Environmental Plan Summary

Beharra Springs Gas Facility

Review Record

Rev	Date	Reason for Issue	Prepared	Checked	Approved
A	12/08/2014	Issued for Review	AG		
0	15/08/2014	Issued for Use	AG	TH	SC
0.1	28/08/2014	Additions to Section 4	AG	TH	
1.0	31/10/16	Issued to DMP for approval	KP	KH	SC

Next Review Date: 28/08/2019

*Please see Document Information and History section for more information.

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

List of Appendices

Table of Figures

List of Tables

1. Introduction

Origin Energy Resource Limited (Origin) operates the Beharra Springs Gas Facility located within Production Licence L11 and EP320, within the North Perth Basin, Western Australia (WA). This Environmental Plan (EP) Summary refers to the Beharra Springs Gas Facility, which incorporates the Gas Field, Gas Production Plant, Sales Gas Pipeline (PL18) and associated infrastructure (the Facility).

1.1 Scope

The scope of this EP summary covers the operational and maintenance aspects of the Facility, including the Gas Production Plant, Gas Field, Sales Gas Pipeline and associated infrastructure. The EP Summary addresses Regulation 11 (8) of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and includes the following:

- Contact Details of Origin Energy (Section 1.2)
- Location of the activity (Section 1.3)
- A description of the existing environment (Section 2)
- Operational details of the activity, including layout of the facility (Section 3)
- Environmental impacts and environmental risks (Section 4)
- Chemical disclosure (Section 5)
- Implementation strategy (Section 6)
- Consultation (Section 7).

1.2 Contact Details

Operations Manager – WA

Origin Energy Resource Limited

135 Coronation Drive

Milton QLD 4064

1.3 Location

The Beharra Springs Gas Production Plant is located on Unallocated Crown Land, Lot 12453 on Parcel P221090, within Production Licence L11. The Gas Production Plant is situated in the Shire of Irwin, in the northern Perth Basin, approximately 25 kilometres southeast of Dongara and 350 kilometres north of Perth.

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

Access to the Gas Production Plant is via Mt Adams Road and the Brand Highway.

Refer to Figure 1.1 and Figure 1.2 for the regional location of the Facility.

