



Application for Licence Amendment

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L4467/1972/14
Applicant	Chevron Australia Pty Ltd
ACN	086 197 757
File Number	DER2013/000939
Premises	Barrow Island Oil and Gas Facility Crown Reserve 11648 BARROW ISLAND WA 6712
Date of Report	13 December 2018
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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Application	means the Application for Licence Amendment submitted by the Licence Holder on 17 January 2018 titled "Additional Supporting Documentation: Barrow Island L4467, Licence Amendment Application 2018". Chevron Australia Pty Ltd (3 January 2018)
BF	Bioremediation Facility
BOD	Biochemical Oxygen Demand
BWI	Barrow Island
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CPF	Central Processing Facility
CPS	Central Power Station
CS Act	<i>Contaminated Sites Act 2003 (WA)</i>
DBCA	Department of Biodiversity, Conservation and Attractions
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DEC	The former Department of Environment and Conservation
DER	The former Department of Environment Regulation
DMIRS	Department of Mines, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>

Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review
GGD	Gorgon Gas Development
HDPE	High Density Poly Ethylene
Licence Holder	Chevron Australia Pty Ltd
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
PFW	Produced Formation Water
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	as defined in Schedule 2 of the Revised Licence
Review	this Licence review
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this Review.
Risk Event	As described in <i>Guidance Statement: Risk Assessment</i>
SBR	Sequence Batch Reactor
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TTF	Terminal Tanks Facility
WWTP	Wastewater Treatment Plant

2. Purpose and scope of assessment

On 17 January 2018, DWER received an Application (Chevron 2018) from Chevron Australia Pty Ltd (the Licence Holder) to amend the Barrow Island Oil and Gas Facility (the Premises) existing operating licence L4467/1972/14 to incorporate a number of operational changes and construction works at the Premises.

The Application relates to the construction and operation of new infrastructure on the premises which may result in a material change to the risk of emissions and discharges on site. As a result of this, DWER has determined it appropriate to conduct a detailed review of the licence to incorporate proposed future works and align the Licence with DWER's risk based Regulatory Framework.

This Decision Report assesses emissions and discharges from operation of the existing oil and gas facility as well as construction and operation of the proposed new infrastructure.

2.1 Application details (17 January 2018)

The Licence Holder applied to remove a number of conditions on the Existing Licence, as well as incorporate construction and operation of additional Prescribed Premises and a bioremediation facility for treatment contaminated soils. Specifically, the Licence Holder requested the following amendments to L4467/1972/14:

- Removal of current licence conditions 2.4.1, 2.4.2 and 3.4.1 which permit the Licence Holder to reinject Produced Formation Water (PFW) back into the oil formation reservoir, set a target for oil in water concentration in reinjected PFW and includes the requirement to monitor oil in water content of reinjected PFW daily;
- Addition of prescribed premises category 57 for used tyre storage (general);
- Addition of prescribed premises category 85 for construction and operation of a new sewage facility; and
- Approval of construction and interim operation of a partially constructed bioremediation facility (approved under works approval W261/2012/1).

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application Form: Licence Amendment Application: Barrow Island Oil and Gas Facility	17 January 2018
Additional Supporting Documentation: Barrow Island L4467, Licence Amendment Application 2018. Chevron Australia Pty Ltd (3 January 2018)	17 January 2018

2.2 Subsequent amendment application (18 October 2018)

On 18 October 2018, a subsequent licence amendment application was sought by the Licence Holder. The amendments are in relation to:

- Extending the date for the construction of the sewage facility to 30 April 2019 instead of 31 December 2018;
- Changing the name of the monitoring point for the sewage facility to 'inline flowmeter'; and

- Changing the reporting due date to 30 September in each year for the annual environmental report.

The Delegated Officer notes the minor nature of the requested amendments listed above and that they will not cause a material change to the normal operations or the emissions profile of the Premises. The requested changes have therefore been approved via a licence amendment processed on 13 December 2018.

