons or hazardous materials more than 50L and up to 500L outside of a containment structure or released either directly or indirectly to the environment
 - Spills of hydrocarbons or hazardous materials that affect a ground surface area of more than 10m² and up to 100 m² outside of operational areas (i.e. land impacted outside of the fenced gas production plant or well site)
 - An unplanned gaseous release to atmosphere of more than 50m³ and up to 500m³ or more.
- Introduction and/or spread of weeds.
- Any new groundwater/land contamination or increased levels of known contamination because of operational activities.
- Any death of fauna because of operational activities.

7.8.4.2 Reportable Incidents

Section 4 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012* defines a reportable incident as 'an incident that is classified as a reportable incident under the Environment Plan' and 'an incident arising from the activity if the incident has caused, or has the potential to cause, an adverse environmental impact; and under the environmental risk assessment process described in the Environment Plan for the activity, that the environmental impacts is categorised as moderate or more serious than moderate.' Although it is important to note that based on the risk matrix that a 'moderate' impact as defined under section 4 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012* is the equivalent to an impact of 'serious' or more.

Under section 28 of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012*, Lattice must notify DMIRS as soon

as practicable, and in any case, not later than **two hours of the incident occurring or within two hours of becoming aware of the reportable incident**. Reportable incidents should be reported to DMIRS via email petroleum.environment@dmirs.wa.gov.au.

A written report must be submitted as soon as practicable, and in any case, not later than three days after the initial incident or when the operator became aware of the incident.

Environmental incident/spill reporting will be in accordance with regulatory guidelines and the process for reporting environmental incidents/spills to DMIRS will be displayed in the Facility site office.

The following incidents have been identified as reportable incidents for the Facility:

- Loss of containment of hydrocarbon at wellsite
- Loss of containment of hydrocarbon from flowline or sales gas pipeline
- Loss of containment of hydrocarbon within gas production plant
- Loss of containment of methanol
- Loss of containment of condensate
- Loss of containment of hazardous materials / waste
- Loss of containment from operational evaporation pond/s
- Loss of containment from flexible hoses
- Annual groundwater extraction in excess of licensed limit
- Bushfire initiated by site activities
- Unauthorised earthworks destroy rare or threatened flora/fauna or cultural heritage sites.

For loss of containment events, reportable incidents are those which result in:

- Spills of hydrocarbons or hazardous materials in excess of 500L outside of a containment structure or released either directly or indirectly to the environment
- Spills of hydrocarbons or hazardous materials that affect a ground surface area of greater than 100 m² outside of operational areas (i.e. land impacted outside of the fenced gas production plant or well site)
- An unplanned gaseous release to atmosphere of 500m³ or more.

7.9 Stakeholder Engagement and Consultation

7.9.1 Objectives of Stakeholder Engagement

Minimising and mitigating the potential impacts associated with the Facility is assisted by the engagement of key stakeholders (including relevant authorities, interested persons and organisations) to ensure all issues are identified and addressed. Consultation has been undertaken with the relevant stakeholders to address the relevant issues and implement the required management measures.

Key stakeholders identified for the facility are based on the long operational history of the facility and are summarised in section 7.9.2.

7.9.2 Identified Stakeholders

Key stakeholders for the facility and the types of consultation undertaken are summarised in Table 7-2 below. Given the remote nature of the facility and the surrounding land is typically unallocated crown land and reserves, the identified stakeholders tenure consists of key regulatory authorities, and operational companies within the area that are either directly impact by operations or required to support operational activities.

Table 7-2: Identified stakeholders for the facility

| Stakeholder | Location | Contact type |
|----------------|--------------------------------|---|
| Tronox | Coolgaroo Mine – Brand Highway | Regular discussions regarding access and activity on tenure |
| Asco Transport | Pye Road | Contact with site and used as a transport contractor |

| Stakeholder | Location | Contact type |
|---------------------|----------------------------|--|
| Patience Sand | Pye Road | Contact as necessary |
| AWE | Pye Road and Brand Highway | Regular discussions regarding process and activity on tenure – JV partner |
| Cyclone Energy | Brand Highway | Site updates |
| DMIRS - Safety | Perth | Scheduled meetings/Reporting |
| DMIRS - Environment | Perth | Site updates/Reporting |
| DMIRS - Tenures | Perth | Licence updates |
| DER | Perth | Site updates/Reporting |
| DOW | Geraldton | Site updates/Reporting |
| Shire of Irwin | Dongara | Site updates/Reporting |
| FESA | Dongara | Site updates |
| Crown | Perth | Site lease agreement and associated operational issues associated with the gas production plant. |

A summary of the consultation held with key stakeholders is summarised in Table 7-3, along with issues raised and any actions undertaken to address raised issues.

Table 7-3: Summary of Consultation with Regulatory Authorities

| DMIRS and DWER | |
|---|---------------------------|
| Consultation between Balaji Bindinganavilé (Origin), Kelly Hill (Origin), Chris Zadow (DMP), Zoe Jones (DMP) and Lisa Huitema (DMP) regarding submission, review and acceptance of the 2009 Beharra Springs Gas Facility EP. | January 2007 - March 2009 |
| Chris Zadow (DMP) provided substantial comment on the Draft Beharra Springs | May 2007 |
| Kelly Hill (Origin) contacted Danielle Eyre (DEC) to obtain approval to discharge drilling fluid from the Freshwater Point 1 drilling sump into the Beharra Springs evaporation pond. | June 2008 |
| Kelly Hill (Origin) and DEC attended a meeting to discuss their preference for consultation in relation to new approvals. In particular, the proposed drilling programme for Beharra Springs Deep 1, Beharra Springs West and Dugite was discussed. | June 2008 |
| Kristy Presley (Origin) contacted Michael Gartrell (DEC) and advised of the progress for development of the Operations and 2009 Drilling Program EMPs. | March 2009 |
| Discussion between Balaji Bindinganavile (Origin), Tom Hatfield (Origin) Lisa Huitema (DMP), Zoe Jones (DMP) and Grant O'Donoghue (DMP) to discuss EP and clearing permit requirements for the Redback South 1 flowline. | October 2009 |
| Phone call between Balaji Bindinganavile (Origin), Tom Hatfield (Origin) and Lisa Huitema (DMP) to discuss environmental approval requirements for the 2010 Drilling Program. Meeting between Dean Powell (Origin), Julia Grewar (Origin), Mark Stevens (DMP), Stephen Collyer (DMP) and Steve Walsh (DMP) to discuss the Beharra Springs 2010 Drilling Program. DMP staff concluded that the 2010 Drilling Program was primarily an exploration program. Phone call between Tom Hatfield and Chris Heary (DMP – Vegetation) to discuss clearing permits/exemptions given that the drilling program had been deemed to be primarily exploration by the DMP. | January 2010 |
| Correspondence between Amelia Badri (Origin) and Lisa Huitema (DMP) to discuss updates of the Jingemina OEMP. | March 2013 to August 2013 |
| Discussion between Tom Hatfield (Origin) and Lisa Huitema (DMP) on submission dates for the revised EP. | August 2013 |

| DMIRS and DWER | |
|---|-------------------------|
| Discussion between Tom Hatfield (Origin) and Lisa Huitema (DMP) regarding environmental objectives, performance standards and criteria. | November 2013 |
| Email from Lisa Huitema (DMP) to Angela Greenwood (Origin) regarding environmental commitments and well abandonment. | December 2013 |
| Submission of Annual Environmental Reports (AERs). | January 2014 |
| Update of commitment list | March 2014 |
| Submission of Annual Environmental Reports (AER's) for Beharra Springs Gas production facility | January 2015 |
| Beharra Springs annual report updated draft email sent from Origin to DMP | May 2015 |
| Licence renewal letter from DMP to Origin | June 2015 |
| Beharra Springs annual report email sent from DMP to Origin | June 2015 |
| Phone calls / Emails from Origin to DMP in regards to Clearing permit application CPS 6643/1 for Beharra Springs | August 2015 |
| Email / Letter from DMP to Origin (via APA Group) regarding acceptance of PL39 Cockburn Cement Lateral Safety Case | October 2015 |
| Letter (via email) to DMP from Origin in respect to a clearing permit breach (under CPS 6643/1) at Beharra Springs Facility | October 2015 |
| Email communication and Inspection Brief from DMP to Origin for Jingemina and Beharra Inspection Planning (16 th -17 th November 2015) | October / November 2015 |
| Report sent to DMP (Petroleum monthly status report form) | November 2015 |
| Email from DMP to Origin regarding Beharra Springs clearing permit decision report | November 2015 |
| Email from DER to Origin requesting feedback on draft guidance statement | December 2015 |
| Inspection closeout letter emailed from DMP to Origin for Beharra Springs and Jingemina | December 2015 |
| Email confirmation from DMP to Origin of receipt of monthly recordable incident reports for Beharra Springs and Jingemina | December 2015 |
| DMP – submission/review and acceptance shutdown bridging EP | September 2016 |
| DMP - submission/review and acceptance sampling bridging EP | September 2016 |
| DMP – Site inspection report received | October 2016 |
| DER/DMP meeting to review Beharra Evaporation Ponds contamination | October 2016 |
| Technical meeting to review contamination investigation requirements | October 2016 |
| Direction letter received to undertake contamination investigation | October 2016 |
| DMP – Response provided to provide evidence of flare area clearing | October 2016 |
| Origin provided update on options analysis process with selected option being replacement of evaporation pond 1 with dual lined evaporation pond 2, including leak detection. | July 2017 |
| Department of Water (DoW) | |
| Groundwater licence (GWL158764(4) issued which removed unnecessary monitoring and redundant conditions and term extended to 10 years). | August 2013 |

| DMIRS and DWER | |
|---|----------------|
| Presentation of 'Beharra Springs Briefing – Evaporation Ponds and Groundwater Monitoring' via telecon. | April 2016 |
| Groundwater licence (GWL154737(4) amendment application submission and renewal granted (November 2016). | April 2016 |
| Submission of the Annual Water Monitoring Report 2015 | May 2016 |
| K. Hunt (Origin) contacted M.Major (DoW) regarding work undertaken to DoW water bores along the Origin main access track into the Beharra Springs Gas Facility. | September 2016 |
| K. Hunt (Origin) contacted M. Major (DoW) regarding location and information associated with DoW monitoring bores within the vicinity of the Beharra Springs Gas Facility. | October 2016 |
| K.Hunt (Origin) contacted M.Major (DoW) regarding changes made to description of activities associated with Revision 5.0 of this EP. Copy of Revision 5.0 provided to DoW for information. | November 2016 |
| Clarification of pond design/construction guidelines – Letter. Consideration of DOW guidelines have been incorporated into design of evaporation pond 2 upgrade. | August 2017 |
| Shire of Irwin (Chief Bushfire Control Officer) | |
| Peter Summers, the Chief Bushfire Control Officer at the Shire of Irwin was contacted by Kelly Hill (Origin) regarding the BS4 flowline construction project. Peter advised that fire management requirements during the prohibited and restricted season. | October 2007 |
| Origin (Kristy Presley) contacted Shire of Irwin (Peter Summers) and advised that potential flaring operations may occur associated with drilling in May to July 2009. Peter advised that activity is being undertaken outside of fire break / permit season and therefore no specific requirements. | April 2009 |
| Origin (Tom Hatfield) contacted Stephen Johnson, DFES District Manager, Geraldton, regarding hot work activities associated with the Redback South 1 flowline. The District Manager advised that, as welding work is to be undertaken outside of the burning prohibited season (i.e. 1 December to 31 January), an exemption from DFES is not likely to be necessary. | November 2009 |
| Peter Summers, the Chief Bushfire Control Officer at the Shire of Irwin contacted by Operations Manager to review and clarify clearing requirements | October 2016 |
| Email received from Peter Summers, the Chief Bushfire Control Officer at the Shire of Irwin to articulate clearing areas | October 2016 |
| Darren Cole, Shire of Irwin contacted to discuss bushfire risk assessment. | October 2016 |

7.9.3 Indigenous Groups

Correspondence with Indigenous Parties to date has not revealed any comments or issues of concern in respect to the Facility. Lattice will continue to liaise with the Native Title Applicants in respect to operation of the Facility as appropriate.

7.9.4 Ongoing Consultation

Lattice will continue to engage with identified key stakeholders throughout the operational life of the Facility, particularly in relation to construction projects (including but not necessarily limited to drilling new production wells; installation of new flowlines; well workovers etc). A summary of all ongoing consultation that is undertaken with respect of the facility is summarised and provided to DMIRS in the

annual environmental report, along with any complaints received from third parties with respect to operational activities.

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9. Document Information and History

PROCESS OWNER

| Position | Name |
|-------------------------|---------------|
| Operations Manager - WA | Scott Cornish |

DOCUMENT APPROVAL REQUIREMENTS

| Phone Number amendments | All other amendments |
|-------------------------|-------------------------|
| Site Superintendent | Operations Manager – WA |

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| Principal Environmental Advisor | Mack Dreyer |
| Manager, Native Title and Cultural Heritage | Damien Morrissey |
| Senior Tenures Advisor | Alison Araos |
| Environmental Advisor | Amanda Lambert |

DOCUMENT HISTORY

| Rev | Date | Detailed Changes made in Document | Prepared | Checked | Approved |
|-----|------------|--|----------|---------|----------|
| 0.1 | 30/04/08 | Draft Operations EMP issued for internal comment | KLP | - | KH |
| 0.2 | 09/10/2008 | Draft Operations EMP issued for final internal comment | KLP | - | BB |
| 1.0 | 13/10/2008 | Final Operations EMP issued to DoIR | KLP | BB | KA |
| 2.0 | 18/03/2009 | Operations EMP amended to include DMP comments dated 25-Feb-09 | KLP | BB | KA |
| 3.0 | 29/08/2013 | Operations EMP update | TH | RM/JB | MC |
| 3.1 | 29/11/2013 | Update to address DMP comments on Rev 3.0 | TH | RM/JB | MC |
| 3.2 | 30/01/2014 | Updates to address DMP comments on Rev 3.1 | AG | BM | MC |
| 3.3 | 30/03/2014 | Update Commitment List | AG | BM | SC |
| 3.4 | 24/02/2015 | Minor change to section 7.7.3.2 | AG | TH | GR |

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|-----|------------|---|-----|------------|----|
| 4.0 | 29/02/2016 | Update following DMP inspection letter dated 9/12/2015 | KH | SC | GR |
| 5.0 | 31/10/2016 | Draft – Issued for DMP approval | KLP | KH, MD, KK | SC |
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Appendix A HSEMS Manual

HEALTH, SAFETY AND ENVIRONMENT MANAGEMENT SYSTEM MANUAL

Review record

| Rev | Date | Reason for issue | Reviewer/s | Consolidator | Approver |
|-----|------------|---|-----------------------|--------------|----------|
| 4 | 12/01/2017 | Updated for Integrated Gas, new CCPS program, expanded integrity management plans and Integrated Gas Group Emergency Response Issued for Use | - | - | KG |
| 5 | 01/11/2017 | Update of HSE Policy in appendix as per new Managing Director Upgrade to business unit level document. Addition of specific NZ and WA facilities related content from Part 3 of Safety Cases. No change to VIC facilities related content. Rebranding to Lattice Energy Issued for use | JS, ST, EG, RK, CL | ST, CL | SC |

Review due: 01/11/2019
Review frequency: 2 year/s

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THE THREE WHATS

What can go wrong?

What could cause it to go wrong?

What can I do to prevent it?

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1. Definitions/Acronyms

| Abbreviation | Definition/Expansion |
|--------------|--|
| Accident | Any occurrence directly associated with Lattice Energy operations, products or services which results in harm to people, to the environment or to property. |
| AEE | Assessment of Environmental Effects |
| ALARP | As Low As Reasonably Practicable |
| APGA | Australian Pipelines and Gas Association |
| API | American Petroleum Institute |
| AS | Australian Standard |
| AS 2885 | Australian Standard 2885 Pipelines – Gas and Liquid Petroleum |
| AUS | Australia |
| BTEX | Benzene, Toluene, Ethyl benzene, Xylene |
| BOD | Basis of Design |
| BOSIET | Basic Offshore Induction and Emergency Training |
| C1 | Engineering and Design Assurance Certificate |
| C2 | Mechanical Completion Certificate |
| C3 | Ready for Commissioning Certificate (RFCC) |
| C4 | Pre-Start Review (PSSR) Certificate |
| C5 | Performance Check and Provisional Acceptance Certificate |
| C6 | Project Close Out Certificate |
| CCPS | Critical Control Performance Standards |
| CCR | Central Control Room |
| CEO | Chief Executive Officer |
| CFA | Country Fire Authority |
| CFT | Critical Function Testing |
| CM | Corrective Maintenance |
| CMT | Crisis Management Team |
| CMMS | Computerised Maintenance Management System |
| Company | Lattice Energy Limited |
| Competence | A combination of attributes such as knowledge, skills, abilities, experience and attitudes that determine the manner by which a person would perform their duties. |
| COO | Chief Operating Officer |
| COP | Critical Operating Procedure |
| CS | Critical Procedure - System |
| DS | Detection System (in CCPS) |
| Dwg | Drawing |
| DWG | Designated Work Group |
| EAP | Employee Assistance Program |
| EERA | Escape, Evacuation and Rescue Analysis |

| Abbreviation | Definition/Expansion |
|----------------|--|
| EES | Environmental Effects Statement |
| EIMS | Enterprise Incident Management System |
| EIS | Environmental Impact Statement |
| EMP | Environmental Management Plan |
| EP | Environmental Plan |
| EPA | Environmental Protection Authority |
| EPBC Act | Environment Protection and Biodiversity Conservation Act |
| ER | Emergency Response (in CCPS) |
| ERP | Emergency Response Plan |
| ESSA | Emergency Systems Survivability Analysis |
| ESD | Emergency Shut Down |
| FAT | Factory Acceptance Test |
| FD | Facility Description |
| FEA | Fire and Explosion Analysis |
| FSA | Formal Safety Assessment |
| GERT | Group Emergency Response Team |
| Hazard | A situation that has the potential to cause harm to people, the environment, or property. |
| HAZID | Hazard Identification Study |
| HAZOP | Hazard and Operability Study |
| HLO | Helicopter Landing Officer |
| HSE | Health, Safety and Environment |
| HSEMS | Health, Safety and Environmental Management System |
| HSR | Health and Safety Representative |
| HUET | Helicopter Underwater Escape Training |
| IC | Incident Controller |
| Incident | An event that causes or could cause harm (illness, injury or damage) to persons, plant, material or the environment. Incidents include near miss, which are events that caused no harm or damage but had the potential to do so. |
| IPF | Instrumented Protective Function |
| JHA | Job Hazard Analysis |
| KPI | Key Performance Indicator |
| Lattice Energy | Lattice Energy Limited (the Company) |
| LMS | Learning Management System |
| LOPA | Layers of Protection Analysis |
| LPG | Liquefied Petroleum Gases |
| LTI | Lost Time Injury |
| MAE | Major Accident Event |

| Abbreviation | Definition/Expansion |
|-------------------------|--|
| Member of the workforce | In relation to a facility means an individual who does work at the facility: Whether as an employee of the operator of the facility or of another person; or Whether as a contractor of the operator or of another person. Also referred to as personnel |
| MI | Major Incident |
| MOC | Management of Change |
| MSDS | Material Safety Data Sheet |
| NFHA | Non-Flammable Hazard Assessment |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NORM | Naturally Occurring Radioactive Material |
| NZ | New Zealand |
| NZS | New Zealand Standard |
| OEMP | Operations and Environmental Management Plan |
| OHS | Occupational Health and Safety |
| P&ID | Piping and Instrumentation Drawing |
| PCBU | Person Conducting Business Undertaking |
| PCS | Process Control System |
| People | In the context of the HSE Management System documentation, this means Lattice Energy employees, contractors, sub-contractors, visitors, the public and any other person may be exposed to risk as a result of Lattice Energy operations. |
| PIC | Person in Charge |
| PIMP | Pipeline Integrity Management Plan |
| PM | Preventative Maintenance |
| PRD | Pressure Relief Device |
| PPE | Personal Protective Equipment |
| Practicable | The extent to which actions are technically feasible, in view of cost, current knowledge and best practices in existence and under operating circumstances of the time. |
| PS | Performance Standard |
| PSRR | Pre-Start Review (Certificate) |
| PSS | Production Shift Supervisor |
| PSV | Pressure Safety Valve |
| PTW | Permit to Work |
| QRA | Quantitative Risk Assessment |
| RFCC | Ready for Commissioning (Certificate) |
| RFDS | Royal Flying Doctor Service |
| Risk | The likelihood of harm (a consequence) occurring – a function of exposure to the risk event and the probability of it occurring. |
| QA/QC | Quality Assurance/ Quality Control |
| QHSE | Quality Health Safety and Environment |

| Abbreviation | Definition/Expansion |
|--------------|---|
| SA/ SAA | Southern Australia/ Southern Australia Assets (Victorian and Tasmanian) |
| SCE | Safety Critical Element |
| SCEq | Safety Critical Equipment |
| SERT | Site Emergency Response Team |
| Site ERP | Site Emergency Response Plan |
| SIF | Safety Instrumented Function |
| SIL | Safety Integrity Level |
| SIMOPS | Simultaneous Operations |
| SIS | Safety Instrumented System |
| SMP | Safety Management Plan |
| SMS | Safety Management System |
| SOP | Standard Operating Procedure |
| Spec | Specification |
| St | Standard |
| TFL | Tanker Loading Facility |
| VIC | Victoria |
| WA | Western Australia |
| WOMP | Well Operations Management Plan |
| WorkSafe | WorkSafe Victoria |

2. Purpose/Scope

This document describes the Health, Safety and Environmental (HSE) Management System (HSEMS) utilised across the Victorian, Western Australian and New Zealand facilities and has been updated to reflect the amalgamation of these assets. This document expands upon the Lattice Energy's HSE Management System [2] in which senior management and board roles and responsibilities are summarised, system architecture is explained and performance criteria for each element of the HSEMS is listed.

This HSEMS Manual addresses the offshore and onshore facilities including pipelines to and from these facilities and its purpose is to demonstrate compliance to and implementation of the HSE Management System, as well as compliance to relevant legislation that requires a documented safety management system.

As such, this document constitutes a common part – Health, Safety and Environment Management System Description - for the relevant Safety Cases, Safety Management Systems (SMSs), Safety Management Plans (SMPs) and Operations and Environmental Management Plans (OEMP/EMPs) prepared for the Lattice Energy facilities. Typically, the HSEMS is contained within Part 3 or Part 4 depending on the applicable regulations.

With specific regard to pipelines, this document details the elements of the Pipeline Management System (as required by Part 3 of Australian Standard 2885 Pipelines – Gas and Liquid Petroleum (AS 2885)) and describes the functions and relationships of these elements.

3. HSE Management System Structure

The Lattice Energy companywide HSEMS is depicted in Figure 3.1 and is comprised of three tiers of documentation as follows:

- **HSE Policy** [1] - defines the strategic objectives for the effective control of and continuing improvement to health, safety, and environmental issues throughout operations
- **HSE Management Standards** – 20 standards (as listed in Table 3.1) which interpret support and detail the intent and performance requirements of the HSE Policy and form the basis for development and application of HSE Plans within the organisation
- **HSE Directives** - detail minimum requirements, the responsibilities and the business guidance that is needed to implement the HSE Policy and HSE Management Standards. A Directive document is either implemented as the guiding document or (where further information about the implementation process is required at a Divisional or Business level) a procedure is developed to detail application of the Directive.

Table 3.1: HSEMS Management Standards

| NO | STANDARD | NO | STANDARD |
|----|---|----|--|
| 1 | Leadership and Commitment | 11 | Management of Change |
| 2 | Organisation, Accountability, Responsibility and Authority | 12 | Facilities Design, Construction, Commissioning and Decommissioning |
| 3 | Planning, Objectives and Targets | 13 | Contractors and Procurement |
| 4 | Legal Requirements, Document Control and Information Management | 14 | Crisis and Emergency Management |
| 5 | Personnel, Competence, Training and Behaviours | 15 | Plant and Equipment |
| 6 | Communication, Consultation and Community Involvement | 16 | Monitoring the Working Environment |
| 7 | Hazard and Risk Management | 17 | Health and Fitness for Work |
| 8 | Incident Management | 18 | Environmental Effects and Management |
| 9 | Performance Measurement and Reporting | 19 | Product Stewardship, Conservation and Waste Management |

| NO | STANDARD | NO | STANDARD |
|----|---------------------|----|--------------------------------|
| 10 | Operational Control | 20 | Audits, Assessments and Review |

3.1 Pipeline Management System Structure

For assets that are licensed onshore pipelines, Lattice Energy as Licensee is responsible for establishment and implementation of appropriate management systems in accordance with AS 2885. Table 3.2 shows the HSEMS Standard that addresses the criteria specified in AS 2885.3-2012.

Table 3.2: Relevant HSEMS Standard to AS 2885 Requirements

| | Pipeline Management System Elements | Relevant HSEMS Standard (St) |
|-----------------------------------|--|---|
| Management | Policy and commitment | St. 1 Leadership and Commitment |
| | Management structure/ Responsibilities, accountabilities and authorities | St. 2 Organisation, Accountability, Responsibility and Authority |
| | Training and competency | St. 5 Personnel, Competence, Training and Behaviours |
| | Resourcing | St. 15 Plant and Equipment St. 13 Contractors and Procurement |
| | Change management | St. 11 Management of Change |
| Risk management planning | Planning for normal/abnormal operations Emergency planning | St. 7 Hazard and Risk Management St. 14 Crisis and Emergency Management |
| Implementation | Operational arrangements | St. 10 Operational Control St. 12 Facilities Design, Construction, Commissioning and Decommissioning |
| | Site safety management | St. 10 Operational Control St. 16 Monitoring the Working Environment St. 17 Health and Fitness for Work |
| | Environmental management | St. 18 Environmental Effects and Management St. 19 Product Stewardship, Conservation and Waste Management |
| | Pipeline integrity management | St. 15 Plant and Equipment |
| | Emergency response | St. 14 Crisis and Emergency Management |
| | Records management | St. 4 Legal Requirements, Document Control and Information Management |
| Measurement and evaluation | Data acquisition and analysis | St. 16 Monitoring the Working Environment St. 3 Planning, Objectives and Targets |
| | Accident Incident investigation and reporting | St.8 Incident Management |
| | System audits including Corrective and preventative actions | St. 20 Audits, Assessments and Review St. 8 Incident Management |
| | HSE management review and improvement | St. 9 Performance Measurement and Reporting |

| | Pipeline Management System Elements | Relevant HSEMS Standard (St) |
|---------------------------------------|---|---|
| Consultation and communication | Consultation, communication and reporting | St. 6 Communication, Consultation and Community Involvement |

4. Implementation within Facilities

The following section outlines each of the 20 HSE Management Standards, and documents for each standard, how they apply to the Lattice Energy assets.

4.1 HSEMS Standard 1 – Leadership and Commitment

The Board and Executive Management establish the HSE Policy, set expectations and provide resources for successful implementation of the HSE Policy and HSE Management System including HSE Directives. These documents are the framework for Lattice Energy's commitment to effective:

- Occupational health and safety management
- Major hazards safety management
- Environmental management
- Pipeline integrity management.

4.1.1 HSE Policy

The Health & Safety and Environmental (HSE) Policy [1] defines the way in which the Company conducts its business and consequently is approved by the Board and signed by the Chief Executive Officer. The HSE Policy is subject to a formal periodic review. A copy of the Health & Safety and Environmental (HSE) Policy is provided as Appendix A.

Engagement and alignment of the workforce personnel with HSE policy is achieved by:

- Induction processes including new employee inductions and site inductions during which the requirements of the HSE Policy are outlined
- Displaying HSE policy at all sites; making the HSE policy accessible internally via the Intranet, and externally via internet, and including HSE policy within contracts with Contractors
- Revision and changes to the HSEMS are subject to Management of Change processes thereby promoting review by members of the workforce, and via authorisation signatory requirements such as– Health Safety Representatives (HSRs) (refer to Section 4.11 for MOC processes).

Refer:

[1] ORG-HSE-POL-001 HSE Policy

4.1.2 Leadership and Commitment

Leadership and commitment is demonstrated in many ways across all levels of the organisation. Examples of how leadership and commitment are demonstrated are as follows:

- Setting of annual HSE Improvement Plans and key performance targets
- Leadership Team HSE meeting in which members range from Chief Executive Officer (CEO), Chief Operating Officer (COO), HSE Manager and direct reports to discuss HSE issues
- HSE monthly meeting [3] in which members range from Operations, Integrity Engineering, and HSE who review the past month's performance, learnings from incidents and assurance activities and discuss other key HSE matters
- At site level, each site daily meeting commences with discussion of HSE issues.

All employees and contractors (members of the workforce) are expected to demonstrate commitment to HSE in all facets of their work and to comply with HSE procedures associated with this HSEMS.

Refer:

[3] HSE Meeting Agenda

4.1.3 HSE Awareness and Communication of Company Expectations

The induction process is a key mechanism for communication of Company expectations in relation to HSE performance. The site inductions also cover the major potential hazards associated with assets and the management of risks associated with these hazards. Companywide or divisional information such as HSE Alerts are also used for such communications. Regular HSE toolbox meetings are used for ongoing reinforcement of key information.

4.1.4 Encouraging HSE Accountability

Roles and responsibilities are defined with Section 4.2.3 where management of major hazards is an integral part of the management responsibilities at all levels of the organisation. Lattice Energy endorses the Life Saving Rules [4] that hold each individual accountable for HSE performance. These Life Saving Rules describe eleven mandatory rules that relate to the highest risk activities undertaken.

Refer

[4] Life Saving Rules

4.2 HSEMS Standard 2 – Organisation, Accountability, Responsibility and Authority

4.2.1 Organisation and Resources

The Chief Executive Officer of Lattice Energy has the ultimate responsibility for ensuring that Lattice Energy has the appropriate organisation in place to meet the commitments of the HSE Standards. The Chief Executive Officer, Chief Operating Officer, asset Operations Managers and the Engineering Manager have the responsibility and delegated authority to ensure that they provide the resources within their areas of operation to comply with this HSEMS and the applicable HSE Standards, and to comply with the other regulatory documents such as Safety Cases, Safety Management Systems, Safety Management Plans and Environmental Management Plans.

Responsibility for control of all activities is delegated from the Chief Operating Officer to the Operations Manager for each asset. The main safety management responsibilities of the Operations Manager for each asset are:

- Responsible person for all asset operational Safety Cases/SMS/SMPs/OEMPs/EMPs
- Approve deviations associated with these operational Safety Cases/SMS/SMPs/OEMPs/EMPs
- Ensuring that adequate resources are provided to manage the assets under their control, and the operation of those assets is compliant with all regulations.

The Facilities Manager and/or Operations Superintendent for each asset has the responsibility for ensuring that all work carried out is undertaken in accordance with all relevant procedures, systems and standards.

4.2.2 Organisation Structure

A clearly defined organisation structure, detailing lines of reporting and communication during operations is critical to the effective management of HSE. A complete set of organisational charts is available on the Intranet. Organisation charts are periodically reviewed and updated.

4.2.3 Roles and Responsibilities

HSE roles, responsibilities and authorities are outlined in individual position descriptions held by the Human Resources Department. The roles and responsibilities in the organisation in relation to HSE management are summarised in Table 4.1. The key roles and responsibilities for pipeline integrity management are summarised in Manning and Organisation section of the relevant Pipeline Safety Management Plan/Safety Case.

The Performance Management System is run on an annual cycle. This process helps to ensure that HSE roles, responsibilities and authorities are understood and complied with.

Table 4.1: Key HSE Management Roles and Responsibilities

| Role | Responsibility |
|--------------------------------|---|
| Chief Operating Officer | <ul style="list-style-type: none"> HSE performance of all activities across Lattice Energy Ensuring a system is in place for the ongoing identification and control of HSE risks Developing HSE Improvement Action Plan and ensuring all sites/activities have one Ensuring systems are in place to define requirements for personnel (including contractors) HSE competencies to carry out their work Ensuring managers and supervisors understand, accept and carry out their responsibilities in safety and health matters and that they are trained and instructed to undertake these responsibilities Ensuring processes are in place for interpreting and communicating relevant legislative requirements and industry standards and any changes thereto, and compliance with these obligations i.e. Annual Safety Report, Safety Case/Safety Management Plans, Environmental Management Plans where these documents exist due to regulatory requirements Monitor safety performance through review of lead and lag Key Performance Indicators (KPIs) and actions are taken to improve safety performance and correct any identified deficiencies. |
| HSE Manager | <ul style="list-style-type: none"> Providing technical support to the Chief Operating Officer and the Operations Managers for each asset on HSEMS and HSE issues Supporting development, revision and effective implementation of HSE procedures and tools necessary for efficient functioning of the HSEMS Supporting the identification and management of HSE risks across production operations Assisting to uniformly implement the HSEMS across Lattice Energy facilities Ensuring appropriate audits and other assurance activities for improving the effectiveness of the HSEMS. |
| Engineering Manager | <ul style="list-style-type: none"> Providing assurance that the onshore and offshore facilities have been designed and constructed to meet the requirements of the HSEMS performance standards Managing inspections, maintenance and testing programs for plant, equipment and associated control systems to ensure continued reporting Managing implementation, monitoring, periodic review and update of the relevant Asset Integrity Management Plans Ensuring systems are in-place to maintain plant and equipment operations strictly within their designed operating envelope Ensuring personnel inspecting, maintaining and testing equipment are competent to do so Maintaining systems to control the quality and suitability of maintenance consumables and replacement parts Maintaining systems to retain records of all scheduled programs for maintenance, inspection, testing and calibration of facilities, plant, equipment and machinery Ensuring all engineering and maintenance contracts are in accordance with the HSEMS performance standards Providing specifications, technical advice and recommendations on new plant and equipment to ensure HSEMS performance standards are met Ensuring appropriate HSE reviews are undertaken for any new equipment or any planned modifications or changes in the design or operation of existing plant and equipment Maintaining as built drawings and documentation of the facilities, plant and equipment. Implementation and verification of Critical Control Performance Standards (CCPS) within site Safety Cases/SMS/SMPs/OEMPs. |

| Role | Responsibility |
|--|---|
| Operations Manager for each asset | <ul style="list-style-type: none"> HSE performance of all activities across their asset Responsible Person/Person Conducting Business Undertaking (PCBU) for the development, implementation and compliance with the asset's Safety Cases/SMS/SMPs/OEMPs. Ensuring the Facilities Manager and Operations Superintendent has the required skills and can fulfil their duties as the "Accountable Person" for managing HSE performance at each site Ensuring that, for every site and activity in their area of responsibility: <ul style="list-style-type: none"> appropriate systems exist for monitoring existing and identifying new HSE risks key controls are identified appropriate risk treatment plans are implemented Ensuring there is a site level HSE Improvement Plan which is formally scheduled and reviewed for progress Ensuring that regional and site level emergency response plans are in place and regularly tested Implementing and ensuring compliance with systems which define the HSE competencies for personnel (including contractors) to carry out their work Ensuring that appropriate reporting, verification, authorisation and escalation processes are in place for the review and actioning of all incidents, defects, hazards, inadequacies of procedures Ensuring assurance activities are undertaken in accordance with performance standards for safety critical elements Maintaining relationship and reporting relevant requirements under the Safety Cases/Safety Management Systems/Safety Management Plans/Operations and Environmental Management Plans and HSE legislation. |
| Facilities Manager / Operations Superintendent for each asset | <ul style="list-style-type: none"> Day to day management of the asset in line with the Safety Case/SMS/SMP/OEMP/EMP and this HSEMS NZ - Compliance with all "Permitted Operations" as described in the Safety Case Performance Standards for each Safety Critical Element Ensuring appropriate and effective HSEMS procedures, work instructions and support documents exist for their site or activity Providing supervision and processes to ensure that the HSEMS is implemented correctly on site Ensuring compliance with all relevant procedures, systems and standards; Appointing competent personnel to manage day-to-day HSE matters and associated compliance risks Ensuring appropriate risk management is undertaken for their site or activity in accordance with relevant procedures Ensuring that appropriate reporting, verification, authorisation and escalation occurs within their area of responsibility for the review and actioning of all incidents, defects, hazards, inadequacies of procedures Ensuring that processes are implemented to ensure that all employees and contractors (members of the workforce) in their area of responsibility are appropriately inducted, hold the required competencies and licences to undertake their assigned work. |

| Role | Responsibility |
|--|---|
| Employees and Contractors (Members of the Workforce) | <ul style="list-style-type: none"> Carrying out work safely and without harm to themselves, others, equipment or the environment and in accordance with their training, operating procedures and work instructions described within the HSEMS Only complete tasks/activities that they have been instructed to do, and ensure they have the required competency and/or licence and experience to undertake the activity/task Identifying and assessing hazards/risks associated with their work and ensuring suitable controls are in place before and during completion of the work Enacting the Authority to Stop Work in the case of an immediate threat to the health or safety of any person Reporting any hazards, unsafe acts or incidents observed in the workplace or deficiencies observed in work practice or procedures to their Supervisor or Facilities Manager/Operations Superintendent Participating in training and development activities and competency reviews as and when required |
| Health and Safety Representatives (HSRs) role in regards to representing their Designated Work Group (DWG) Refer to Section 4.6.3 for further information | <ul style="list-style-type: none"> Work with management to identify and assess hazards/risks and provide feedback on proposed risk controls, and review of the effectiveness of implemented risk control measures in accordance with risk management plans Complete inspections of the workplace if requested by members of DWG or if requested to support inspection program Assist management to establish and maintain the Safety Case, including updating and maintaining currency of HSEMS and related procedures Discuss and advise feedback on proposed changes that may affect the health and safety of employees, to the workplace, the plant, substances or other things used at the workplace, the conduct of the work performed Speak up and act on occupational health and safety (OHS) issues, including investigation of any OHS concerns raised by DWG members Attend HSE committee meetings (or ensuring information is provided for the meeting), and completing any allocated actions Attempt to resolve with management any health and safety issue that could affect members of their DWG, prior to use of HSR powers such as issuing Provisional Improvement Notices or requesting regulator involvement Meet or accompany OHS regulators (if required) when on site With the consent of the DWG member, attend any interview concerning health and safety at work between that person and management or an OHS inspector HSR (or their nominated delegate); represent members of the workforce within their DWG Assume the Safety Role for being involved/consulted in identification of major incident hazards and possible major incidents/major accident events (MIs/MAEs) and the related Safety Assessments and in determining control measures The role for HSRs will be reviewed if there is a change of circumstances, including a modification to the facility, which would require additional or different knowledge and skills on the part of the employees to perform the HSR role. |

| Role | Responsibility |
|---|---|
| Health and Safety Representatives (HSRs) role in regards to a person selected as a safety and health representative for a designated work group under Schedule 1 clause 23 of the Petroleum Pipelines (Occupational Safety and Health) Regulations 2010 | <ul style="list-style-type: none"> • Work with management to identify and assess hazards/risks and provide feedback on proposed risk controls, and review of the effectiveness of implemented risk control measures in accordance with Risk Management Plan • Complete inspections of the workplace if requested by members of workforce or if requested to support inspection program • Assist management to establish and maintain the Safety Case, including updating & maintaining currency of HSEMS and related procedures • Discuss and advise feedback on proposed changes that may affect the health and safety of employees, to the workplace, the plant, substances or other things used at the workplace, the conduct of the work performed • Speak up and act on OHS issues, including investigation of any OHS concerns raised by members of the workforce • Attend HSE meetings (or ensuring information is provided for the meeting), and completing any allocated actions • Attempt to resolve with management any health and safety issue that could affect members of the workforce, prior to requesting regulator involvement • Meet or accompany OHS regulators (if required) when on site • Represent members of the workforce in identification of major hazards and possible major accident events (MAEs) and the related Safety Assessments and in determining control measures. |
| Health and Safety Representatives (HSRs) role in regards to a person selected as a safety and health representative under Schedule 2 of the NZ Health and Safety at Work Act 2015 | The functions of a health and safety representative for a work group are — (a) to represent the workers in the work group in matters relating to health and safety; (b) to investigate complaints from workers in the work group regarding health and safety; (c) if requested by a worker in the work group, to represent the worker in relation to a matter relating to health and safety (including a complaint); (d) to monitor the measures taken by the PCBU that are relevant to health and safety; (e) to inquire into anything that appears to be a risk to the health or safety of workers in the work group arising from the conduct of the business or undertaking; (f) to make recommendations relating to work health and safety; (g) to provide feedback to the PCBU about whether the requirements of the Act or regulations are being complied with; and (h) to promote the interests of workers in the work group who have been harmed at work, including in relation to arrangements for rehabilitation and return to work. |

4.2.4 Specialist HSE Advice

The HSE Team provide appropriate HSE expertise, advice and assistance to employees and contractors as required.