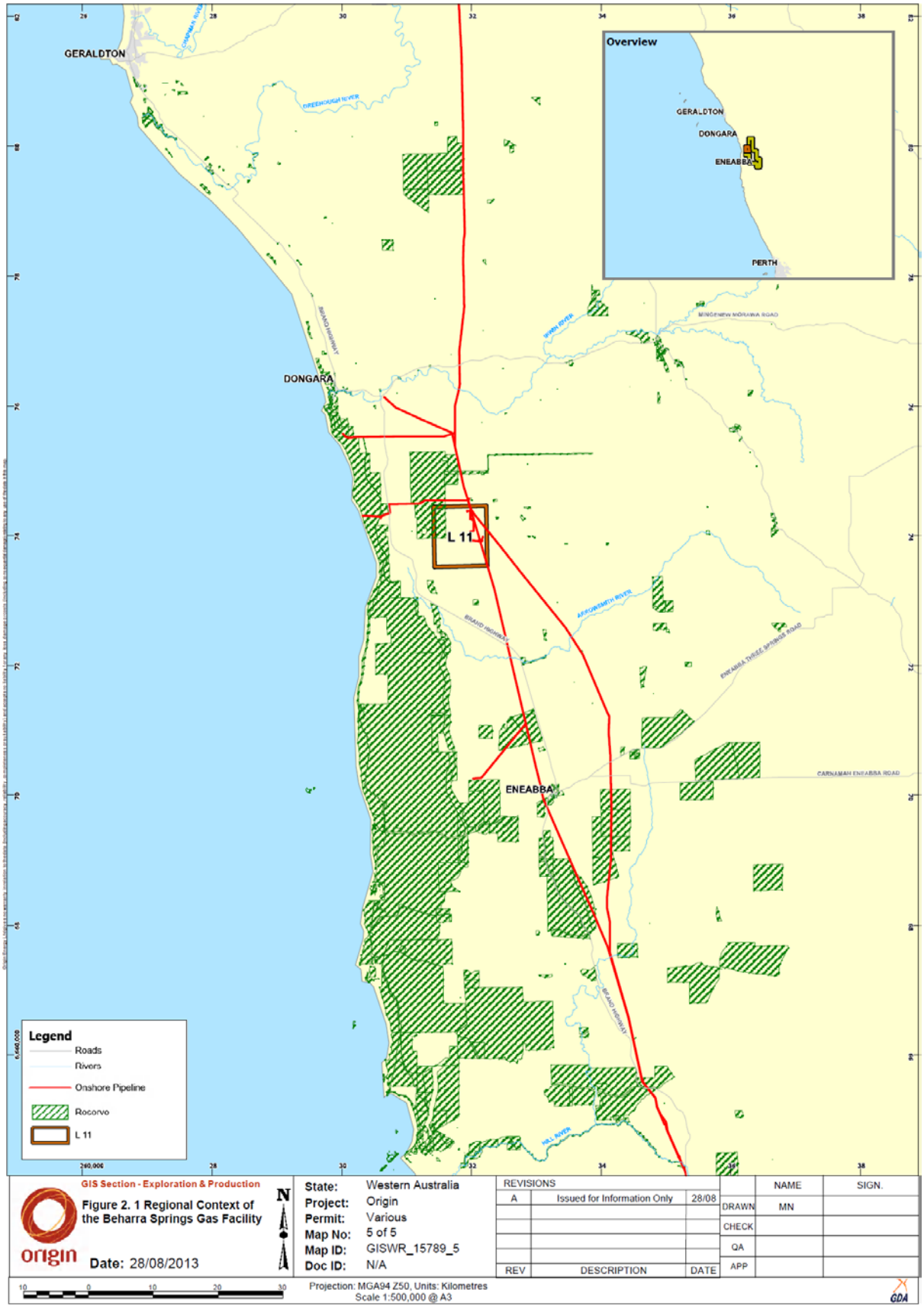


Figure 1-1 :Regional Context of the Beharra Springs Gas Facility

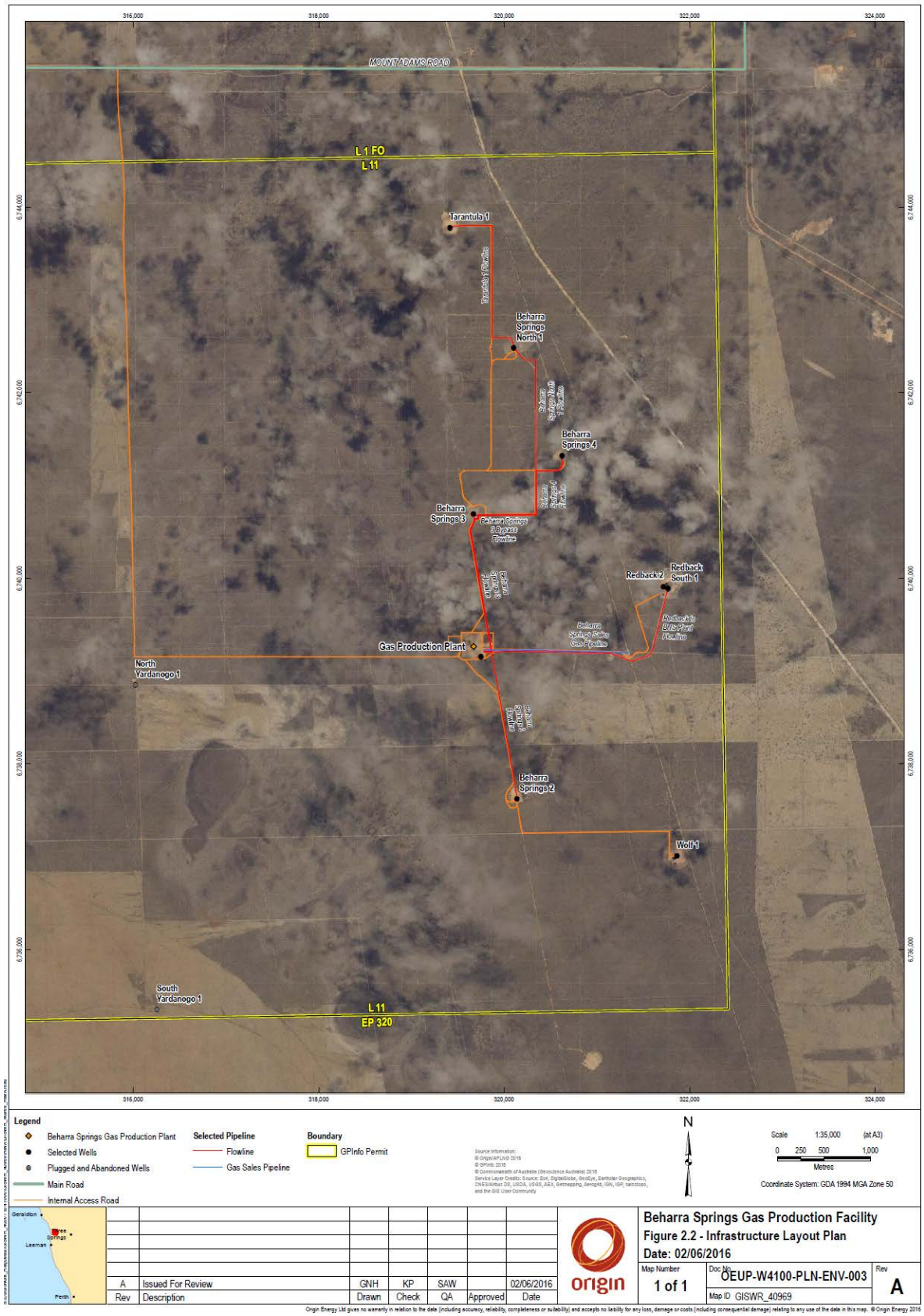


Figure 1-2 : Infrastructure Layout Plan of the Beharra Springs Gas Facility

2. Description of the Existing Environment

2.1 Regional Landform and Climate

The Facility is located 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 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. 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. The average annual rainfall is around 500 mm with the majority of 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.

2.2 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 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.

2.2.1 Soils

The Facility is situated in the northern Agricultural Region of West Midlands and the soil-landscape zone is ‘Geraldton Coastal’ code 221. 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 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.

2.3 Hydrology

2.3.1 Surface Water and Drainage

The Facility is situated in the Arrowsmith River surface water sub-catchment of the West Midlands Region. This sub-catchment is 183,326ha and predominately flows in an east to west direction into the Dandaragan Plateau across the Urella Fault.

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.

There are two springs within the Gas Field, being Beharra Spring and Mungenooka Spring approximately 800 m west and 10 km west of the Gas Production Plant, respectively.

2.3.2 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.

2.3.2.1 *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 course-grained sandstone confined between thick sequences of shale and siltstone. The water table is fairly deep ranging up to as much as 150 m 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.