3. Background

Barrow Island (BWI) is located approximately 60km off the coast of North West Australia, about 88km north of Onslow on the North West Shelf (Figure 1). BWI is a Class A Nature Reserve (Barrow Island Nature Reserve No. 11648) recognised to have high conservation values supporting a diverse range of flora and fauna both on the Island and in the surrounding waters. The Island is approximately 30km long, 10km wide and covers an area of 23,425ha.

Petroleum exploration and production operations have been undertaken on BWI since the early 1960s within petroleum titles L1H(R2), TL/3, L10, EP61, EP62 and WA-7-L. The Licence Holder operates the Premises oil and gas production facilities on behalf of the BWI Joint Venture. WA Oil Asset is the business unit within Chevron that manages the BWI Joint Venture. The other Joint Venture participants are Santos Offshore Pty Ltd and Mobil Australia Resources Company Pty Ltd.

The WA Oil production facilities are predominantly located in the southern portion of the Island while transport, oil storage and export, and personnel accommodation facilities are located on the eastern shore of the island. Operations are supported by a workforce of approximately 240 employees and contracting resources as required.

The Gorgon Gas Development (GGD), a separate project also operated by Chevron, is also located on Barrow Island on a portion of land to the mid-east of the Island. Five areas have been excised from the L1H(R2) lease area for the GGD. The GGD operates under separate EP Act licences and under a State Agreement Act (the *Barrow Island Act 2003*) and as such is not considered further in this Decision Report.

Figure 2 shows the tenure boundaries associated with the WA Oil Asset and the GGD, including Joint Use Areas shown in red.