Seeking and administering HSE advice is a line responsibility. The HSE Team provides Operations with technical guidance to support and enable implementation of the HSEMS and management of risks. Specialist HSE Advisers are available to provide support to the assets such as aviation, security, health/hygiene and emergency response technical advice.

4.3 HSEMS Standard 3 – Planning, Objectives and Targets

4.3.1 HSE Annual Improvement Action Plans

An annual HSE Improvement Plan [5] is developed for all facilities, outlining the inputs, development process, implementation process and review frequency for HSE improvement plans for each site. This plan details objectives, targets and actions.

At site level an annual HSE Improvement Plan [6] [7] [8] [9] is developed in consultation with HSRs and approved by the Operations Manager for each asset. These plans are “live” documents that are

reviewed and updated on at least a quarterly basis. The site HSE Committee is responsible for reviewing progress of the site level HSE Improvement Action Plan.

Refer:

[5] INT-1000-SAF-PLN-3675078 - Annual HSE Improvement Plan

[6] Site Annual HSE Improvement Action Plan – BassGas

[7] Site Annual HSE Improvement Action Plan – Otway

[8] Site Annual HSE Improvement Action Plan – Beharra Springs

[9] Site Annual HSE Improvement Action Plan – Kupe

4.3.2 HSE Targets/Key Performance Indicators

HSE targets/Key Performance Indicators (KPIs) are set on an annual basis by the Leadership team and are consistent with company-wide targets. Some of the detailed KPIs include:

- Observations reported (Hazards, Unsafe Acts, Safe Acts and Environmental good practice)
- Overdue HSE actions
- Close out of HSE actions arising from incidents and observations investigation
- Injury statistics, e.g. Total Recordable Injury Frequency Rate Lost Time Injuries (LTI)
- Process Safety Incidents
- Emergency response exercises and drills

4.3.2.1 Monitoring Objectives and Tracking of KPIs

All individuals have established KPIs that are aligned with the HSE objectives and targets. KPIs are tracked monthly via HSE Dashboard [10].

The HSE Dashboard is posted prominently in lunch rooms and displays safety performance and includes lagging indicators such as injuries and overdue investigation actions along with leading indicators such as observations.

Additionally, the HSE monthly meeting agenda includes a review of the HSE Scorecard to identify any trends and actions required to improve performance

Refer:

[10] HSE Dashboard

4.4 HSEMS Standard 4 – Legal Requirements, Document Control and Information Management

4.4.1 Legal and Regulatory Compliance

Compliance with statutory provisions is mandatory and is therefore a core principle of the corporate HSE policy. Safety Cases/Safety Management Systems/Pipeline Safety Management Plans (SMPs)/Operational and Environmental Management Plans (OEMPs) are developed for each asset as appropriate and are regularly reviewed and updated.

Part 1 – Introduction - of the Safety Cases/SMS/SMP/OEMP documents the relevant legislations for that document and contains a concordance table demonstrating compliance with the governing regulations for a particular jurisdiction.

Other regulatory documents such as Environmental Management Plans (EMPs) and Well Operations Management Plan (WOMPs) are prepared in accordance with the requirements of the relevant legislation and are listed in Part 1 of the Safety Cases and Pipeline Safety Management Plans for reference.

4.4.2 Document Management System

An electronic document management system is used for document management and control. This system allows for electronic review and approval of revisions to controlled documents with records kept of the input from all reviewers and approvers. Document revision frequency forms part of the document metadata, the system generates reminder notices with escalation when documents fall due.

Controlled documents are prepared, revised, approved and distributed in accordance with Document Control Procedures.

[For internal use: as part of the transition to Lattice Energy some referenced documents may still contain "Upstream" or "Integrated Gas" within the title, and will be amended during periodic revision of these documents. Similarly, following the transition to the electronic document management system now in use, some referenced documents may refer to the previous controlled document number if that is the number still used on the cover page of the referenced document. These too will be amended during the scheduled, periodic review of these documents.]

Refer:

[11] INT-IGMS-IMT-PRO-00001 Document Control OpenText eDRMS

4.4.3 Retention of Specific Documents

The following documents and records will be made available to the relevant regulators when requested:

- Safety Case/SMS/SMP/OEMP/EMP/WOMP in force
- Revisions of the Safety Case/SMP/OEMP/EMP/WOMP
- Records of reportable incidents
- Safety Case/SMS/SMP/OEMP/EMP/WOMP audit reports.

These documents and records will be securely stored at the nominated address of the licensee for communications on matters relating to the facility and stored in a way that makes their retrieval reasonably practicable.

The Safety Case/SMS/SMP/OEMP/EMP/WOMP and any revisions will be kept for a minimum of 5 years from the acceptance of the document.

The records of reportable incidents and audit reports will be kept for a minimum of 5 years from making of the record.

4.4.4 Pipeline Record Management Plans

The records management plan (RMP) for each pipeline is documented in Part 2 – Facility Description - of the relevant Safety Cases/SMS/SMP/OEMP. The RMP describes the document control systems used by the facility and provides the records management matrices for the specific pipeline which contain the information as prescribed by AS 2885.

Archiving and disposal of records associated with an abandoned pipeline shall be documented. A record shall be kept of all abandoned pipelines that remain in situ.

4.4.5 Management System Review

The criteria for revision of the entire Safety Case/SMS/SMP/OEMP document is stated in Part 1 – Introduction of that document. In addition, the HSEMS – this document - (Part 3 or Part 4 of each Safety Case/SMS/SMP/OEMP) may be revised separately and will be reviewed at a frequency no longer than 2 years.

In accordance with AS 2885 requirements, the Pipeline Management System (documented within this document) is to be reviewed at least every two (2) years and as necessary for any changes in

4.5 HSEMS Standard 5 – Personnel, Competence, Training and Behaviours

4.5.1 Competency Assessment and Training Plans

The HSEMS requires that each safety critical role or task is assessed for necessary competencies and skills, utilising formal competency based assessment. Specific HSE responsibilities are outlined in position descriptions.

The Learning Management System (LMS) records and tracks core, and critical HSE and technical compliance training. Site based training and competency matrices detail the positional HSE and technical competency requirements.

The workforce capability frameworks outline the specific capability requirements for operational and maintenance roles/positions. The competency framework includes both company specific competencies, in addition to statutory competencies, and refresher requirements on those competencies which have defined recertification periods. A training needs analysis is completed with new and existing employees to evaluate the individual's competencies for completion of the role.

Learning and development is delivered through face to face training, on the job coaching and online methods and may contain competency and/or proficiency assessments.

Before an individual is permitted to conduct a task or operate on a specific plant system unsupervised, they are required to demonstrate an appropriate level of competence for the task or system, as per the competency framework.

Employees are required to provide evidence of any training certificates, licences and qualifications they hold. Contractors are required to provide competent personnel and to regularly assess and monitor the competence and behaviours of their personnel.

The Operations Manager for each asset is responsible for ensuring there is a process in place for training needs analysis and verification of competence, and that HSE competencies have been defined for roles; as well ensuring there is a budget for HSE training.

The Facilities Manager, or equivalent and assigned Supervisors are responsible for ensuring all personnel are competent to perform tasks associated with their role/scope of work; ensuring identified training is completed and ensuring appropriate supervision is provided to support the level of risk associated with the task being performed.

Development of personnel is an integral part of the performance management process requiring both the employee and his/her manager to assess development needs and what each party can do to meet those needs. Having identified those needs and actions to address them, progress is then monitored throughout the year during regular performance review sessions.

Refer:

[12] LAT-HSE-DVE-022 Directive HSE Training and Competency

[13] Workforce Capability Requirements - Otway

[14] Workforce Capability Requirements - BassGas

[15] Workforce Capability Requirements – Beharra Springs

[16] Workforce Capability Requirements – Kupe

[17] Workforce Capability Requirements - Contractors

4.5.2 HSE Training

HSE training is provided by means of either in-house training courses, or using industry training providers conducting nationally accredited programs, when appropriate. Training requirements are regularly reviewed so that personnel requiring training receive the appropriate training and are competent prior to commencing the task or role unsupervised.

Training requirements include, however are not limited to:

- HSE related training required by legislation
- Induction programs
- Safety Case/SMS/SMP/OEMP including the types of major incident/accident events, and the associated risk controls
- HSE Management System
- Risk management including hazard identification
- Permit to Work system
- Emergency response
- Training required for specific tasks including safety critical and work related procedures
- Training and assessment on site operation process systems
- Light vehicle driver training
- Incident management
- Training in safety critical and work related procedures
- HSE leadership for supervisors and managers.

4.5.3 Training Records

Records are maintained of all training and assessment provided to individuals and of any qualifications, or certificates held. Relevant information is recorded in the Learning Management System.

4.5.4 Inductions

An induction is provided to all personnel (employees, contractors, visitors) when first arriving at an office, site, or offshore facility.

All personnel employed or contracted to work at the facilities are required to undertake an induction as per the Induction Procedure [18]. The induction training covers site specific HSE information that is applicable to the work location and the individual's position. This typically includes, but is not limited to:

- Policies: HSE, Drug and Alcohol
- Life Saving Rules
- HSE Management System principles
- Facility Safety Cases/SMS/SMP/EMP/OEMP
- Major Hazards associated with the facilities
- Emergency response arrangements including alarms, muster processes and points, and evacuation routes
- Permit to Work System
- Location of amenities
- First aid facilities and their location
- Environmental matters such as waste management.

Refer:

[18] INT-1000-SAF-PRO-3675129 HSE Induction – Conventional Operations Procedure

4.5.5 First Aid Training

It is recognised that Lattice Energy facilities are located some distance away from third party medical providers and therefore importance is placed upon the availability of qualified first aiders on-site. As such, the site has adopted high standards with respect to first aid training and equipment.

Training will be undertaken to appropriate standards using accredited training providers.

Refer:

[19] VIC-1000-SAF-PRO-000013 First Aid and Tele-medicine Procedure

[20] NZL-1000-SAF-PRO-00006 First Aid & First Aid Training

4.5.6 Offshore Specific Training

Operations will routinely utilise helicopters for travel to and from the offshore facilities. Training and competency requirements are documented in the Aviation Operations Directive [21] and apply to all personnel required to fly offshore to an offshore facility.

All passengers who travel offshore by helicopter must have a current Basic Offshore Safety Induction and Emergency Training (BOSIET) certificate as the minimum standard. Any exemption requires a one-off approval by the relevant Executive Management Team member. Personnel must view the helicopters induction video prior to a flight offshore.

A core crew undertake all offshore Platform visits, and the following competencies must be held among those in the party:

- Person in charge (PIC)
- Helicopter Landing Officer (HLO)
- Lifeboat Commander/Coxswain
- First Aid.

Refer:

[21] LAT-HSE-DVE-016 Directive Aviation Operations

[22] VIC-1000-SAF-PRO-3974220 Access and Movement to Offshore Platforms

[23] NZL-K301-OPS-PRO-00001 Access to Kupe Wellhead Platform Procedure

4.6 HSEMS Standard 6 – Communication, Consultation and Community Involvement

4.6.1 Employee/Members of the Workforce Involvement & Consultation

All employees and members of the workforce are encouraged to provide constructive feedback on HSE policies, procedures, etc. and to actively participate in hazard identification, HSE meetings and other HSE activities. All personnel are encouraged to participate in HSE issues and nominated workforce representatives routinely attend the monthly HSE Meeting.

Personnel are consulted on those matters that may affect their health and safety by way of the following:

- Morning Meetings
- Management of Change process
- Conducting or reviewing a risk assessment
- Establishing and implementing the HSEMS
- Preparing and revising a Safety Case/SMP/SMS/EMP/OEMP
- Accident, Incident and Near Miss reporting
- HSE Alerts and notices
- HSE communication such as HSE alerts, incidents, updates and current performance data

Refer:

[24] LAT-HSE-GDE-025 Daily Prestart Meeting

4.6.2 HSE Committees and HSE Meetings

The Lattice HSE Committee Guideline [24] provides the structure, composition, roles, record keeping and terms of reference for the establishment and operation of an HSE Committee for each Lattice Energy asset. The BassGas and Otway facilities have a site HSE committee that meets at least quarterly and is governed by site-specific HSE Committee Terms of Reference. In addition to this the Lattice Energy facilities hold regular site HSE Meetings.

[25] LAT-HSE-GDE-083 HSE Committee

[26] S4200-AF-702649 Otway Gas Plant HSE Committee Terms of Reference

[27] VIC-5000-SAF-GDL-00001 BassGas HSE Committee Terms of Reference

4.6.3 Health and Safety Representatives

Health and Safety Representatives (HSRs) are elected by their respective workgroups to represent company employees and contractors (members of the workforce) at the facilities. The role of the HSR is outlined in Section 4.2.3 - Roles and Responsibilities and is spelled out in more detail in the Lattice Energy Health and Safety Representatives Guideline [28]. This Guideline instructs the assets about the election of HSRs, the rights and responsibilities of HSRs and the training requirements.

HSRs are provided with resources and are able to complete accredited HSR training to ensure they are competent to conduct their duties in accordance with applicable Occupational Health and Safety legislative requirements.

Further information about HSR roles can be gained from relevant Regulators' websites. Publications currently available are listed below and further publications to support the role of HSR are available from the regulators website.

- Offshore (NOPSEMA): The HSR Handbook - A guide for health and safety representatives in Australia's offshore petroleum industry. Available on NOPSEMA website (<http://www.nopsema.gov.au/safety/health-and-safety-representatives/>)
- Victoria Onshore (WorkSafe): Guide for HSRs - Consultation, representation and resolving health and safety issues (<http://www.worksafe.vic.gov.au/hsr/about-hsrs>)
- Western Australia (Department of Mines and Petroleum): How can safety and health representatives help improve safety and health? <http://www.dmp.wa.gov.au/Safety/How-can-safety-and-health-5376.aspx>

- New Zealand (WorkSafe NZ): Guidance on Health and Safety Representatives (HSRs)
<http://www.worksafe.govt.nz/worksafe/hswa/working-together/representation/health-and-safety-representatives-hsrs>

Employees/members of the workforce are encouraged to raise any HSE concerns directly with their Supervisor, the site Facilities Manager/Operations Superintendent, HSR or the Operations Manager. A formal procedure is in place for the follow up of such concerns.

Refer:

[28] LAT-HSE-GDE-024 – Health and Safety Representatives

4.6.4 HSE Complaints

Should a HSE related complaint be received, from either an internal or external source, regarding operations, the complaint shall be recorded in the EIMS and investigated as an incident. Following investigation, the complaint shall be satisfactorily resolved with the party raising it, using if necessary, formal dispute resolution mechanisms.

4.6.5 Community Consultation

The Lattice Energy Community Directive [29] provides the operational requirements for Lattice Energy assets to deliver Lattice Energy's commitments to communities. There are eight requirements required by this directive, each with specific deliverables and each with guidance documentation providing instruction on how to establish the necessary documentation and systems to comply with the directive. The requirements of the Community include but are not limited to:

- Conducting a community risk assessment that addresses Lattice Energy's activities in a community and the community perception of those activities
- Stakeholder identification and assessment
- Develop a Community Engagement Plan that demonstrates how information is provided to stakeholders, how stakeholder input is sought and an evaluation process

The Safety Case and Pipeline Safety Management Plan processes have identified health and safety hazards which may impact on the local community. Emergency Response Plans have been put in place identifying the appropriate emergency response in the event of incidents at the plants or along the pipelines.

For the BassGas and Otway facilities, a summary of each of the Gas Plant Safety Cases is made available to the public at local libraries and Shire Council offices – and has been written to meet the required information detailed in the Victorian legislation. There are forums at the Otway and BassGas facilities which act as a medium for consultation with the community.

Throughout Lattice Energy, Community Liaison and Community Stakeholder Advisors are established to provide a contact for the community regarding operation of the pipeline and gas plant facilities.

For pipelines, community consultation and engagement is described further in the pipeline specific Environmental Management Plans including gaining access to landholder's properties for inspection of pipeline easements, the reporting of landowner and third party liaison and the information given.

Refer:

[29] LAT-HSE-DVE-026 – Community Directive

4.6.6 Major Hazard Facility Coordination

Where adjoining Major Hazard Facilities (MHFs) have the potential to impact on each other, regulators may direct Operators to co-ordinate risk assessments and the sharing of relevant information on off-site impacts. Sharing of such information shall therefore result in the consideration of offsite incidents affecting Lattice Energy assets in areas such as escalation of a loss of containment, shared emergency response equipment and shared infrastructure such as access roads.

Coordination with neighbouring MHF is likely to consist of meetings which shall be documented in the form of minutes of meetings, so that evidence may be produced of the coordination activities. Emergency response exercises and response scenarios shall also include these neighbouring MHFs by, at a minimum, calling the control room or 24 hour contact number to advise of an incident or a drill.

4.6.7 Cultural Heritage

Each facility has processes in place to assess cultural heritage.

For the BassGas and Otway Developments, an Environmental Effects Statement (EES)/Environmental Impact Statement (EIS) was undertaken. This involved studies of cultural heritage issues in the

relevant project areas and included: Aboriginal consultation, Aboriginal ethnography, a history of European occupation, Indigenous heritage, Non-Indigenous heritage issues and maritime heritage.

The reports concluded that the proposed projects would not impact on any culturally sensitive areas.

The Beharra Springs Environmental Plan (EP) details natural heritage, Indigenous and Non-indigenous cultural heritage, Native Title applications, ethnology and archaeology. No cultural heritage sites listed on the Register of the National Estate occur at the Beharra Springs facility.

For the Kupe Development, the preparation of an Assessment of Environmental Effects [AEE] is an essential part of the consenting process and includes an archaeological assessment to determine the likelihood of archaeological and/or culturally significant sites being present. The consultation and archaeological assessment process did not identify any area of interest.

Refer:

[30] Otway Gas Project Environmental Effects Statement/Environmental Impact Statement

[31] V-5100-15-RP-0001 BassGas Project Environmental Effects Statement/Environmental Impact Statement

[32] NZL-1000-ENV-PLN-00001 NZ Environment Management Plan

[33] WAA-4100-ENV-PLN-00001 Environmental Plan Beharra Springs Gas Facility

4.7 HSEMS Standard 7 – Hazard and Risk Management

4.7.1 Risk Management Framework

The Risk Management Plan [36] and Risk Toolkit Matrix [35] are used for management of risk associated with site and site activities. The Risk Management Plan outlines the authorised roles for risk acceptance and treatment plan approval. The Risk Management Plan explains where risk assessment results are stored and how frequently they must be reviewed.

Onshore licensed pipelines, are risk assessed using the AS 2885 mandated Safety Management Study process, utilising the AS 2885 risk matrix. This is described in the Formal Safety Assessment of the relevant Pipeline Safety Case/Safety Management Plan.

For Major Accident Events and Major Incidents, the Technical Safety Risk Matrix is used, primarily to demonstrate the orders of magnitude reduction in likelihood by the application of independent preventative controls, and thus that risk has been reduced to ALARP. Refer to the Technical Risk Guideline [37] for more information on the use of the correct risk assessment matrix for a particular facility or hazard.

Note, whilst Lattice Energy guidance material including this HSEMS Manual treat the expressions 'as low as reasonably practicable' (ALARP) and 'so far as reasonably practicable' (SFARP) to be synonyms, regulatory documents must align with the specific expression required by the governing regulations for the relevant jurisdictions.

Refer:

[35] Risk Toolkit

[36] AUS-1000-SAF-PLN-3674818 Risk Management Plan

[37] VIC-1000-BUS-GDL-3974190 Technical Risk Guideline

4.7.2 Hazard Identification and Risk Assessment

Hazard identification is carried out throughout the life of the facilities. In particular, a risk assessment may be conducted as part of the following:

- Initial design phase
- Job Safety Analysis prior to completion of a work permit
- Identification of a hazard during the recording of an observation or incident
- Introduction of new major equipment or methods of operation
- Prior to undertaking substantial change to existing equipment or method of operation
- 5 yearly Process Hazard Analysis re-validation prior to the Safety Cases/SMS/SMPs/EMPs/OEMPs undergoing a major revision to ensure their continued applicability.

The method of hazard identification and risk assessment will vary per need and may vary between formal workshop based assessments and formal safety studies such as fire and explosion analysis

(FEA) through to direct field based hazard and incident observations as reported via the Enterprise Incident Management System. The method of hazard identification and risk assessment selected is documented within the Hazard Identification (HAZID) procedure [38].

In addition, other processes such as Hazard and Operability (HAZOP) studies and Safety Integrity Level (SIL) determination studies are undertaken as required as part of design and operational changes. The Asset Integrity Directive [41] requires a Process Hazard Analysis (PHA) study to be conducted every 5 years, nominally to align with Safety Case 5 year revisions. The PHA technique to be used is approved by the business unit and, depending on the age of the facility, previous ownership and incident history, the PHA selected may include one or more of the following:

- Re-validation of the existing Major Accident/Major Accident Event/Major Incident Hazard Identification;
- Re-validation of the existing Major Accident/Major Accident Event/Major Incident Layers of Protection Analysis;
- Retrospective HAZOP of the entire facility or part thereof; or
- Retrospective Safety Integrity Level (SIL) verification for one or more safety instrumented functions.

At a task level, personnel utilise techniques such as Job Hazard Analysis (JHA) and the Three Whats [42].

Refer:

[38] LAT-HSE-PRO-007 Hazard Identification (HAZID) Studies Procedure

[39] INT-1000-ENG-PLN-00011 Integrity Management Plan - Functional Safety - Operation and Maintenance

[40] VIC-1000-SAF-PRO-3974228 Job Hazard / Safety Analysis (JHA / JSA) – Performance Of

[41] LAT-HSE-DVE-005 Asset Integrity Directive

[42] 3 WHATs booklet

4.7.3 Formal Safety Assessment (FSA)

In developing the Safety Case/SMS/SMP/OEMP, hazards are also assessed by some or all of the studies below to ensure that hazards have been identified, their associated risks are understood, that all practicable controls have been applied to these risks and that these risks have been reduced to As Low As Reasonably Practicable (ALARP):

- Hazard Identification Workshops (HAZID) - identification of all hazards to personnel on/visiting the sites/facilities and summarised in a Hazard Register
- Fire and Explosion Analysis (FEA) - assessment of the consequences of flammable events (blowouts, fires and explosions)
- Non-Flammable Hazard Assessment (NFHA) - assessment of the consequences of non-flammable accident/incident events
- Escape, Evacuation and Rescue Analysis (EERA) - assessment of the adequacy of the escape, evacuation and rescue facilities (offshore only)
- Emergency Systems Survivability Analysis (ESSA) - assessment of the survivability of safety critical elements/emergency systems in Major Accident Events (offshore only)
- Quantitative Risk Assessment (QRA) – numeric assessment of the frequencies and risk levels associated with Major Accident Events/Major Incidents
- Layers of Protection Analysis (LOPA) – semi quantitative method of risk assessment based on assessing layers of protection
- As Low As Reasonably Practicable (ALARP) Review - assessment of possible risk reduction measures and demonstration that the residual risks are ALARP.

4.7.4 Hazard and Risk Registers

Risks applicable to ongoing operations are captured in an asset Risk Register and are loaded into the document management system for tracking and review.

The hazards and risks identified in developing the Safety Cases for offshore facilities and for the onshore gas plants will be recorded in the relevant Safety Case Major Accident Event/Major Incident Hazard Register which documents all information pertaining to the identified Major Accident Events

(MAEs) or Major Incidents (MIs). However due to the detailed level of information required to manage these hazards, and especially to identify safety critical elements, only a summary of these hazards is included in the asset Risk Register.

Similarly, in developing the onshore pipeline Safety Cases/Safety Management Plans, the pipeline threats/hazards and suitable controls are identified and the risks assessed in line with AS 2885 requirements and documented in the Pipeline AS 2885 Safety Management Study worksheets. A high-level summary of the AS 2885 risk assessment is then copied into the asset Risk Register.

The Formal Safety Assessment of each Safety Case/SMS/SMP/OEMP provides the detailed information about the hazard identification and risk assessment process followed.

4.7.5 Risk Treatment

Risk control measures will be systematically identified and assessed for their practicability of implementation to:

- Reduce risk of a Major Accident Event/Major Incident so far as is reasonably practicable; or
- If required under governing Acts and Regulations, demonstrate that risk is considered to be as low as reasonably practicable (ALARP)

Assessment of the practicability of potential risk reduction measures recognises that no industrial activity is entirely free from risk, and that there remains a level of risk where the cost of additional risk reduction measures is disproportionate to the risk reduction achieved.

This process considers a range of factors such as:

- Demonstrable reduction in risk by a proposed control measure
- Introduction of new hazards by a proposed control measure
- Use within Lattice Energy or within similar industries
- Acceptance and use by Operations
- Lifetime cost of the control measure

Risk treatment plans are developed for risks not considered acceptable. The Risk Management Plan outlines the requirements for escalation to management for approval of these risk treatment plans.

4.7.6 Action Tracking of Risk Treatment Plans

The risk treatment plans associated with potential risk reduction measures, including PHA Re-validation HAZID and LOPA workshop risk reduction measures for consideration, are classified as Category A actions in the PHA report and are recorded in the Enterprise Incident Management System and assigned to appropriate personnel for actioning and close-out. Lower priority actions, are assigned as Category B and Category C and are recorded in the Lattice Energy Engineering Action Tracker. Category B actions require confirmation of assumptions made during the PHA study such as relief valve sizing or existence of a controlled document such as a procedure, whereas Category C actions relate to opportunities for improvement.

Should a Category B action find that a flawed assumption has been made, a Category A action may then result, depending on the residual risk involved.

The system enables actions to be regularly monitored until they are closed out and provides an auditable trail for these actions.

4.7.7 Hazard and Risk Register Review

4.7.7.1 Safety Case/SMP Hazard and Risk Register Reviews

Risks related to the control of major hazards/Major Incidents/Major Accident Events as identified through the Formal Safety Assessment process for each Safety Case/SMS/SMP are documented in the Major Accident Event/Major Incident Hazard Register or, in the case of pipelines, the Pipeline Safety Management Study or Pipeline Safety Case.

In accordance with the relevant legislation the Hazard Registers must be reviewed:

- at the direction of the relevant regulatory authority;
- before any modification is made to the major hazard facility; or
- after any major incident occurs at the major hazard facility; or
- when an effectiveness test indicates a deficiency in a risk control measure; or

- if there has been any change to the circumstances that formed part of the initial Property Protection Assessment under Victorian OHS Regulations; or
- after receiving a request from a health and safety representative to conduct a review; and
- in any event, at least once every 5 years as required by both governing regulations and the Asset Integrity Directive [41].

In accordance with AS 2885.1:2012, the Safety Management Study for each Australian onshore pipeline shall be reviewed:

- at intervals not exceeding 5 years;
- at any review for changed operating conditions;
- at any review for extension of the design life;
- at any time that new or changed threats occur; or
- at any time where there is a change in the state of knowledge affecting the safety of the pipelines.

4.7.7.2 Site Risk Register Reviews

The asset Risk Registers are reviewed on a periodic basis as per the Risk Management Plan [36] to ensure risk controls adopted continue to manage the risk as low as low as reasonably practicable (ALARP).

4.8 HSEMS Standard 8 – Incident Management

4.8.1 Incident and Observation Reporting

Observations for hazards, unsafe acts, safe acts or environmental good practices are routine reported and recorded within Observation Module of the Enterprise Incident Management System.

Hazards are defined in the procedure as having “potential to lead to harm, injury, illness or disease to people, damage to property or damage to the environment”. By definition, potential causes of workplace illness and injury fall within the scope of the Incident Management Procedure.

Incidents are reported within the Incident Module of the Enterprise Incident Management System. The requirements of incident analysis and investigations are detailed in the Incident Management Procedure [44]. This procedure describes the steps to be taken after an incident has occurred.

Incidents are defined in the procedure as “any occurrence that has resulted in, or has the potential to result in (i.e. a near miss), adverse consequences to people, the environment, property, reputation or a combination of these. Significant deviations from standard operating procedures are also classed as an ‘incident’.” By definition, workplace illness and injury fall within the scope of the Incident Management Procedure. Near misses are viewed as an incident.

Use of the Incident Module for reporting of incidents guides the user as to whether the incident meets the criteria of a process safety incident. Thereafter, the Process Incident Reporting Procedure [46] applies. This procedure requires the user to categorize the incident as Tier 1 to Tier 4 for reporting purposes, though this can be amended later by senior management and authorized users including Technical Authorities.

The potential of all incidents and hazards are assessed and categorised on a scale ranging from Low to Extreme according to the Risk Matrix [35]. The analysis and reporting requirements are determined by the assessed risk. Incident reports and corrective actions are managed using the Enterprise Incident Management System for tracking and close-out.

Refer:

[44] INT-1000-SAF-PRO-00005 Incident Management Procedure

[46] INT-1000-SAF-PRO-00002 Process Incident Reporting Procedure

4.8.2 Incident Investigation

The Incident Investigation Procedure [44] requires that any incident or near miss is investigated in a timely and systematic manner such that root causes are determined along with corrective actions. The procedure also specifies the appropriate representation on the investigation team and defines responsibilities for the various actions.

The HSE team reviews all incidents to ensure statutory reporting is undertaken and analyses incident and hazard reports to identify trends.

4.8.3 External Regulatory Reporting and Internal Notification

Notifiable incidents as defined by various regulations involving, but not limited to, serious injury or fatality, substantial damage to the environmental or a loss of containment event, shall be immediately reported to relevant regulatory authorities together with the raising of an internal incident report. The criteria and processes for regulatory notifications are described in the Regulatory Notification Guideline.

Refer:

[45] 13852562 Regulatory Notification Guideline

In addition to the incident reporting to regulatory authorities, where required by legislation the circumstances of an incident as defined by the Australian Pipelines and Gas Association (APGA) Pipeline Incident Database should also be reported to APGA.

4.8.4 Control/Preservation of Incident Sites

The measures for control of sites following an accident or incident are described in the site Emergency Response Plans to ensure the incident scene is made safe, others (including members of the public) are protected from injury, and treatment, medical assistance and evacuation of injured personnel is provided. Site preservation requirements are also outlined to ensure personnel or the general public do not interfere with the place of an incident.

4.8.5 Resumption of Work Following a Significant Incident

In the event of a significant incident, work cannot be resumed until the risk is assessed, and actions have been taken to reduce the risk of recurrence, to the satisfaction of relevant regulators/authorities (if required). Authorisation to resume work is then to be given at the appropriate level.

4.8.6 Learnings from Incident Investigation

Investigation of significant hazards and incidents are shared with other sites and business areas and learnings are used to improve systems and processes to prevent recurrence. Investigations and learnings are distributed via HSE Alerts for serious issues relevant to the business.

4.9 HSEMS Standard 9 – Performance Measurement and Reporting

4.9.1 HSE Performance Measurements and Reporting

A HSE scorecard, titled the Monthly HSE Dashboard [10] is produced monthly to outline a number of lead and lag safety management indicators. The Dashboard operates on a rolling 12-month basis and allows for cross referencing of the presented data back to specific Incident and Observation reports within the Enterprise Incident Management System (Refer to Section 4.8).

This report is available via the intranet.

Process safety information is collated on process safety incidents and hazards for all facilities. Process safety performance is reported monthly and distributed widely amongst management. The monthly process safety report is also posted on the intranet [49]. Process safety incident information is broken down facility and then by the following classifications obtained from API 754 - Process Safety Performance Indicators for the Refining Petrochemical Industries, April 2010:

- Loss of primary containment (Tier 1 and Tier 2)
- Safe operating limit exceedance
- Inspection or testing failure of safety critical equipment
- Demands on safety critical equipment
- Other loss of primary containment (flanges, fittings and pipework)
- Reliability Incidents
- Operating Discipline and Management System Performance (Tier 4)

Compliance of each asset with the Integrity Management Plans is reported on a quarterly basis to the Chief Operating Officer as part of the Level 2 assurance plan (see Section 4.19).

The number of outstanding incidents, observations and actions is also reported weekly via the Accountability Report [48] which is emailed to the site management and actioned as required with their teams.

Refer:

[48] Accountability Report

[49] Process Safety Report

4.9.2 Continuous Improvement of HSE Performance

The HSE Performance Measurement and Reporting Directive [50] provides the high level direction on the requirements for developing and recording of HSEMS performance metrics, review and reporting of actual performance against those metrics and development of plans to drive continuous improvement.

Continuous improvement is achieved by various systems including, but not limited to:

- Conducting auditing activities, reviewing results and implementing changes as necessary
- Analysing trend data from the enterprise database – incidents & observations
- Investigating the root-causes of both actual and near-miss incidents and implementing changes and improvements as appropriate
- Regular HSE meetings
- Development and review of the HSE Management Plan
- Training and competency assessments
- Conducting reviews of procedures and other documents to identify areas for improvement.

Underlying trends are identified and where possible remedial or improvement initiatives developed.

Refer:

[50] LAT-HSE-DVE-038 – HSE Performance Measurement and Reporting

4.10 HSEMS Standard 10 – Operational Control

The types of activities undertaken for each facility are described in the Manning and Organisation section of Part 2 Facility Description for the relevant Safety Case/SMS/SMP/OEMP.

4.10.1 Operating Procedures

The Operations Manager for each asset is responsible for ensuring that there are adequate plans, operating and HSE procedures in place to address areas of HSE risk and ensure safe work practices. This requirement is fulfilled through the provision of comprehensive suites of:

- Operating procedures and Work Instructions covering process and equipment operations
- Maintenance procedures covering specific maintenance related works
- Site HSE procedures that specify the method by which works will be safely and competently undertaken.