2.3.2.2 *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.

Shallow groundwater lenses are located within the Tamala Limestone forming an unconfined aquifer in which the groundwater in mainly recharged from local rainfall.

2.4 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.

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 todtiana* 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 rhaphiophylla* dominate. Occasionally these areas also have *Casuarina obesa* and *Eucalyptus camaldulensis*.

2.4.1 Environmentally Sensitive Areas

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

2.4.2 Ecological Communities

The dominant vegetation communities within L11 are described below and shown in Figure 2-1. 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 2-1: Floristic community type (FCT) 4a on L11.

2.5 Weeds and Pathogens

Surveys undertaken by Hart, Simpson and Associates (2000) and Woodman (2004) recorded two environmental weeds within the Facility area. South African marigold (*Ursinia anthemoides*) was the only introduced species recorded by Hart, Simpson and Associates (2000). Capeweed (*Arctotheca calendula*) was recorded by Woodman and found near to the Beharra Springs North 1 well site. Minor occurrences of Capeweed and Patterson's Curse (*Echium plantagineum*) have also been recorded on well leases during routine inspections. The extent of these occurrences are small, restricted to disturbed areas and have been controlled or eliminated by spraying and physical removal.

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. 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.

2.6 Fauna

A search of previously conducted fauna surveys and the DEC Nature Map database for a 10 km buffer around the Gas Production Plant returned records for one threatened and three priority fauna species as listed in

Table 2-1: below.