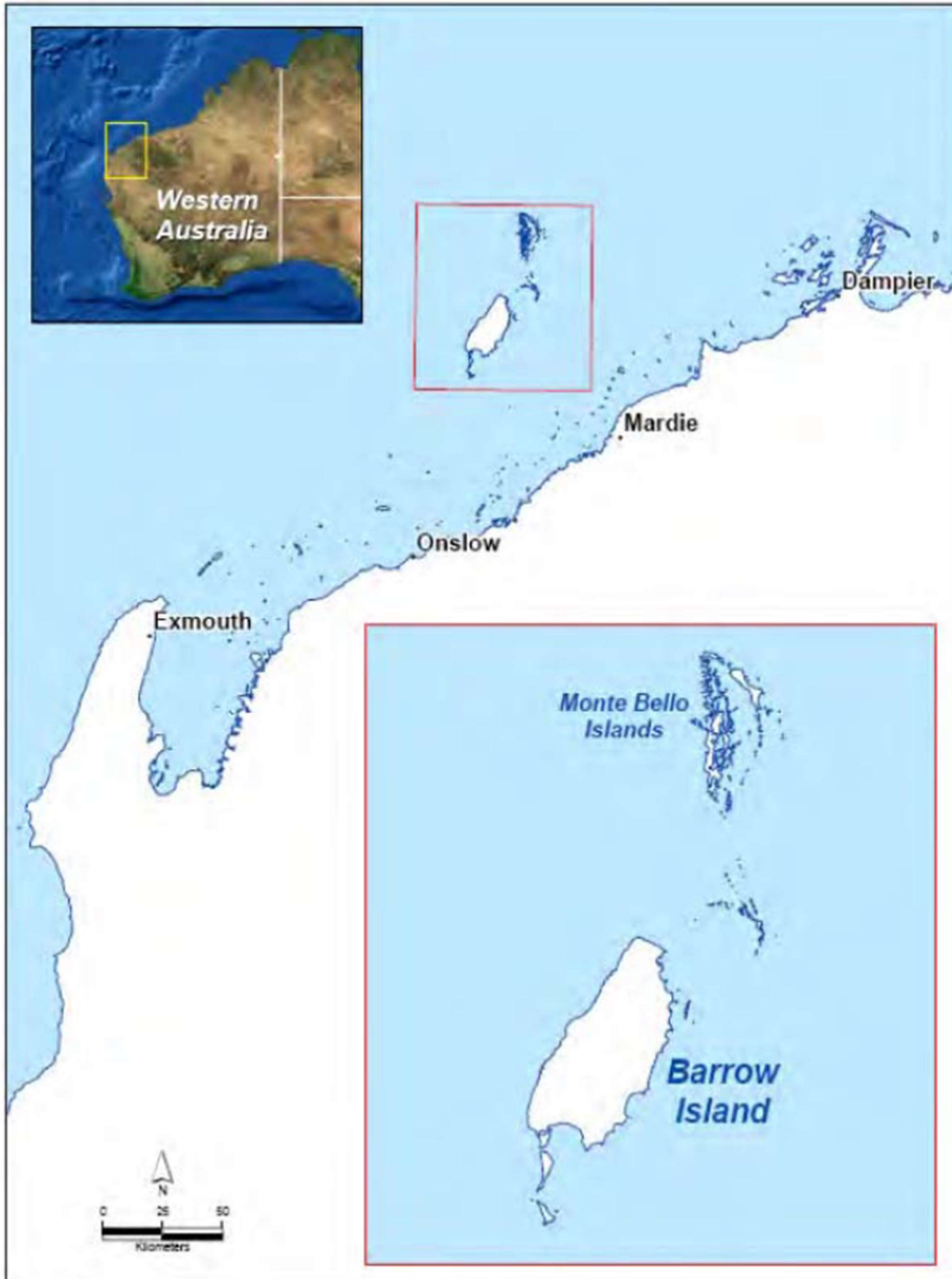


Figure 1: Location of Barrow Island

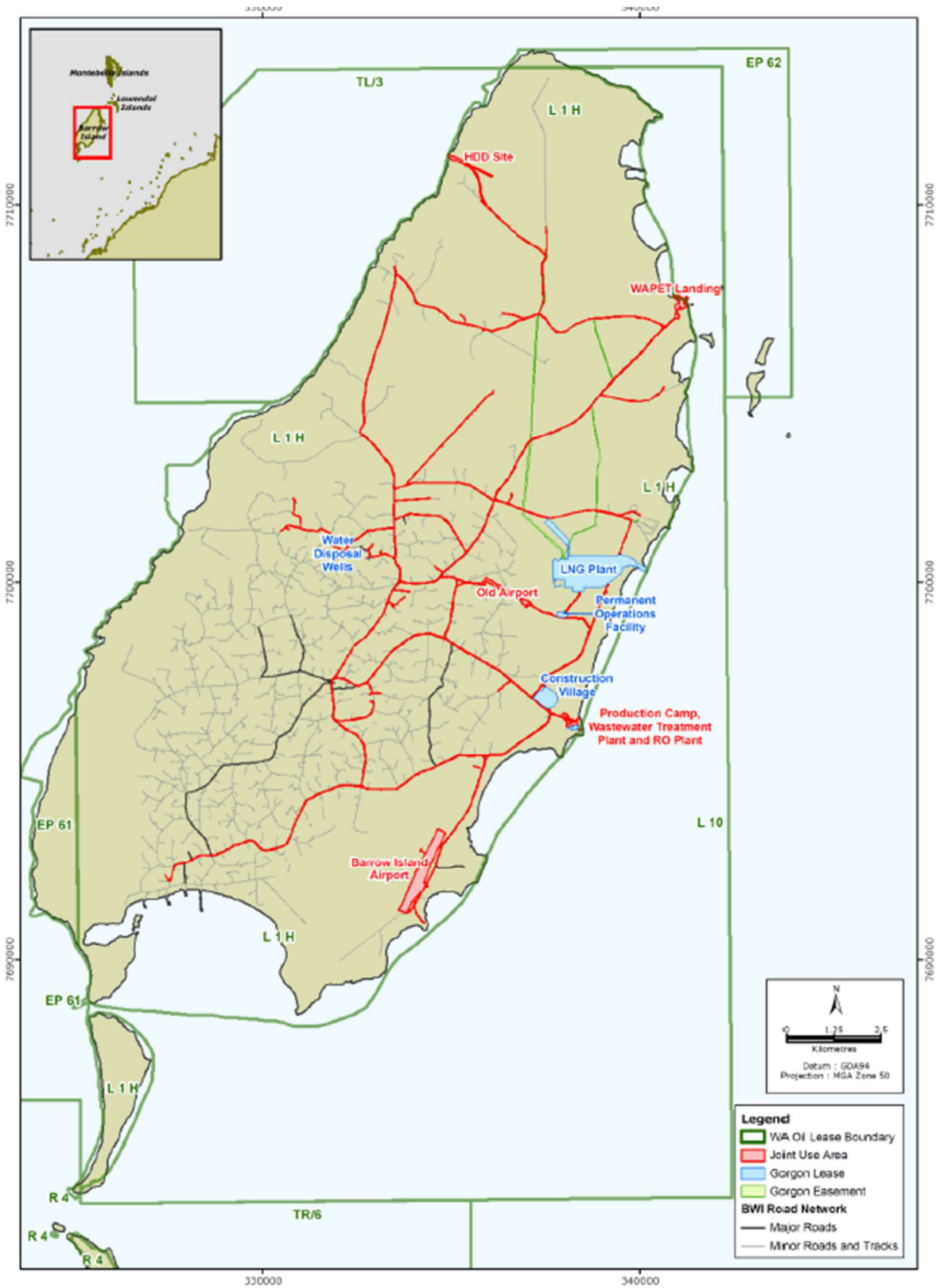


Figure 2: WA Oil and Gorgon Gas Development tenure on Barrow Island

Table 3 lists the existing prescribed premises categories in addition to new categories that have been applied for.

Table 3: Prescribed Premises Categories

Classification of Premises	Description	Approved Premises production or design capacity or throughput
Existing approvals that are reviewed under this Decision Report		
Category 10	Oil or gas production from wells: premises, whether on land or offshore, on which crude oil, natural gas or condensate is extracted from below the surface of the land or the seabed, as the case requires, and is treated or separated to produce stabilized crude oil, purified natural gas or liquefied hydrocarbon gases.	< 310,886.5 tonnes per year
New categories applied for and assessed under this Decision Report		
Category 57	Used tyre storage (general): premises (other than premises within category 56) on which used tyres are stored.	<300 tyres
Category 85	Sewage facility: premises — (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters.	<45.3 cubic metres per day

4. Overview of Premises

4.1 Operational aspects

The Premises is spread over a large proportion of the Barrow Island Nature Reserve and has a 4.5% footprint by land area. There are approximately 450 oil production wells currently in operation, producing a combined total of around 5,500 barrels (bbls) of oil per day. There are approximately 271 injection wells that inject saline (waterflood) water into the producing formation to enhance oil recovery. Eight separator stations are located within the field to treat the oil and remove produced formation water (PFW) and gas. Produced oil and water is pumped from each separator station via a series of above ground pipelines to the Central Processing Facility (CPF). From there, it is further separated and oil is pumped to the Terminal Tanks Facility (TTF) for storage until it is transferred to tanker ships via a submarine loading line and offshore loading buoy. The gas from the CPF is flared at the CPF flare pit.