Operating and maintenance procedures exist as controlled documents and are governed by the Document Management System (Refer to Section 4.4.2).

4.10.1.1 General Operational Procedures

General operational procedures cover operational type activities which are general by description and not specific to an operating site. This includes:

- Helicopter operations
- Supply boat operations
- Lifting operations
- Hazardous materials management
- Operating log sheets.

4.10.1.2 Production Operations Procedures

Production operations procedures are the site-specific procedures required to operate the facilities safely and efficiently. There are several categories of production operations procedures, in increasing level of criticality:

1. Standard Operating Procedure – Level 1 (Level 1 SOP)
2. Standard Operating Procedure - Level 2 (Level 2 SOP)

3. In addition to the levels 1 and 2, the BassGas and Otway facilities also employ a third level titled a Critical Operating Procedure (COP). A COP is developed on the theory that whilst all procedural controls are important, it is recognised that a limited number of controls often have a disproportionately large role in reducing the level of risk in the business, these are designated across the BassGas and Otway facilities as Critical Operating Procedures (COP) [51] and aim to:
 - Clearly identify such procedures so that anyone using them is aware of their criticality and why;
 - Enforce strict levels of compliance with such procedures and define the review and approval process to be followed before any deviation from such procedures;
 - Specify increased levels of audit and review commensurate with their level of criticality.

Refer

[51] VIC-5100-SAF-PRO-00019 Critical Procedural Controls – Management of

4.10.2 Operating Limits

Operating limits, as set by the process Basis of Design (BOD), are documented by alarm and trip schedules which detail installation operating limits and set the operating and protection envelopes. The Basis of Design and operating limits for each facility are described in Part 2 – Facility Description of the relevant Safety Case/SMS/SMP/OEMP.

Amendments to operating limits are controlled by the Management of Change (MOC) process (refer to Section 4.11).

4.10.3 Permit to Work System

The Permit to Work (PTW) System is a formal system used to plan, co-ordinate, authorise, execute and control work on the facility. It is a systematic, disciplined, step wise approach to assessing the risks, planning and executing a job with each step only being initiated when the preceding step has been completed.

Assurance with PTW requirements is achieved through regular PTW audits. Audit records and summary statistics are held on site.

The PTW System:

- Provides a method for ensuring that adequate safety checks and considerations are performed by appropriately qualified personnel for certain types of hazardous work
- Assigns the accountability, responsibility, communication and process for undertaking hazardous work
- Describes the interaction between work groups and contractors when hazardous work is performed.

The PTW system is supported by hazard identification tools including Job Hazard Analysis (JHA) and the 'Three Whats', to identify hazards and controls in operations activities.

Personnel have been trained in the PTW system. This includes a two-tiered approach with different levels of detail depending on the individual's involvement. The Operations Managers, Operations Superintendents, Shift Supervisors and the Senior Operations Technicians are the authorised signatories for work undertaken at the facilities.

The operations technicians are responsible for ensuring that the requirements specified in the permit are in place at the work site before work commences.

PTW offshore will be controlled by the appointed Person in Charge (PIC). Most of the work to be done on the offshore platforms will have been planned in advance and work permits prepared. The PIC is authorised to issue these work permits when all conditions are met. The PIC is also authorised to raise permits to his level of authority as required during an offshore visit.

Refer:

[52] VIC-1000-OPS-PRO-00001 Permit to Work System – SAA (CS)

[53] AUS-1000-OPS-PRO-00001 Permit to Work Procedure (EA/WA)

[54] NZL-1000-SAF-PRO-00015 Common Permit to Work System

4.10.4 Isolations

Guidance on the level of isolation required to isolate process and electrical equipment from energy sources and the process to then return that equipment to service is governed by the facility specific

Equipment Isolation Procedures. This procedure covers the steps required to prepare equipment for isolation, the steps to actually apply an isolation, the level of isolation required (single, double block and bleed, positive isolation etc.) and the tests necessary to prove the effectiveness of the isolation.

Refer:

[55] VIC-1000-SAF-PRO-00012 SA - Equipment Isolation (CS)

[56] AUS-1000-OPS-PRO-00002 Equipment Isolation EA & WA

[57] NZL-1000-OPS-PRO-00001 Isolation Preparation Procedure

[58] NZL-1000-OPS-PRO-00003 OENZ Isolation Principles - Commission & Purge Procedure

4.10.5 Safety Critical Equipment Procedural Controls

Safety critical equipment is identified in the maintenance management system along with appropriate maintenance regimes and schedules.

Safety critical equipment isolation is controlled via the facility specific Isolation procedures. Application of system overrides to process control system or SIS inputs or logic solvers, placement of mechanical devices to inhibit the function of process equipment and movement of car sealed or locked process valves are governed by the Override/Bypass Management Procedure [59] which requires a risk assessment and appropriate, signed authorisation on a system override certificate before application. Application of start-up overrides is exempt from this procedure and is documented, where applicable, in the relevant installation's operating procedures.

Refer:

[59] INT-1000-OPS-PRO-00003 Override/Bypass Management Procedure

4.10.6 Out of Service Tags

A system is in place to report, isolate, and withdraw unsafe plant and equipment from service. This system involves the use of an Out of Service Tag to mark unsafe equipment, which is then reported to the Maintenance Team for action and remains out of service until such time as a qualified technician has made suitable repairs. Risk assessments are conducted to determine what alternate controls are required to maintain operational integrity whenever safety critical elements are out of service.

4.10.7 Helicopter Operations

Helicopters are managed in accordance with Aviation Operations Directive [21] and the Aviation Management Plan [62]. This plan summarises the approved aircraft, approved aviation operators, general information on the planning and documentation required prior to the flight and the nature and scope of periodic auditing of operators. The facility specific helicopter operations procedure [60] [61] provides specific instruction on operation of helicopters for travel to and from the offshore facilities.

Refer:

[21] LAT-HSE-DVE-016 Directive Aviation Operations

[60] VIC-1000-SAF-PRO-00001 SA Helicopter Operations (CA)

[61] NZL-K301-OPS-PRO-00004 Helicopter Operations

[62] INT-1000-SAF-PLN-00007 Aviation Management Plan

4.10.8 Offshore Operations

There are a number of hazards specific to the offshore working environment for which the following procedures and guidelines are provided to support management of these hazards:

[64] LAT-HSE-DVE-041 Directive Maritime Operations

[65] VIC-1000-SAF-PRO-00004 Field Support Vessel Operations (CP) – SA

[66] NZL-K301-OPS-PRO-00003 KWHP Supply Vessel Operations

[68] NZL-K339-OPS-SOP-00001 KWHP Crane Operations

4.10.9 Well Intervention/ Wireline

Well operations, well intervention and wireline activities are described in the asset specific Well Operations Management Plans (WOMPs) and these activities will be undertaken by specialist contractors, coordinated and managed by Operations. Each well intervention will be controlled via an activity specific procedure and risk assessment signed off at the appropriate level of authority.

4.10.10 Conflicting Activities

A Conflicting Activities Matrix (also known as SIMOPs Matrix) is in place for each facility. The matrix assists during the planning and co-ordination of conflicting activities. The matrices identify concurrent activities via colour-coded work references and facility specific terms, such as:

- Yes or No
- Allowable – Combination of activities allowable with normal procedures
- Permitted – Acceptable combination of activities provided additional assessment and controls are put in place as specified in a set of advisory notes on the Conflicting Activities Matrix
- Not Permitted - Activity not permitted in these circumstances.

Requests for deviation must be formally approved by the Operations Manager and relevant Technical Authority.

Refer:

[69] TAS-9100-OPS-GDL-00001 Conflicting Activities Matrix – Thylacine Platform

[70] TAS-5100-OPS-GDL-00001 Conflicting Activities Matrix for Yolla Platform

[71] WAA-4100-OPS-GDL-00001 SIMOPs Matrix – Beharra Springs WAA-4100-OPS-GDL-00001 SIMOPs Matrix –

[72] NZL-1000-OPS-FRM-00001 SIMOPS Matrix

4.11 HSEMS Standard 11 – Management of Change

4.11.1 MOC Procedure

Changes to equipment, systems and documentation will be controlled by the Management of Change (MOC) Procedure [73] to ensure that all proposed changes are adequately defined, implemented, reviewed and documented by suitably competent persons and provides assurance that all engineering and regulatory requirements have both been considered and met before any change is operational.

Refer:

[73] INT-1000-BUS-PRO-00004 Management of Change (MOC) Procedure

4.11.2 Change Management Database

The process for reviewing, approving, controlling and effecting improvements, or modifications to plant uses an electronic tracking database which delivers electronic endorsement and tracking of the progress of approved change through the stages. The MOC procedure defines that the following are within its scope and hence require an approved MOC prior to commencement:

- Plant and equipment changes
- Changes to alarm and trip settings for safety critical functions
- Process Control System (PCS) operator interfaces
- Changes that result in a change drawings such as P&IDs, cause and effect or loop diagrams
- Changes to documentation such as procedures where there will be a HSE impact
- All organisational changes where the impacted personnel are in safety critical roles

A detailed checklist acts as a prompt to the Change Initiator, Endorser and Change Review Committee to assist in determining whether any or all of the triggers for the MOC process has been activated. This checklist is reviewed by the committee to ensure that all necessary outputs from the change such as safety cases, emergency response plans, drawings and procedures have been identified. Once approved, the change remains open until all identified outputs have been completed to the Endorser's satisfaction.

All modifications to critical safety equipment shall only be done after consulting the relevant Safety Case/SMS/SMP/OEMP to determine the impact on major hazard management. Significant changes to the facility must be reflected in a revision of the relevant Safety Case/SMS/SMP/OEMP.

Changes that are excluded from the MOC process include:

- Procedural changes that do not affect HSE critical content
- Organisational changes that do not affect HSE critical roles
- Changes to set points within specified operating envelopes

- Like for like replacement.

4.11.3 Risk Assessment

The MOC process includes the requirements for HAZID, HAZOP and operational risk assessments (refer to Section 4.7) depending on the level of risk associated with the proposed change. Selection of suitably competent persons within the MOC Review team to undertake MOC is based on the risk, complexity and nature of the change. The respective engineering discipline leads are involved in the review and endorsement of all proposed changes and determine the type of risk assessment required. If the change is executed, operational risk assessment processes (e.g. JHA) are also applied.

Identified hazards and control measures are added to the site Risk Registers as part of the change process. New identified major hazards will result in revision of the relevant Safety Case/SMS/SMP/OEMP.

4.11.4 Material and Equipment Procurement

The procurement of equipment and materials ensures that:

- Purchasing is undertaken in accordance with approved technical, engineering and testing standards to ensure the materials and equipment meet stated performance, reliability and safety standards
- Suppliers and manufacturers are selected via an evaluation process to ensure they are qualified and experienced and can meet the necessary standards for safety, reliability, technical support, traceability and quality in the supply of materials and equipment.

Procurement is supported by Engineering in the provision of material/equipment data sheets, material/equipment specifications and standards, reliability assessments, and appropriate quality assurance procedures including material test and certification standards and positive materials identification policies.

The MOC process is utilised to manage risks associated with the purchase of goods that may differ from the initially installed part or component.

Where a new or unproven supplier is being considered for tender, a joint quality and HSE (QHSE) review and the need for additional QA/QC (quality assurance/quality control) verification will be considered as appropriate to guarantee the quality of the delivered product. Materials supplied by external suppliers are subject to validation and verification to ensure that the goods supplied conform to defined design, needs, or requirements.

4.12 HSEMS Standard 12 – Facilities Design, Construction, Commissioning and Decommissioning

The design, construction, commissioning and decommissioning for each facility is described in Part 2 Facility Description of the relevant Safety Case/SMS/SMP/OEMP.

4.12.1 Design Controls

Technical design requirements are provided by Company controlled documents, and include Engineering Standards for each discipline, Design Specifications for standard equipment applications, and pro-forma Data and Specification Sheets for procurement purposes. In addition to these, the applicable Australian, New Zealand and International codes and standards are also applied in design.

The design management controls may include:

- Approval by Operations and Engineering teams
- Interdisciplinary checking of all drawings, reports and specifications ("squad checking")
- Independent third party design review
- HAZOP and SIL/LOPA studies
- Instrumented Protective Function (IPF) Classification
- HAZID/Design Reviews including AS 2885 Safety Management Studies for onshore pipelines
- Risk Based Inspection (RBI)
- ALARP Review.

4.12.2 Applicable Codes and Standards

Australian, New Zealand and international engineering design standards and recommended practices used in the design and installation of the facilities and the applicable codes and standards for ongoing operation and maintenance are listed in the Part 2 Facility Description of the relevant Safety Case/SMS/SMP/OEMP.

4.12.3 Validation and Verification

Validation and verification shall be carried out as appropriate for new designs or modifications to existing designs, to ensure that the design requirements and specifications are met.

Validation is performed to ensure that the final product conforms to defined user needs and/or requirements. Validation is usually performed on the final product, but may be necessary in earlier stages prior to product completion and could include:

- Factory acceptance tests (FAT) of equipment
- Performing alternative calculations
- Equipment demonstrations using identical equipment
- Commissioning tests of individual equipment and whole systems both in the construction yards and after final installation.

Design verification involves confirmation by examination, and by obtaining objective evidence that the particular requirements for the specific intended use are fulfilled.

A validation and verification plan may be developed as appropriate for each specific design or modifications as part of a quality control plan.

4.12.4 Construction, Installation and Commissioning

Typically work packs are prepared for installation, testing and commissioning of facilities. Verification activities will be in accordance with the Handover Package Procedures [74] which follow a six-stage certification system from Engineering Design and Assurance Certificate (C1) through to Project Close-out Certificate (C6) as given in Table 4.2.

Table 4.2: Handover Package Procedures

| Drawing Number | Drawing Title |
|------------------|---|
| A-1000-95-DF-002 | Project Completion and Handover Framework |
| A-1000-95-AQ-001 | C1 Engineering and Design Assurance Certificate |
| A-1000-95-AQ-002 | C2 Mechanical Completion Certificate |
| A-1000-95-AQ-003 | C3 Ready for Commissioning Certificate (RFCC) |
| A-1000-95-AQ-004 | C4 Pre-Start Review (PSSR) Certificate |
| A-1000-95-AQ-005 | C5 Performance Check and Provisional Acceptance Certificate |
| A-1000-95-AQ-006 | C6 Project Close Out Certificate |

Refer:

[74] Handover Package Procedures

4.12.5 Decommissioning Plans

Decommissioning plans are developed as required and the relevant Safety Cases/SMS/SMP/OEMP are revised accordingly.

4.13 HSEMS Standard 13 – Contractors and Procurement

4.13.1 Contractor Management

The Contractor Management Directive [75] is in place to effectively manage the HSE aspect of contractors engaged to work on Lattice Energy sites and/or equipment.

The key aspects of the contractor management process are:

- Contractor pre-qualification prior to contract award
- Assurance of contractor HSE performance

- Evidence of competency

During pre-qualification, the principal's management processes are scrutinized to ensure that sub-contractors selection is appropriate.

Refer:

[75] LAT-HSE-DVE-011 Directive Contractor Management

4.13.2 Contractor Pre-qualification

All contractors are assessed for HSE performance to ensure they align with or exceed the performance requirements. In addition to this, Contractors identified as Level 1 (high risk) are further assessed by which the contractor supplies evidence of implementation of their system.

Refer:

[76] LAT-HSE-FRM-021 Contractor Pre-qualification (Level 1 to 3)

[77] INT-1000-SAF-FRM-3675025 HSE Two Year Contract Assurance Checklist – Lattice Energy

4.13.3 HSE Requirements in Contracts

The Contracts Team will ensure that invitations to tender and contract documents contain clauses that require the contractor to comply with Lattice Energy's HSE objectives, and will monitor the contractor's performance throughout the duration of the contract to achieve these objectives.

4.13.4 Contractor Work Management

Contractors may be permitted to work under their own HSEMS depending on the scope and complexity of the work. In such cases, project specific HSE Management Plans/bridging documents may be required to clarify all interfaces between a contractor's HSEMS and the HSEMS Manual (this document). These bridging documents describe the associated responsibilities and actions required for these interfaces.

Before any work commences, clear reporting lines will be established between contractor representatives and Operations personnel. All contractors receive an induction appropriate to the nature of the work and the site hazards they may be exposed to.

4.13.5 Monitoring Contractor Performance

Performance indicators are included into the contract and monitored. Two yearly contractor assurance activities, such as a contractor HSE audit or review of contractor performance is undertaken.

All contractors who perform work at the facility are required to comply with the HSE Management System. To ensure this compliance responsibility for managing a specific contract is assigned to a Contract Holder/Project Manager who is accountable for all aspects of the contractor's performance.

4.14 HSEMS Standard 14 – Crisis and Emergency Management

4.14.1 Potential Emergency Situations at Sites

Potential major accident events and major incidents associated with the facilities have been identified in the Formal Safety Assessment of the relevant Safety Cases/SMS/SMP/OEMP and risk assessment of these scenarios has been conducted.

In the event of an emergency, all personnel on site will:

- Be aware of the muster point and evacuation procedure
- Immediately report an actual or potential emergency situation
- Follow the directions of the designated Incident Controller (IC). This role may be fulfilled by:
 - Offshore - the Person In Charge (PIC)
 - Onshore - Operations Superintendent or the Production Shift Supervisor (PSS)/Lead Technician

The fire-fighting philosophy is that personnel will not attempt to fight major process fires but will seek a place of refuge and allow the Emergency Shutdown (ESD) systems to cut off the fuel supply to the fire. Personnel should not place their own lives in danger to attempt a rescue of any missing or injured personnel.

4.14.2 Emergency Response Document Interfaces

Emergency management is based on a tiered structure whereby the severity of the emergency triggers the activation of particular management levels.

There is a site Emergency Response Plan (Site ERP) for the BassGas, Otway, Beharra Springs, Kupe facilities and Omata Tank Farm. These address the offshore and onshore facilities including the pipelines.

The Site ERPs contain generic response procedures for a range of credible emergency scenarios, and are supported by a specific toolkit where individual requirements for that site are captured (i.e. site evacuation plan, particular areas of risk).

Reporting relationships for command, control and communications are specified in the Site ERP together with interfaces to emergency services, specialist response groups, statutory authorities and other external bodies. The roles and responsibilities are detailed for onshore and offshore personnel involved in an emergency, including the response teams, onshore support teams, employees, contractors and visitors.

The Site ERP details the emergency escalation protocol depending on the nature of the emergency. If the consequences of the emergency reach the major or critical definitions of the Risk Assessment Matrix, management of the emergency is escalated to the Group Emergency Management Team (GEMT) and, in turn to the Crisis Management Team (CMT).

Where a company is required to work under its own HSEMS when working within the facilities, a bridging emergency response plan detailing the clear reporting lines between the contractor representatives and Operations personnel may be established.

4.14.3 Emergency Plan Activation and Escalation

Emergency response and escalation of response is summarised in Table 4.3.

Table 4.3: Emergency Response Levels

| Emergency Plan | Escalation | ERP | Responsible Team | Person In Charge |
|----------------------------------|--|--|-------------------------------|--|
| Site Emergency Response Plans | The site emergency plan is activated when: A major accident occurs; or An uncontrolled event or incident occurs that could reasonably be expected to lead to a major accident. | [78] VIC-9000-SAF-PLN-3977022 - <i>Emergency Response Plan - Otway</i> [79] VIC-5100-SAF-PLN -3974548 <i>Emergency Response Plan - BassGas</i> [80] WAA-4100-SAF-PLN-3677589 <i>Emergency Response Plan – Beharra Springs</i> [81] NZL-1000-SAF-MNL-3237653 <i>New Zealand Site Emergency Response Manual</i> | Site Emergency Response Team | Incident Controller |
| Group Emergency Management Plan | The Group Emergency Management Team (GEMT) provides non-tactical support to the site and acts as the contact point with the Crisis Management Team. | [82] INT-1000-SAF-PLN-14768064 <i>Lattice Energy Group Emergency Management Plan</i> | Group Emergency Response Team | Duty Operations Manager / Group Emergency Management Team Leader |
| Corporate Crisis Management Plan | The Crisis Management Team (CMT) provides strategic support for high consequence events. This includes human resources, external affairs, commercial, HSE and administration. | [83] ORG-RMS-PLA-001 <i>Crisis Management Plan</i> | Crisis Management Team | Crisis Management Team Leader |

4.14.4 Emergency Response Training

Emergency response training is conducted in accordance with regulatory obligations and commitments.

All personnel on site are informed of key elements of the Emergency Response Plan applicable to that site during the induction and are notified of any changes as part of toolbox meetings. Matters covered include:

- Muster and assembly points
- Emergency notification (sirens, radio, etc.) and communication arrangements
- Communication protocols, equipment and facilities.

Personnel assigned roles in the ERP receive additional training as defined in the competency framework. This training allows personnel to develop competence and proficiency in fulfilling their assigned roles and responsibilities under the ERP.

4.14.5 Emergency Response Drills and Exercises

Emergency response drills and exercises will be conducted both onshore and offshore in accordance with regulatory obligations and commitments, the Emergency Response Activity Planning and Reporting Procedure [84] and the Site Emergency Response Plan.

The planning procedure specifies the frequency and types of emergency exercises to be conducted with the exercises generally relating to high risk and/or high potential events.

The list of potential scenarios is extensive and may include:

- Well emergency
- Hydrocarbon events (process loss of containment and/or subsequent ignition)
- Offshore pipeline rupture
- Onshore pipeline rupture
- Road tanker emergency
- Medical emergency
- Bomb threat
- Hazardous materials spill
- Bushfire
- Various offshore specific events (main overboard, vessel collision, helicopter emergency).

A schedule of exercises and drills has been developed and is managed through the CMMS. The schedule details the type of activity (i.e. desktop, drill or exercise) and the scenario to be tested. The schedule ensures that each shift participates in a number of activities each year.

Each Site ERP mandates that the facility engage the relevant local emergency services. Refer to the Site ERP for the specific frequency. It is acknowledged that for the emergency services that are staffed by volunteers, obtaining involvement may be problematic.

As mentioned in Section 4.6.6, where Major Hazard Facilities are required to coordinate activities and hazard management, emergency response scenarios and corresponding drills shall involve neighbouring MHFs at an appropriate level, including, at the very least, telephone notification to a 24 hour contact number.

Exercises related to pipelines must also conform to pipeline related events as discussed in AS 2885 Part 3.

Exercises and drills will be debriefed to capture learnings and opportunities for improvement. The results of such exercises and drills will be used to make improvements to procedures, systems and equipment as appropriate. Recording and tracking of completion of drills and exercises and follow-up actions is done via EIMS.

Refer:

[84] INT-1000-SAF-PRO- 4749814 - Lattice Energy Emergency Response Exercise Planning and Reporting Procedure

4.14.6 Development and Revision of the Emergency Response Plan

The ERP is periodically reviewed to establish its effectiveness and updated, as necessary, to incorporate lessons learned from training, exercises and incidents and as part of any major projects which may change the operating conditions of the various facilities.

4.14.7 Spill Contingency Plans/Response

Systems are established to provide effective management in the event of a loss of containment event onshore or a discharge of hydrocarbons or chemicals to the marine environment. The spill contingency plans in place are documented in the relevant Site ERP and/or Spill Contingency Plan. Such processes include initial response, reporting requirements, and the involvement of third parties having the appropriate skills and facilities necessary to respond effectively to spill issues.

Refer

[85] NZL-1000-SAF-PLN-4152174 - *Spill Contingency Plan – KPS KOTF Onshore Pipelines*

[86] TAS-5100-SAF-PLN-00001 *Oil Pollution Emergency Response Plan Yolla-A Platform*

[87] TAS-9100-SAF-PLN-00001 *Oil Spill Contingency Plan Otway Offshore*

[88] 12707383 *Oil Spill Contingency Plan Beharra Springs*

4.15 HSEMS Standard 15 – Plant and Equipment

4.15.1 Facility Design Parameters and Operating Integrity

Systems and procedures are maintained to ensure that plant and equipment is not operated outside its design parameters and capabilities. Primarily this is achieved by site operating and maintenance procedures developed to meet Asset Integrity Management Plans (as referenced in Part 2 Facility Description of the relevant Safety Case/SMS/SMP/OEMP), with independent control provided by the Safety Instrumented Systems (SIS) and mechanical safety devices (e.g. PSVs).

All facilities are provided with a Safety Instrumented System to safely identify process upsets or other abnormal conditions and to automatically initiate appropriate shut-down of equipment or systems. These monitoring systems interface with alarm systems to provide immediate warnings to Operators.

Equipment, instrumentation, alarms or safety instrumented systems that are identified in a SIL determination study (LOPA) or that are identified as a critical control in a risk assessment, must be identified as safety critical elements (SCEs). These SCEs are broken down into sub-components and recorded in a register of Safety Critical Equipment (SCEq) that has been prepared /are being developed for each asset (SCEq Register).

This classification is then used as a guide for the development of maintenance strategies, test and calibration schedule and critical spare parts.

The Technical Integrity Engineering team is responsible to ensure the compliance and ongoing certification of plant and equipment.

The assurance activities necessary to ensure the reliability and effectiveness of these safety monitoring, alarm and shutdown systems are developed on the basis of the criticality of the instrumentation in question and are subject to independent verification processes.

4.15.2 Critical Control Performance Standards

The MAE/MI/MA Hazard Register and Production Risk Register document and classify the preventative and mitigating measures to control the risks associated with the identified hazards for each facility.

In terms of developing performance standards, essentially all control measures documented in the MAE/MI/MA Hazard Register Hazard Registers – preventative and mitigating, hardware and software (systems and procedures) – are captured within the Critical Control Performance Standards (CCPS). The Performance Standards are shown in Table 4.4 and are intended to ensure that safety critical elements remain effective and reliable. Assurance activities and performance criteria are based on relevant standards and design specifications.

The CCPS package contains rigorous verification assessments conducted by staff not in direct reporting line to the Operations Manager for that asset, hence achieving a sufficient degree of independence and as part of the Level 2 assurance program described in Section 4.19.

Table 4.4: Critical Control Performance Standards

| Code | Description | Owner (Responsibility) |
|-----------|---|------------------------|
| SI | Structural Integrity | |
| SI-01 | Subsea Structures & Foundations | Structural/Civil |
| SI-02 | Offshore Topsides Structures | Structural/Civil |
| SI-03 | Onshore Structures and Foundations | Structural/Civil |
| SI-04 | Cranes & Mechanical Handling | Mechanical Static |
| SI-05 | Road Vehicles | Mechanical Static |
| SI-06 | Mooring Systems | Structural/Civil |
| SI-07 | Drilling Systems | Structural/Civil |
| PC | Process Containment | |
| PC-01 | Pressure Vessels | Mechanical Static |
| PC-02 | Heat Exchangers | Mechanical Static |
| PC-03 | Rotating Equipment | Rotating Equipment |
| PC-04 | Tanks | Mechanical Static |
| PC-05 | Piping Systems | Mechanical Static |
| PC-06 | Pipeline & Flowline systems | Pipeline |
| PC-07 | Relief System | Mechanical Static |
| PC-08 | Operational Well Containment | Well Integrity |
| PC-09 | Fired Heaters | Mechanical Static |
| PC-10 | Well intervention / Well Control Equipment | Drilling & Completion |
| IC | Ignition Control | |
| IC-01 | Hazardous Area Ventilation | ICCE |
| IC-02 | Non-hazardous Area Ventilation | ICCE |
| IC-03 | Certified Electrical Equipment | ICCE |
| IC-04 | Earth Bonding | ICCE |
| IC-05 | Fuel Gas Purge System Process | Process |
| IC-06 | Inert Gas Blanket System Process | Process |
| IC-07 | Misc Ignition Control Components ICCE | ICCE |
| IC-08 | Flare Tip Ignition Systems ICCE | ICCE |
| DS | Detection Systems | |
| DS-01 | Fire & Gas Detection | ICCE |
| DS-02 | Security systems | ICCE |
| PS | Protection Systems | |
| PS-01 | Deluge Systems | Technical Safety |
| PS-02 | Fire and Explosion Protection | Technical Safety |
| PS-03 | Fire Water Pumps | Rotating Equipment |
| PS-04 | Fire Water Ring Main & Distribution Systems | Mechanical Static |
| PS-05 | Passive Fire Protection | Mechanical Static |
| PS-06 | Gaseous Fire Protection Systems | Mechanical Static |

| Code | Description | Owner (Responsibility) |
|-----------|---|------------------------|
| PS-07 | Fine Water Spray Systems | Mechanical Static |
| PS-08 | Sprinkler Systems | Mechanical Static |
| PS-09 | Electrical Power Protection System | ICCE |
| PS-10 | Fixed Foam Systems | Mechanical Static |
| PS-11 | Sand Management Systems | Mechanical Static |
| PS-12 | Chemical Injection Systems | ICCE |
| PS-13 | Navigation Aids | ICCE |
| PS-14 | Collision Avoidance Systems | ICCE |
| PS-15 | Metoccean Data Gathering Systems | ICCE |
| PS-16 | Heat Tracing | ICCE |
| PS-17 | Safety Instrumented Functions | ICCE |
| PS-18 | Cathodic Protection Systems | ICCE |
| SD | Shutdown Systems | |
| SD-01 | Emergency Shutdown System ICCE | ICCE |
| SD-02 | Depressurisation System Process | Process |
| SD-03 | Operational Well Isolation Well Integrity | Well Integrity |
| SD-04 | Pipeline Isolation Valves Pipeline | Pipeline |
| SD-05 | Emergency Shutdown Valves (ESDVs) ICCE | ICCE |
| SD-06 | Subsea Isolation Valves (SSIVs) ICCE | ICCE |
| SD-07 | Drilling Well Control Equipment Drilling & Completion | Drilling & Completion |
| SD-08 | Utility Air Rotating Equipment | Rotating Equipment |
| ER | Emergency Response | |
| ER-01 | Temporary Refuge/Prim. Muster Areas | Technical Safety |
| ER-02 | Escape and Evacuation Routes | Technical Safety |
| ER-03 | Emergency / Escape Lighting | ICCE |
| ER-04 | Communication Systems | ICCE |
| ER-05 | Uninterrupted Power Supply (UPS) I | ICCE |
| ER-06 | Helicopter Facilities Technical Safety | Technical Safety |
| ER-07 | Emergency Power ICCE | ICCE |
| ER-08 | Drain Systems Process | Process |
| LS | Lifesaving | |
| LS-01 | Personal Survival Equipment | Technical Safety |
| LS-02 | Rescue Facilities | Technical Safety |
| LS-03 | Life boats/TEMPSCs | Technical Safety |
| LS-04 | Other means of Escape | Technical Safety |
| LS-05 | Working Area Breathing Air Supply | Technical Safety |

The performance standards [114] are guidance documents that direct the user to particular industry standards, design specifications and asset integrity management plans on which to base the specific performance criteria, inspection and test methods and record keeping to ensure that safety critical elements remain fit for purpose.

Each performance standard documents criteria for:

- Functionality
- Reliability/availability
- Survivability
- Interdependency with other controls
- Permitted operations.

With the implementation of the CCPS program, every safety critical element used to prevent or mitigate a Major Accident Event/Major Incident as documented in the SCE Register has a governing performance standard.

Refer:

[114] INT-IGMS-ENG-STD-10129714 – Generic Operate Phase Performance Standards

4.15.3 Verification of Performance Standards

Each performance standard has a verification assessment and summary report developed for it in which safety, operational and administrative assessment criteria are numerically scored. Pass/fail criteria are provided for each assurance activity. Failure to reach certain thresholds for each category of assessment criteria triggers notification to senior management for action.

As explained in Section 4.15.2, the verification assessment component of each performance standard is conducted by persons not associated with the asset, providing independent verification that appropriate SCE assurance activities conducted at site, that defects are resolved to completion and that record keeping and reporting, if required, meets the requirements of the performance standards system and governing regulations.

Performance is monitored on a continuous basis by the provision of a reporting tool to Engineering, Operations and HSE management teams, providing a visual display of the compliance level and trends of each asset as well as compliance gaps.

In New Zealand, independent third party verification of management of major accident hazards at the Kupe assets is also through of Certificates of Fitness issued for Kupe Wellhead Platform, Kupe Raw Gas Pipeline, the Kupe Sales Gas Pipeline and the Omata Condensate Export Pipeline. For wells, Well Examination Certificates are issued by an independent third party and contained within a Well Examination Scheme document prepared for each well.

Refer:

[115] LR NZL 0900001/002/09/1 Certificate of Fitness of Offshore Structure

[116] LR NZL 0900232/002/09/1 Certificate of Fitness of Subsea and Land Raw Gas Pipeline

[117] SGS M&I 316-759-01 Certificate of Fitness, Kupe Sales Gas Pipeline

[118] NZ-1000-35-TR0002 Well Examination Scheme, Kupe South 6

[119] NZ-1000-35-TR0003 Well Examination Scheme, Kupe South 7/ST1

[120] NZ-1000-35-TR0004 Well Examination Scheme, Kupe South 8

4.15.4 Asset Integrity

As required by and specified in the Asset Integrity Directive [41], Integrity Management Plans (IMPs) are in place for each facility as documented in the Part 2 Facility Description of the relevant Safety Case/SMS/SMP/OEMP. Asset specific Pipeline Integrity Management Plans (PIMPs) for offshore and onshore pipelines have been developed given the location specific threats that these pipelines experience. The plans define the systems and procedures applied to maintenance, inspection and testing activities for that asset and are aligned to the HSEMS Asset Integrity Management Standard, Risk Management and Health, Safety and Environment Policies.

Specifically relating to mechanical equipment, integrity management plans have been developed to cover:

- Conventional Wells [89]
- Pressure vessels [90]
- Piping systems [91]
- Pressure relief devices [92].

Similarly, for electrical and instrumentation equipment, integrity management plans have been developed for:

- Electrical equipment in Hazardous Areas [93]
- Earthing and lightning protection [94]
- Instrument tubing [95]
- Functional safety [96]
- Emergency and escape lighting [98]
- Fire and gas detection systems [99].

Operational technology such as operator interface and process control systems are developed and maintained to:

- Operational technologies IMP (includes PLCs and human-machine interfaces) [97]
- Alarm management philosophy [108]

The plans provide detailed instruction on the activities needed to ensure Safety Critical Equipment remain fit for purpose. To cite one example, the Pressure Relief Devices Integrity Management Plan includes the following requirements:

- Tests to be performed and the method to be used
- Test reporting and certification
- Establishment and maintenance of a pressure relief device (PRD) register
- PRD tagging, including the specific location of the tag on the PRD
- Test performance criteria and tolerances
- Overhaul and test method.

The requirements in the Asset Integrity Plans are translated into Preventative Maintenance (PM) tasks which specify clearly, concisely and realistically the nature of the tasks and the frequencies at which they are to be completed.

The Computerised Maintenance Management System (CMMS) controls the requirements for ordering, suitability, and quality of maintenance consumables and replacement components. These requirements are defined in consultation with the equipment manufacturer/supplier where applicable, and from design and operating information and data sources.

Refer:

[89] INT-1000-ENG-PLN-00023 7726350 – Conventional Wells Integrity Management Plan

[90] INT-1000-ENG-PLN-00005 Pressure Vessels Integrity Management Plan

[91] INT-1000-ENG-PLN-00003 Piping Systems Integrity Management Plan

[92] INT-1000-ENG-PLN-00013 Pressure Relief Devices Integrity Management Plan

[93] INT-1000-ENG-PLN-00008 Electrical Equipment in Hazardous Areas Technical Integrity Management Plan

[94] INT-1000-ENG-PLN-00010 Earthing and Lightning Protection Integrity Management Plan

[95] INT-1000-ENG-PLN-00007 Instrument Tubing Technical Integrity Management Plan

[96] INT-1000-ENG-PLN-00011 Functional Safety Integrity Management Plan

[97] INT-1000-ENG-PLN-00012 Operational Technology Asset Integrity Management Plan

[98] INT-1000-ENG-PLN-00022 Emergency and Escape Lighting Integrity Management Plan

[99] INT-1000-ENG-PLN-00021 Fire and Gas Detection System Integrity Management Plan

[100] NZL-1000-MTC-PLN-00005 Asset Integrity Management Plan

[101] NZL-1000-MTC-PLN-00004 Integrity Management Plan Structural and Civil Equipment

[102] NZL-K300-ENG-PLN-00001 Integrity Management Plan Kupe Wellhead Platform

[103] NZL-K400-ENG-PLN-00001 Integrity Management Strategy Plan Kupe Offshore Pipeline

[104] NZL-K400-ENG-PLN-00002 Kupe Electro/Hydraulic Sub-Sea Umbilical Integrity Management Plan

[105] NZL-1000-MTC-PLN-00001 Storage Tanks Integrity Management Plan

[106] NZL-K400-ENG-PLN-00001 Integrity Management Plan Kupe Offshore Pipeline

[107] NZL-K300-ENG-PLN-00002 Kupe Wells Integrity

[108] INT-1000-ENG-SPE-00003 Alarm Management Philosophy

4.15.5 Maintenance Management System

Lattice Energy utilises a Computerised Maintenance Management System (CMMS) for the control and recording of asset integrity and maintenance activities.