The EPBC Act Protected Matters search conducted for the Beharra Springs Gas Facility identified three listed threatened species (2 birds and one arachnid) and six listed migratory species as potentially occurring within a 10 km buffer around the Gas Production Plant. The results of this search are summarised in Table 2-1 below.

Table 2-1:Significant fauna species known or with potential to occur within the Beharra Springs Gas Facility

Species	Conservation Status	
	Federal	WA
Recorded within a 10 km radius of the Gas Production Plant (NatureMap 2013)		
Calyptorhynchus latirostris (Carnaby's Black-Cockatoo)	E	E
Calamanthus campestris subsp. *montanellus* (Rufous Fieldwren)		P4
Ardeotis australis (Australian Bustard)		P4
Macropus irma (Western Brush Wallaby)		P4
Potential to occur within a 10km radius of the Gas Production Plant (EPBC protected matters search)		
Calyptorhynchus latirostris (Carnaby's Black-Cockatoo)	E	E
Leipoa ocellata (Malleefowl)	V, M	V
Idiosoma nigrum (Shield-backed Trapdoor Spider)	V	V
Apus pacificus (Fork-tailed Swift)	M	
Haliaeetus leucogaster (White-bellied Sea-Eagle)	M	
Merops ornatus (Rainbow Bee-eater)	M	
Ardea alba (Great Egret)	M	
Ardea ibis (Cattle Egret)	M	

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.

2.7 Socio-economic Environment

2.7.1 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.

Oil and gas exploration and production has occurred extensively in the area including the Origin operated Jingemia 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.

2.7.2 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 Epic Energy, approximately 1.8 km to the east; and
- The Parmelia Natural Gas Pipeline, owned by CMS Gas Transmission Australia, approximately 1.7 km west of the Gas Production Plant.

2.8 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.

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.

2.9 Indigenous and Non-indigenous Cultural Heritage

No cultural heritage sites listed on the Register of the National Estate occur within L11.

2.9.1 Native Title Applications

A search of the National Native Title Tribunal database (http://www.ntv.nntt.gov.au/ntv.asp) on 16 August 2013 revealed two registered Native Title applications relevant to L11. These are the Widi Mob application (WC1997/072) and the Amangu People application (WC04/2). L11 is entirely within the area of both applications.

2.9.2 Archaeology

Archaeological studies have been conducted throughout the Facility area and were conducted by Quartermaine Consultants as part of the Origin 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 were recorded for the Facility area.

3. Operational Details of the Activity

3.1 Facility Life and Decommissioning

The Facility is currently operating in accordance with the EP.

Prior to any abandonment and decommissioning activities a detailed decommissioning and closure plan will be prepared and submitted to DMP for approval.

3.2 Description of the Facility

3.2.1 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 Origin customers in the south-west of WA.

The Gas Facility is comprised of:

- Gas Field, incorporating 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 condensate storage and load out facility, power generation plant, hazardous material and chemical storage and accommodation camp.

Refer to Appendix A for a copy of the Beharra Springs Gas Production Plant Site Layout Drawing.

The Facility is designed to operate 365 days per year, 24 hours per day.

3.2.2 Flowlines

Well stream fluids from the producing wells are transported to the Gas Production Plant via seven flowlines which are designed, constructed and maintained in accordance with AS-2885.

3.2.3 Gas Production Plant

The Gas Production Plant is located in an approximately 270 m x 288 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 (CO_2) and hydrogen sulphide (H_2S) removal (via membrane unit and H_2S removal beds).

3.2.4 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 Origin's operation and maintenance responsibility for the Sales Gas Pipeline.

3.2.5 Associated Infrastructure

Other infrastructure at the Facility includes:

- Power generation.
- Process equipment from well gathering system pipework through to sales gas export pipeline
- Site Drainage and Evaporation Ponds.
- Flare.
- Workshop.
- Chemical Storage.
- Operations Accommodation.
- Groundwater monitoring bores.

3.2.6 Produced Formation Water Management

Produced water from the extraction and treatment process flows via an API separator (interceptor pit) and then into two evaporation ponds (Evaporation Pond 1 and Evaporation Pond 2). All site bunds are self draining into the gravity fed Gas Production Plant drainage system and these liquids also make their way via a series of tundish collection points, into the API separator.