All PFW is reinjected back into the oil reservoir via 14 disposal wells on the Island (two in service).

Produced gas from the separator stations is collected in a low pressure gas gathering system supplying the Compressor Station, as well as supplying fuel gas to other users. Excess gas is flared at the J Station flare pit, which is lit continuously to negate the need to vent. High pressure gas from the Compressor Station is sent to the high pressure gas distribution system, which supplies gas lifted production and water source wells, as well as high pressure fuel gas for the Central Power Station (CPS) and other users.

The Licence Holder operates the CPS to supply power for the Island. The CPS consists of a number of small power generation units operating on a combination of gas and diesel with a maximum capacity of less than 10 megawatts (MW) in aggregate and therefore does not trigger category 52 or 84 Electric power generation prescribed premises. The CPS generally

runs at an aggregate throughput of 5-6 MW.

Oily liquid wastes associated with oil production activities are sent to the L71 Evaporation Ponds, which are designed to enhance natural evaporation of the water component in oily wastewater with low hydrocarbon content. The oily water is circulated between the ponds with the liquid trickling down a concrete evaporation ramp to enhance clean water evaporation and concentrate the residual liquid waste product prior to further disposal. The waste types treated at the facility are:

- Stormwater from sumps and cellars, delivered via vacuum tanker;
- Liquid waste and stormwater from the J Station Interceptor;
- Wash down from vehicles, equipment and storage tanks;
- Groundwater samples; and
- Well workover and drilling returns.