The CMMS provides a continuous status of planned preventative maintenance (PM) and corrective maintenance tasks (CM) and an indication of the state of integrity of the installation. These scheduled tasks on SCEq, such as critical function tests (CFTs), provide assurance that the SCEq remain effective and reliable.

The CMMS is the primary vehicle for initiation of integrity activities, control and tracking of completion, and close out and recording of the activities. The CMMS contains the following elements:

- Equipment Register (plant and equipment requiring registration through regulatory authorities or their agents with formal inspections by certified personnel)
- Planned preventative maintenance (PM) procedures
- Spare parts listing
- Work Order System
- Work History Recording System
- Reporting and analysis functions.

The maintenance planner, under advice from the Maintenance, Engineering, and Operations Superintendents is responsible for on-going use of the CMMS.

Refer:

[110] INT-1000-OPS-PRO-00002 Management Of Work Process

4.15.6 Critical Equipment Testing

Assurance of the effectiveness of the safety critical equipment (SCEq) is undertaken by assurance, inspection and testing. Assurance activities include but are not limited to non-destructive testing, PSV lift tests, critical function tests, monitoring of corrosion coupons, visual inspection and the CCPS program. These requirements are mandated in the applicable Asset Integrity Management Plans which provide the detail on the specific tasks required.

Safety Instrumented Systems are tested and maintained in accordance with AS 61508. A detailed maintenance strategy for each safety instrumented function is prepared. The method for selection of test and inspection frequency of instrumentation, control and electrical equipment is discussed in detail in the ICE Equipment Preventative Maintenance Strategy, with the frequency determined by risk assessment (SIL/LOPA), regulatory requirements and suppliers' recommendations [111].

Specifically for the New Zealand assets, for safety instrumented functions (SIFs), the SIS Test and Calibration procedure [113] defines the requirement for critical function tests (CFTs) and calibration procedures to be developed in the CMMS for both initiators and final elements within a SIF. The procedure requires all inputs into safety instrumented functions to be both functionally tested and periodically calibrated. This procedure defines the frequency of functional testing and calibration for each component of a SIF. The SIL rating of this critical maintenance activity has been reviewed to ensure that the SIL value is appropriate to each critical item.

If a permanent or temporary physical or electronic modifications is required for SCE including test frequencies, it must be made according to the Management of Change Procedure (refer to Section 4.11) unless this modification is specially managed via another process such as the Override and Bypass Procedure (see Section 4.10.5).

Refer:

[111] AUS-1000-MTC-GDL-00001 ICE Preventative Maintenance Strategy

[112] NZL-1000-MTC-PRO-00002 Planned Preventative Maintenance

[113] NZL-1000-MTC-PRO-00013 Safety Instrumented Systems Test & Calibration Procedure

4.15.7 Hazardous Area Electrical Equipment

Inspections for all electrical equipment installed in hazardous areas (classified in accordance with AS 2430) have been previously conducted on a periodic basis per the requirements of AS 2381. These inspections are now managed under the provisions of AS/NZS 60079.

A hazardous area electrical equipment dossier is maintained for the management of ignition risk due to electrical installations in hazardous areas. All inspections are scheduled using the CMMS and are carried out by trained and competent site staff.

4.15.8 Portable Electrical Equipment

The integrity of portable electrical equipment is managed via pre-use inspections and scheduled inspections and maintenance via preventative maintenance (PM) work orders in the CMMS. These may include:

- Test and tag
- Gas detection and atmospheric monitoring equipment. This equipment is subject to bump testing and calibration in line with the manufacturers' recommendations
- Hire and incoming equipment checklist.

Refer:

[109] VIC-1000-SAF-FRM-10874328 Hire and/or Incoming Equipment Checklist

4.15.9 Materials Handling and Storage

4.15.9.1 Hazardous and Dangerous Goods Handling

A register of hazardous materials and dangerous goods is maintained by the sites. An electronic system (Chemwatch) is used to obtain Safety Data Sheets (SDS). Hazards associated with the use of hazardous materials are assessed and incorporated into the task Job Hazard Analysis.

Hazardous materials or dangerous goods are stored in designated areas consistent with the legislation and segregation requirements, i.e. explosives stored in a separate and secure location away from the public and personnel.

Hazardous materials storage areas and containers are sign posted and plant, equipment and materials are secured to prevent unauthorised access or damage including deterioration, e.g. as a result of excessive heat/cold/moisture/dust.

Plant and materials are transported by road, rail, sea and air in accordance with Transport of Dangerous Goods requirements. Disposal of hazardous waste is in accordance with Waste Management Plans/Environmental Plan (refer to Section 4.19.4).

Refer:

[121] INT-1000-SAF-PRO-3675133 Hazardous Materials – Approval and Control

[122] 8743319 Hazardous Materials Risk Assessment Form

4.15.9.2 Lifting Equipment

Mechanical handling devices such as cranes, winches, hoists, trolleys etc. will comply with the appropriate codes and standards. Only personnel with the appropriate training, licensing and competency will use mechanical handling equipment.

Lifting or winching is as per Lifting and Load Safety Operations procedure [123] incorporating lifting checklists prepared prior to commencement of the lift. Lifting equipment is inspected by a competent person with certification and marking requirements recorded in a Lifting Equipment Register. All lifting equipment is inspected prior to use on site.

Contractors are required to provide appropriate documentation before any contractor-owned lifting equipment may be used at the facilities as per Lifting and Load Safety Operations procedure [123].

Refer:

[123] AUS-1000-SAF-PRO-3674901 Lifting and Load Safety Operations - Australia

4.16 HSEMS Standard 16 – Monitoring the Work Environment

4.16.1 Identification of Hazards and Exposures at the Workplace

The site risk management processes identify potential health hazards and exposures at the workplace and these are documented in the site Risk Register. Specific working practices and guidelines apply to minimise the hazards to personnel.

4.16.2 Control of Workplace Environment

Regular workplace inspections are conducted to inspect the storage and containment of hazardous materials. Where results indicate new hazards or exposures or find that existing controls are ineffective, this information is fed back into the risk management process and may result in a review of the site Risk Register.

Such inspections may typically include the following:

- Presence of safety signs, barriers, etc.
- Tripping hazards, missing or open hatches
- General housekeeping
- Storage of gas cylinders
- Status of fire-fighting equipment, e.g. fire extinguishers, etc.
- Fire hazards
- Drain seals
- Ladders and scaffolding
- Condition of lifting equipment, e.g. slings, etc.
- Oil or hazardous substance spills
- Condition of portable tools and equipment
- Correct use of PPE
- Correct application of Work Permits
- Presence of isolation tags, etc.

In addition, specific procedures and checklists have been developed to address the specific work tasks such as the following:

- Confined Space Entry
- Working at heights
- Rope access
- Excavation and trenching.

Refer:

[124] INT-1000-SAF-PRO-00003 Personal Protective Equipment (PPE) Procedure

[125] VIC-5100-SAF-PRO-00004 Confined Space Entry Procedure (CA)

[126] AUS-1000-SAF-PRO-00003 Confined Space Entry Procedure – Western Australia

[127] NZL-1000-SAF-PRO-3237718 Confined Space Entry Procedure – New Zealand

[128] VIC-1000-SAF-PRO-00006 Excavation and Penetration – SA

[129] AUS-1000-OPS-PRO-00006 Excavation Pipeline and General

[130] AUS-1000-OPS-PRO-3674900 Working at Heights (CA) – AUS

4.16.3 Monitoring Impacts of the Operations to Personnel and Host Community

Environmental, health and hygiene aspects of the operations are monitored by surveillance programmes covering good housekeeping and key exposures (such as chemical, environmental and biological) to personnel and host communities.

4.16.3.1 Personnel

Baseline medicals are conducted as part of pre-employment requirements. Monitoring programs for workplace exposures are in place and include the following:

- Audiometric testing
- Mercury (Hg) health surveillance via urinate testing
- Gas detection systems such as Hg and Benzene Toluene, Ethyl benzene, Xylene (BTEX).
- Radiation detection for NORMs

4.16.3.2 Community

Exposure monitoring programs at the facilities may include:

- Environmental noise monitoring – undertaken at the nearest residences and onsite monitoring at four nominated derived points. Regular onsite monitoring takes over once compliance at the nearest residences is achieved

- Environmental emissions testing.

Refer:

[131] LAT-HSE-DVE-030 - Directive – Occupational Noise

[132] VIC-1000-OPS-PRO-8187956 – Portable Gas Detection Equipment Usage

[133] AUS-1000-OPS-PRO-00004 Portable Atmospheric Gas Detection - EA & WA

[134] INT-1000-SAF-GDL-00002 Chemical PPE Selection Matrix Guideline

[135] INT-1000-SAF-PRO-00015 BTEX Testing and Control of

[136] INT-1000-SAF-PRO-00016 Mercury, Control of (CA) – AUS

4.16.4 Personal Protective Equipment

Personal protective equipment (PPE), consistent with the nature of the task being undertaken, is used by all personnel working at the sites. Suitable additional PPE equipment is provided for specific hazards. Personnel are required to wear PPE whenever they are within a mandatory PPE area as per the PPE procedure [124].

The facility supplies PPE to all employees. Contractors are expected to arrive at a facility with standard PPE such as clothing, glasses, gloves and hard hats. The facility provides specialist PPE such as respirators and cartridges if required. Hearing protection is provided in various locations around the facilities.

The requirement for additional specific PPE is identified in various ways, including but not limited to:

- Work-permits
- Procedures
- Signs
- Safety Data Sheets (SDS).

Refer:

[124] INT-1000-SAF-PRO-00003 Personal Protective Equipment (PPE) Procedure

[134] INT-1000-SAF-GDL-00002 Chemical PPE Selection Matrix Guideline

4.16.5 Manual Handling

Assessment of manual handling tasks provides an important hazard and control measure as part of the Job Hazard Analysis process. Manual handling awareness is incorporated into training and into the Job Hazard Analysis (JHA) for specific tasks as a means of communicating control measures. Monitoring the effectiveness of manual handling controls is part of the observation program.

4.16.6 Occupational Hygiene

It is important that personnel are protected from chemical, physical, and biological hazards in the workplace that could cause disease or discomfort. Occupational hygiene practices include the anticipation, recognition, evaluation and control of health hazards in the work environment with the objective of protecting worker health and well-being and safeguarding the community at large. An example of this is during shutdowns where occupational hazards are monitored by conducting both real time ("grab") samples and passive monitoring for VOC, BTEX and mercury (Hg) and then assessing the results of that sampling.

All workplaces will maintain a high standard of hygiene where the standards to be adopted will meet or exceed those required by local regulations.

Refer:

[134] INT-1000-SAF-GDL-00002 Chemical PPE Selection Matrix Guideline

[135] INT-1000-SAF-PRO-00015 BTEX Testing and Control of

[136] INT-1000-SAF-PRO-00016 Mercury, Control of (CA) – AUS

[137] VIC-1000-SAF-PRO-00002 Food Substances - Transportation, Storage, and Preservation of

[138] TAS-5100-SAF-PRO-00003 Communicable Disease Prevention and Control

4.16.7 Lighting, Ventilation, and Noise

The permanent lighting systems installed at each facility meet, or exceed, the requirements of applicable codes and standards for normal workspaces and access ways. This includes minimum levels of emergency lighting. Suitable temporary lighting will be provided for all confined spaces and areas in which unusual operations are being conducted.

Noise levels within the facility are monitored and controlled in compliance to applicable regulations and the National Code of Practice for Noise Management and Protection of Hearing at Work [NOHSC: 2009 (2004)]. Noise monitoring results are documented in the site-specific Noise Hazard Register and Control Plan and associated site specific Noise Map.

Where necessary, sound attenuation devices have been installed to reduce noise to a safe level. Where permanent sound attenuation is not utilised, signage has been posted to mark any areas where unacceptably high sound levels exist. The wearing of hearing protection within these zones is mandatory.

Refer:

[131] LAT-HSE-DVE-030 - Directive – Occupational Noise

4.16.8 Hot/Cold Working Conditions

Procedures and protective devices are available to provide protection to personnel in situations where they may be required to work in extreme hot or cold conditions, or come into contact with hot/cold surfaces.

Protection against hot/cold surfaces are provided in the form of insulation or guarding while procedural controls are in place to limit activities that may present a hazard to personnel or the environment as a result of adverse weather conditions.

Refer:

[139] INT-1000-SAF-PRO-4741245 Hot and Cold Condition Management

4.16.9 Security, Access and Egress

The security, access and egress arrangements for each site are detailed in Part 2 Facility Description of the relevant Safety Case/SMS/SMP/OEMP.

Access and egress to work locations are monitored to ensure that they are free of obstructions and that requirements for emergency escape are maintained.

Personnel access to the facilities is restricted to authorised persons only. Their arrival and departure are recorded to ensure an accurate count of personnel on site is available for use in the event of a site muster being required.

Refer:

[22] VIC-1000-SAF-PRO-3974220 Access and Movement to Offshore Platforms

[23] NZL-K301-OPS-PRO-00001 Access to Kupe Wellhead Platform Procedure

[139]

VIC-1000-OPS-PLN-00001 Offshore Security Plan

4.17 HSEMS Standard 17 - Health and Fitness for Work

The Health and Fitness for Work Directive outlines the general requirements of employee fitness for work. The Directive covers pre-employment fitness for work, stress, and drug and/or alcohol impairment.

Refer:

[141] LAT-DVE-037 Directive Health and Fitness for Work

4.17.1 Medical Examinations

All new employees will undergo a pre-employment or pre-transfer medical to verify that they are fit and able to perform the range of duties required by their new role. Periodic medical examinations are required for operations roles.

4.17.2 Medical Records

Employee health records are maintained in a secure location, under the responsibility of the Human Resources team. Reports and records are retained for the period required by legislation, or for the period required by the company's documentation retention policy, whichever is the greater.

4.17.3 First Aid Facilities

First aid facilities are established at each facility and consist of the necessary equipment to allow the administering of first aid. This may include a stretcher bed, defibrillator, first aid medications, oxygen, neck braces, blankets, etc. First aid kits are also placed into work vehicles which are used in the field (i.e. off site). A Royal Flying Doctor's Service (RFDS) kit and telemedicine service is also provided for the Yolla and Thylacine offshore facilities.

Each facility has at least one person holding a current recognised first aid qualification. A list of trained first aiders is displayed on site noticeboard. The core crew for the offshore facilities include a trained First-Aider.

Requirements for the management of first aid facilities including the RFDS Kit are described in the First Aid procedures. The first aid equipment is inspected and maintained via the CMMS and an associated equipment checklist.

Refer:

[19] VIC-1000-SAF-PRO-000013 First Aid and Tele-medicine Procedure

[20] NZL-1000-SAF-PRO-00006 First Aid & First Aid Training

4.17.4 Drug and Alcohol Management

The Drug and Alcohol Management policy prohibits personnel from working while under the influence of drugs or alcohol and is supported by various forms of testing regimes including fitness for work testing, post incident testing and random tests. Such testing regimes apply to all personnel onsite including employees, contractors, suppliers and visitors.

The use of intoxicant substances including alcohol, illegal drugs or the misuse of prescription or non-prescription drugs will not be tolerated on any Lattice Energy sites. Any person at site who is required to take prescription drugs which may affect his or her work performance must notify the PSS/Operations Superintendent/PIC immediately.

Personnel receiving medication (such as an EpiPen) from their private medical providers are expected to advise site management. This information may be used to assess incompatibilities between assigned tasks and medication being taken and to provide the emergency services with advice for treatment should personnel be unable to communicate it themselves.

When accommodation is onsite, personnel keep their personal belongings in their assigned rooms.

Smoking is not permitted on the offshore platforms, and is only permitted in designated areas at the onshore facilities.

Refer:

[142] LAT-DVE-023 Directive Drug and Alcohol Management

[143] LAT-POL-002 Drug and Alcohol Policy

[144] LAT-GDE-009 Guide - For Cause Testing

4.17.5 Working Hours and Fatigue

The Directive – Fatigue Risk Management [145] outlines the standards regarding fatigue. Planned working hours are generally set at a maximum of 12 hours/day with a peak level of 14 hours/day under specific conditions. Rosters for rostered personnel are generally set at 7 or 14 continuous days before a rest break. Guidance is provided around controls for when rosters extend beyond a 12 hour shift or for when rosters extend beyond 14 days.

When planning a task it is the responsibility of supervisors to determine if there is a risk of fatigue among the individuals assigned to carry out the task. If there is such a risk, then the Supervisor is to consider reassigning the task to another individual, delaying the task until the next shift, or permitting the individual to take an appropriate rest break before commencing the task.

At Beharra Springs, compliance to the Fatigue Risk Management Directive is achieved by an on-call roster for operator response to afterhours operational upsets.

Refer:

[145] LAT-DVE-043 Directive Fatigue Risk Management

4.17.5.1 Remote Travel

Arrangements for all land transport are defined in the Land Transport Procedure. This addresses remote travel precautions and maximum hours of driving.

Refer

[146] LAT-DVE-001 Directive – Land Transport

[147] INT-1000-SAF-PRO-3675127 Land Transport Procedure

4.17.6 Injury Management and Rehabilitation

All employees including subcontractors and self-employed persons are covered under worker's compensation policy arrangements.

Injury management and rehabilitation processes are maintained utilising expertise from external medical providers and internal advisers.

A medical provider experienced in industrial medicine has been engaged to work with management and employees as the initial contact point for non-critical work related medical matters.

In the event of injury or illness, a system is in place to support the rehabilitation of employees. Where appropriate, employees will be offered alternative duties and periodically assessed to determine their suitability to resume their normal duties. Employees are encouraged to return to their normal duties as soon as it is medically possible. The services of a Rehabilitation Coordinator are made available as required via the Workers Compensation and Rehabilitation Group.

Refer:

[149] ORG-HSE-POL-004 Policy - Rehabilitation

4.17.7 Violence, Harassment and Victimisation

Violence, bullying, or victimisation of employees/members of the workforce in the workplace is not condoned and companywide measures exist to allow such concerns to be reported, investigated and addressed with appropriate levels of confidentiality. Code of conduct training is mandatory for all employees/members of the workforce.

Refer:

[150] ORG-P&C-POL-004 Policy Discrimination, Harassment and Bullying Policy

[151] ORG-COC-PRO-001 Dealing with a Serious Concern

[152] ORG-P&C-POL-001 Policy Diversity and Inclusion

[153] ORG-P&C-POL-003 Policy Code of Conduct Policy

4.17.8 Employee Assistance Program (EAP)

Employees are provided with access to an Employee Assistance Program (EAP). The EAP is a professional, confidential and free counselling service paid for by Lattice Energy to provide employees and their family with help on any issues or concerns they may have, whether they be personal or professional.

For employees who manage others, there is also a telephone-based service called Manager Assist. This service allows you to gain advice and coaching on any issues which are impacting you in your management role.

4.18 HSEMS Standard 18 – Environmental Effects and Management

4.18.1 Environmental Hazard Identification and Assessment

Each facility has processes in place for environmental hazard identification and assessment.

In the development phase, Environmental Effects Statements (EES)/Environmental Impact Statements (EIS) were prepared for the BassGas and Otway facilities. These environmental impact assessments were to address Commonwealth and State environmental requirements in accordance with the Federal Environment Protection and Biodiversity Conservation Act (EPBC Act) (1999) and the Victoria Environment Protection Act 1970 and were carried out as part of the sites' development approvals process. The EES/EIS were used to plan the development to identify and minimise environmental impact, ensure compliance with applicable environmental legislation, and to develop the site Environmental Management System.

Similarly, the Kupe facility has an Assessment of Environmental Effects [AEE] that was undertaken as an essential part of the consenting process, and the Beharra Springs facility has an environment risk assessment.

In the Operations phase, including ongoing projects associated with the facilities, environmental hazards are identified as part of the overall risk identification and assessment process (refer to Section 4.7).

Refer:

[30] Otway Gas Project Environmental Effects Statement/Environmental Impact Statement

[31] V-5100-15-RP-0001 BassGas Project Environmental Effects Statement/Environmental Impact Statement

[32] NZL-1000-ENV-PLN-00001 NZ Environment Management Plan

[33] WAA-4100-ENV-PLN-00001 Environmental Plan Beharra Springs Gas Facility

4.18.2 Environmental Management System

The Lattice Energy facilities operate under the following facility specific environment documentation:

[32] NZL-1000-ENV-PLN-00001 NZ Environment Management Plan

[33] WAA-4100-ENV-PLN-00001 Environmental Plan Beharra Springs Gas Facility

[154] TAS-5100-ENV-PLN-00001 Offshore Environment Plan BassGas

[155] VIC-5100-ENV-PLN-3974547 Environmental Management Plan - Lang Lang Gas Plant

[156] VIC-9000-ENV-PLN-00003 Offshore Environment Plan – Otway

[157] VIC-9400-ENV-PLN-00001 Environmental Management Plan - Otway Gas Plant

4.18.3 Environmental Risk Management

Environmental impacts are evaluated as part of any hazard identification process and as with other risk items, the credible consequences of each hazard to the environment are assessed, the risks quantified, and actions undertaken to reduce risk levels to acceptable levels by implementation of appropriate control measures (as per Section 4.7 Hazard & Risk Management).

A sampling program has been implemented to periodically measure the various discharges from the facilities to ensure that they comply with the site Licence requirements (refer to Section 4.16.3).

4.18.4 Environmental Effects

In addition to the potential effects identified during the development phase, an environmental risk assessment workshop was conducted at each site involving Engineering, Operations, HSE and the general workforce to review other potential environmental risks associated with the operations phase of the facilities. This is documented in Environmental Risk Register within the facility specific environment documentation.

4.18.5 Hazardous Materials

The impact and risks associated with the use of hazardous materials are assessed prior to such materials being brought onsite and approved for use. Where practicable, the least environmentally harmful material will be used. The process involves several steps as follows:

- Obtaining current Safety Data Sheets (SDS) (Chemwatch is used for information)
- Conducting a review of the hazardous material, evaluating its hazard to personnel, the environment, etc.
- Ensuring the material is recorded in the Hazardous Materials Register
- Ensuring that all necessary procedures and PPE are in place prior to receipt of the substance
- Selection and ongoing monitoring of its storage conditions and location to ensure they are appropriate and fit for purpose
- Ongoing monitoring of a material's use
- Managing the disposal of any waste material.

Refer:

[121] INT-1000-SAF-PRO-3675133 Hazardous Materials

[122] 8743319 Hazardous Materials Risk Assessment Form

4.19 HSE Standard 19 – Product Stewardship, Conservation and Waste Management

4.19.1 Environmental and Health Hazard Assessments of Products

Safety Data Sheets for all key products produced at Lattice Energy sites have been developed and supplied to customers to ensure safe handling of those products. This includes MSDS for:

- Natural Gas
- LPG (Liquefied Petroleum Gases)
- Condensate.

4.19.2 Product Safety Warnings and Recalls

Regular sampling of all products is conducted in the Laboratory in each plant or via on-line analysers. External verification tests are also undertaken. Results are available for customers. In the event of abnormal specifications the issue will be communicated to customers.

4.19.3 Resource and Waste Identification and Evaluation

All resources utilised, or consumed as a result of Lattice Energy operations are identified and documented. These include natural resources, materials and energy.

Systems have been established to ensure that the consumption of these resources is carried out both efficiently and in a manner that conserves such resources. This includes the setting of documented objectives and targets. Preference is given to the use of renewable resources over non-renewable ones. Waste streams from the process operations are evaluated with a view to maximising the use of recycling wherever practicable.

4.19.4 Waste Management

Waste management is documented within the facility Environmental Plan or Waste Management Plan. These plans, together with associated procedures, are used to manage the disposal of waste. Only licensed disposal contractors are used for such disposal.

Monitoring is conducted to ensure that material usage and discharges are minimised, and as a minimum comply with legislation.

Waste is collected in separate bins to simplify the waste treatment, disposal, or re-cycling process as described in the relevant Waste Management or Environment Plan. Nets, enclosed bins, or other appropriate means are provided to prevent waste materials from being scattered as a result of high winds, etc.

Refer:

[158] VIC-9000-ENV-PLN-8199521 - Management of Waste - Otway

[159] VIC-5100-SAF-PLN-3974553 - Waste Management Plan – BassGas

[33] WAA-4100-ENV-PLN-00001 Environmental Plan Beharra Springs Gas Facility

[32] NZL-1000-ENV-PLN-00001 NZ Environment Management Plan

4.20 HSEMS Standard 20 – Audits, Assessment and Review

4.20.1 Audits, Inspections, and Reviews

Audits, inspections and reviews are carried out to:

- Assess the implementation and effectiveness of activities in accordance with the HSE Management System
- Assess the management of major accident hazards and other workplace hazards
- Ensure compliance with set performance standards
- Evaluate whether current management plans and HSE objectives are being achieved
- Measure the effectiveness of the HSE management system in use at all sites.

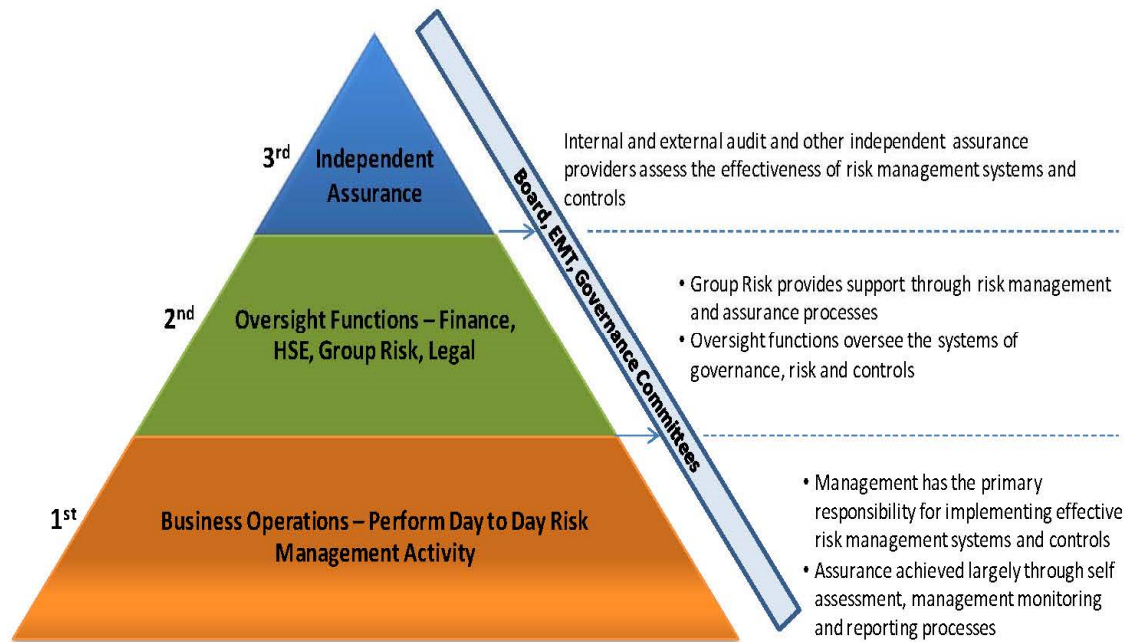
The Assurance Plan [164] details the assurance principles based on the “Three Lines of Defence” to manage risk, with the assurance activities targeted to assess the effectiveness of controls. Each line of defence is described by the primary roles, responsibilities and accountabilities that combine for an effective control framework as outlined in the diagram below.

The management of Major Accident Events/Major Incidents is audited against compliance to this HSEMS. Verification that SCE remain effective forms one part of the internal and external audit program. Other significant audit focus areas are contractor management and the permit to work system.

Independent auditing of compliance to the HSEMS is achieved through the Level 2 and Level 3 audit programs. The method, scope and personnel are defined within the Assurance Plan [164] - a document prepared outlining a pre-determined number of the 20 HSEMS elements to be audited in the year with auditing conducted to a published schedule.

Refer:

[164] INT-1000-SAF-PLN-3675079 - Assurance Plan



4.20.2 First Line of Defence - Site Level Assurance Activities

The First Line of Defence is the review of day to day risk management activity through self assessments, monitoring and reporting to review the effectiveness of controls from the site Risk Register, and critical controls identified in the relevant Safety Cases/SMS/SMP/OEMPs.

Level 1 assurance activities are completed by site personnel or personnel supporting sites (e.g. HSE, Engineering). Control assurance at this first line of defence is primarily obtained through management self-assessment, management monitoring and reporting processes. Examples of self-assurance activities may include:

- Permit to Work Audits
- Tanker load out checks and audits
- Site managed maintenance, test and inspection activities for safety critical equipment including Critical Function Testing using the performance standard criteria
- Hazardous area inspections.

Refer:

[160] VIC-5000-SAF-PLN-8203395 - Level 1 Assurance Plan – BassGas

[161] NZL-K000-SAF-PLN-10836380 - Level 1 Assurance Plan Kupe Assets

[162] WAA-4100-SAF-PLN-10359300 - Level 1 Assurance Plan Beharra Springs

[163] VIC-9000-SAF-PLN-11157113 - Level 1 Assurance Plan Otway Assets

4.20.3 Second Line of Defence - Oversight

The Second Line of Defence is assurance independent of the facility and focuses on high level systems implemented at each facility. The topics, schedule and nomination of internal auditors are managed at the Lattice Energy business level.

Inclusive of this is the HSEMS assurance that verifies compliance to the HSEMS 20 standards and the Critical Control Performance Standards (CCPS) verification assessment program that verifies compliance to the performance standards.

Level 2 assurance is conducted by competent personnel not aligned to the facility. The level of objectivity and freedom from influence from asset line management provide the necessary independence. Furthermore, this level of objectivity and freedom from influence from line management satisfies the definition of independent required by the NZ Health and Safety at Work (Petroleum Exploration and Extraction) and NZ Health and Safety at Work (Major Hazard Facilities) Regulations 2016.

Level 2 assurance is conducted by staff trained in auditing, familiar with the HSEMS and subject matter experts in the topic under consideration (e.g. alarm management, contractor management processes, piping systems integrity). Integrity management audits are conducted by members of the Operations Integrity and/or Engineering team and who possess the necessary expertise and experience.

Refer:

[164] INT-1000-SAF-PLN-3675079 - Assurance Plan

4.20.4 Third Line of Defence – Independent Assurance

The Third Line of Defence is assurance independent of the Operations business unit. Level 3 audits are conducted by the HSE group that oversees all Lattice Energy's production, distribution and generation businesses across New Zealand and Australia. Level 3 audits focus on the effectiveness of management systems and/or specific controls.

Level 3 assurance can include the services performed by the HSE group, independent specialist auditors and external audits completed by regulatory bodies or their accredited assessors (e.g. certificates of fitness, well examination schemes). Every two years the HSE group undertakes assurance on the Lattice Energy facilities for compliance to the HSEMS.

As with the Level 2 assurance, use of independent personnel or external third parties to complete Level 3 assurance satisfies the requirements of independence as required by the NZ Health and Safety at Work (Petroleum Exploration and Extraction) Regulations 2016.

4.20.5 Pipeline Integrity Management Audits

Key performance indicators for integrity management are specified for each pipeline and audits are undertaken to assess the effectiveness of the integrity management systems as prescribed in the pipeline specific Integrity Management Plans. These audit reports will form part of the annual reports submitted to the regulators.

4.20.6 Corrective Action Plans

Corrective actions to address findings from the three levels of assurance activities are tracked for completion via the Enterprise Incident Management System with allocation of responsible person and timeframe for completion.