The evaporation ponds have been lined with 2mm high-density polyethylene (HDPE) to prevent possible contamination of the environment and groundwater.

Origin is currently reviewing produced water management system (as part of the soil and groundwater investigation project) 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.

This review will involve a staged process and will:

- identify and assess the feasibility of alternative water management strategies (including improvement and optimisation of the existing infrastructure) based on the current understanding of the Facility's operational life and produced formation water profile
- assess the environmental impacts of the selected feasible water strategy (or changes to the existing strategy)
- ensure the environmental risks are minimised to as low as reasonably practicable.

The review is currently being undertaken and is expected to be completed by 5 April 2017.

3.2.7 Operation and Maintenance Activities

3.2.7.1 Routine Activities

Routine activities associated with the operation and maintenance of the Facility include:

- well site inspections and general maintenance such as replacing worn or malfunctioning equipment, painting and cleaning equipment;
- Sales Gas Pipeline inspections, integrity testing and maintenance;
- flowline inspection, integrity testing and general maintenance;

- 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;
- firebreak and vegetation maintenance in accordance with site specific fire management plan, conditions of DFES approval and Shire of Irwin requirements;
- environmental monitoring;
- 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.

3.2.7.2 Planned Major Maintenance Activities

In addition to routine activities, planned major maintenance activities are undertaken as required and include:

- well workovers, wirelining and intervention;
- pigging of the Sales Gas Pipeline;
- shutdown of the Facility for major maintenance campaigns;
- direct inspection of the Beharra Springs flowlines and sales gas pipeline;
- upgrade of the impressed current cathodic protection system; and
- catalyst change outs.

3.2.7.3 Non-routine activities

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

- seismic surveys;
- drilling of new gas wells;
- installation of new flowlines;
- replacement of pond liner;
- repair and validation of pond liner;
- installation of new groundwater monitoring bores;
- soil sampling under the pond liner;
- installing new processes or plant/equipment that is not like for like during plant maintenance and shutdowns;
- plant closure and decommissioning.

4. Environmental Impacts and Risks

A risk assessment of the operational aspects was undertaken using Origins risk assessment methodoloogy which follows Australian Standard *AS/NZS ISO 31000:2009: Risk management – Principles and guidelines.* Nine Low, twenty-six Medium and five High potential risk events were identified. No Severe or Extreme environmental risks were identified.

The identified environmental risks are grouped into 12 categories and include:

1. Initiation of bushfire;
2. Loss of containment of fuels, chemicals and hazardous materials;
3. Inadequate disposal of liquid and solid wastes;
4. Groundwater extraction exceeds aquifer recharge;
5. Vegetation clearing and earthworks activities reduce local biodiversity values;
6. Disturbance to sites of cultural heritage;
7. Introduction or spread of weeds or pathogens;
8. Amenity (noise, dust, light, odour emissions) impacts;
9. Excessive air emissions;
10. Rehabilitation activities are inadequate or unsuccessful;
11. Negative impact/change to existing users of groundwater; and
12. Negative impact to suitability of existing soils/land uses.

Table 4-1: indicates that the risk events can be managed through existing environmental controls and, in some cases, through project-specific mitigation measures.

Table 4-1:Summary of Environmental Risks and their Performance Objective and Mitigation Measures.

Risk ID	Risk Title	Environmental Performance Objective	Management and Mitigation Measures
01	Site activities will initiate a bushfire	Avoid initiation of bushfire due to Facility activities	• DFES back-burning in local area • Weed control around plant • Permit to Work for Hot Work activities • Earthing • DFES approval for drilling ground pits for flaring • License for flares at facility • Designated smoking area with adequate disposal • Fire extinguishers • Bushfire management plan developed in consultation with Shire of Irwin firebreak requirements and DFES approval for flaring
02	Site activities will result in the loss of containment of fuels, chemicals and hazardous	No loss of containment of fuels, chemicals and hazardous materials	• Bunding • Emergency Spill Kits • Corrosion inhibitors in flowlines • Cathodic protection • Competency trained operators (first aid, fire trained)