The Licence Holder has applied to amend the Existing Licence to remove some conditions relating to the reinjection of PFW and allow two new prescribed premises categories to be added to the licence, in addition to finalising construction followed by operation of a Bioremediation Facility (BF).

4.1.1 Request to remove conditions relating to reinjection of PFW

The conditions that the Licence Holder has requested be removed include conditions that regulate the disposal and monitoring of PFW, which are referred to in the existing licence as point source emissions to groundwater. The Licence Holder has provided clarification to DWER demonstrating that the disposal of PFW to the Windalia Formation and also the Barrow Group Flacourt Formation do not constitute emissions to groundwater.

The Windalia Formation is an oil-producing reservoir and therefore not considered to be a beneficial source of groundwater. The Licence Holder has advised (Chevron 2018) that the Windalia formation is overlain by the Lower Gearle Formation which is impermeable and that an impermeable section with vertical thickness greater than 200m lays between the Windalia Formation and shallower intervals (including the groundwater). The Licence Holder has advised DWER that presence of the Windalia Oil Field is evidence that there is no pressure communication between this reservoir and the groundwater closer to the surface; otherwise there would be no oil accumulation.

The Licence Holder also advises (Chevron 2018) that the Flacourt Formation is a high permeability regional aquifer overlain by the Muderong Formation, which is a regional impermeable sealing unit in the Barrow Sub-basin. There is an impermeable section in between the Flacourt and Windalia Formation greater than 100m thick (vertical thickness) causing the Flacourt and Windalia to be pressure disconnected (Chevron 2018). The presence of small hydrocarbon columns in the Flacourt Formation and lower most Muderong Formation provide more evidence that there is no pressure communication between these reservoirs and shallower reservoirs (Chevron 2018).

Further to the above information, DWER notes that disposal of PFW is regulated by the Department of Mines, Industry Regulation and Safety (DMIRS) under the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* and the *Petroleum Pipelines (Environment) Regulations 2012* (WA); therefore regulation through Part V of the EP Act is not required for this activity.

4.1.2 Used Tyre Storage

The Licence Holder has applied for approval to store up to 300 used tyres on the Premises at any one time, and activity that triggers approval for a category 57 Prescribed Premises. Used tyres from vehicles will be stored in waste tyre receptacles (half height containers, or similar container suitable for transport) at three locations on the Premises, two areas at the Base (at

the LV Workshop and Hamburger Hill) and one area at the WAPET Landing (refer Figure 3). Tyres will be progressively removed off the Premises and recycled on the mainland (Dampier). Appropriate firefighting equipment capable of controlling and / or abating a tyre fire at the premises will be available as a contingency in the unlikely event of a fire occurring in one of the waste tyre receptacles.



Figure 3: Locations of Used Tyre Storage areas on Barrow Island

4.1.3 New Sewage Facility

The Licence Holder is proposing to upgrade an existing sewage facility (category 85 Prescribed Premises) that is currently operating under a separate licence, and incorporate construction and operation of a new sewage facility under the Existing Licence L4467/1972/14. The existing sewage facility is a 600 EP wastewater treatment plant (WWTP) currently licenced under L8817/2014/1 and managed as part of the GGD. The Licence Holder is proposing to replace the 600 EP with a smaller WWTP system, a 206 EP. Licence L8817/2014/1 will be surrendered by Chevron and the new 206 EP will be constructed and operated under L4467/1972/14.