5. References

5.1 Internal Documents

The following Policies, Systems and Processes are an integral part of this system and referred to in this document:

1. ORG-HSE-POL-001 HSE Policy
2. LAT-HSE-SYS-001 HSE Management System
3. HSE Meeting Agenda
4. Life Saving Rules
5. INT-1000-SAF-PLN-3675078 - Annual HSE Improvement Plan
6. Site Annual HSE Improvement Action Plan – BassGas
7. Site Annual HSE Improvement Action Plan – Otway
8. Site Annual HSE Improvement Action Plan – Beharra Springs
9. Site Annual HSE Improvement Action Plan – Kupe
10. HSE Dashboard
11. INT-IGMS-IMT-PRO-00001 Document Control OpenText eDRMS Procedure
12. LAT-HSE-DVE-022 Directive HSE Training and Competency
13. Workforce Capability Requirements - Otway
14. Workforce Capability Requirements - BassGas
15. Workforce Capability Requirements – Beharra Springs
16. Workforce Capability Requirements – Kupe
17. Workforce Capability Requirements - Contractors
18. INT-1000-SAF-PRO-3675129 HSE Induction – Conventional Operations Procedure
19. VIC-1000-SAF-PRO-000013 First Aid and Tele-medicine Procedure
20. NZL-1000-SAF-PRO-00006 First Aid & First Aid Training
21. LAT-HSE-DVE-016 Directive Aviation Operations
22. VIC-1000-SAF-PRO-3974220 Access and Movement to Offshore Platforms – Southern Australia
23. NZL-K301-OPS-PRO-00001 Access to Kupe Wellhead Platform Procedure
24. LAT-HSE-GDE-025 Daily Prestart Meeting
25. LAT-HSE-GDE-083 HSE Committee
26. S4200-AF-702649 Otway Gas Plant HSE Committee Terms of Reference
27. VIC-5000-SAF-GDL-00001 BassGas HSE Committee Terms of Reference
28. LAT-HSE-GDE-024 – Health and Safety Representatives
29. LAT-HSE-DVE-026 – Community Directive
30. Otway Gas Project Environmental Effects Statement/Environmental Impact Statement
31. V-5100-15-RP-0001 BassGas Project Environmental Effects Statement/Environmental Impact Statement
32. NZL-1000-ENV-PLN-00001 NZ Environment Management Plan
33. WAA-4100-ENV-PLN-00001 Environmental Plan Beharra Springs Gas Facility
34. LAT-RSK-DVE-001 Directive Risk Management
35. Risk Toolkit
36. AUS-1000-SAF-PLN-3674818 Risk Management Plan – Lattice Energy
37. VIC-1000-BUS-GDL-3974190 Technical Risk Guideline

38. LAT-HSE-PRO-007 Hazard Identification (HAZID) Studies Procedure
39. INT-1000-ENG-PLN-00011 Integrity Management Plan - Functional Safety - Operation and Maintenance
40. VIC-1000-SAF-PRO-3974228 Job Hazard / Safety Analysis (JHA / JSA) – Performance Of
41. LAT-HSE-DVE-005 Asset Integrity Directive
42. 3 WHATs booklet
43. LAT-RMS-DIR-006 Directive Incident Management
44. INT-1000-SAF-PRO-00005 Incident Management Procedure
45. 13852562 Regulatory Notification Guideline
46. INT-1000-SAF-PRO-00002 Process Incident Reporting Procedure
47. HSE Performance Report
48. Accountability Report
49. Process Safety Report
50. LAT-HSE-DVE-038 – HSE Performance Measurement and Reporting
51. VIC-5100-SAF-PRO-00019 Critical Procedural Controls – Management of
52. VIC-1000-OPS-PRO-00001 Permit to Work System – SAA (CS)
53. AUS-1000-OPS-PRO-00001 Permit to Work Procedure (EA/WA)
54. NZL-1000-SAF-PRO-00015 Common Permit to Work System
55. VIC-1000-SAF-PRO-00012 SA - Equipment Isolation (CS)
56. AUS-1000-OPS-PRO-00002 Equipment Isolation EA & WA
57. NZL-1000-OPS-PRO-00001 Isolation Preparation Procedure
58. NZL-1000-OPS-PRO-00003 OENZ Isolation Principles - Commission & Purge Procedure
59. INT-1000-OPS-PRO-00003 Override/Bypass Management Procedure
60. VIC-1000-SAF-PRO-00001 SA Helicopter Operations (CA)
61. NZL-K301-OPS-PRO-00004 Helicopter Operations
62. INT-1000-SAF-PLN-00007 Aviation Management Plan
63. VIC-1000-SAF-PRO-00005 Working over water (CA) – SA
64. LAT-HSE-DVE-041 Directive Maritime Operations
65. VIC-1000-SAF-PRO-00004 Field Support Vessel Operations (CP) – SA
66. NZL-K301-OPS-PRO-00003 KWHP Supply Vessel Operations
67. NZL-K334-SAF-PRO-00001 Adverse Weather Procedure
68. NZL-K339-OPS-SOP-00001 KWHP Crane Operations
69. TAS-9100-OPS-GDL-00001 Conflicting Activities Matrix – Thylacine Platform
70. TAS-5100-OPS-GDL-00001 Conflicting Activities Matrix for Yolla Platform
71. WAA-4100-OPS-GDL-00001 SIMOPs Matrix – Beharra Springs
72. NZL-1000-OPS-FRM-00001 SIMOPS Matrix
73. INT-1000-BUS-PRO-00004 Management of Change (MOC) Procedure
74. Handover Package Procedures
75. LAT-HSE-DVE-011 Directive Contractor Management
76. LAT-HSE-FRM-021 Contractor Pre-qualification (Level 1 to 3)
77. INT-1000-SAF-FRM-3675025 HSE Two Year Contract Assurance Checklist – Lattice Energy
78. VIC-9000-SAF-PLN-3977022 - Emergency Response Plan - Otway
79. VIC-5100-SAF-PLN -3974548 Emergency Response Plan - BassGas

80. WAA-4100-SAF-PLN-3677589 Emergency Response Plan – Beharra Springs
81. NZL-1000-SAF-MNL-3237653 New Zealand Site Emergency Response Manual
82. INT-1000-SAF-PLN-14768064 Lattice Energy Group Emergency Management Plan
83. ORG-RMS-PLA-001 Crisis Management Plan
84. INT-1000-SAF-PRO- 4749814 - Lattice Energy Emergency Response Exercise Planning and Reporting Procedure
85. NZL-1000-SAF-PLN-4152174 - Spill Contingency Plan KPS KOTF Onshore Pipelines
86. TAS-5100-SAF-PLN-00001 Oil Pollution Emergency Response Plan Yolla-A Platform
87. TAS-9100-SAF-PLN-00001 Oil Spill Contingency Plan Otway Offshore
88. 12707383 Oil Spill Contingency Plan Beharra Springs
89. INT-1000-ENG-PLN-00023 7726350 – Conventional Wells Integrity Management Plan
90. INT-1000-ENG-PLN-00005 Pressure Vessels Integrity Management Plan
91. INT-1000-ENG-PLN-00003 Piping Systems Integrity Management Plan
92. INT-1000-ENG-PLN-00013 Pressure Relief Devices Integrity Management Plan
93. INT-1000-ENG-PLN-00008 Electrical Equipment in Hazardous Areas Technical Integrity Management Plan
94. INT-1000-ENG-PLN-00010 Earthing and Lightning Protection Integrity Management Plan
95. INT-1000-ENG-PLN-00007 Instrument Tubing Technical Integrity Management Plan
96. INT-1000-ENG-PLN-00011 Functional Safety Integrity Management Plan
97. INT-1000-ENG-PLN-00012 Operational Technology Asset Integrity Management Plan
98. INT-1000-ENG-PLN-00022 Emergency and Escape Lighting Integrity Management Plan
99. INT-1000-ENG-PLN-00021 Fire and Gas Detection System Integrity Management Plan
100. NZL-1000-MTC-PLN-00005 Asset Integrity Management Plan
101. NZL-1000-MTC-PLN-00004 Integrity Management Plan Structural and Civil Equipment
102. NZL-K300-ENG-PLN-00001 Integrity Management Plan Kupe Wellhead Platform
103. NZL-K400-ENG-PLN-00001 Integrity Management Strategy Plan Kupe Offshore Pipeline
104. NZL-K400-ENG-PLN-00002 Kupe Electro/Hydraulic Sub-Sea Umbilical Integrity Management Plan
105. NZL-1000-MTC-PLN-00001 Storage Tanks Integrity Management Plan
106. NZL-K400-ENG-PLN-00001 Integrity Management Plan Kupe Offshore Pipeline
107. NZL-K300-ENG-PLN-00002 Kupe Wells Integrity Management Plan
108. INT-1000-ENG-SPE-00003 Alarm Management Philosophy
109. VIC-1000-SAF-FRM-10874328 Hire and/or Incoming Equipment Checklist
110. INT-1000-OPS-PRO-00002 Management Of Work Process
111. AUS-1000-MTC-GDL-00001 ICE Preventative Maintenance Strategy – Inspection and Testing Requirement
112. NZL-1000-MTC-PRO-00002 Planned Preventative Maintenance
113. NZL-1000-MTC-PRO-00013 Safety Instrumented Systems Test & Calibration Procedure
114. INT-IGMS-ENG-STD-10129714 – Generic Operate Phase Performance Standards
115. LR NZL 0900001/002/09/1 Certificate of Fitness of Offshore Structure
116. LR NZL 0900232/002/09/1 Certificate of Fitness of Subsea and Land Raw Gas Pipeline
117. SGS M&I 316-759-01 Certificate of Fitness, Kupe Sales Gas Pipeline
118. NZ-1000-35-TR0002 Well Examination Scheme, Kupe South 6
119. NZ-1000-35-TR0003 Well Examination Scheme, Kupe South 7/ST1

120. NZ-1000-35-TR0004 Well Examination Scheme, Kupe South 8
121. INT-1000-SAF-PRO-3675133 Hazardous Materials – Approval and Control
122. 8743319 Hazardous Materials Risk Assessment Form
123. AUS-1000-SAF-PRO-3674901 Lifting and Load Safety Operations - Australia
124. INT-1000-SAF-PRO-00003 Personal Protective Equipment (PPE) Procedure
125. VIC-5100-SAF-PRO-00004 Confined Space Entry Procedure (CA)
126. AUS-1000-SAF-PRO-00003 Confined Space Entry Procedure – Western Australia
127. NZL-1000-SAF-PRO-3237718 Confined Space Entry Procedure – New Zealand
128. VIC-1000-SAF-PRO-00006 Excavation and Penetration – SA
129. AUS-1000-OPS-PRO-00006 Excavation Pipeline and General
130. AUS-1000-OPS-PRO-3674900 Working at Heights (CA) – AUS
131. LAT-HSE-DVE-030 - Directive – Occupational Noise
132. VIC-1000-OPS-PRO-8187956 – Portable Gas Detection Equipment Usage - Victoria
133. AUS-1000-OPS-PRO-00004 Portable Atmospheric Gas Detection - EA & WA
134. INT-1000-SAF-GDL-00002 Chemical PPE Selection Matrix Guideline
135. INT-1000-SAF-PRO-00015 BTEX Testing and Control of
136. INT-1000-SAF-PRO-00016 Mercury, Control of (CA) – AUS
137. VIC-1000-SAF-PRO-00002 Food Substances - Transportation, Storage, and Preservation of
138. TAS-5100-SAF-PRO-00003 Communicable Disease Prevention and Control
139. INT-1000-SAF-PRO-4741245 Hot and Cold Condition Management
140. VIC-1000-OPS-PLN-00001 Offshore Security Plan – Yolla and Thylacine Platforms
141. LAT-DVE-037 Directive Health and Fitness for Work
142. LAT-DVE-023 Directive Drug and Alcohol Management
143. LAT-POL-002 Drug and Alcohol Policy
144. LAT-GDE-009 Guide - For Cause Testing
145. LAT-DVE-043 Directive Fatigue Risk Management
146. LAT-DVE-001 Directive – Land Transport
147. INT-1000-SAF-PRO-3675127 Land Transport Procedure
148. INT-1000-SAF-FRM-00016 Health Conditions Medication Declaration Form
149. ORG-HSE-POL-004 Policy - Rehabilitation
150. ORG-P&C-POL-004 Policy Discrimination, Harassment and Bullying Policy
151. ORG-COC-PRO-001 Dealing with a Serious Concern
152. ORG-P&C-POL-001 Policy Diversity and Inclusion
153. ORG-P&C-POL-003 Policy Code of Conduct Policy
154. TAS-5100-ENV-PLN-00001 Offshore Environment Plan BassGas
155. VIC-5100-ENV-PLN-3974547 Environmental Management Plan - Lang Lang Gas Plant
156. VIC-9000-ENV-PLN-00003 Offshore Environment Plan – Otway
157. VIC-9400-ENV-PLN-00001 Environmental Management Plan - Otway Gas Plant
158. VIC-9000-ENV-PLN-8199521 - Management of Waste - Otway
159. VIC-5100-SAF-PLN-3974553 - Waste Management Plan – BassGas
160. VIC-5000-SAF-PLN-8203395 - Level 1 Assurance Plan – BassGas
161. NZL-K000-SAF-PLN-10836380 - Level 1 Assurance Plan Kupe Assets
162. WAA-4100-SAF-PLN-10359300 - Level 1 Assurance Plan Beharra Springs

- 163. VIC-9000-SAF-PLN-11157113 - Level 1 Assurance Plan Otway Assets
- 164. INT-1000-SAF-PLN-3675079 - Assurance Plan – Conventional Operations

5.2 External Documents

The following external documents were considered in the design and preparation of this HSE Management System Manual:

- AS 2885 – Pipelines Oil and Gas
- ISO 31000: 2009 - Risk Management Principles and Guidelines
- ISO 9001:1994 - Quality Systems – Model for Quality Assurance in Design, Development, Production, Installation and Servicing
- ISO 9001(INT):2000 - Quality Management Systems – Requirements
- ISO 14001:1996 - Environmental Management Systems – Specification with Guidance for Use
- AS 4581:1999 - Management System Integration – Guidance to Business, Government and Community Organisations
- AS/NZS4804:2001 – Occupational Health and Safety Management Systems – General Guidelines on Principles, Systems and Supporting Techniques
- AS 4801:2001 – Occupational Health and Safety Management Systems – Specification with Guidance for Use
- AS 3806:1998 - Compliance Programs
- API 754 - Process Safety Performance Indicators for the Refining Petrochemical Industries, April 2010

5.3 Connected Documents – Distribution List

Any revisions of this document – ensure to place updated version into the below documents:

- Yolla-A Safety Case - OEUP-T5100-PLN-SAF-005
- BassGas Gas Plant Safety Case - OEUP-V5100-PLN-SAF-004
- BassGas Offshore Pipeline Safety Case - OEUP-T5100-PLN-SAF-013
- BassGas Sales Gas Pipeline PL244 Safety Case - OEUP-V5100-PLN-SAF-018
- BassGas Raw Gas Pipeline PL243 Safety Management Plan – OEUP-V5100-PLN-SAF-042
- Thylacine-A Safety Case – OEUP-V9000-PLN-SAF-001
- Otway Gas Plant Safety Case – OEUP-V9000-PLN-SAF-002
- Otway Offshore Pipeline Safety Case - OEUP-V9000-PLN-SAF-007
- Otway Onshore Pipeline PL250 Safety Management Plan – OEUP-V9500-PLN-SAF-001
- Otway Pipelines PL237 and PL240 Safety Management Plan – OEUP-V9100-PLN-SAF-001
- Beharra Springs Facility Safety Case WAA-SAF-PLN-3677590
- Beharra Springs Wellsites Safety Management System – WAA-SAF-PLN-10623974
- Kupe Production Station (KPS) Operations Safety Case - NZL-K001-SAF-PLN-3237774
- Kupe Wellhead Platform Safety Case - NZL-K300-SAF-PLN-3237777
- Omata Tank Farm Safety Case – NZL-K900-SAF-PLN-3238024

6. Document information and history

DOCUMENT CUSTODIAN GROUP

| Title | Name/s |
|-------------------------------|---|
| LE-Operations-Conv-HSE-Safety | Scott Cornish, Stephanie Treharne, Emma Grigore |

STAKEHOLDERS AND OTHER CONTRIBUTORS

| Title | Name/s |
|---|--------------------|
| Operations Manager - BassGas | Kamran Khalfay |
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| Operations Manager - Kupe | Mat Quinn |
| HSE, Operations Authority & Community Manager | Scott Cornish |
| HSE Risk & Systems Manager | Stephanie Treharne |
| Facilities Manager - BassGas | John Peel |
| Facilities Manager - Otway | Josh McKenzie |
| Facilities Manager - Kupe | Rex Prestidge |

DOCUMENT HISTORY

| Rev | Date | Changes made in document | Reviewer/s | Consolidator | Approver |
|------------------------|----------|---|--------------|--------------------|--------------|
| OEUP-V1000-MAN-SAF-001 | | | | | |
| 0 | 19/09/13 | HSEMS developed to address both BassGas and Otway Gas facilities for onshore WorkSafe Victoria submission | Jane Bourke | Stephanie Treharne | Mark Sanford |
| 1 | 9/12/13 | Revision to include feedback from offshore workforce | Rhonda Keene | Jane Bourke | Mark Sanford |
| 1.1 | 20/1/14 | Revision to include response to NOPSEMA clarifications | Rhonda Keene | Seona Groves | Mark Sanford |
| 2A | 22/12/14 | Update to address organisational changes plus general revision to include pipeline management system elements | Rhonda Keene | Chris Lane | - |
| 2B | 05/01/15 | Draft for review | Rhonda Keene | Chris Lane | |
| 2 | 22/01/15 | Issue for use under MOC 2015 – 24438 | Rhonda Keene | Chris Lane | O Hobbs |

| VIC-1000-SAF-MNL-00001 | | | | | |
|------------------------|------------|---|--|--------------------|---------------|
| 3 | 14/01/16 | Issued for review. Reformatted into Integrated Gas template. Updated for Integrated Gas, new CCPS program, expanded integrity management plans and Integrated Gas Group Emergency Response | Stephanie Treharne Jason Kuzmanovski | Chris Lane | Mark Sanford |
| CDN/ID 3974195 | | | | | |
| 4 | 12/01/2017 | Document number updated Stakeholder role titles updated | Stephanie Treharne | Stephanie Treharne | Kevin Galea |
| 4A | 22/03/2017 | Update of HSE Policy in appendix as per new Managing Director. | Stephanie Treharne | Stephanie Treharne | - |
| 4B | 02/05/2017 | Issued for Review | Jess Schipanski | | - |
| 4C | 06/2017 | Upgrade to business unit level document. Addition of specific NZ and WA facilities related content from Part 3 of Safety Cases. Added content mostly in Element 7 and a piece in Element 6 around coordination of activities for adjoining Major Hazard Facilities. No change to VIC facilities related content. Rebranding to Lattice Energy. Updated document numbers. | Stephanie Treharne Emma Grigore Rhonda Keene Chris Lane | Stephanie Treharne | - |
| 4D | 13/10/17 | Typos and references corrected. Issued for review and management approval | Chris Lane | Chris Lane | - |
| 5 | 18/10/2017 | Issued for use | - | - | Scott Cornish |

Appendix A HSE Policy

OUR HEALTH, SAFETY AND ENVIRONMENT POLICY



OUR PRINCIPLE OF DUE CARE

We care about the wellbeing of our people and our impact on the environment.

OUR HSE ASPIRATION

To conduct our business in a way that causes no harm to the health and safety of people and has no unforeseen impacts to the environment.

OUR HSE ACTIONS

We all believe that our HSE aspiration is achievable and we embrace our responsibility for supporting it by:

Always mindful of risk

Recognising that risk is present in every task we do and taking the time to identify and understand these risks and manage them safely and responsibly.

Enabled and accountable

Taking ownership and using our authority, resources, systems and competencies to manage the risks associated with our work. We stop work when confronted by an unknown hazard and proceed only when satisfied we can continue safely and responsibly.

Continuously learning

Being open and transparent about how well we are doing and relentless in learning from our experience to manage our risks. We work together effectively, welcome any feedback and recognise that we can always do better.

Our Compass and HSE Management System set out how we will implement this policy.

Frank Calabria
CEO
Origin Energy

ORG-HSE-POL-001 November 2016

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Appendix B Risk Matrix

Risk Matrix

| | | | | | | | LIKELIHOOD | | | | | |
|------------------------|--|--|--|--|--|--|--|---|---|---|--|---|
| | | | | | | | 1 REMOTE | 2 HIGHLY UNLIKELY | 3 UNLIKELY | 4 POSSIBLE | 5 LIKELY | 6 ALMOST CERTAIN |
| | | | | | | | <1% chance of occurring within the next year. Occurrence requires exceptional circumstances exceptionally unlikely event in the long-term future only occur as a 100-year event. | >1% chance of occurring within the next year. May occur but not anticipated could occur years to decades. | >5% chance of occurring within the next year. May occur but not for a while could occur within a few years. | >10% chance of occurring within the next year. May occur shortly but a distinct probability it wont occur could occur within months to years. | >50% chance of occurring within the next year. Balance of probability will occur could occur within weeks to months. | 99% chance of occurring within the next year. Impact is occurring now could occur within days to weeks. |
| CONSEQUENCE CATEGORIES | Impact to Origin or contracting personnel | Natural environment | Community damage/ impact/ social/ cultural heritage | Financial impact (e.g. due to loss of revenue, business) | Damage to reputation, services interruption, customer interruption | Breach of law or criminal prosecution or civil action (e.g. OHS, environment, industrial relations, trade practices, industry acts) | 6 CATASTROPHIC | 6 CATASTROPHIC | 6 CATASTROPHIC | 6 CATASTROPHIC | 6 CATASTROPHIC | 6 CATASTROPHIC |
| | Multiple fatalities >4 or severe irreversible disability to large group of people (>10). | Long term destruction of highly significant ecosystem or very significant effects on endangered species or habitats. | Multiple community fatalities, complete breakdown of social order, irreparable damage of highly valued items or structures of great cultural significance. | EBIT: impact, loss or deterioration from expectation greater than \$100m. CASH FLOW: severe cash flow crisis, unable to source funds. | Negative international or prolonged national media (e.g. 2 weeks). continued severe degradation of services to customers > 1 month or > 10,000 customer days. | Potential jail terms for executives and or very high fines for the company. Prolonged multiple litigations. | | | | | | |
| | 1-3 fatalities or serious irreversible disability (>30%) to multiple persons (<10). | Major offsite release or spill, significant impact on highly valued species or habitats to the point of eradication or impairment of the ecosystem. Widespread long-term impact. | Community fatality. Significant breakdown of social order. Ongoing serious social issue. Major irreparable damage to highly valuable structures/ items of cultural significance. | EBIT: impact, loss or deterioration from expectation greater than \$30m but less than \$100m. CASH FLOW: severe cash flow crisis, difficulty to source funds. Probable credit rating downgrade. | Negative media national for 2 days or more. Significant public outcry. severe degradation of services to customers up to 1 month or >5,000 customer days | Very significant fines and prosecutions. Multiple prosecution and fines. | | | | | | |
| | Serious permanent injury/ illness or moderate irreversible disability (<30%) to one or more persons. | Offsite release contained or immediately reportable event with very serious Environmental effects, such as displacement of species and partial impairment of ecosystem. Widespread medium and some long-term impact. | Serious injury to member of the community, Widespread social impacts. Significant damage to items of cultural significance. | EBIT: impact, loss or deterioration from expectation greater than \$3m but less than \$30m. CASH FLOW: Loss of flexibility and/or increase in cost to source funds. Market explanation required. | Negative national media for 1 day. Individual customers or segments disadvantaged up to 1 week. Customer interruption >500 customer days. NGO adverse attention. | Major breach of regulation and significant prosecution including class actions. | | | | | | |
| | Serious reversible/ temporary injury/illness (e.g. lost time >5 days or hospitalisation or alternate/Restricted Duties > 1 month). | Moderate effects on biological or physical environment and serious short term effect to ecosystem functions. | Media attention and heightened concerns by local community and criticism by NGOs. Ongoing social issues. Permanent damage to items of cultural significance. | EBIT: impact, loss or deterioration from expectation greater than \$0.3m but less than \$3m. CASH FLOW: Material impact to cash flow. | Negative state media. Heightened concern from local community. Service interruption up to 1 day or > 10 customer days. Criticism by NGOs. | Serious breach of law/regulation with investigation or report to authority with possible prosecution. Performance infringement notice (Pin). | | | | | | |
| | Reversible temporary injury/illness requiring Medical treatment (e.g. lost time <5 days or alternate/Restricted Duties for < 1 month). | Event contained within site. Minor short term damage to area of limited significance. Short term effects but not affecting ecosystem functions. | Medical treatment injury to a member of the community, Minor adverse local public or media attention and complaints. Minor medium term social impact on local population, mostly repairable. | EBIT: impact or loss greater than \$30k but less than \$0.3m. CASH FLOW: impact to project or business unit cash flow. | Public concern restricted to local complaints. Negative local media. Internal escalation to senior management. Few hours service interruption. Adverse local public attention. | Breach of law/regulation or non-compliance. Minor legal issues, minor litigation possible. | | | | | | |
| 1 MINOR | Injury/illness requiring Medical treatment (no lost time, no alternate/ Restricted Duties), First aid, Report only. | Minor consequence, local response. No lasting effects. Low level impacts on biological and physical environment to an area of low significance. | Public concern restricted to local complaints, low level repairable damage to common place structures. | EBIT: impact or loss greater than \$3k but less than \$30k. CASH FLOW: no significant impact. | Public concern restricted to local complaints. | Local investigation, minor breach of regulation, on the spot fine or technical non-compliance. Prosecution unlikely. | 1 MINOR | 1 MINOR | 1 MINOR | 1 MINOR | 1 MINOR | 1 MINOR |