Risk ID	Risk Title	Environmental Performance Objective	Management and Mitigation Measures
	materials		• Transport companies are appropriately licensed and competent • Integrity checks • Inspection Checklists • Load in/Load out Procedure • Environmental Licence requirements • Oil spill contingency plan to be developed and submitted by 31 December 2016
03	Site activities will result in the inadequate disposal of liquid and solid wastes	No loss of containment of liquid and solid wastes	• Interceptor Pit and skimming of evaporation pond • 2mm HDPE liner for evaporation ponds • Groundwater monitoring around evaporation ponds • Waste segregation • Licensed contractors to remove wastes • Environmental Licence requirements • Evaporation pond liner integrity inspections and where necessary repairs undertaken • Produced formation water strategy and management plan to be reviewed and where appropriate optimised
04	Groundwater extraction for operations and drilling will exceed aquifer recharge	Sustainable groundwater extraction	• Groundwater licence including annual volumetric entitlement • Metering of water extraction • New bores for drilling activities require licensing
05	Vegetation clearing and earthworks activities will reduce local biodiversity values	Minimise impacts to rare and endangered flora and fauna, vegetation communities and fauna habitat	• Pre-clearing flora surveys (if required) • Use of existing disturbed areas wherever practicable • Regulatory approval for vegetation clearing • JSA and Permit to Work processes
06	Site activities will cause disturbance to sites of cultural heritage	Avoid, or if avoidance is not practicable, minimise disturbance to sites of cultural heritage.	• Use of existing disturbed areas wherever practicable • Database Searches • Cultural Heritage Surveys
07	Site activities will cause the introduction or spread of weeds or pathogens	Eliminate or minimise amenity impacts due to noise, dust or light emissions	• Spraying Programs • Weed removal by operators • Well site inspections

Risk ID	Risk Title	Environmental Performance Objective	Management and Mitigation Measures
08	Site activities will cause amenity (noise, dust, light, odour emissions) impacts	Eliminate or minimise amenity impacts due to noise, dust or light emissions	• Remote location of facility • Facility maintenance • Plant integrity monitoring • Environmental Licence requirements
09	Site activities will cause excessive air emissions	Minimise impacts to the local airshed due to air emissions	• Facility maintenance including flares • Minimised venting • Plant integrity monitoring • Remote location of facility • Environmental Licence requirements
10	Rehabilitation activities are inadequate or unsuccessful	Progressively rehabilitate disturbed areas	• Progressive rehabilitation • Rehabilitation undertaken in accordance with Land Clearing Permit Approval
11	Negative impact/change to existing users of groundwater	No negative impact to suitability of groundwater for existing users	• Soil and groundwater investigation to be completed by 5 April 2017 • Groundwater monitoring program implemented
12	Negative impact to suitability of existing soils/land uses	No negative impact to suitability of soils/land use for existing users	• Soil and groundwater investigation to be completed by 5 April 2017

5. 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 EP. Additionally if any changes to current operation of wells at the Facility require the use down well use of products, additives, chemicals and other substances, these will be disclosed to the regulator prior to use occurring.

6. Implementation Strategy

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 as low as reasonably practicable (ALARP).

Origin operates in accordance with an established health, safety and environmental management system (HSEMS) to minimise and manage the impacts on its workforce, the environment and the communities in which the company operates. In addition to the Origin HSEMS, 20 HSE Management Standards and Directives exist that set and formalise expectations, provide auditable criteria against which the HSEMS can be measured and provide a basis from which to drive continual improvement.

The directives mandate the minimum requirements, the responsibilities and the business rules that are needed to implement the HSE policy and HSE management system. Directives are supported by Toolkits that include procedures, guidelines, checklists and forms.

In addition to the Directives supporting procedures, there are also specific environmental procedures for weed management; wellsite selection, design and construction; and aboriginal and cultural heritage.

6.1 Performance Objectives, Standards and Criteria

The environmental risks identified as part of the risk assessment form the basis of environmental performance standards to manage the identified risks**.** Measurement criteria of these performance objectives and standards include records that demonstrate implementation of environmental performance standards.

6.2 Competency, Training and Inductions

All staff and contractors that operate at the Facility are required to be trained and competent to undertake their roles.

6.2.1 Origin HSE training

Training and competency requirements for Origin employees are defined in the HSE Training and Competency Directive (ORG-HSE-DVE-022).This directive describes the method for identifying and verifying health, safety and environment training and competency requirements within Origin.

Mandatory minimum HSE training requirements have been implemented for anyone to work at an Origin Upstream site.

6.2.2 Site HSE induction

All staff and contractors operating at the Facility receive a site specific HSE induction to inform them of their obligations and activity-specific HSE management procedures. The HSE induction also covers emergency events, contingency preparedness and activity specific fire prevention requirements.

6.2.3 Bushfire Management

Origin has developed a bushfire management plan (CDN/ID12104502), in consultation with the Shire of Irwin and DFES approval that clearly details:

- the minimum distance required to be maintained clear around the Facility's infrastructure,
- the method for maintaining firebreaks clear of vegetation; and
- the roles and responsibilities for undertaking the work.

6.2.4 Cultural Heritage Awareness Training

Mandatory Cultural Heritage Awareness Training has been implemented for all employees and contractors working at an Origin Upstream site.

6.3 Environmental Emergency Planning and Response

An Emergency Response Plan (ERP OEUP-W4100-PLN-SAF-002) has been developed for the Facility.

6.3.1 Oil Spill Contingency Planning

The Facility Emergency Response Plan provides an Emergency Response Toolkit for the emergency scenario of Pollutant/Spill. This toolkit addresses the requirements for an oil spill contingency plan defined in Regulation 15 (10) of the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*.

6.3.2 Drills and exercises

Emergency response drills and Emergency Response Plan reviews are conducted monthly at Beharra Springs. These are held and documented by the Site Supervisor. Additionally, a major desktop Emergency Exercise is carried out on an annual basis, with one major field exercise also carried out every year. At least two emergency response drills for environmental emergencies will be conducted annually.

6.4 Environmental Inspections and Auditing

Origin has established inspection and auditing programs as part of the EP. Inspections and audits have been scheduled at key phases of the Facility's operational life to ensure compliance with regulatory approvals, applicable legislation and the EP is maintained.

6.5 Environmental Monitoring

There are two key routine environmental monitoring programs implemented at the Facility being:

- Groundwater monitoring of nine bores located at the Facility, in accordance with the Environmental Licence L8385/2009 issued by DER and the Groundwater Licence GWL155141 issued by DOW; and
- Rehabilitation monitoring of disturbed areas in accordance with relevant clearing permits.

In addition to these routine environmental monitoring programs, Origin is currently undertaking a soil and groundwater investigation under the evaporation pond liners and at various locations around the Facility. The soil and groundwater investigation aims to:

- identify whether any detectable hydrocarbons or other chemicals of potential concern associated with operational activities is present in the soil and shallow aquifer; and
- determine the environmental and human health risks posed by any identified impacts.

The findings of the investigation will then be utilised to determine further actions (if any) for the remediation/management of any identified impact/s.

The soil and groundwater investigation will potentially consist of:

- Soil sampling underneath the liner of evaporation pond 1 (up to 8 locations) and evaporation pond 2 (up to 15 locations)
- Soil sampling at key locations around the Facility (up to 13 locations)
- Installation of groundwater monitoring bores (up to additional 14 locations) to complement the existing monitoring network
- Monitoring groundwater quality.

The soil and groundwater investigation will be developed in consultation with key stakeholders, including DMP and DER.

The findings of the investigation will be provided to DMP and DER by the 5 April 2017.

7. Consultation

Minimising and mitigating the potential impacts associated with the Facility is assisted by the engagement of key stakeholders to ensure all issues are identified and addressed. Origin has undertaken consultation with the relevant stakeholders in order to address the relevant issues and implement the required management measures. Key stakeholders include:

- DMP;
- DER;
- DoA;
- DoW;
- DFES;
- Shire of Irwin; and
- Origin site staff.