Appendix C Beharra Springs Facility Environmental Risk Assessment

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|--|--|--|---------------|---|-------------------------------|-------------|--------------|-----------------------|----------------------|---------------|------------------------|
| Env01 | <p>Loss of containment (LOC) of hydrocarbon at wellsite (blow out at operational well, loss of well integrity, workover or well intervention)</p> <p>EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment</p> | <p>Corrosion</p> <p>Erosion</p> <p>Incorrect material selection</p> <p>Incorrect design</p> <p>Dropped objects</p> <p>Impact (vehicle/mobile plant/unsecured items/setup of workover rig)</p> <p>Crane or lifting equipment failure</p> <p>Single block on some drains and sample points</p> <p>Natural disaster (flood, fire, earthquake)</p> <p>Vibration</p> <p>Excavation</p> <p>Mis-matched or poor installation of tubing, fittings and gaskets</p> <p>Inadequate / non verified flange makeup</p> <p>Operator error</p> <p>Sabotage</p> <p>Well intervention / Wireline</p> <p>Subsidence</p> <p>Well integrity</p> | <p>Release of hydrocarbon negatively impacts local air quality leading to increased greenhouse gas emissions.</p> <p>Release of hydrocarbon negatively impacts soil quality which could lead to localised loss of vegetation and reduced suitability for land use.</p> <p>Release of hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use.</p> <p>Release of hydrocarbon negatively impacts local amenity.</p> <p>Release of hydrocarbon negatively impacts fauna through loss of habitat, and loss of food sources.</p> | <p>Escalation of LOC event could occur if ignition source available. Risk of Bushfire assessed separately.</p> <p>Permeable soil-landscape system tends to allow infiltration of LOC events to shallow groundwater rather than as runoff to surface waters. (Section 4 of Beharra Springs Environmental Plan (OEUP-4100-ENV-PLN-003).</p> <p>Sand production within Redback produced fluids has not been a significant issue to date. Potential for sand production has been managed through control and monitoring of well flow rates. Therefore, surface sand catching facilities have not been installed or deemed necessary as it is not a significant issue for well/flowline integrity.</p> <p>Redback incident in 2013 showed minimal hydrocarbon liquid released. Therefore consequences based primarily on hydrocarbon gas release.</p> <p>“oiled wildlife” is not considered to be a credible consequence for any LOC events. This is because:</p> <p>a. The facility is located within close proximity to the coast which supports bird habitat, feeding and breeding grounds</p> <p>b. There are alternative water sources available for birds within the vicinity of the Facility e.g. wetlands (Beharra Springs located approximately 800m west ad Mungenooka Spring located approximately 10km west of the gas plant) as well as the Irwin and Arrowsmith River catchments</p> <p>c. No incidents of bird drownings at the Facility have been recorded, supporting the assumption that the surrounding areas provide more suitable habitat/water sources and do not attract birds</p> <p>d. Should a LOC event occur, the activities associated with responding to the incident would provide further deterrent for birds</p> | 3 - Serious | <p>Well Integrity Management Plan - Conventional wells (Operate & Maintain phase) (CDN 7726350) which includes:</p> <p>* Fitness for service testing completed</p> <p>* Wellhead valve maintenance (Greasing)</p> <p>* integrity checks, critical function testing, maintenance SOPs (flange tightening)</p> <p>* Water sampling - Major ions, conductivity, pH, salinity</p> <p>* Pipe design has corrosion allowance</p> <p>Well Management Plan - Beharra Springs 4 (CDN 7769470)</p> <p>Well Management Plan - Redback 2 (CDN 8229176)</p> <p>Well Management Plan - Beharra Springs North 1 (CDN 8202546)</p> <p>Well Management Plan - Redback South 1 (CDN 8278584)</p> <p>Well Management Plan - Beharra Springs 1 (CDN 8185801)</p> <p>Well Management Plan - Beharra Springs 2 (CDN 8226115)</p> <p>Well Management Plan - Tarantula (CDN 8211681)</p> <p>Operator checks (daily) annulus pressure gauges</p> <p>Operator checks (daily) for leaks or defects captured in log / incident management system</p> <p>Pressure indicated through process control system (PCS) (tubing only)</p> <p>Well management - flow rate</p> <p>Wells completed as per well completion reports and verified well schematics</p> <p>Barrier standards (CDN INT-1000-35-TS-002)</p> <p>Cellar inspection - PM for photos sent to Petroleum engineer quarterly</p> <p>Trained and competent operators</p> <p>Well head protection through security fencing and bollarding</p> <p>Plant and equipment design including, emergency shutdown systems, earthing, instrumentation (hi/low trips)</p> <p>Securing of portable containers</p> <p>Blowout Preventer (BOP) for wireline/workover activities</p> <p>Contractor HSE Management Directive (LAT-HSE-DVE-011)</p> <p>Well specific campaign risk reviews</p> <p>Risk Management Directive (LAT-RISK-DIR-001) and Plan (CDN/ID 3674818)</p> <p>Permit To Work - Conventional Operations (EA/WA) (CDN 3674860)</p> <p>Land Transport Procedure (CDN 3675127)</p> <p>Lifting and Load Safety Operations - AUS (CDN 3674901) which includes:</p> <p>* Lifting equipment certified by 3rd party contractor</p> <p>* Lifting equipment register (LER)</p> <p>* Requirements for exclusion zones and barriers</p> <p>Maintenance Management System (CMMS)</p> <p>Management of Change (MOC) Directive (LAT-HSE-DVE-004) and Procedure (CDN 3675087)</p> <p>WAA-4100-SAF-PLN-00002 - Emergency Response Plan - Beharra Springs (CDN 3677589)</p> <p>Emergency Shutdown</p> <p>Trained and competent staff</p> <p>SIMOPS Matrix (CDN 12554691)</p> <p>SAMS checklist for visual inspection every 3 months (section 6)</p> <p>Specific flange management procedure (NZL-ROOO-MTC-PRO-10234418)</p> <p>Oil spill contingency plan (CDN/ID 12707383)</p> <p>Methanol injection during start up or wells post maintenance</p> <p>Beharra Springs Field and Well Operations (CP) (CDN 3677671)</p> | Substantially Effective - 75% | 3 - Serious | 3 - Unlikely | Medium | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|--|---|--|---------------|--|-------------------------------|-------------|---------------------|-----------------------|----------------------|---------------|------------------------|
| Env02 | Loss of containment (LOC) of hydrocarbon from production flowline EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Excavation in unauthorised areas Corrosion Erosion Loss of cathodic protection Exceeding design conditions (e.g. overpressure) Vibration Utilisation of out of specification material Inadequate plant monitoring Maintenance system failure Natural disaster (flood, fire, earthquake) Formation of hydrates on Redback South #1 Low temperature embrittlement across choke valve Operator error Subsidence | Release of hydrocarbon negatively impacts local air quality leading to increased greenhouse gas emissions. Release of hydrocarbon negatively impacts soil quality which could lead to localised loss of vegetation and reduced suitability for land use. Release of hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use. Release of hydrocarbon negatively impacts local amenity. Release of hydrocarbon negatively impacts fauna through loss of habitat and loss of food sources. | Suspended flowlines are purged and inerted with low pressure nitrogen. Therefore, no environmental risks associated with LOC event. Sand production within Redback produced fluids has not been a significant issue to date. Potential for sand production has been managed through control and monitoring of well flow rates. Therefore, surface sand catching facilities have not been installed or deemed necessary as it is not a significant issue for well/flowline integrity. Escalation of LOC event could occur if ignition source available. Risk of Bushfire assessed separately. Permeable soil-landscape system tends to allow infiltration of LOC events to shallow groundwater rather than as runoff to surface waters. (Section 4 of Beharra Springs Environmental Plan OEUP-4100-PLN-ENV-003). All Beharra Springs flowlines and sales gas pipeline right of ways are maintained clear of vegetation (easements cleared in October 2015). “oiled wildlife” is not considered to be a credible consequence for any LOC events. This is because: a. The facility is located within close proximity to the coast which supports bird habitat, feeding and breeding grounds b. Alternative water sources available for birds within the vicinity of the Facility e.g. wetlands (Beharra Springs located approximately 800m west ad Mungenooka Spring located approximately 10km west of the gas plant) as well as the Irwin and Arrowsmith River catchments c. No incidents of bird drownings at either Facility have been recorded supporting the assumption that the surrounding areas provide more suitable habitat/water sources and do not attract birds d. Should a LOC event occur, the activities associated with responding to the incident would provide further deterrent for birds | 3 - Serious | Pipeline are maintained and externally coated in accordance with flowline integrity management plan (CDN 12121215) Well Head Automated Shut Off Valves Pipeline markers Cathodic protection Corrosion inhibitor injection at the wellhead Preventative Maintenance including: ongoing ultra-sonic thickness testing; annual coating surveys; routine corrosion checks Underground service drawings Pipeline locator Easement checks and maintenance Pressure safety valve (PSVs) Pressure control with alarm Hydraulically actuated pressure trip Methanol injection Hydrate temperature alarm with trip function (closes choke valve) Beharra Springs Field and Well Operation (CP) SOP (CDN 3677671) 2 out of 3 voting low temperature trip - closes the SDV (Beharra Springs Cause and Effects Matrix CDN 8362276) Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Emergency Response Plan - Beharra Springs (CDN 3677589) Activity/project specific inductions to ensure all contractors aware of buried services and flowlines and requirements of the PTW system | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |
| Env03 | Loss of containment (LOC) of hydrocarbon within gas processing facility EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Corrosion Impact (vehicle/mobile plant/unsecured items) Dropped objects Crane or lifting equipment failure Maintenance system failure Vibration Overpressure Fire (escalation of process incident, flaring, welding or liner repairs/replacement) Hydrates Operator error Natural disaster (flood, fire, earthquake) Inappropriate selection of plant, equipment and materials for repair/replacement during shutdowns Sabotage/unauthorised third party access to site Subsidence Poor project planning and overlapping project specific activities and operations (SIMOPS) | Release of hydrocarbon negatively impacts local air quality leading to increased greenhouse gas emissions. Release of hydrocarbon negatively impacts soil quality leading to localised loss of vegetation and reducing its existing suitability for land use. Release of hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use. Release of hydrocarbon negatively impacts local amenity. Release of hydrocarbon negatively impacts fauna through loss of habitat and loss of food sources. | Escalation of LOC event could occur if ignition source available. Risk of Bushfire assessed separately. Gas processing facility includes: * Low pressure (LP) slug catcher and piping * Gas compressors * Process separators (Low temperature separator - LTS and/or FP Flash Drum) * High Pressure (HP) Slug catcher, downstream HP piping and compressor discharge piping. Risk causes and consequence are the same for each part within the process therefore have been assessed as one item. Site classified "contaminated - restricted use" | 3 - Serious | Integrity Management Plan - Piping Systems (CDN 3675061) WAA-4100-ENG-PLN-00001 - Integrity Management System - Beharra Springs Integrity Management Plan - Pressure Vessels (CDN3675063) Compressor operation (3k-1A) Beharra Springs (CDN 3677665) Corrosion Inhibitor in liquid phase only Cathodic protection Operator checks Piping design: corrosion allowance, appropriate material of construction, painting, wrapping Maintenance Management System (CMMS) Physical bollards Diesel vehicle entry into hazardous areas (CDN 3677658) Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Land Transport Procedure - Conventional Operations (CDN 3675127) Lifting and Load Safety Operations - AUS (CDN 3674901) requires: * Lifting equipment certified by 3rd party contractor * Lifting equipment register (LER) Management of Change (MOC) Directive (LAT-HSE-DVE-004) and Procedure (CDN 3675087) Emergency Response Plan - Beharra Springs (CDN 3677589) Fire and gas detection systems located throughout gas plant (e.g. compressor shed) Vibration sensors with trip function Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Job safety analysis for all non routine tasks Contractor HSE management directive (LAT-HSE-DVE-011) Activity/project specific inductions to ensure all contractors aware of SIMOPS requirements | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|---|---|--|---------------|--|-------------------------------|--------------|---------------------|-----------------------|----------------------|---------------|------------------------|
| | | | | | | Dampeners on compressors PSVs/Pressure Relieving Device (PRD) Compressor control system Housekeeping Fire fighting equipment (hose reels, extinguishers) Process and Emergency Shutdown (Cause and effect matrix CDN 8362276) Compressor shed is banded which is drained via the site drain system Blowdown to ground flare Level monitoring on process separators Process control system Methanol injection in low temperature separator (LTS) Trained and competent staff AUS-1000-SAF-PRO-00015 - Working at Heights Procedure Exclusion zones, barricading etc. Simultaneous Operations (SIMOPS) - Western Australia Matrix (CDN 12554691) Site is manned 24hrs - no night shift for continuous monitoring Signage Positive community relationships including local sponsorship (Scott) Site in remote location Hazardous area is fully fenced and locked Gates surrounding plant are shut out of hours Site potable water bores located upgradient of gas production plant Faux CCTV camera - deterrent Private road leading to site | | | | | | | |
| Env04 | Loss of containment (LOC) of methanol during load-in operations EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Failure to follow load out Safe Operating Procedure (SOP) Corrosion of load out equipment and associated pipe work Ruptures and leaks from tanker Release from load out hose Overfill Loss of integrity of pump in systems Failure of local manual shutoff valve Failure to disconnect fittings prior to tanker movement Impact (vehicle, mobile plant) Subsidence | Release of methanol negatively impacts local air quality leading to reduced local amenity. Release of methanol negatively impacts groundwater quality. | Loss of containment from a single compartment during loading operations estimated to be 1,500L. Long term methanol exposure can affect the fertility of biota and affect their appearance or behaviour. Therefore risk to flora and fauna not considered as long term exposure not credible. In air, methanol remains as a vapour for 18 days, eventually breaking down to other chemicals. Therefore risk that spill could be ignited has been considered for on site impact only. Risk of Bushfire considered in RSK-103522. Methanol does not bind well to soil, so it can enter the groundwater. Therefore impact to soil not considered. http://www.npi.gov.au/resource/methanol Due to lack of significant watercourses in the area and low potential for off site release during load in no impact to surface water considered. | 2 - Moderate | BHS Methanol Tank Load-In Beharra Springs (CDN 3677646) which requires: * Operator conducts loading with tanker driver * Operator carries personal gas monitor * Earthing of tanker * Hose integrity checks and certification * Pre-inspection of hose * Dry break fitting * Tanker battery isolated WAA-4100-ENG-PLN-00001 - Integrity Management System - Beharra Springs WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist Electrical hazardous area compliance PVV - no overpressure from tanker Explosion hatch Bollards and guardrails Maintenance Management System (CMMS) Emergency Response Plan - Beharra Springs (CDN 3677589) Banded and drained concrete pad in load out bay Fire fighting equipment (hose reels, extinguishers) Spill kits Emergency stop of the pumps Fusible loop - fire detection emergency shutdown Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009) and Environmental Management Plan (OEUP-4100-PLN-ENV-003) | Substantially Effective - 75% | 2 - Moderate | 2 - Highly Unlikely | Low | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|--|---|--|---|---------------|--|-------------------------------|--------------|---------------------|-----------------------|----------------------|---------------|------------------------|
| Env05 | Loss of containment (LOC) during condensate load-out operations EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Failure to follow load out Safe Operating Procedure/s (SOP) Corrosion of load out equipment and associated pipe work Ruptures and leaks from tanker Release from load out hose Overfill Loss of integrity of pump out systems Failure of local manual shutoff valve Failure to disconnect fittings prior to tanker movement Impact (vehicle, mobile plant) | Release of condensate negatively impacts local soil quality. Release of condensate negatively impacts groundwater quality reducing its existing suitability for use. | Monthly load out from site. Escalation from loss of containment may lead to pool fire contained on site. Load-out area is not bunded. assume full tanker compartment release of 11kL. Transport of condensate from site to processing facility undertaken under Contractor HSE management system. Groundwater extraction bores (Camp North 1 and Camp South 1) located up gradient of condensate load out operation | 2 - Moderate | OEUP-W-4100-SOP-OPS-006 - SOP Condensate storage and load-out WAA-4100-ENG-PLN-00001 - Integrity Management System - Beharra Springs WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist OE Operator conducts loading with Tanker driver Operator carries PGM Earthing of tanker Hose integrity checks and certification Pre-inspection of hose EHA compliance Tanker battery isolated Maintenance Management System (CMMS) Contractor HSE Management Directive (LAT-HSE-DVE-011) OEUP-INT1000-PRO-SAF-006 - Land Transport Procedure Emergency Response Plan - Beharra Springs (CDN 3677589) Drained concrete pad in load out bay which can hold small spills Fire fighting equipment (hose reels, extinguishers) Emergency Shutdown Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009) and EP (OEUP-4100-PLN-ENV-003) Bore water quality monitored to ensure fit for purpose | Substantially Effective - 75% | 2 - Moderate | 2 - Highly Unlikely | Low | Accept | Scott Cornish | |
| Env06 | Loss of containment (LOC) of hydrocarbon from the Sales Gas Pipeline EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Corrosion Excavation Maintenance system failure Pigging - opening the pig receiver under pressure Natural disaster (flood, fire, earthquake) Impact (vehicle, mobile plant) Crane or lifting equipment failure Loss of cathodic protection Exceeding design conditions (e.g. overpressure) Utilisation of out of specification material Inadequate plant monitoring | Release of hydrocarbon negatively impacts local air quality leading to increased greenhouse gas emissions. Release of hydrocarbon negatively impacts soil quality leading to localised loss of vegetation and reducing its existing suitability for land use. Release of hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use. Release of hydrocarbon negatively impacts local amenity. | Sales Gas Pipeline is approximately 1.64km long Operating Pressure 4500kpa Buried for majority of route (1.5km) with exception of pig receiving and metering station which is fenced No public access Pipeline located within Redback to BHS Plant right of way Loss of containment could escalate to bushfire (see Risk ID RSK-103522) No potential for liquid based hydrocarbon to be released due to gas processing and treatment Maximum production is 25TJ/d typically operations running at 15TJ/d Direct inspection and pipeline coating repairs undertaken during 2017. | 3 - Serious | Depth of burial Pipeline design - wall thickness, corrosion allowance, material of construction Pipeline design - designed to be pigged Wrapped pipeline (painted) Pipeline markers Cathodic Protection Ultra-sonic thickness testing Annual coating surveys Routine corrosion checks Underground service drawings Pipeline locator Easement checks and maintenance Pressure safety valves (PSVs) Low pressure trip closing plant outlet (cause and effect matrix) Maintenance Management System (CMMS) Permit To Work - Conventional Operations (CDN 3674860) OEUP-INT1000-PRO-SAF-006 - Land Transport Procedure Management of Change (MOC) Directive (LAT-HSE-DVE-004) and Procedure (CDN 3675087) Emergency Response Plan - Beharra Springs (CDN 3677589) Emergency Shutdown Pipeline designed, maintained and operated in accordance with AS2885 Pipeline integrity management plan (CDN 11750246) Pipeline coating and fabric maintenance Beharra Springs Pipeline Pigging SOP (OEUP-4100-SOP-OPS-057) OEUP-1000-PRO-SAF-182 - Lifting and Load Safety Operations - AUS which requires: * Trained and competent staff involved in lifting operations (drivers, riggers, doggers) * Lifting equipment certified by 3rd party contractor * Lifting equipment register (LER) AUS-1000-SAF-PRO-00015 - Working at Heights Procedure which requires: * Exclusion zones, barricading etc. WAA-4100-OPS-GDL-00001 - SIMOPS Matrix | Substantially Effective - 75% | 3 - Serious | 1 - Remote | Low | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
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| Env07 | Loss of containment (LOC) of hydrocarbon at shut in wellsite (i.e. Isolated, suspended plug) EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Corrosion Dropped objects Impact (vehicle/mobile plant/unsecured items) Natural disaster (flood, fire, earthquake) Excavation Mis-matched or poor installation of tubing fittings Inadequate / non verified flange makeup Gasket incorrectly fitted, wrong material/specification Sabotage Subsidence Loss of well integrity | Release of hydrocarbon negatively impacts local air quality leading to increased greenhouse gas emissions. Release of hydrocarbon negatively impacts soil quality leading to local loss of vegetation. Release of hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use. Release of hydrocarbon negatively impacts local amenity. Release of hydrocarbon negatively impacts fauna through loss of habitat, loss of food sources, disturbance to normal feeding, breeding cycles (noise). Cross communication between geological formations. | * BHS 3 - plugged and suspended * BHS 2 - shut-in * Wolf - suspended * Irwin 1 - currently managed by AWE and not in scope of Beharra Springs operational scope Plugged and abandoned wells are not in scope of the Facility, these included: * Yardanogo South 1- EP320 * Yardanogo North 1 - EP320 * Beharra Springs South 1 - EP320 | 3 - Serious | Operator inspections (weekly for pressure/leaks) Quarterly SAMS checklist (section 6) (addresses compound security) Well Integrity Management Plan - Conventional wells (Operate & Maintain phase)(Con Ops) (CDN 7726350) which includes: * 3rd party assurance - verification of integrity (annual) * Well heading valve maintenance (greasing) Well Management Plan - Beharra Springs 3 (CDN 8187841) WAA-4120-OPS-PLN-00004 - Well Management Plan - Beharra Springs North 1 (isolated pending SDV reinstatement) Well Management Plan - Beharra Springs 2 (CDN 8226115) Well Management Plan - Wolf (CDN 9459608) Origin Barriers Standard (CDN INT-1000-35-TS-002) Well completed and suspended as per well completion reports and verified well schematics Maintenance Management System (CMMS) Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) OEUP-INT1000-PRO-SAF-006 - Land Transport Procedure OEUP-1000-PRO-SAF-182 - Lifting and Load Safety Operations - AUS which requires: * Lifting equipment certified by 3rd party contractor * Lifting equipment register (LER) AUS-1000-SAF-PRO-00015 - Working at Heights Procedure which requires: * Exclusion zones, barricading etc. WAA-4100-OPS-GDL-00001 - SIMOPS Matrix Management of Change (MOC) Directive (LAT-HSE-DVE-004) and Procedure (CDN 3675087) Emergency Response Plan - Beharra Springs (CDN 3677589) Trained and competent staff Backfilling undertaken in accordance with project specific procedure (AUS-1000-ENG-PRO-9111421) | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |
| Env08 | Loss of containment (LOC) from condensate and methanol storage tanks EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Static electricity Corrosion Overfill from process Overfill from API separator Drain valve left open Weather event Vacuum of tank Overpressure / under pressure (e.g. Failure of tank breather) Control valve failure Dropped objects Impact (vehicle, mobile plant) Crane or lifting gear failure during shutdown activities Subsidence | Release of methanol negatively impacts local air quality leading increased greenhouse gas emissions. Release of condensate negatively impacts soil quality leading to localised loss of vegetation and reducing its existing suitability for land use. Release of condensate or methanol negatively impacts groundwater quality reducing its existing suitability for use. | Blanket gas tanks Maximum tank fill capacity = 100,600L condensate 16,194L methanol Storage tank bund designed to hold 157,690 L (more than 110% of largest tank capacity). Permeable soil-landscape system tends to allow infiltrate to the water table rather than running off the land surface giving rise to the lack of defined watercourses surrounding the Facility. Therefore surface water impacts are unlikely. (Section 4 of Beharra Springs EP OEUP-4100-PLN-ENV-003). | 3 - Serious | Blanket gas Tanks are earthed Lightning protection Fusible loop at the methanol and condensate load out pumps PVV vent Explosion hatch/blast vent Level control - Level high alarm and High High Trip (Cause and effect matrix CDN 8362276) Load in pump trip Operator checks Weekly dipping of B-T-2301 Operator competency and training OEUP-W-4100-SOP-OPS-006 - SOP Condensate storage and load-out OEUP-W-4100-SOP-OPS-007 - SOP Methanol Load-in Condensate and methanol tank banded Maintenance Management System (CMMS) Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) OEUP-1000-PRO-SAF-182 - Lifting and Load Safety Operations - AUS Management of Change (MOC) Directive (LAT-HSE-DVE-004) and Procedure (CDN 3675087) Emergency Response Plan - Beharra Springs (CDN 3677589) Fire protection system (hose reels) Emergency Shutdown Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009) and EP (OEUP-4100-PLN-ENV-003) Tank integrity management and inspection WAA-4100-ENG-PLN-00001 - Integrity Management System - Beharra Springs Bund capacity maintained through periodically removing (as necessary) wind blown sand | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|---|--|--|---------------|---|-------------------------------|-------------|--------------|-----------------------|----------------------|---------------|---|
| Env09 | <p>Loss of containment (LOC) of hazardous materials / waste</p> <p>EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment</p> <p>EPO: No loss of containment of liquid and/or solid wastes to the environment</p> | <p>Inadequate waste storage, facilities and containers</p> <p>Inadequate segregation of stored materials</p> <p>Inadequate labelling / damaged or missing labels</p> <p>Vehicle / mobile plant incident during loading/unloading and transportation</p> <p>Equipment failure e.g. hose failure during transfer</p> <p>Operator error</p> <p>Poor Housekeeping</p> <p>Pipe rupture (diesel lines)</p> <p>Hose rupture</p> <p>Natural disaster (flood, fire, earthquake)</p> <p>Drilling sump overflow (workovers)</p> <p>Well intervention / wirelining activities</p> <p>Poor shutdown / project planning</p> <p>Subsidence</p> <p>Inadequate management of drilling muds/cuttings</p> <p>Inadequate management of pipeline pigging activities</p> <p>Inadequate disposal of contaminated rainwater and soils (e.g. within evaporation pond 1 footprint or removal of windblown sand within in operational pond)</p> <p>Inappropriate handling and management of potentially contaminated H2S removal unit filter material and carbon beds (during material change out)</p> | <p>Release of hazardous materials/waste negatively impacts:</p> <p>* local air quality leading to increased greenhouse * soil quality leading to localised loss of vegetation and reducing its existing suitability for land use</p> <p>* groundwater quality reducing its existing suitability for use</p> <p>* local amenity</p> | <p>Products: Diesel (tank 4500 L), Oil Storage 3 x 1000 L ICB, Nitrogen, Lube Oil, Pond waste, corrosion inhibitor, biocide, water treatment chemicals.</p> <p>Cortron storage at well heads approx. 200L</p> <p>Methanol storage at Redback wells approx. 200L</p> <p>Diesel tank bund holds 2700 L - insufficient to hold entire tank content of 4500L.</p> <p>LOC Condensate and Methanol tanks assessed in separate risk.</p> <p>Drilling sump required for workovers (<450 kL).</p> <p>Tanker (20 kL) rollover and release on/off site resulting in recordable spill.</p> <p>Release could escalate to fire depending on proximity to ignition source.</p> <p>No Declared Rare Flora (DFR) or EPBC species known within L11 permit area.</p> <p>Refer section 4 of Beharra Springs EP (OEUP-4100-PLN-ENV-003).</p> <p>Evaporation pond 1 offline upon commissioning and handover of evaporation pond 2 upgrade project.</p> <p>Evaporation pond 1 will contain potentially contaminated material such as liner, soil/sand.</p> <p>Evaporation pond 2 upgrade works addressed within project specific Bridging EP - not in scope</p> <p>Radiological surveys to date have not indicated any areas of concern, with background levels (28.9cps) less than trigger level (57.8cps). (Radiation Professionals July 2016 ORG141008-VAR3-TM2)</p> <p>Carbon bed and H2S removal unit potentially contaminated with mercury, H2S and BTEX</p> | 3 - Serious | <p>Designated Hazardous Materials storage onsite</p> <p>Bunded storage areas</p> <p>Hazardous Materials Procedure - Approval and Control procedure (CDN/ID3675133)</p> <p>Segregation</p> <p>Chemwatch access - SDS, Manifest, DG Labels.</p> <p>Hazardous Materials Register</p> <p>WAA-4100-SAF-REG-00001- Dangerous Goods Manifest</p> <p>IBCS, drums etc. available and used onsite for storage.</p> <p>Diesel transfer underground piping (steel wrapped pipe)</p> <p>Diesel transfer to generator by steel wrapped pipe</p> <p>Standing order in place to limit diesel tank inventory is limited to 2450 L to ensure bund has at least 110% capacity of volume stored</p> <p>Operator surveillance of sight glass LI-4100-0430</p> <p>Operator checks</p> <p>Emergency Spill Kits</p> <p>Corrosion inhibitors in flowlines</p> <p>Cathodic protection</p> <p>Competent and trained operators and contractors in accordance with:</p> <p>* HSE Induction Procedure (CDN 3675129)</p> <p>* Training and Competency Matrix</p> <p>Integrity checks</p> <p>Routine inspection of hazardous material storage areas</p> <p>Load in/Load out Procedure for diesel (CDN/ID 3677661), operator present during load in of diesel</p> <p>Cortron and methanol storage at wellheads is bunded</p> | Substantially Effective - 75% | 3 - Serious | 4 - Possible | Medium | Treat | Scott Cornish | <p>1. Investigate options for long term diesel storage (Q1 2018).</p> <p>2. Implement selected option for long term diesel storage (Q4 2018).</p> <p>3. Investigate alternative options to offsite transport and disposal of contaminated sand/soil (Q2 2018)</p> |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
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| Env10 | Site activities result in excessive air emissions EPO: Minimise impacts to the local airshed EPO: Minimise amenity impacts due to noise, dust, light and odour emissions | Excessive flaring and/or venting as a result of: * loss of power to the gas plant * Loss of flare (ground and vertical) * shut-in or shutdown of gas plant (Beharra is unable to produce on specification gas) Production processes involving combustion (fuel burning equipment and flaring) or venting (PSVs, failure of flare, fugitive emissions) Venting during major maintenance campaigns / pipeline pigging | Excessive air emissions negatively impacts local air quality leading to loss of amenity and increased greenhouse gas emissions. | Loss of power assumed to be short term 3 days (time needed to mobilise emergency power generation) Loss of flare event <24hours 12 days shut down Lost production for shutdown period (12 days) Producing condensate only | 1 - Minor | <div>Maintenance Management System (CMMS) 100% redundancy Back up generator Tie in for hire generator Load bank fitted Beharra integrity management plan (CND/ID3677581) Fugitive emission surveys Operator checks Process control system Continuous flare header purge with fuel gas Alternative purge via fuel gas skid connection to flare header (line 1004) Flame Arrestor installed Purge or inert gas available Manual nitrogen purge on long duration shut down OEUP-W4100-OPS-SOP-059 - BHS Gas Plant Start-up WAA-4100-OPS-SOP-00033 - BHS Gas Plant Shutdown Flare exclusion zone with signage Flare thermocouples</div> <div>Visual monitoring Flare maintenance during shutdown - check flare head etc. Function Testing of Ignition Panel Mechanical stop on PV100 to prevent excessive flow to ground flare. (Low temp embrittlement) Sufficient methane to maintain combustion under normal operating conditions Trained Operations (CRO) including plant monitoring and control (automated control systems) Daily Reporting of Production Performance Well selection / well changeover for gas composition Guard Bed Change Out Communication Pathway between Beharra Operations and APA (GC) On spec parameters Off spec sales gas alarms Plant can be shut in if going off spec Plant rates can be reduced to reduce flaring OEUP-W4100-OPS-SOP-059 - BHS Gas Plant Start-up OEUP-W-4100-SOP-OPS-064 - SOP Guard Bed Filter Operation Integrity checks on membrane banks Engineering Design Nitrogen purge on shut down Maintenance CFTS, shutdown valve integrity, NDT, Draeger reads (Carbon Dioxide reads) Upgraded Low temperature Separator internals Carbon bed changeover Complete set of spares onsite Remote location of facility Pipeline pigging SOP implemented (Sam Maloney to confirm)</div> | Substantially Effective - 75% | 1 - Minor | 3 - Unlikely | Low | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
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| Env11 | <p>Loss of containment as a result of accident involving land transport / mobile plant and equipment</p> <p>EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment</p> <p>EPO: EPO: No loss of containment of liquid and/or solid wastes to the environment</p> | <p>Fatigue</p> <p>Stress</p> <p>Poor road conditions (unsealed roads)</p> <p>Poor vehicle conditions</p> <p>Unfamiliar conditions and location</p> <p>Speeding / reckless driving</p> <p>Collision with an animal</p> <p>Other road users / Third party</p> <p>Adverse weather (rain etc.)</p> <p>Drug & Alcohol influence</p> <p>Multiple work teams within small area due to plant shutdown campaign and/or project activities</p> <p>Rollover</p> <p>Hydraulic failure</p> <p>Incorrect tyre pressures</p> <p>Impact with process equipment and pipework</p> <p>Impact with vehicles</p> <p>Reversing into plant or persons - poor visibility</p> <p>Congestion in the workshop.</p> <p>Unstable ground</p> <p>Incorrect use of equipment</p> <p>Poorly maintained equipment</p> <p>Incompetent operator</p> <p>Offsite transfer of produced</p> | <p>Release of produced formation water, hydrocarbon /hydraulic oil or diesel negatively impacts soil quality leading to localised loss of vegetation.</p> <p>Release of produced formation water, hydrocarbon /hydraulic oil or diesel negatively impacts groundwater quality reducing its existing suitability for use.</p> | <p>Injury to / fatality of fauna (refer to Risk ID30).</p> <p>EP states offsite transfer of produced formation water may be considered / occur should operational pond/s have no holding capacity</p> | 1 - Minor | <p>ORG-HSE-FRM-006 - Safety Specifications - Light and Heavy Vehicles</p> <p>OEUP-INT1000-PRO-SAF-006 - Land Transport Procedure</p> <p>Regular inspections of all vehicles (weekly checklists completed)</p> <p>Journey Management Plans (particularly during shutdown activities)</p> <p>Driver training</p> <p>Life Saving Rule #2 - Never talk or text on a hand-held mobile phone when operating a vehicle or mobile plant</p> <p>ORG-HSE-DVE-037 - Health and Fitness for Work</p> <p>ORG-HSE-DVE-023 - Drug and Alcohol Management</p> <p>ORG-HSE-POL-002 - Drug and Alcohol Policy</p> <p>ORG-HSE-DVE-043 - Fatigue Risk Management</p> <p>Licensed drivers</p> <p>Road Rules compliance</p> <p>Speed Limits on Site (variable as required)</p> <p>Minimum vehicle specification has been clarified by ORA for dirt road driving</p> <p>Avoid driving at dusk and dawn where fauna movements greatest</p> <p>Permit To Work - Conventional Operations (EA/WA) (CDN 3674860)</p> <p>OEUP-1000-PRO-SAF-182 - Lifting and Load Safety Operations - AUS</p> <p>OEUP-1000-PRO-SAF-181 - Working at Heights (CA) - AUS</p> <p>Licensed operators and/or trained and competent operators in accordance with:</p> <p>* HSE Induction Procedure (CDN 3675129)</p> <p>* Training and Competency Matrix</p> <p>Familiarisation checklists</p> <p>VOC checklists</p> | Substantially Effective - 75% | 1 - Minor | 4 - Possible | Medium | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|--|--|--|---|---------------|---|-------------------------------|--------------|--------------|-----------------------|----------------------|---------------|--|
| | | formation water | | | | Traffic Management Plan in place for increased volumes of traffic (Shutdowns) Exclusion zones Forklift reversing beepers and beacons EWP users wear a harness Escorting and Spotters Maintenance management system (CMMS) Pre-inspection of equipment Life Saving Rule 5 - barricading and signage | | | | | | | |
| Env12 | Flammable levels of hydrocarbons are ignited in the evaporation pond resulting in liner damage EPO: No loss of containment of liquid and/or solid wastes to the environment | Inadequate removal of hydrocarbons in process water stream Wash down of compressor skids Draining of liquids Condensate/Methanol carry through to evaporation pond Process upset Failure of interceptor pit Storm water overwhelms API separator Operator error Operation of flare Hot work undertaken during shutdown campaigns, well intervention/ wirelining and workovers, or liner repair Flammable levels of hydrocarbons (earthmoving equipment failure, friction) ignite and damage the liner | Release of produced fluids negatively impacts local soil quality, reducing its existing suitability for land use. Release of produced fluid negatively impacts groundwater quality reducing its existing suitability for use. | Release to the soil would be localised and limited to plant boundary therefore no impact to vegetation. Release to groundwater would be localised and limited to impacts within plant boundary therefore no impacts to any downstream springs. Separator system upgrades in place | 2 - Moderate | Produced water and site drains pass through separator before discharge into operational evaporation pond Skim pond of usable condensate as a routine Skim separator of usable condensate as a routine Visual inspection of plant and equipment skids that lead to site drains are visual inspected and spills cleaned up Spill kits Operator inspections of interceptor pit - level check, functionality (SAMS checklist) Permit To Work - Conventional Operations (EA/WA) (CDN3674860) Control of ignition sources Fencing around evaporation ponds Emergency Response Plan - Beharra Springs (CDN 3677589) and post incident clean up Emergency Response Drill and Exercises Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009/4) and EP (OEUP-4100-PLN-ENV-003) | Substantially Effective - 75% | 2 - Moderate | 3 - Unlikely | Medium | Accept | Scott Cornish | |
| Env13 | Loss of containment from operational pond/s EPO: No loss of containment of liquid and/or solid wastes to the environment | Loss of integrity of pond liner due to: * external interference * damage and /or leaks from seams and joins * breakdown of material due to Ultra Violet (UV) and extreme changes in temperature * damage during unloading and skimming activities * ineffective repairs *access by fauna * intrusive soil sampling below liner * removal of windblown sand to maintain pond capacity Loss of integrity of pond wall due to: * poor maintenance and erosion * damage from fauna / vegetation growth * over filling above pond design capacity. Sedimentation build-up in ponds potentially reducing the holding capacity Extreme wet weather reduces pond capacity Unexpected change in reservoir Operator error Unexpected delays to evaporation pond 2 commissioning | Release of produced fluids negatively impacts soil quality (leading to localised loss of vegetation) and reducing its existing suitability for land use. Release of produced fluid negatively impacts groundwater quality reducing its existing suitability for use. Release of produced fluid negatively impacts local amenity. Release of produced fluid negatively impacts fauna through loss of habitat, drowning, ingestion of contaminated surface water. | Short term strategy - Evaporation pond 1 operational until commissioning of Evaporation pond 2 Mid term strategy - Evaporation pond 2 operational, with evaporation pond 1 under care and maintenance until remediation completed Long term strategy - Evaporation pond 2 operational with additional water management capacity to be installed (possibly remediation and recommissioning of evaporation pond 1) should Facility water balance model identify the need. Loss of integrity of pond liner could be caused by fire in pond/s. Risk addressed separately. Current production forecast indicates no increase in water production. Produced fluid could contain minimal hydrocarbons as a result of carryover from process separators. Regional groundwater flow is towards the southwest. Closest groundwater springs are Beharra Spring and Mungenooka Spring more than 10 km west of evaporation ponds. GW5, GW11 returning results of the TPH (Total Petroleum Hydrocarbon) Test Results to the | 3 - Serious | Operator surveillance of evaporator pond levels and interceptor pit contents (conducted daily) Operator visual integrity checks on the liner and independent validation Pond wall - visual inspections Vegetation management undertaken in accordance with clearing permit Contractor HSE Management Directive (LAT-HSE-DVE-011) Interceptor Pit and skimming of evaporation pond WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist Emergency Response Plan - Beharra Springs (CDN 3677589) Oil spill contingency plan requirements Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009/4) and EP (OEUP-4100-PLN-ENV-003) Ponds are fenced to prevent fauna access BHS Produced Water System Operation (OEUP-W4100-SOP-OPS-073) Produced Formation Water Management Strategy which includes: * maintaining minimum 300mm freeboard * liner permeability less than 1 x 10-9m/s Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Requirement to undertaken JSA for all non routine tasks Liner repairs undertaken as per the project specifications Offsite transport and disposal of contaminated rainwater/produced formation water where operational evaporation pond has insufficient capacity Permanent fencing to be reinstated around evaporation pond 2 at completion of the activity Evaporation pond 2 consists of dual liners with leak detection and collection system Evaporation pond 1 liner integrity maintained and validated while in care and maintenance Adaptive water management strategy which requires operations to take steps as | Partially Effective - 50% | 3 - Serious | 4 - Possible | Medium | Treat | Scott Cornish | 4. Investigate requirement for additional long-term water management infrastructure (Q2 2018) 5. Investigate feasibility of short term storage of produced water within condensate tank as part of adaptive water management strategy (Q4 2017) 6. Review and update pond 1 integrity and inspection requirements to allow for adaptive approach for independent validation (Q4 2017) 7. Implementation of soil and groundwater investigation recommendations (Q4 2017) |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
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| | | pond 2 commissioning | | Soil and groundwater investigation (Senversa April 2017) concluded: * unlikely exposure pathway to subterranean fauna * no evidence of hydrocarbon soil impacts beneath evaporation pond 1 * localised TRH impacts above Tier 1 ecological screening criteria in soils near separator, with impact not considered to pose an unacceptable risk to ecological or human receptors * likely that nitrate detected above background levels but below Tier 1 screening criteria is contributing to hydrocarbon natural attenuation as a dominant electron acceptor * impacts to groundwater environmental values is deemed immaterial to the ongoing use of the site given shallow groundwater is not abstracted for any purpose and background groundwater quality is degraded and the absence of onsite ecological receptors. No community consequences due to remote nature of site. At least 7km from nearest site, cattle grazier. No decrease in vegetation growth noted. Less than 300mm freeboard in evaporation pond triggers Facility shutdown Escalation triggers detailed in adaptive water management strategy | | water level increases | | | | | | | |
| Env14 | Loss of containment from flexible hoses EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment EPO: No loss of containment of liquid and/or solid wastes to the environment | Hose deterioration (age, UV, vibration, corrosion, surface abrasion, vehicle damage, chemical attack) Poor maintenance Incorrect hose specifications Incorrect use of hoses Incorrect hose fittings and connections Overpressure Thermal expansion Low Temperature | Release of produced water/hydrocarbon negatively impacts local soil quality. Release of produced water/hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use. | Air compressor hoses, load in/load out hoses, pond skimming hoses, fuel transfer hoses. Products: Methanol, Condensate, Diesel, Compressed Air, Nitrogen, Lube Oil, Pond waste, corrosion inhibitor, biocide, water treatment chemicals. Transfer of produced water during pond dewatering operations, freeboard exceedance | 2 - Moderate | Tagged and certified hoses (12 monthly for utility hoses) Hose Register Dedicated hose storage area Regular inspections and maintenance of hoses Inspections of hoses prior to use - checking fit for purpose Trained and competent operations personnel Hoses tested by 3rd party - Methanol and Condensate hoses sent to Perth for testing Spare hoses retained onsite Spill kits WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist | Substantially Effective - 75% | 2 - Moderate | 3 - Unlikely | Medium | Accept | Scott Cornish | |
| Env15 | Site activities initiate a fire that escalates off site (beyond plant boundary, right of way or well lease) or results in a bushfire EPO: Site activities do not initiate a bushfire | Flaring at gas production plant Testing of new production wells / flowlines (ground flaring) Process incident resulting in fire Loss of well control Hot work Inadequate cigarette disposal Vehicle use including trucks (mufflers, exhausts, load in/out). Mechanical/electrical or operational failure of equipment on site Accumulation of combustibles - vegetation under/around process skids and admin building Arid environment Windy conditions Back burning / Burn offs Vegetation maintenance restrictions | Degradation of local air quality (smoke). Disturbance to existing land use and amenity (destruction of vegetation, infrastructure). Disturbance or destruction of sites of cultural heritage significance. Disturbance of fauna through loss of habitat and food source. Destruction of rare and endangered flora and fauna, vegetation communities and fauna habitat. | Reliant on Dongara Fire Brigade for Bushfire response. Fire contained within plant / right of way or well lease boundary considered to pose no environmental impact. Ecosystem has evolved to recover from fire reducing the duration of the impact. | 3 - Serious | Maintenance Management System (CMMS) WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist Firebreak maintenance and flare kept clear of combustible material Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Beharra Springs Fire Management Plan Emergency Response Plan - Beharra Springs (CDN 3677589) Emergency Response Drill and Exercises Fire protection system (hose reels, extinguishers) Emergency Shutdown Certified earthing of plant equipment Weed control around plant DFES/FESA approval for drilling ground pits for flaring Licence for flares at gas production plant current and allows flaring during Designated smoking area with adequate disposal Fire detection system Local fire authority consulted in preparation of fire management plan and firebreak maintenance work Job safety analysis for all non routine tasks. | Substantially Effective - 75% | 3 - Serious | 3 - Unlikely | Medium | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|---|--|---|---------------|---|-------------------------------|-------------|---------------------|-----------------------|----------------------|---------------|--|
| Env16 | Inappropriate/unauthorised clearing of vegetation EPO: Minimise impacts to rare and endangered flora and fauna, vegetation communities and fauna habitat | Lack of awareness of requirements for * routine operations (maintenance of firebreaks, operational areas, access roads) lack of awareness of requirements * Construction activities (clearing new drilling pads, flowline right of way, access roads) * Major maintenance campaigns (clearing for well workovers, flowline repair) | Loss of vegetation, loss of declared rare flora or priority species. Loss of fauna habitat. Soil erosion. Weed and pest invasion. | Clearing permit CPS6643 allows area of up to 25 ha for facility access roads and right of ways (well lease, flowlines and sales gas pipeline) to be maintained for operations. Clearing permit CPS4607 allows clearing of up to 14.15 ha within the gas production plant area (including evapoaration ponds, accomodation building and groundwater monitoring bores). Shire of Irwin firebreak maintenance requirements allowing for 20m mulching around buildings and 30m to the east of the facility. Any new clearing will require a permit. North Yardanogo 1 and South Yardanogo 1 fully rehabilitated and not in scope of facility. | 3 - Serious | Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Trained and competent employees and contractors in accordance with: * HSE Induction Procedure (CDN 3675129) * Training and Competency Matrix Contractor HSE Management Directive (LAT-HSE-DVE-011) Pre-clearing flora surveys for any new clearing Use of existing disturbed areas wherever practicable Regulatory approval obtained for all new vegetation clearing or where outside the permitted areas on CPS 6643 and CPS4607 Shire of Irwin approval for mulching 20m around buildings and up to 30m to the east of the facility Rehabilitation undertaken in accordance with clearing permit CPS6643 and CPS4607 Vehicle hygiene inspection and hygiene declaration procedures will be used during construction activities Soil erosion control measures implemented and maintained until rehabilitation established/completed | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |
| Env17 | Rehabilitation activities are inadequate or unsuccessful EPO: progressively rehabilitate disturbed areas | Inadequate knowledge of rehabilitation techniques for Kwongan heath Traffic disturbance to rehabilitating areas Delay in rehabilitation Availability of seed stock Natural disaster Tenure overlaps results in rehabilitated areas being disturbed Use of inappropriate soil quality | Weed encroachment. Reduction in local biodiversity values. Failure to meet regulatory obligations. Soil instability and erosion. Reduction in local amenity. Loss of fauna habitat. | Clearing permit CPS6643 conditions set rehabilitation requirement, with total operational area that is maintained under clearing permit is 25 ha North Yardanogo 1 and South Yardanogo 1 rehabilitated and final rehabilitation reports submitted to DMP on 29 July 2016 Potential sand mining tenure overlap with operations Mattiske (Feb 2017) rehabilitation report summarised there are very few weeds present within the Beharra Springs survey area and positive signs of rehabilitation development to date Beharra Springs South 1 final rehabilitation works are outstanding with removal of drilling access road necessary. Final rehabilitation report to DMP outstanding. | 3 - Serious | Rehabilitation of cleared areas to an operational area to be undertaken as soon as practical after work completed Rehabilitation assessment undertaken by Mattiske in 2017 Quarterly rehabilitation inspection completed Well site inspections Designated access roads / traffic management Weed management involving spraying programs and removal by operators Soil erosion control measures implemented until stabilisation of topsoil Training and competency Weed hygiene procedures implemented for project specific campaigns Cleared / disturbed areas rehabilitated in accordance with clearing permit CPS6643 and CPS4607 Fauna habitat will be stockpiled during earthwork and respread during rehabilitation Where practical, stockpiled topsoil (stripped during earthworks) will be respread during rehabilitation Photograph reference points for ongoing rehabilitation monitoring have been established and staked | Partially Effective - 50% | 3 - Serious | 4 - Possible | Medium | Treat | Scott Cornish | 8. Prepare and submit the Beharra Springs South 1 final rehabilitation report to DMIRS |
| Env18 | Site activities will cause disturbance to sites of cultural heritage EPO: Avoid, or if avoidance is not practicable, minimise disturbance to site of cultural heritage | Vegetation clearing and earthworks Transportation of staff and equipment Installation of new groundwater monitoring bores | Negative impact to local cultural heritage values. | Sites of cultural heritage significance are likely to exist near site. No known aboriginal archaeological sites identified in surveys undertaken within L11. (Section 4 of Beharra Springs EP) Current Native Title Claimant Parties for Redback Terrace are Amangu People Native Title Claim Group | 3 - Serious | Cultural Heritage Surveys / desktop survey undertaken for new clearing activities where appropriate HSE Induction Procedure (CDN 3675129) Designated access roads, flowline right of way and sales gas pipeline right of way for routine operation and maintenance Traffic management plans for well intervention/wireline and workover campaigns developed and implemented Consultation with traditional owners undertaken prior to new construction activities where appropriate Consultation with native title parties is undertaken in accordance with executed agreements Unexpected Aboriginal Cultural Heritage Find procedure (CDN 3674820) | Substantially Effective - 75% | 3 - Serious | 1 - Remote | Low | Accept | Scott Cornish | |