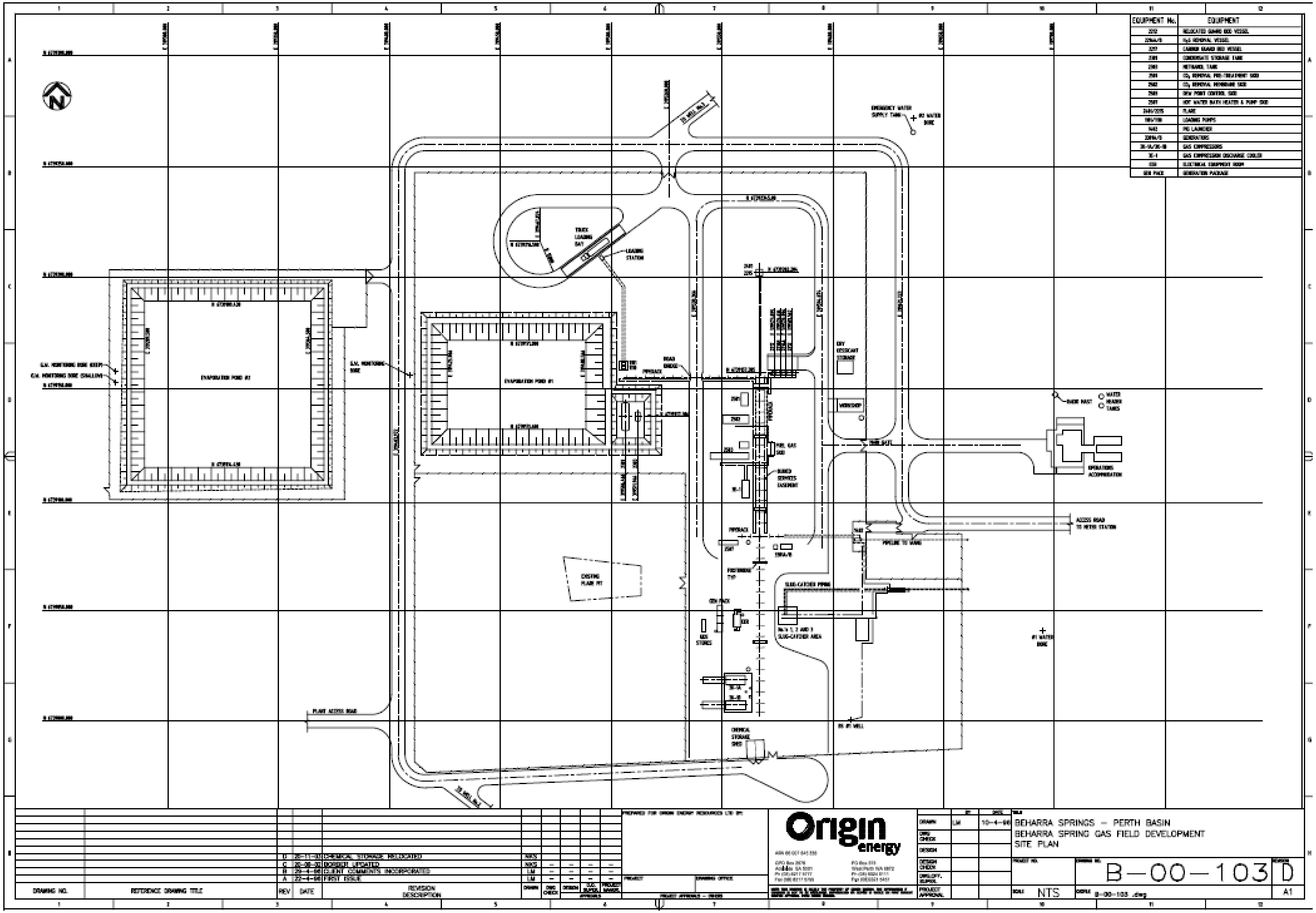
7.1 Native Title

Origin will continue to liaise with the Native Title Applicants in respect to operation of the Facility as appropriate.

7.2 Ongoing Consultation

Origin 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).

Appendix A Beharra Springs Production Plant Layout


EQUIPMENT No.
EQUIPMENT
EVAPORATION POND #2
EVAPORATION POND #1
WORKSHOP
OPERATIONS ACCOMMODATION
ACCESS ROAD TO METER STATION
PLANT ACCESS ROAD
FIRST ISSUE
CLIENT COMMENTS INCORPORATED
CHEMICAL STORAGE RELOCATED
DRAWING NO.
REFERENCE DRAWING TITLE
REV
DATE
REVISION DESCRIPTION
Origin energy
BEHARRA SPRINGS – PERTH BASIN
BEHARRA SPRING GAS FIELD DEVELOPMENT
SITE PLAN
B-00-103
D
NTS
A1