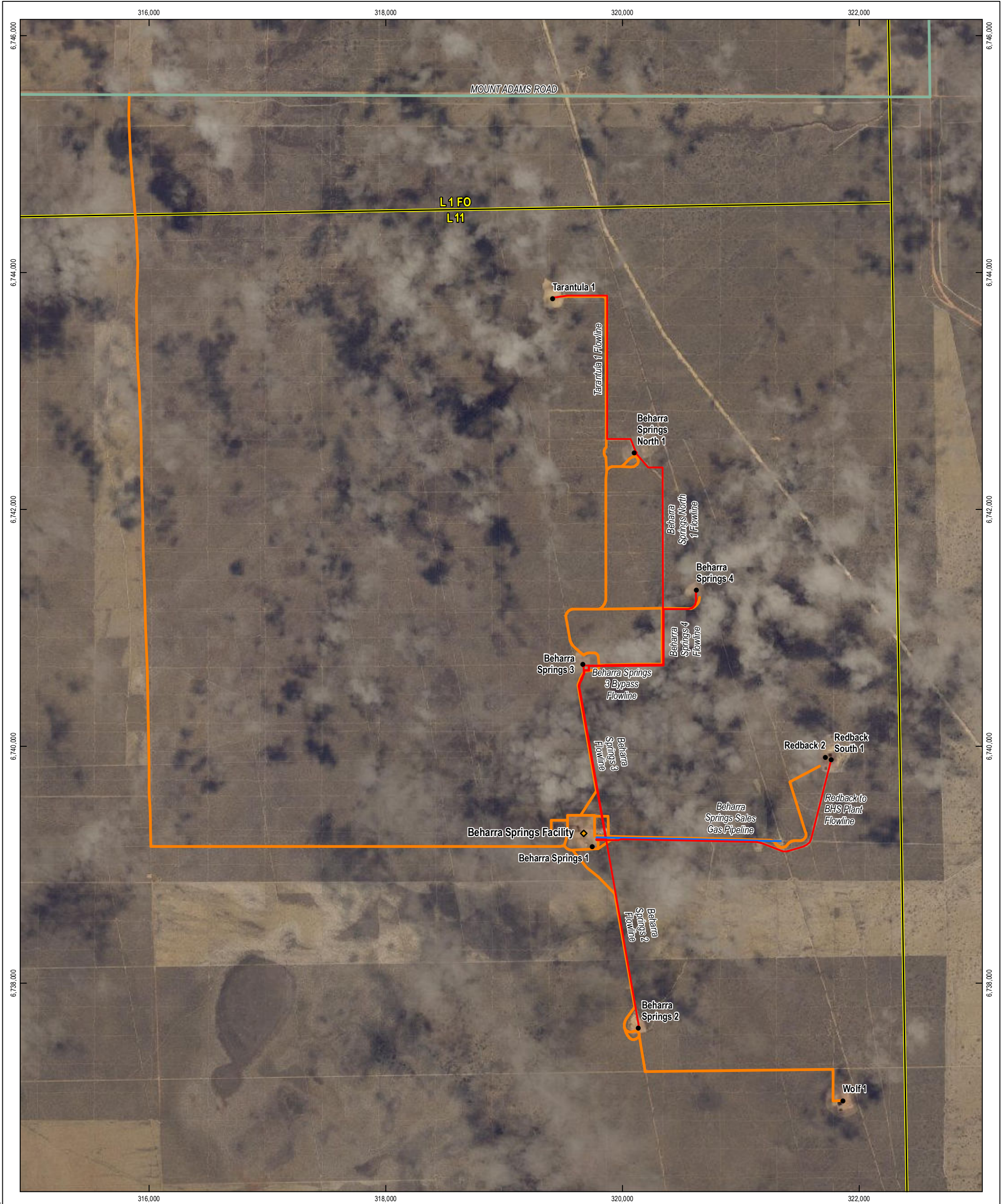
| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|--|--|--|---------------|---|-------------------------------|--------------|---------------------|-----------------------|----------------------|---------------|------------------------|
| Env19 | Site activities will cause the introduction or spread of weeds or pathogens EPO: Minimise the potential for introduction or spread of weeds, pest animals or soil based pathogens | Routine operations (e.g. Maintenance of firebreaks, operational areas, access roads) Transportation of staff and equipment Import of gravel/soil for road construction and maintenance, well lease establishment | Reduction in local biodiversity values. Reduction in land use capability. | Weeds can establish on disturbed areas with minor encroachment into neighbouring bushland. Weeds have previously been introduced in gravel brought to site. Dieback disease risk minimal due to calcareous nature of soils. | 2 - Moderate | Spraying Programs Weed removal by operators Routine inspections for evidence of weeds undertaken (WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist) HSE Induction Procedure (CDN 3675129) Designated access roads for routine operations Traffic management plans for well intervention/wireline and workover campaigns Cleared / disturbed areas rehabilitated in accordance with clearing permit CPS6643 and CPS4607 Training and competency Weed hygiene procedures implemented during construction activities Gravel sourced from local quarries that hold current extractive licence | Partially Effective - 50% | 2 - Moderate | 2 - Highly Unlikely | Low | Accept | Scott Cornish | |
| Env20 | Vegetation clearing and earthworks activities will reduce local biodiversity values EPO: Minimise impacts to rare and endangered flora and fauna, vegetation communities and fauna habitat | Vegetation clearing and earthworks for new gas wells, flowlines, right of way Vegetation management of existing operational areas (i.e. Firebreak maintenance or hazard reduction at the gas production plant, well sites, access road, flowline right of way, sales gas pipeline) Clearing without a permit inappropriate installation of temporary plant/facilities associated with major maintenance campaigns | Fauna mortality. Soil erosion. Disturbance or destruction of rare and endangered flora and fauna, vegetation communities and fauna habitat. Exposed areas susceptible to soil erosion and weed / pest invasion. | Vegetation at the site demonstrates high floral diversity and could contain rare and threatened flora and fauna Clearing permit CPS6643 allows area of up to 25 ha for facility access roads and right of ways (well lease, flowlines and sales gas pipeline) to be maintained for operations. Clearing permit CPS4607 allows clearing of up to 14.15 ha within the gas production plant area (including evaporation ponds, accommodation building and groundwater monitoring bores). Shire of Irwin firebreak maintenance requirements allowing for 20m mulching around buildings and 30m to the east of the facility. Any new clearing will require a permit. North Yardanogo 1 and South Yardanogo 1 fully rehabilitated and not in scope of facility. | 3 - Serious | Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Pre-clearing flora surveys Use of existing disturbed areas wherever practicable Regulatory approval obtained for all new vegetation clearing or where outside the permitted areas on CPS 6643 and CPS4607 Shire of Irwin approval for mulching 20m around buildings and up to 30m to the east of the facility Rehabilitation undertaken in accordance with clearing permit CPS6643 and CPS4607 Trained and competent employees and contractors in accordance with: * HSE Induction Procedure (CDN 3675129) * Training and Competency Matrix Contractor HSE Management Directive (LAT-HSE-DVE-011) Vehicle hygiene inspection and hygiene declaration procedures will be used during construction activities Soil erosion control measures implemented and maintained until rehabilitation established/completed | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |
| Env21 | Site activities will cause amenity (air, noise, dust, light, odour emissions) impacts EPO: Minimise amenity impacts due to air, noise, dust, light and odour emissions | Flaring and other production processes generating air, light and noise emissions Production well drilling, workovers and well intervention activities generating air, light, noise and dust emissions Shutdown campaigns generating air, light, noise and dust emissions Transportation of staff and equipment generating noise, dust emissions Odour from evaporation ponds Dust emissions due to pipeline pigging Stockpiling of sand/soil materials | Reduced amenity for sensitive receptors. Reduction in habitat value. Reduction in land use capability. Increase in insects. | Facility is remote keeping consequences contained Closest residence to gas plant approximately 7km. Odour emissions associated with the evaporation pond unlikely to have offsite impacts due distance from sensitive receptors. | 2 - Moderate | Remote location of facility minimises impact of noise, light and odour Facility maintenance Plant integrity monitoring Environmental Licence requirements (L8385/2009/4) and EP (OEUP-4100-PLN-ENV-003) Plant Layout / Plant design Physical noise barriers - Purpose built noise reduction on compressor shed walls Sound reducing enclosures on permanent diesel and gas generators Temporary lighting towers required for plant shutdown, well intervention/workovers located to ensure directed to worksite with minimal offsite impact Where practical major maintenance campaigns limited to daylight hours Pigging of sales gas pipeline to be undertaken in accordance with project specific SOP Construction areas will be managed to minimise generation of dust through spraying of water and limiting construction traffic speed Complaints from landholders will be recorded within OCIS, investigated and actions assigned where appropriate Stockpiles of sand/soil materials have: * suitable soil and erosion controls implemented such as slit fencing * wetted down to prevent dust or surface suitably treated to prevent generation of dust (e.g. seed or geofabric coverings) | Substantially Effective - 75% | 2 - Moderate | 1 - Remote | Low | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|--|--|---|---------------|---|-------------------------------|--------------|---------------------|-----------------------|----------------------|---------------|--|
| Env22 | Site activities will result in groundwater extraction that exceeds aquifer recharge EPO: Site activities will result in adverse impact to existing users of groundwater resources | Unauthorised extraction of groundwater for routine and non-routine activities such as potable water, dust suppression, washdown, drilling, well workovers and intervention, rehabilitation, and decommissioning | Unsustainable drawdown of aquifer. Damage to vegetation due to drawdown of shallow water. | Shutdown campaigns and normal operations require minimal water supply. | 2 - Moderate | Groundwater licence includes annual volumetric entitlement Metering of water extraction New bores for drilling activities require licensing Meters are installed and calibrated in accordance with DoW guidelines | Substantially Effective - 75% | 2 - Moderate | 1 - Remote | Low | Accept | Scott Cornish | |
| Env23 | Site activities will result in the loss of containment of hydrocarbons, fuels, chemicals and hazardous materials EPO: No loss of containment of hydrocarbons, fuels, chemicals and hazardous materials to the environment | Transport, storage and handling of fuels, chemicals and hazardous materials (refuelling, vehicle accident, spills and leaks, blown hydraulic hoses, PSV lift) Process incident Production well drilling, workovers and well intervention activities Operation and refuelling of mobile plant and equipment Inclement weather Inappropriate storage during major maintenance campaigns Accidental damage to methanol/condensate tank bund liner | Contamination of groundwater. Contamination of surface water. Contamination of soils. Disturbance or destruction of rare and endangered flora and fauna, vegetation communities and fauna habitat. Fire. Regulatory breach. | Loss of hydrocarbons associated with produced water storage addressed in Risk ID ENV013. | 3 - Serious | Bunding Emergency Spill Kits Corrosion inhibitors in flowlines Competency trained operators (first aid, fire trained) Transport companies are appropriately licensed and competent OEUP-W-4100-SOP-OPS-006 - SOP Condensate storage and load-out OEUP-W4100-SOP-OPS-007 - BHS Methanol Tank Load-In Beharra Springs WAA-4100-OPS-FRM-00002 - Self Area Management System - SAM - Checklist INT-1000-ENG-PLN-00003 - Integrity Management Plan - Piping Systems WAA-4100-ENG-PLN-00001 - Integrity Management System - Beharra Springs Contractor HSE Management Directive (LAT-HSE-DVE-011) Risk Assessment for scope of work AUS-1000-SAF-PLN-00005 - Risk Management Plan Well Integrity Management Plan - Conventional wells (Operate & Maintain phase)(Con Ops) (CDN 7726350) Permit To Work - Conventional Operations (CDN 3674860) OEUP-INT1000-PRO-SAF-006 - Land Transport Procedure OEUP-1000-PRO-SAF-182 - Lifting and Load Safety Operations - AUS Major maintenance campaigns to mobilise appropriate banded storage facilities where onsite facilities are not adequate Maintenance Management System (CMMS) Management of Change (MOC) Directive (LAT-HSE-DVE-004) and Procedure (CDN 3675087) Emergency Response Plan - Beharra Springs (CDN 3677589) Permit To Work - Conventional Operations (EA/WA) (CDN 3674860) Job safety analysis for all non routine tasks Power plant has redundancy | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Treat | Scott Cornish | 9. Implement oil spill contingency plan (Q4 2017) 10. Load in/Load out transfer pump bund to be repaired to provide adequate containment (Q4 2017) 11. Methanol and condensate tank bund capacity to be reviewed and if necessary any windblown sand removed (Q4 2017) |
| Env24 | Inappropriate management of sewage and domestic waste EPO: No loss of containment of liquid and/or solid wastes to the environment EPO: Minimise potential for introduction or spread of weeds, pest animals, or soil-based pathogens | Generation and handling of liquid and solid wastes Inadequate waste segregation Overloading of sewage treatment system at gas plant/accommodation building (operations) Release of insufficiently treated sewage at project/maintenance sites. | Contamination of groundwater. Contamination of surface water. Contamination of soils. Disturbance or destruction of biodiversity values. Increase in vermin / pests. | System upgraded in 2015. Septic system confirmed to be designed in accordance with local laws but final approval to use is outstanding | 3 - Serious | Banded waste store Emergency Spill Kits Competency trained operators Transport companies are appropriately licensed and competent Integrity checks Inspection Checklists Weekly collection of domestic waste undertaken and disposed of at local transfer station by an appropriately licensed contractor Covered bins provided for the collection and storage of domestic wastes Plant and equipment for sewage treatment appropriately constructed, monitored and maintained Sewage treatment leach drains fenced Sewage treatment facilities are designed, operated and maintained in accordance with local and state laws Licensed plumber engaged to undertake necessary maintenance / upgrade works During major maintenance campaigns, consideration given to mobilising temporary amenities | Partially Effective - 50% | 3 - Serious | 2 - Highly Unlikely | Medium | Treat | Scott Cornish | 12. Confirm that septic system meets relevant WA Department of Health and Shire of Irwin requirements. |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|---|--|--|---------------|--|-------------------------------|-------------|---------------------|-----------------------|----------------------|---------------|---|
| Env25 | <p>Site activities will result in adverse impact to existing suitability of soils/land use offsite</p> <p>EPO: No adverse impacts to existing users of soils/land</p> | <p>Subsidence</p> <p>Inappropriate placement of infrastructure</p> <p>Inadequate rehabilitation</p> <p>Construction of new gas wells, access roads, flowlines</p> <p>Inadequate post incident (LOC/spills leaks) clean up</p> <p>Inadequate decommissioning and closure</p> <p>Soil profile / contours not correctly reinstated and compacted</p> <p>Storage and handling and transfer of hazardous material, fuels, dangerous goods, chemicals</p> <p>Use of inappropriate soil quality for rehabilitation works</p> | <p>Disturbance to landholders during construction activities (new wells, flowlines, access roads) and major maintenance campaigns (e.g. Well workover).</p> <p>Soil erosion or subsidence.</p> | <p>Separator system risks assessed separately ENV28 and 29</p> <p>LOC from evaporation pond assessed separately Risk ID Env13</p> <p>Contaminated land classification - prevents future development of site for sensitive uses</p> | 2 - Moderate | <p>When required, adequate consultation with landholders will be undertaken prior to commencement of construction activities</p> <p>Rehabilitation to be completed as soon as practicable upon completion of works in accordance with clearing permit</p> <p>Rehabilitation works may include:</p> <ul style="list-style-type: none"> * ripping of heavily compacted soils * installing and maintaining soil erosion control measures <p>Only clean material to be imported or used for rehabilitation activities</p> <p>Site contaminated land classification prevents use of site for sensitive uses with accessible soil such as childcare centre, kindergartens, pre-schools and primary schools.</p> | Substantially Effective - 75% | 3 - Serious | 3 - Unlikely | Medium | Accept | Scott Cornish | |
| Env26 | <p>Site activities will result in adverse impact to existing suitability of groundwater use offsite</p> <p>EPO: No negative impact to existing users of groundwater resources</p> | <p>Inadequate rehabilitation and decommissioning</p> <p>Inadequate post incident (LOC events, spills and leaks) clean up</p> <p>Loss of well integrity</p> | <p>Adverse impact to existing users of groundwater.</p> | <p>Groundwater users:</p> <p>onsite potable water supply</p> <p>landholder bore 7km</p> <p>Elevated hydrocarbon levels identified in groundwater monitoring bores (GW5 and GW11) appear to be localised. Gas production plant classified as "contaminated - restricted use" which prevents down gradient extraction of groundwater for potable use.</p> <p>Currently no chemicals used down well, however in future may use soap sticks to improve gas uplift. Possible soap stick products will be approved by regulatory authority prior to use and risk assessment updated.</p> <p>Refer to WOMP for Loss of well integrity risks and associated financial impacts.</p> | 3 - Serious | <p>Monitoring of operations potable water quality</p> <p>Incident management procedure</p> <p>Oil spill contingency plan and emergency response</p> <p>Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009) and EP (OEUP-4100-PLN-ENV-003)</p> | Substantially Effective - 75% | 3 - Serious | 3 - Unlikely | Medium | Treat | Scott Cornish | <p>13. Adaptive groundwater monitoring program to be developed (Q4 2017)</p> <p>14. Implemented adaptive groundwater monitoring program (Q1 2018)</p> |
| Env27 | <p>Site activities cause fauna and/or stock injury or death</p> <p>EPO: Minimise impacts to rare and endangered flora and fauna, vegetation communities and fauna habitat</p> | <p>Evaporation ponds/drill sumps not fenced</p> <p>Inadequate stakeholder / landholder engagement</p> <p>Gates left open / unlocked</p> <p>Transportation of personnel, plant and equipment during routine and non routine activities</p> <p>Pond fencing removed or inadequate during pond repairs/intrusive soil sampling</p> <p>Fauna ladders removed and not replaced</p> <p>Tundish, sumps and pit grates/covers not replaced</p> <p>Ecavation for repair/maintenance and/or direct inspection of sales gas pipeline, flowlines or buried pipework</p> | <p>Fauna/stock death or injury due to:</p> <ul style="list-style-type: none"> * entrapment in pond/sump/open trenches * drinking unsuitable water quality * collision with vehicle, mobile plant and equipment. | <p>Impacts as a result of bushfire addressed in separate risk.</p> <p>Review of OCIS records shows incident involving fauna occurs almost weekly</p> | 3 - Serious | <p>When required, adequate consultation with landholders will be undertaken prior to commencement of construction activities</p> <p>Drilling sumps inspected regularly and reinstated as soon as practical upon completion of work</p> <p>OEUP-INT1000-PRO-SAF-006 - Land Transport Procedure requires:</p> <ul style="list-style-type: none"> * Journey Management Plans (particularly during shutdown activities) * Driver training * Avoid driving during dawn and dusk <p>Minimal and intermitted stored water in evaporation ponds with three fauna ladders in each pond</p> <p>Lighting towers are fitted with spikes to deter nesting birds</p> <p>Lighting is minimise at the facility</p> <p>Housekeeping to ensure all covers/grates cover tundishes and sumps and pits as appropriate</p> <p>Evaporation ponds fenced</p> <p>Excavations required to be left open overnight are inspected each day to confirm no trapped fauna</p> | Substantially Effective - 75% | 3 - Serious | 2 - Highly Unlikely | Medium | Accept | Scott Cornish | |
| Env28 | <p>Separator system not performing as required</p> <p>EPO: No loss of containment of liquid and/or solid wastes to the environment</p> | <p>Separator is not adequately designed appropriately for the flow</p> <p>Inefficient oil/water separation</p> | <p>Excess hydrocarbon overflowing to evaporation ponds may result in:</p> <p>Reduction in condensate product to the tank due to increased skimming requirement.</p> <p>Fire/damage to pond liner as condensate product may ignite.</p> | <p>current flow of 18,000L/day of PFW up to a max of 32,000L/day.</p> <p>During evaporation pond 2 upgrade, pumping and transfer system from existing separator outlet to pond 1 to be implemented to prevent backflow of water to separator - risk addressed separately below.</p> | 3 - Serious | <p>Daily visual inspection undertaken of pond water surface for evidence of hydrocarbons</p> <p>Skimming the product from the ponds in accordance with SOP (WAA-4100-OPS-SOP-00022)</p> <p>Inspection, maintenance and validation undertaken in accordance with integrity management plan</p> <p>Holding/buffer tank installed</p> <p>Additional separation system installed (Fox Environmental x6000)</p> <p>API Separator recoated in September 2017 and integrity confirm</p> | Partially Effective - 50% | 3 - Serious | 4 - Possible | Medium | Accept | Scott Cornish | |

| Risk ID | Risk Title | Risk Causes | Risk Consequence | Assumption Made | Environmental | Existing Controls | Overall Control Effectiveness | Consequence | Likelihood | Overall Level of Risk | Treat or Accept Risk | Acceptance By | Risk Treatment Options |
|---------|---|--|--|---|---------------|--|-------------------------------|-------------|--------------|-----------------------|----------------------|---------------|------------------------|
| Env29 | Loss of containment of produced/site drain water from upgraded separator system EPO: No loss of containment of liquid and solid wastes | Pump or piping leak or rupture due to: * inadequate design * incorrect installation * inappropriate material/equipment selection * inadequate maintenance * inadequate or loss of secondary containment integrity Loss of power to pumping / transfer system | Release of produced water negatively impacts soil quality and groundwater quality reducing its existing suitability for use. Release of hydrocarbon negatively impacts groundwater quality reducing its existing suitability for use. | Overflow of separator may occur in once the system is upgraded due to pump or piping failure. No potential for pond backflow. All controls proposed for the new system have been included as existing controls even though not expected to be operational under 31 December 2017 . New system will essentially consist of: 1. site drains and PFW gravity feed to existing separator pit. 2. outflow from existing separator pit pumped to new CPI separator 3. All water then flows through CPI separator and filtration system and is gravity feed to new evaporation pond 2. | 3 - Serious | Upgraded separator system designed such that: * existing separator, new separator, pump and transfer pipework between separators are within a suitably designed, sized bunded area * pumping redundancy / spare parts maintained on site * Interceptor pit pump operations continuously monitored by plant process control system * pump failure initiates controlled plant shutdown * transfer piping designed in accordance with Technical Specification for Polyethylene (PE) Pipe Requirements A-100-55-TS-1004 and Technical Specification for High Density Polyethylene (HDPE) Pipeline Construction A-1000-55-TS-1003; • Australian Standard AS4041 Pressure Piping, and • NATO Standard STANAG3756 where relevant. Emergency spill kits located within vicinity of separator bunded area Competent and trained operators Groundwater monitoring program implemented in accordance with Environmental Licence (L8385/2009) and EP (OEUP-4100-PLN-ENV-003) Power plant has redundancy Additional separator capacity provided which consists of weir and filters Separator system maintained in accordance with integrity management plan Separator system is suitably bunded and integrity of bund maintained in accordance with integrity management plan | Partially Effective - 50% | 3-Serious | 4 - Possible | Medium | Accept | Scott Cornish | |

Appendix D Beharra Springs Clearing Permit Area Plans



Facility

GPInfo Well

Main Road

Internal Access Road

Selected Pipeline

Flowline

Gas Sales Pipeline

Boundary

GPInfo Permit

Source Information:
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Scale

1:30,000 (at A3)

0

250

500

1,000

Metres

Coordinate System: GDA 1994 MGA Zone 50

| Rev | Description | Drawn | Check | QA | Approved | Date |
|-----|-------------------|-------|-------|-----|----------|------------|
| 0 | Issued For Use | XML | KH | CGS | KH | 23/03/2016 |
| A | Issued For Review | GNH | KH | SAW | | 17/03/2016 |

Beharra Springs

Clearing Permit Area Plan 6643/1

Date: 23 March 2016

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| Map Number | Doc No | Rev |
| 1 of 1 | Map ID GISWR_30619 | 0 |

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Legend

 Facility

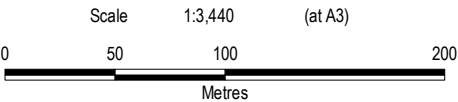
Clearing Permit

 CPS4607/2

 CPS6643/2



Source Information:
Origin 2017
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Coordinate System: GDA 1994 MGA Zone 50

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| Rev | Description | Drawn | Check | QA | Approved | Date |



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|---|-------------------------|-----------------|
| Beharra Springs Gas Facility - Clearing Permit Areas and Targeted Flora Surveys Date: 21 September 2017 | | |
| Map Number 4 of 4 | Doc No GISWR_56028_4 | Rev 0 |

Appendix E Beharra Springs Production Plant Layout Drawings



CATHODIC PROTECTION
PIPELINES GB1 ANODE GROUNDED

REFER TO DRAWING D-1371013.1-04

IMPORTANT NOTE: THIS IS AN APPROXIMATE LOCATION
A MINIMUM DISTANCE OF 50M FROM THE NEAREST PROTECTED
STRUCTURE IS RECOMMENDED. THE ACTUAL LOCATION WILL BE
CONFIRMED BASED ON ORIGIN ENERGY APPROVAL AND BASED
ON INSTALLATION FEASIBILITY

ACCOMMODATION
& OFFICE

TELSTRA TOWER

PIPELINE TO BEHARRA #2 WELL

CATHODIC PROTECTION
PIPELINES GB2 ANODE GROUNDED

REFER TO DRAWING D-1371013.1-04

IMPORTANT NOTE: THIS IS AN APPROXIMATE LOCATION
A MINIMUM DISTANCE OF 50M FROM THE NEAREST PROTECTED
STRUCTURE IS RECOMMENDED. THE ACTUAL LOCATION WILL BE
CONFIRMED BASED ON ORIGIN ENERGY APPROVAL AND BASED
ON INSTALLATION FEASIBILITY

REFERENCE CELL

REDBACK TIE-IN

TR UNIT

REFERENCE CELL

GREEN CP TEST POINT

YELLOW CP TEST POINT

NORTH 1, BSA, TARANTULA

SLUG CATCHERS EAST

REFERENCE CELL

SALES GAS LINE

MAIN GATE

WORK
SHOP
&
B/WAY
PAD

BS#1 WELL

IMPORTANT NOTE: THIS IS AN APPROXIMATE LOCATION
A MINIMUM DISTANCE OF 50M FROM THE NEAREST PROTECTED
STRUCTURE IS RECOMMENDED. THE ACTUAL LOCATION WILL BE
CONFIRMED BASED ON ORIGIN ENERGY APPROVAL AND BASED
ON INSTALLATION FEASIBILITY

CATHODIC PROTECTION
PLANT GB3 ANODE GROUNDED

REFER TO DRAWING D-1371013.1-04

DISMANTLED CP
ANODE GROUNDED

SLUG CATCHERS WEST

PLANT PIPELINES CONNECTED
TO CP SYSTEM

| REV No. | DATE | REVISION | PROJECT No. | DRAWN | DRAFTING CHECKED | DESIGNED | DRN: | DATE: | SCALE: | DRG. NO. | REV. |
|---------|----------|---------------------|-------------|-------|------------------|----------|------|----------|--------|----------------|------|
| 3 | 31/05/16 | ISSUED FOR COMMENTS | 1371013 | BS | DP | | BS | 31/05/16 | NTS | D-1371013.1-02 | 3 |
| 2 | 18/02/15 | ISSUED FOR COMMENTS | 1371013 | BS | JDM | | | | | | |
| 1 | 14/11/14 | ISSUED FOR COMMENTS | 1371013 | BS | DP | | | | | | |

ORIGIN ENERGY
BEHARRA SPRINGS
CATHODIC PROTECTION SYSTEM
PLANT AREA GENERAL ARRANGEMENT

Appendix F NatureMap Species Report

NatureMap Species Report

Created By Guest user on 25/10/2017

Current Names Only Yes

Core Datasets Only Yes

Method 'By Circle'

Centre 115° 08' 26" E, 29° 27' 47" S

Buffer 10km

| | Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|-----|---------|---|-------------|-------------------|------------------------------------|
| 1. | 3231 | <i>Acacia auronitens</i> | | | |
| 2. | 15472 | <i>Acacia cavealis</i> | | | |
| 3. | 3303 | <i>Acacia dilatata</i> | | | |
| 4. | 3332 | <i>Acacia fagonioides</i> | | | |
| 5. | 11519 | <i>Acacia lasiocarpa</i> var. <i>bracteolata</i> | | | |
| 6. | 15481 | <i>Acacia pulchella</i> var. <i>glaberrima</i> | | | |
| 7. | 3525 | <i>Acacia rostellifera</i> (Summer-scented Wattle) | | | |
| 8. | 3532 | <i>Acacia scirpifolia</i> | | | |
| 9. | 15484 | <i>Acacia sphacelata</i> subsp. <i>sphacelata</i> | | | |
| 10. | 3557 | <i>Acacia stenoptera</i> (Narrow Winged Wattle) | | | |
| 11. | 14153 | <i>Acacia vittata</i> | | P2 | |
| 12. | 1205 | <i>Acanthocarpus canaliculatus</i> | | | |
| 13. | 20797 | <i>Acanthocarpus</i> sp. <i>Ajana</i> (C.A. Gardner 8596) | | | |
| 14. | 25536 | <i>Accipiter fasciatus</i> (Brown Goshawk) | | | |
| 15. | 6205 | <i>Actinotus leucocephalus</i> (Flannel Flower) | | | |
| 16. | 11837 | <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush) | | | |
| 17. | 4905 | <i>Alyogyne hakeifolia</i> | | | |
| 18. | 4906 | <i>Alyogyne huegelii</i> (Lilac Hibiscus) | | | |
| 19. | 1061 | <i>Anarthria polyphylla</i> | | | |
| 20. | 6311 | <i>Andersonia heterophylla</i> | | | |
| 21. | 7833 | <i>Angianthus preissianus</i> | | | |
| 22. | 1409 | <i>Anigozanthos humilis</i> (Catspaw) | | | |
| 23. | 11434 | <i>Anigozanthos humilis</i> subsp. <i>humilis</i> | | | |
| 24. | 2332 | <i>Anthobolus foveolatus</i> | | | |
| 25. | 6949 | <i>Anthocercis littorea</i> (Yellow Tailflower) | | | |
| 26. | 24610 | <i>Ardeotis australis</i> (Australian Bustard) | | | |
| 27. | 1264 | <i>Arnocrinum preissii</i> | | | |
| 28. | 6328 | <i>Astroloma glaucescens</i> | | | |
| 29. | 6332 | <i>Astroloma microdonta</i> (Sandplain Cranberry) | | | |
| 30. | 6337 | <i>Astroloma stomarrhena</i> (Red Swamp Cranberry) | | | |
| 31. | 6339 | <i>Astroloma xerophyllum</i> | | | |
| 32. | 45398 | <i>Babingtonia erecta</i> | | | |
| 33. | 1809 | <i>Banksia candolleana</i> (Propeller Banksia) | | | |
| 34. | 32623 | <i>Banksia carlinoides</i> (Pink Dryandra) | | | |
| 35. | 32578 | <i>Banksia dallanneyi</i> subsp. <i>media</i> | | | |
| 36. | 1816 | <i>Banksia elegans</i> (Elegant Banksia) | | P4 | |
| 37. | 32527 | <i>Banksia fraseri</i> var. <i>crebra</i> | | P3 | |
| 38. | 32523 | <i>Banksia fraseri</i> var. <i>fraseri</i> | | | |
| 39. | 1821 | <i>Banksia hookeriana</i> (Hooker's Banksia) | | | |
| 40. | 1825 | <i>Banksia lanata</i> | | | |
| 41. | 1834 | <i>Banksia menziesii</i> (Firewood Banksia) | | | |
| 42. | 1846 | <i>Banksia scabrella</i> (Burma Road Banksia) | | P4 | |
| 43. | 32074 | <i>Banksia shuttleworthiana</i> (Bearded Dryandra) | | | |
| 44. | 17761 | <i>Beaufortia aestiva</i> (Kalbarri Beaufortia) | | | |
| 45. | 5382 | <i>Beaufortia elegans</i> (Elegant Beaufortia) | | | |
| 46. | 4596 | <i>Beyeria gardneri</i> | | P3 | |
| 47. | 11274 | <i>Boronia coerulescens</i> subsp. <i>spinescens</i> | | | |
| 48. | 4414 | <i>Boronia cymosa</i> (Granite Boronia) | | | |
| 49. | 25716 | <i>Cacatua sanguinea</i> (Little Corella) | | | |
| 50. | 1582 | <i>Caladenia crebra</i> (Arrowsmith Spider Orchid) | | | |
| 51. | 34000 | <i>Calamanthus campestris</i> subsp. <i>montanellus</i> (Rufous Fieldwren, Western Fieldwren (western wheatbelt)) | | | |
| 52. | 44184 | <i>Calandrinia baccata</i> | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|------|---------|---|-------------|-------------------|------------------------------------|
| 53. | 2846 | <i>Calandrinia calyptrata</i> (Pink Purslane) | | | |
| 54. | 2856 | <i>Calandrinia liniflora</i> (Parakeelya) | | | |
| 55. | 1213 | <i>Calectasia cyanea</i> (Blue Tinsel Lily) | | T | |
| 56. | 19312 | <i>Calectasia hispida</i> | | | |
| 57. | 19196 | <i>Calectasia palustris</i> | | P2 | |
| 58. | 36560 | <i>Callitris arenaria</i> (Sandplain Cypress) | | | |
| 59. | 35856 | <i>Calothamnus glaber</i> | | | |
| 60. | 5411 | <i>Calothamnus hirsutus</i> | | | |
| 61. | 5417 | <i>Calothamnus longissimus</i> | | | |
| 62. | 35756 | <i>Calothamnus quadrifidus</i> subsp. <i>angustifolius</i> | | | |
| 63. | 5429 | <i>Calothamnus sanguineus</i> (Silky-leaved Blood flower, Pindak) | | | |
| 64. | 24734 | <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo) | | T | |
| 65. | 5443 | <i>Calytrix brevifolia</i> | | | |
| 66. | 5447 | <i>Calytrix chrysanthia</i> | | P4 | |
| 67. | 5450 | <i>Calytrix depressa</i> | | | |
| 68. | 5476 | <i>Calytrix sapphirina</i> | | | |
| 69. | 19888 | <i>Calytrix</i> sp. <i>Eneabba</i> (B.J. Lepschi & T.R. Lally BJL3617) | | | |
| 70. | 5479 | <i>Calytrix strigosa</i> | | | |
| 71. | 2798 | <i>Carpobrotus virescens</i> (Coastal Pigface, Kolboko, Bain) | | | |
| 72. | 11206 | <i>Cassytha glabella</i> forma <i>bicallosa</i> | | | |
| 73. | 760 | <i>Caustis dioica</i> | | | |
| 74. | 7916 | <i>Centaurea melitensis</i> (Maltese Cockspur, Malta Thistle) | Y | | |
| 75. | | <i>Cercophonius michaelsoni</i> | | | |
| 76. | 8788 | <i>Chamaescilla versicolor</i> | | | |
| 77. | 4553 | <i>Comesperma drummondii</i> (Drummond's Milkwort) | | | |
| 78. | 14663 | <i>Comesperma griffinii</i> | | P2 | |
| 79. | 4560 | <i>Comesperma rhadinocarpum</i> (Slender-fruited Comesperma) | | P2 | |
| 80. | 40872 | <i>Commersonia borealis</i> | | | |
| 81. | 15511 | <i>Conospermum boreale</i> | | | |
| 82. | 15513 | <i>Conospermum boreale</i> subsp. <i>boreale</i> | | | |
| 83. | 1859 | <i>Conospermum brachyphyllum</i> | | | |
| 84. | 1878 | <i>Conospermum nervosum</i> | | | |
| 85. | 15523 | <i>Conospermum wycherleyi</i> | | | |
| 86. | 15524 | <i>Conospermum wycherleyi</i> subsp. <i>glabrum</i> | | | |
| 87. | 6349 | <i>Conostephium preissii</i> | | | |
| 88. | 1423 | <i>Conostylis aurea</i> (Golden Conostylis) | | | |
| 89. | 12027 | <i>Conostylis candicans</i> subsp. <i>calicicola</i> | | | |
| 90. | 11438 | <i>Conostylis candicans</i> subsp. <i>candicans</i> | | | |
| 91. | 11515 | <i>Conostylis candicans</i> subsp. <i>procumbens</i> | | | |
| 92. | 1428 | <i>Conostylis canterinata</i> | | | |
| 93. | 11938 | <i>Conostylis crassinervia</i> subsp. <i>crassinervia</i> | | | |
| 94. | 1435 | <i>Conostylis hiemalis</i> | | | |
| 95. | 1442 | <i>Conostylis neocymosa</i> | | | |
| 96. | 1448 | <i>Conostylis resinosa</i> | | | |
| 97. | 2891 | <i>Corrigiola litoralis</i> (Strapwort) | Y | | |
| 98. | 25592 | <i>Corvus coronoides</i> (Australian Raven) | | | |
| 99. | 11283 | <i>Corynotheca micrantha</i> var. <i>micrantha</i> | | | |
| 100. | 7945 | <i>Cotula coronopifolia</i> (Waterbuttons) | Y | | |
| 101. | 35839 | <i>Cristonia stenophylla</i> | | | |
| 102. | 9076 | <i>Cryptandra myriantha</i> | | | |
| 103. | 4809 | <i>Cryptandra pungens</i> | | | |
| 104. | 30899 | <i>Ctenophorus adelaidensis</i> (Southern Heath Dragon, Western Heath Dragon) | | | |
| 105. | 24881 | <i>Ctenophorus maculatus</i> subsp. <i>maculatus</i> (Spotted Military Dragon) | | | |
| 106. | 24882 | <i>Ctenophorus nuchalis</i> (Central Netted Dragon) | | | |
| 107. | 25039 | <i>Ctenotus fallens</i> | | | |
| 108. | 7453 | <i>Dampiera lindleyi</i> | | | |
| 109. | 7459 | <i>Dampiera oligophylla</i> (Sparse-leaved Dampiera) | | | |
| 110. | 7475 | <i>Dampiera spicigera</i> (Spiked Dampiera) | | | |
| 111. | 7482 | <i>Dampiera teres</i> (Terete-leaved Dampiera) | | | |
| 112. | 5522 | <i>Darwinia pauciflora</i> | | | |
| 113. | 5529 | <i>Darwinia speciosa</i> | | | |
| 114. | 18560 | <i>Daviesia divaricata</i> subsp. <i>divaricata</i> | | | |
| 115. | 15506 | <i>Daviesia incrassata</i> subsp. <i>teres</i> | | | |
| 116. | 12329 | <i>Daviesia nudiflora</i> subsp. <i>hirtella</i> | | | |
| 117. | 15508 | <i>Daviesia oxyclada</i> | | | |
| 118. | 3831 | <i>Daviesia pedunculata</i> | | | |
| 119. | 3845 | <i>Daviesia triflora</i> | | | |
| 120. | 17663 | <i>Desmocladus asper</i> | | | |
| 121. | 17712 | <i>Desmocladus semiplanus</i> | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|------|---------|--|-------------|-------------------|------------------------------------|
| 122. | 15271 | <i>Diplolaena eneabbensis</i> | | | |
| 123. | 4455 | <i>Diplolaena ferruginea</i> | | | |
| 124. | 15273 | <i>Diplolaena leemaniana</i> | | | |
| 125. | 4746 | <i>Diplopeltis huegelii</i> | | | |
| 126. | 18542 | <i>Diplopeltis huegelii</i> subsp. <i>subintegra</i> | | | |
| 127. | 13201 | <i>Drosera eneabba</i> | | | |
| 128. | 3095 | <i>Drosera erythrorhiza</i> (Red Ink Sundew) | | | |
| 129. | 14298 | <i>Drosera macrantha</i> subsp. <i>macrantha</i> | | | |
| 130. | 13216 | <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | | | |
| 131. | 3117 | <i>Drosera paleacea</i> (Dwarf Sundew) | | | |
| 132. | 29178 | <i>Drosera porrecta</i> | | | |
| 133. | 1066 | <i>Ecdeiocolea monostachya</i> | | | |
| 134. | 5537 | <i>Eremaea beaufortioides</i> | | | |
| 135. | 14098 | <i>Eremaea beaufortioides</i> var. <i>beaufortioides</i> | | | |
| 136. | 14100 | <i>Eremaea beaufortioides</i> var. <i>microphylla</i> | | | |
| 137. | 13955 | <i>Eremaea ectadioclada</i> | | | |
| 138. | 36239 | <i>Eremaea violacea</i> subsp. <i>violacea</i> | | | |
| 139. | 13953 | <i>Eremaea x codonocarpa</i> | | | |
| 140. | 13956 | <i>Eremaea x phoenicea</i> | | | |
| 141. | 35345 | <i>Eucalyptus camaldulensis</i> subsp. <i>obtus</i> (Blunt-budded River Red Gum) | | | |
| 142. | 5638 | <i>Eucalyptus erythrocorys</i> (Illyarrie) | | | |
| 143. | 5673 | <i>Eucalyptus horistes</i> | | | |
| 144. | 13531 | <i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i> (Small-leaved Mottlecah) | | P4 | |
| 145. | 5756 | <i>Eucalyptus pyriformis</i> (Pear-fruited Mallee) | | | |
| 146. | 5790 | <i>Eucalyptus todtiana</i> (Coastal Blackbutt) | | | |
| 147. | 13544 | <i>Eucalyptus zopherophloia</i> (Blackbutt Mallee) | | P4 | |
| 148. | | <i>Eviota bimaculata</i> | | | |
| 149. | 3894 | <i>Gastrolobium callistachys</i> (Rock Poison) | | | |
| 150. | 3915 | <i>Gastrolobium plicatum</i> | | | |
| 151. | 3924 | <i>Gastrolobium spinosum</i> (Prickly Poison) | | | |
| 152. | 24959 | <i>Gehyra variegata</i> | | | |
| 153. | 4483 | <i>Geleznovia verrucosa</i> | | | |
| 154. | 47962 | <i>Glyciphila melanops</i> (Tawny-crowned Honeyeater) | | | |
| 155. | 3957 | <i>Gompholobium tomentosum</i> (Hairy Yellow Pea) | | | |
| 156. | 11584 | <i>Gonocarpus confertifolius</i> var. <i>confertifolius</i> | | | |
| 157. | 12551 | <i>Goodenia micrantha</i> | | | |
| 158. | 7538 | <i>Goodenia pulchella</i> | | | |
| 159. | 7557 | <i>Goodenia trichophylla</i> | | | |
| 160. | 1956 | <i>Grevillea argyrophylla</i> (Silvery-leaved Grevillea) | | | |
| 161. | 15763 | <i>Grevillea biformis</i> subsp. <i>biformis</i> | | | |
| 162. | 1973 | <i>Grevillea candelabroides</i> | | | |
| 163. | 2032 | <i>Grevillea leucopteris</i> (White Plume Grevillea) | | | |
| 164. | 17745 | <i>Grevillea shuttleworthiana</i> subsp. <i>canarina</i> | | | |
| 165. | 13233 | <i>Guichenotia alba</i> | | P3 | |
| 166. | 5011 | <i>Guichenotia ledifolia</i> | | | |
| 167. | 5014 | <i>Guichenotia sarotes</i> | | | |
| 168. | 2784 | <i>Gyrostemon ramulosus</i> (Corkybark) | | | |
| 169. | 1465 | <i>Haemodorum discolor</i> | | | |
| 170. | 1473 | <i>Haemodorum simulans</i> | | | |
| 171. | 1475 | <i>Haemodorum spicatum</i> (Mardja) | | | |
| 172. | 2131 | <i>Hakea auriculata</i> | | | |
| 173. | 2136 | <i>Hakea candolleana</i> | | | |
| 174. | 2166 | <i>Hakea incrassata</i> (Marble Hakea) | | | |
| 175. | 2175 | <i>Hakea lissocarpha</i> (Honey Bush) | | | |
| 176. | 45333 | <i>Hakea neospathulata</i> | | | |
| 177. | 17726 | <i>Hakea polyanthema</i> | | | |
| 178. | 2205 | <i>Hakea smilacifolia</i> | | | |
| 179. | 2216 | <i>Hakea varia</i> (Variable-leaved Hakea) | | | |
| 180. | 6685 | <i>Halgania argyrophylla</i> | | | |
| 181. | | <i>Helcogramma decurrens</i> | | | |
| 182. | 25410 | <i>Heleioporus eyrei</i> (Moaning Frog) | | | |
| 183. | 6840 | <i>Hemiandra rubriflora</i> | | | |
| 184. | 19411 | <i>Hemiandra</i> sp. <i>Eneabba</i> (H. Demarz 3687) | | P3 | |
| 185. | 41020 | <i>Hemiphora bartlingii</i> (Woolly Dragon) | | | |
| 186. | 45534 | <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> | | | |
| 187. | 5162 | <i>Hibbertia racemosa</i> (Stalked Guinea Flower) | | | |
| 188. | 44609 | <i>Hibbertia robur</i> | | | |
| 189. | 5173 | <i>Hibbertia subvaginata</i> | | | |
| 190. | 5216 | <i>Hybanthus calycinus</i> (Wild Violet) | | | |
| 191. | 5221 | <i>Hybanthus floribundus</i> | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|------|---------|--|-------------|-------------------|------------------------------------|
| 192. | 12007 | <i>Hybanthus floribundus</i> subsp. <i>floribundus</i> | | | |
| 193. | 20851 | <i>Hypocalymma gardneri</i> | | P3 | |
| 194. | 5829 | <i>Hypocalymma xanthopetalum</i> | | | |
| 195. | 912 | <i>Isolepis cyperoides</i> | | | |
| 196. | 2219 | <i>Isopogon adenanthoides</i> (Spider Coneflower) | | | |
| 197. | 2227 | <i>Isopogon divergens</i> (Spreading Coneflower) | | | |
| 198. | 2232 | <i>Isopogon linearis</i> | | | |
| 199. | 2239 | <i>Isopogon tridens</i> (Three-toothed Coneflower) | | | |
| 200. | 4015 | <i>Jacksonia hakeoides</i> | | | |
| 201. | 14778 | <i>Jacksonia nutans</i> | | | |
| 202. | 4025 | <i>Jacksonia restioides</i> | | | |
| 203. | 4029 | <i>Jacksonia sternbergiana</i> (Stinkwood, Kapur) | | | |
| 204. | 17785 | <i>Kunzea micrantha</i> subsp. <i>petiolata</i> | | | |
| 205. | | <i>Laiphognathus multimaculatus</i> | | | |
| 206. | 5031 | <i>Lasiopetalum drummondii</i> | | | |
| 207. | 5042 | <i>Lasiopetalum ogilvieanum</i> | | P1 | |
| 208. | 33499 | <i>Lasiopetalum</i> sp. <i>Watheroo</i> (K. Shepherd & C. Wilkins KS 220) | | | |
| 209. | 4955 | <i>Lawrenzia glomerata</i> | | | |
| 210. | 1303 | <i>Laxmannia grandiflora</i> | | | |
| 211. | 1305 | <i>Laxmannia omnifertilis</i> | | | |
| 212. | 11679 | <i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i> | | | |
| 213. | 7568 | <i>Lechenaultia biloba</i> (Blue Leschenaultia) | | | |
| 214. | 7574 | <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia) | | | |
| 215. | 7577 | <i>Lechenaultia hirsuta</i> (Hairy Leschenaultia) | | | |
| 216. | 7586 | <i>Lechenaultia stenosepala</i> (Narrow-sepaled Leschenaultia) | | | |
| 217. | 1073 | <i>Lepidobolus chaetocephalus</i> (Bristle-headed Chaff Rush) | | | |
| 218. | 42741 | <i>Lepidosperma apricola</i> | | | |
| 219. | 940 | <i>Lepidosperma pubisquameum</i> | | | |
| 220. | | <i>Lepidosperma</i> sp. | | | |
| 221. | 947 | <i>Lepidosperma tenue</i> | | | |
| 222. | 2344 | <i>Leptomeria empetriformis</i> | | | |
| 223. | 15428 | <i>Leptosema aphyllum</i> | | | |
| 224. | 5853 | <i>Leptospermum oligandrum</i> | | | |
| 225. | 5857 | <i>Leptospermum spinescens</i> | | | |
| 226. | 6397 | <i>Leucopogon glaucifolius</i> | | | |
| 227. | 6401 | <i>Leucopogon hamulosus</i> | | | |
| 228. | 6403 | <i>Leucopogon hispidus</i> | | | |
| 229. | 48181 | <i>Leucopogon inflexus</i> | | | |
| 230. | 6405 | <i>Leucopogon insularis</i> | | | |
| 231. | 34157 | <i>Leucopogon</i> sp. <i>Northern ciliate</i> (R. Davis 3393) | | | |
| 232. | 7672 | <i>Levenhookia octomaculata</i> (Eight-spotted Stylewort) | | | |
| 233. | 7677 | <i>Levenhookia stipitata</i> (Common Stylewort) | | | |
| 234. | 25661 | <i>Lichmera indistincta</i> (Brown Honeyeater) | | | |
| 235. | 7407 | <i>Lobelia rhytidosperra</i> (Wrinkled-seeded Lobelia) | | | |
| 236. | 18049 | <i>Lyginia imberbis</i> | | | |
| 237. | 34736 | <i>Lysinema pentapetalum</i> | | | |
| 238. | 2838 | <i>Macarthuria apetala</i> | | | |
| 239. | 24133 | <i>Macropus irma</i> (Western Brush Wallaby) | | P4 | |
| 240. | 5865 | <i>Malleostemon roseus</i> | | | |
| 241. | 5876 | <i>Melaleuca aspalathoides</i> | | | |
| 242. | 5983 | <i>Melaleuca trichophylla</i> | | | |
| 243. | 955 | <i>Mesomelaena pseudostygia</i> | | | |
| 244. | 11623 | <i>Mesomelaena stygia</i> subsp. <i>defflexa</i> | | P3 | |
| 245. | | <i>Meuschenia flavolineata</i> | | | |
| 246. | 4100 | <i>Mirbelia spinosa</i> | | | |
| 247. | 19584 | <i>Monotaxis bracteata</i> | | | |
| 248. | 24223 | <i>Mus musculus</i> (House Mouse) | Y | | |
| 249. | 7289 | <i>Myoporum caprarioides</i> (Slender Myoporum) | | | |
| 250. | 2367 | <i>Olaix scalariformis</i> | | | |
| 251. | 8149 | <i>Olearia rudis</i> (Rough Daisybush) | | | |
| 252. | 34012 | <i>Oreoica gutturalis</i> subsp. <i>pallascens</i> (Crested Bellbird, central) | | | |
| 253. | 13867 | <i>Paracaleana dixonii</i> | | T | |
| 254. | | <i>Paraperis haackei</i> | | | |
| 255. | 2254 | <i>Persoonia acicularis</i> | | | |
| 256. | 14084 | <i>Persoonia chapmaniana</i> | | P3 | |
| 257. | 14563 | <i>Persoonia filiformis</i> | | P2 | |
| 258. | 2271 | <i>Persoonia rudis</i> | | P3 | |
| 259. | 20368 | <i>Petrophile axillaris</i> | | | |
| 260. | 2286 | <i>Petrophile brevifolia</i> | | | |
| 261. | 2294 | <i>Petrophile drummondii</i> | | | |

| Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|---------|---|-------------|-------------------|------------------------------------|
| 262. | 2301 <i>Petrophile macrostachya</i> | | | |
| 263. | 2303 <i>Petrophile megalostegia</i> | | | |
| 264. | 10784 <i>Petrophile scabriuscula</i> | | | |
| 265. | 48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater) | | | |
| 266. | 6009 <i>Pileanthus filifolius</i> (Summer Coppercups) | | | |
| 267. | 5231 <i>Pimelea angustifolia</i> (Narrow-leaved Pimelea) | | | |
| 268. | 5232 <i>Pimelea argentea</i> (Silvery Leaved Pimelea) | | | |
| 269. | 11402 <i>Pimelea imbricata</i> var. <i>piligera</i> | | | |
| 270. | 5254 <i>Pimelea leucantha</i> | | | |
| 271. | 5268 <i>Pimelea sulphurea</i> (Yellow Banjine) | | | |
| 272. | 8175 <i>Podolepis gracilis</i> (Slender Podolepis) | | | |
| 273. | 8182 <i>Podotheca angustifolia</i> (Sticky Longheads) | | | |
| 274. | 8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads) | | | |
| 275. | <i>Pomacentrus milleri</i> | | | |
| 276. | <i>Pseudochromis wilsoni</i> | | | |
| 277. | 1693 <i>Pterostylis recurva</i> (Jug Orchid) | | | |
| 278. | 41063 <i>Quoya loxocarpa</i> | | | |
| 279. | 41080 <i>Quoya verbascina</i> (Golden Bush) | | | |
| 280. | 6012 <i>Regelia ciliata</i> | | | |
| 281. | 13249 <i>Rhodanthe oppositifolia</i> subsp. <i>oppositifolia</i> | | | |
| 282. | 14108 <i>Samolus repens</i> var. <i>floribundus</i> | | | |
| 283. | 14107 <i>Samolus repens</i> var. <i>paucifolius</i> | | | |
| 284. | 7603 <i>Scaevola canescens</i> (Grey Scaevola) | | | |
| 285. | 7613 <i>Scaevola glandulifera</i> (Viscid Hand-flower) | | | |
| 286. | 7614 <i>Scaevola globulifera</i> | | | |
| 287. | 7634 <i>Scaevola phlebopetala</i> (Velvet Fanflower) | | | |
| 288. | 29356 <i>Scaevola repens</i> subsp. <i>Northern Sandplains</i> (R.J. Cranfield & P.J. Spencer 8445) | | | |
| 289. | 13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i> | | | |
| 290. | 17606 <i>Schoenus griffinianus</i> | | P4 | |
| 291. | 1006 <i>Schoenus odontocarpus</i> | | | |
| 292. | 1009 <i>Schoenus pleiostemoneus</i> | | | |
| 293. | 16274 <i>Schoenus</i> sp. A3 <i>Ciliate Sheaths</i> (K.R. Newbey 9402) | | | |
| 294. | 19945 <i>Schoenus</i> sp. <i>Eneabba</i> (F. Obbens & C. Godden 1154) | | P2 | |
| 295. | 1018 <i>Schoenus subfascicularis</i> | | | |
| 296. | 1026 <i>Schoenus unispiculatus</i> | | | |
| 297. | 6034 <i>Scholtzia laxiflora</i> | | | |
| 298. | 36057 <i>Scholtzia</i> sp. <i>Winchester</i> (C. Chapman s.n. PERTH 05625386) | | | |
| 299. | 6041 <i>Scholtzia umbellifera</i> | | | |
| 300. | <i>Scorpaena sumptuosa</i> | | | |
| 301. | 25884 <i>Senecio pinnatifolius</i> var. <i>latilobus</i> | | | |
| 302. | 25534 <i>Sericornis frontalis</i> (White-browed Scrubwren) | | | |
| 303. | 46818 <i>Seringia hermanniifolia</i> (Crinkle-leaved firebush) | | | |
| 304. | 10800 <i>Sphaerolobium pulchellum</i> | | | |
| 305. | 4713 <i>Stachystemon axillaris</i> (Leafy Stachystemon) | | | |
| 306. | 9070 <i>Stackhousia pubescens</i> (Downy Stackhousia) | | | |
| 307. | 1314 <i>Stawellia dimorphantha</i> (Arrowsmith Stilt-lily) | | P4 | |
| 308. | 16182 <i>Stenanthemum notiale</i> | | | Y |
| 309. | 15065 <i>Stenanthemum notiale</i> subsp. <i>notiale</i> | | | |
| 310. | 2316 <i>Stirlingia latifolia</i> (Blueboy) | | | |
| 311. | 24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i> | | | |
| 312. | 7679 <i>Stylidium adpressum</i> (Trigger-on-stilts) | | | |
| 313. | 30276 <i>Stylidium bicolor</i> | | | |
| 314. | 30715 <i>Stylidium carnosum</i> subsp. <i>Narrow leaves</i> (J.A. Wege 490) | | P1 | |
| 315. | 7709 <i>Stylidium crossoccephalum</i> (Posy Triggerplant) | | | |
| 316. | 12848 <i>Stylidium diuroides</i> subsp. <i>paucifolium</i> | | | |
| 317. | 12855 <i>Stylidium drummondianum</i> | | P3 | |
| 318. | 7720 <i>Stylidium elongatum</i> (Tall Triggerplant) | | | |
| 319. | 18420 <i>Stylidium flagellum</i> | | | |
| 320. | 17412 <i>Stylidium kalbarriense</i> | | | |
| 321. | 7760 <i>Stylidium maitlandianum</i> (Fountain Triggerplant) | | | |
| 322. | 25837 <i>Stylidium purpureum</i> (Purple Fountain Triggerplant) | | | |
| 323. | 7785 <i>Stylidium repens</i> (Matted Triggerplant) | | | |
| 324. | 20521 <i>Stylidium rigidulum</i> | | | |
| 325. | 19247 <i>Stylidium septentrionale</i> | | | |
| 326. | <i>Stylidium</i> sp. | | | |
| 327. | 17510 <i>Stylidium</i> sp. <i>Kalbarri</i> (A. Carr 145) | | | |
| 328. | 3182 <i>Stylobasium spathulatum</i> (Pebble Bush) | | | |
| 329. | 2329 <i>Synaphea spinulosa</i> | | | |
| 330. | 2791 <i>Tersonia cyathiflora</i> (Button Creeper) | | | |
| 331. | 4528 <i>Tetratheca confertifolia</i> | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|------|---------|---|-------------|-------------------|------------------------------------|
| 332. | 6064 | <i>Thryptomene racemulosa</i> | | | |
| 333. | 1334 | <i>Thysanotus glaucus</i> | | P4 | |
| 334. | 1348 | <i>Thysanotus rectantherus</i> | | | |
| 335. | 1356 | <i>Thysanotus teretifolius</i> | | | |
| 336. | 1357 | <i>Thysanotus thyrsoides</i> | | | |
| 337. | 1358 | <i>Thysanotus triandrus</i> | | | |
| 338. | 25203 | <i>Tiliqua occipitalis</i> (Western Bluetongue) | | | |
| 339. | 1362 | <i>Tricoryne humilis</i> | | | |
| 340. | 29481 | <i>Tricoryne</i> sp. <i>Eneabba</i> (E.A. Griffin 1200) | | | |
| 341. | 4737 | <i>Tripterococcus brunonis</i> (Winged Stackhousia) | | | |
| 342. | 7665 | <i>Velleia trinervis</i> | | | |
| 343. | 12396 | <i>Verticordia blepharophylla</i> | | | |
| 344. | 12411 | <i>Verticordia densiflora</i> var. <i>cespitosa</i> | | | |
| 345. | 15432 | <i>Verticordia densiflora</i> var. <i>densiflora</i> | | | |
| 346. | 12422 | <i>Verticordia eriocephala</i> (Common Cauliflower) | | | |
| 347. | 6083 | <i>Verticordia grandis</i> (Scarlet Featherflower) | | | |
| 348. | 14715 | <i>Verticordia luteola</i> var. <i>luteola</i> | | P3 | |
| 349. | 14688 | <i>Verticordia luteola</i> var. <i>rosea</i> | | P1 | |
| 350. | 15435 | <i>Verticordia monadelphae</i> var. <i>monadelphae</i> | | | |
| 351. | 10822 | <i>Verticordia nobilis</i> | | | |
| 352. | 6103 | <i>Verticordia ovalifolia</i> | | | |
| 353. | 11788 | <i>Vittadinia dissecta</i> var. <i>hirta</i> | | | |
| 354. | 7386 | <i>Wahlenbergia gracilentia</i> (Annual Bluebell) | | | |
| 355. | 13330 | <i>Waitzia acuminata</i> var. <i>albicans</i> | | | |
| 356. | 6658 | <i>Wilsonia backhousei</i> (Narrow-leaf Wilsonia) | | | |
| 357. | 1398 | <i>Wurmbea monantha</i> | | | |
| 358. | 1252 | <i>Xanthorrhoea drummondii</i> | | | |
| 359. | | <i>Zephyrichthys barryi</i> | | | |

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix G EPBC Protected Matters Search



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 25/10/17 13:14:03

[Summary](#)

[Details](#)

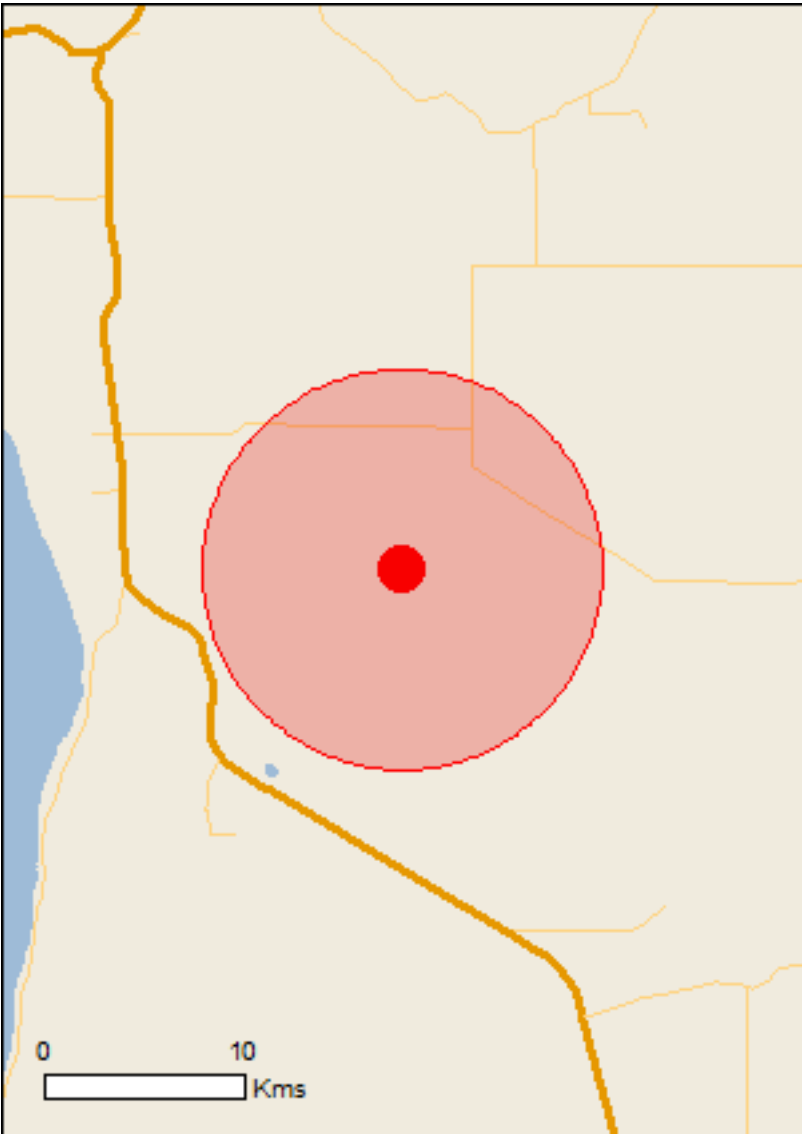
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

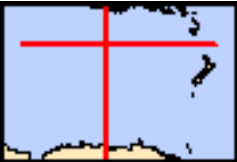
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

| | |
|---|------|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 20 |
| Listed Migratory Species: | 9 |

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|--|------|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 13 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Commonwealth Reserves Marine: | None |

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|--|------|
| State and Territory Reserves: | 3 |
| Regional Forest Agreements: | None |
| Invasive Species: | 14 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

Details

Matters of National Environmental Significance

| Listed Threatened Species | | [Resource Information] |
|--|-----------------------|--|
| Name | Status | Type of Presence |
| Birds | | |
| Calidris canutus Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris ferruginea Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523] | Endangered | Species or species habitat known to occur within area |
| Leipoa ocellata Malleefowl [934] | Vulnerable | Species or species habitat likely to occur within area |
| Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Mammals | | |
| Dasyurus geoffroii Chuditch, Western Quoll [330] | Vulnerable | Species or species habitat likely to occur within area |
| Parantechinus apicalis Dibbler [313] | Endangered | Species or species habitat may occur within area |
| Plants | | |
| Conostylis dielsii subsp. teres Irwin's Conostylis [3614] | Endangered | Species or species habitat likely to occur within area |
| Conostylis micrantha Small-flowered Conostylis [17635] | Endangered | Species or species habitat may occur within area |
| Daviesia speciosa Beautiful Daviesia [56698] | Endangered | Species or species habitat likely to occur within area |
| Eucalyptus crispata Yandanooka Mallee [24268] | Vulnerable | Species or species habitat may occur within area |
| Eucalyptus impensa Eneabba Mallee [56711] | Endangered | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|--|------------|--|
| Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712] | Endangered | Species or species habitat likely to occur within area |
| Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816] | Endangered | Species or species habitat may occur within area |
| Hemiandra gardneri Red Snakebush [7945] | Endangered | Species or species habitat may occur within area |
| Leucopogon obtectus Hidden Beard-heath [19614] | Endangered | Species or species habitat likely to occur within area |
| Paracaleana dixonii Sandplain Duck Orchid [86882] | Endangered | Species or species habitat known to occur within area |
| Thelymitra stellata Star Sun-orchid [7060] | Endangered | Species or species habitat may occur within area |
| Wurmbea tubulosa Long-flowered Nancy [12739] | Endangered | Species or species habitat may occur within area |

| Reptiles | | |
|--|------------|--|
| Egernia stokesii badia Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483] | Endangered | Species or species habitat may occur within area |

| Listed Migratory Species | [Resource Information] |
|--|--------------------------|
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | |

| Name | Threatened | Type of Presence |
|------------------------|------------|------------------|
| Migratory Marine Birds | | |

| | | |
|---|--|--|
| Apus pacificus Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
|---|--|--|

| Migratory Terrestrial Species | | |
|---|--|--|
| Motacilla cinerea Grey Wagtail [642] | | Species or species habitat may occur within area |

| Migratory Wetlands Species | | |
|--|--|--|
| Actitis hypoleucos Common Sandpiper [59309] | | Species or species habitat may occur within area |

| | | |
|--|--|--|
| Calidris acuminata Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
|--|--|--|

| | | |
|--|------------|--|
| Calidris canutus Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
|--|------------|--|

| | | |
|---|-----------------------|--|
| Calidris ferruginea Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
|---|-----------------------|--|

| | | |
|--|--|--|
| Calidris melanotos Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
|--|--|--|

| | | |
|---|-----------------------|--|
| Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
|---|-----------------------|--|

| Name | Threatened | Type of Presence |
|---|------------|--|
| Pandion haliaetus Osprey [952] | | Species or species habitat likely to occur within area |

Other Matters Protected by the EPBC Act

| Listed Marine Species | [Resource Information] | |
|--|--------------------------|--|
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | | |
| Name | Threatened | Type of Presence |
| Birds | | |
| Actitis hypoleucos Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Apus pacificus Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea alba Great Egret, White Egret [59541] | | Species or species habitat likely to occur within area |
| Ardea ibis Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris acuminata Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris ferruginea Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Merops ornatus Rainbow Bee-eater [670] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|-----------------------|--|
| Motacilla cinerea Grey Wagtail [642] | | Species or species habitat may occur within area |
| Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus Osprey [952] | | Species or species habitat likely to occur within area |

Extra Information

| State and Territory Reserves | [Resource Information] |
|-------------------------------|--------------------------|
| Name | State |
| NTWA Bushland covenant (0084) | WA |
| Unnamed WA47436 | WA |
| Yardanogo | WA |

| Invasive Species | [Resource Information] |
|---|--------------------------|
| Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001. | |

| Name | Status | Type of Presence |
|--|--------|--|
| Birds | | |
| Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Passer montanus Eurasian Tree Sparrow [406] | | Species or species habitat likely to occur within area |
| Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781] | | Species or species habitat likely to occur within area |

| | | |
|--|--|--|
| Mammals | | |
| Canis lupus familiaris Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Capra hircus Goat [2] | | Species or species habitat likely to occur within area |
| Felis catus Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Mus musculus House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus Rabbit, European Rabbit [128] | | Species or species habitat likely to occur |

| Name | Status | Type of Presence |
|--|--------|--|
| | | within area |
| Sus scrofa Pig [6] | | Species or species habitat likely to occur within area |
| Vulpes vulpes Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| Plants | | |
| Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] | | Species or species habitat likely to occur within area |
| Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213] | | Species or species habitat may occur within area |
| Lycium ferocissimum African Boxthorn, Boxthorn [19235] | | Species or species habitat likely to occur within area |
| Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018] | | Species or species habitat likely to occur within area |

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-29.46306 115.14056

Acknowledgements

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- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

Appendix H Conservation Status Codes

| Conservation Code | Category |
|---|--|
| THREATENED AND PRIORITY FLORA SPECIES - WA | |
| T | Threatened Flora (Declared Rare Flora – Extant) “Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the Wildlife Conservation Act 1950). Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: <ul style="list-style-type: none"> • CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild • EN: Endangered – considered to be facing a very high risk of extinction in the wild • VU: Vulnerable – considered to be facing a high risk of extinction in the wild.” |
| P1 | Priority One – Poorly Known Species “Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.” |
| P2 | Priority Two – Poorly Known Species “Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.” |
| P3 | Priority Three – Poorly Known Species “Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.” |
| P4 | Priority Four – Rare Threatened and other species in need of monitoring “a. Rare -Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. b. Near Threatened -Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. c. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.” |
| P5 | Priority Five – Conservation Dependent Species “Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.” |
| THREATENED FLORA SPECIES – EPBC Act | |
| Ex | Extinct Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died. |
| ExW | Extinct in the Wild Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form. |
| CE | Critically Endangered Taxa which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. |
| E | Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria. |
| V | Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria. |
| CD | Conservation Dependent Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years. |
| Threatened Ecological Communities - WA | |

| Conservation Code | Category |
|---|---|
| PTD | <p>Presumed Totally Destroyed An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:</p> <ul style="list-style-type: none"> (i) records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or; (ii) all occurrences recorded within the last 50 years have since been destroyed. |
| CE | <p>Critically Endangered An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:</p> <ul style="list-style-type: none"> (i) The estimated geographic range and distribution has been reduced by at least 90 per cent and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification; (ii) The current distribution is limited ie. highly restricted, having very few small or isolated occurrences, or covering a small area; (iii) The ecological community is highly modified with potential of being rehabilitated in the immediate future. |
| E | <p>Endangered An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:</p> <ul style="list-style-type: none"> (i) The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification; (ii) The current distribution is limited ie. highly restricted, having very few small or isolated occurrences, or covering a small area; (iii) The ecological community is highly modified with potential of being rehabilitated in the short term future. |
| V | <p>Vulnerable An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:</p> <ul style="list-style-type: none"> (i) The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated; (ii) The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; (iii) The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes. |
| Priority Ecological Communities - WA | |
| P1 | Poorly-known ecological communities Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. |
| P2 | Poorly-known ecological communities Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. |
| P3 | <p>Poorly known ecological communities</p> <ul style="list-style-type: none"> (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or; (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes. |
| P4 | Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. |

| Conservation Code | Category |
|---|--|
| P5 | Conservation Dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years. |
| THREATENED ECOLOGICAL COMMUNITIES – EPBC Act | |
| Critically endangered | If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future. |
| Endangered | If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future. |
| Vulnerable | If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future. |

Appendix I Legislative requirements concordance table

| Reference | Requirement | Section where requirement addressed in this EP |
|--|--|---|
| Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 | | |
| 14(1) | The environment plan must include a comprehensive description of the activity including the following — | |
| | (a) the location or locations of the activity | Section 1.1, Figure 1-1, Figure 1-2, Section 3 |
| | (b) details of the construction and layout of any facility; | Section 3, Appendix E |
| | (c) a description of the operational details of the activity and proposed timetables; | Section 3 |
| | (d) any additional information relevant to consideration of the environmental impacts and environmental risks of the activity. | Section 2 |
| 14(2) | The environment plan must — | |
| | (a) describe the existing environment that may be affected by the activity; | Section 4 |
| | (b) include details of the particular relevant values and sensitivities (if any) of that environment. | Section 4 |
| 14(3) | The environment plan must include — | |
| | (a) details of all environmental impacts and environmental risks of the activity; and | Section 5.2 to section 5.10 and Appendix C |
| | (b) an evaluation of those impacts and risks; and | Section 5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4, 5.8.4, 5.9.4, 5.10.4 |
| | (c) a description of the environmental risk assessment process used to evaluate those impacts and risks, including the terms used in that process to categorise the levels of seriousness of those impacts and risks. | Section 5.1 |
| 14(4) | For the avoidance of doubt, the evaluation mentioned in subregulation (3)(b) must evaluate all the environmental impacts and environmental risks arising directly or indirectly from — | |
| | (a) all aspects of the activity; and | Section 3 |
| | (b) potential emergency conditions, whether resulting from accident or any other cause. | Section 7.7 |
| 14(5) | The environment plan must include — | |
| | (a) environmental performance objectives that define the goals of the operator in relation to the — (i) processes, policies and practices to be followed; and (ii) equipment to be used; and (iii) actions to be taken, | Section 6 |
| | (b) environmental performance standards — (i) that state the performance required of persons, equipment and procedures for the purposes of managing the environmental impacts and environmental risks of the activity; and | Section 6 |

| Reference | Requirement | Section where requirement addressed in this EP |
|-----------|---|--|
| | (ii) against which the performance of the operator in meeting the environmental performance objectives in the environment plan can be measured; | |
| | (c) measurement criteria for the purposes of determining whether — (i) the environmental performance objectives and environmental performance standards in the environment plan have been met; and (ii) the implementation strategy in the environment plan has been complied with. | Section 6 |
| 14(6) | The environment plan must describe the requirements that — | |
| | (a) apply to the activity under legislation (including conditions imposed under legislation), international conventions or agreements, or applicable codes of practice; and | Section 2 |
| | (b) are relevant to the environmental management of the activity. | Section 2 |
| 15(1) | The environment plan must include an implementation strategy for the activity in accordance with this regulation. | Section 7 |
| 15(2) | The implementation strategy must include measures to ensure that the environmental performance objectives and environmental performance standards in the environment plan are met. | Section 7.5 |
| 15(3) | The implementation strategy must identify the specific systems, practices and procedures to be used to ensure that — (a) the environmental impacts and environmental risks of the activity are continuously reduced to as low as is reasonably practicable; and (b) the environmental performance objectives and environmental performance standards in the environment plan are met. | Section 7.5 |
| 15(4) | The implementation strategy must establish a clear chain of command, setting out the roles and responsibilities of personnel in relation to the implementation, management and review of the environment plan | Section 7.3 |
| 15(5) | The implementation strategy must include measures to ensure that each employee or contractor working on, or in connection with, the activity is aware of his or her responsibilities in relation to the environment plan and has the appropriate competencies and training. | Section 7.4 |
| 15(6) | The implementation strategy must provide for the monitoring of, audit of, management of non-compliance with, and review of, the operator's environmental performance and the implementation strategy. | Section 7.5.1, 7.5.2, 7.5.3, 7.5.4 |
| 15(7) | The implementation strategy must provide for — | |
| | (a) specified emissions and discharges (whether occurring during normal operations or otherwise) to any land, air, marine, seabed, sub-seabed, groundwater, sub-surface or | Section 3.8, section 7.5.1 |

| Reference | Requirement | Section where requirement addressed in this EP |
|-----------|--|---|
| | inland waters environment to be monitored and recorded in a way that — (i) is accurate; and (ii) can be audited against the environmental performance standards and measurement criteria in the environment plan; | |
| | (b) the monitoring mentioned in paragraph (a) to be done either continuously or at specified intervals; | Section 7.5.1 |
| | (c) tests to assess the performance of the monitoring equipment used for the purposes of paragraph (a) to be conducted at specified intervals. | Section 7.5.1 |
| 15(8) | If the activity is a petroleum activity that may involve the injection or re-injection of produced formation water into wells, the implementation strategy must specify the maximum permissible concentration of petroleum in that produced formation water. | Not applicable |
| 15(9) | The implementation strategy must include details of any chemicals or other substances that may be — | |
| | (a) in, or added to, any treatment fluids to be used for the purposes of drilling or hydraulic fracturing undertaken in the course of the activity; or | Not applicable. Refer section 3.4.1.1 |
| | (b) otherwise introduced into a well, reservoir or subsurface formation in the course of the activity. | Not applicable. Refer section 3.4.1.1 |
| 15(10) | The implementation strategy must include an oil spill contingency plan that — (a) sets out details of the following — (i) preparations to be made for the possibility of an oil spill; (ii) emergency response arrangements to be implemented if an oil spill occurs; (iii) recovery arrangements to be implemented if an oil spill occurs; (iv) current oil spill trajectory modelling that applies to the activity; and (b) requires the operator to conduct tests of the emergency response arrangements set out in the oil spill contingency plan at specified intervals; and (c) describes the tests mentioned in paragraph (b). | Oils spill contingency plan has been developed and approved by DMIRS as a stand alone document. Only a high level description is provided in section 7.7. |
| 15(11) | The implementation strategy must provide for appropriate consultation with relevant authorities and other relevant interested persons or organisations. | Section 7.9 |
| 16 | The environment plan must include arrangements for — | |
| | (a) monitoring, and recording information about, the activity that are sufficient to enable the Minister to determine whether — (i) the environmental performance objectives and environmental performance standards in the environment plan have been met; and (ii) the implementation strategy in the environment plan has been complied with; | Section 7.8.1 |

| Reference | Requirement | Section where requirement addressed in this EP |
|-----------|--|--|
| | (b) reporting to the Minister on the information recorded under paragraph (a) at intervals agreed with the Minister, but not less often than annually. | Section 7.8.1 |
| 17(1) | The environment plan must include the following — | |
| | (a) a statement of the operator's corporate environmental policy; | Appendix A of the HSEMS Manual (provided as Appendix A of this EP) |
| | (b) a report on all consultations between the operator and relevant authorities and other relevant interested persons and organisations in the course of developing the environment plan; | Section 7.9 |
| | (c) a list of all incidents that are classified as reportable incidents in relation to the activity. | Section 7.8.4.2 |
| 17(2) | The environment plan must classify an incident as a reportable incident if — | |
| | (a) it could arise from the activity; and (b) it has the potential to cause an environmental impact that is classified, under the environmental risk assessment process described in the environment plan, as moderate or more serious than moderate. | Section 7.8.4.2 |