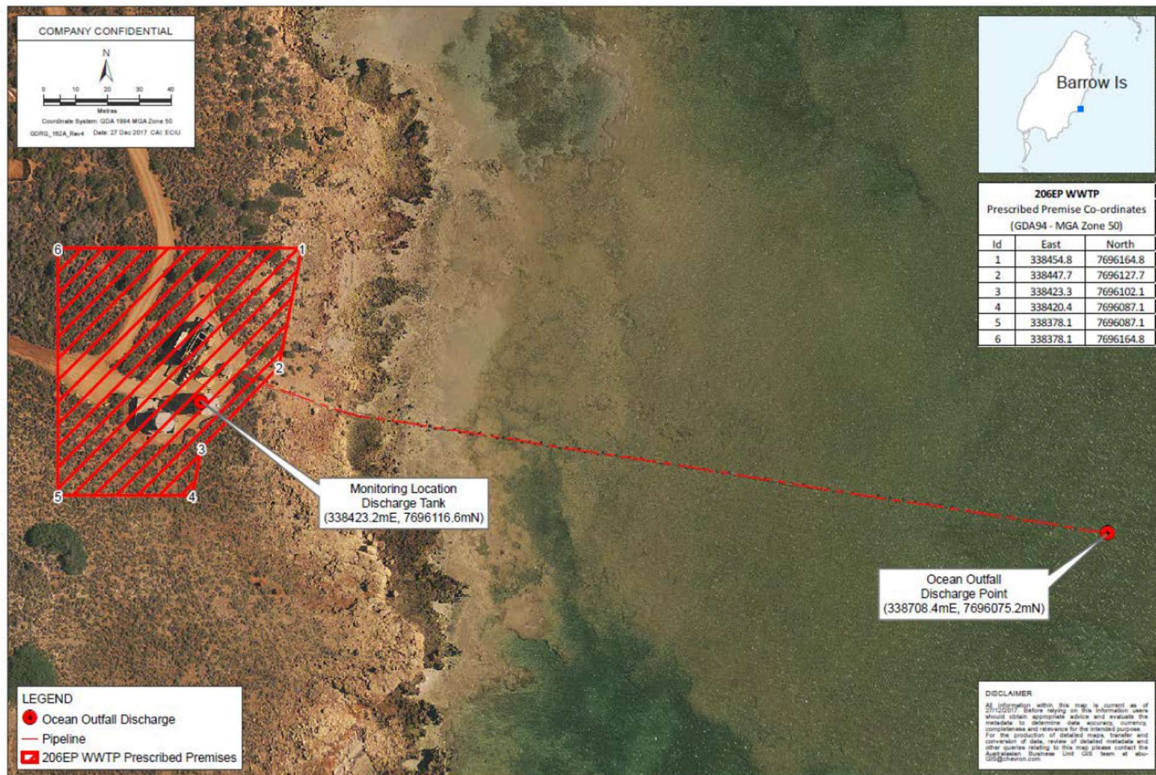


Figure 4: Location of new WWTP, including treated wastewater monitoring location and discharge point.

The new 206 EP WWTP will use some infrastructure from the existing WWTP including:

- the inlet pump and lift station;
- the balance/equalisation tank;
- the raw sewage pump;
- the screw compactor screening system;
- chemical storage and metering systems;
- concrete bunds in place;
- the treated effluent holding tank; and
- the ocean discharge pipeline.

The new WWTP will be built off site and then connected into the existing influent feed pump and the outlet connection to the existing treated effluent tank.

The new WWTP will use the Sequence Batch Reactor (SBR) process which uses a combination of aerobic and anoxic stages for removal of Biological Oxygen Demand and nitrogen. Following the aerobic/anoxic cycles a settler mode is maintained to allow solids to settle at the base of the SBR tank leaving a clear liquor at the top, which is then decanted from the top of the SBR tank and transferred to the treated effluent storage tank. Treated wastewater then flows via gravity from the top overflow port to the WWTP Outfall via pipeline. An inline flowmeter monitors discharge volumes, and sample points are fitted on the WWTP for sampling influent and effluent water quality.

Sludge is removed from the SBR tank at the start of each decant cycle and transferred to the sludge storage tank prior to being transferred to the sludge screw press for dewatering. The sludge is then transferred to enclosed containers for transfer from the Island to the mainland for disposal. Poly-Aluminium Chloride is used in the process to precipitate phosphorous in the wastewater which is removed from the system to the sludge tank digester. Other chemicals used in the process include sodium hypochlorite, caustic soda, and poly sucrose.

The General Arrangement for the 206 EP WWTP is shown in Figure 5.

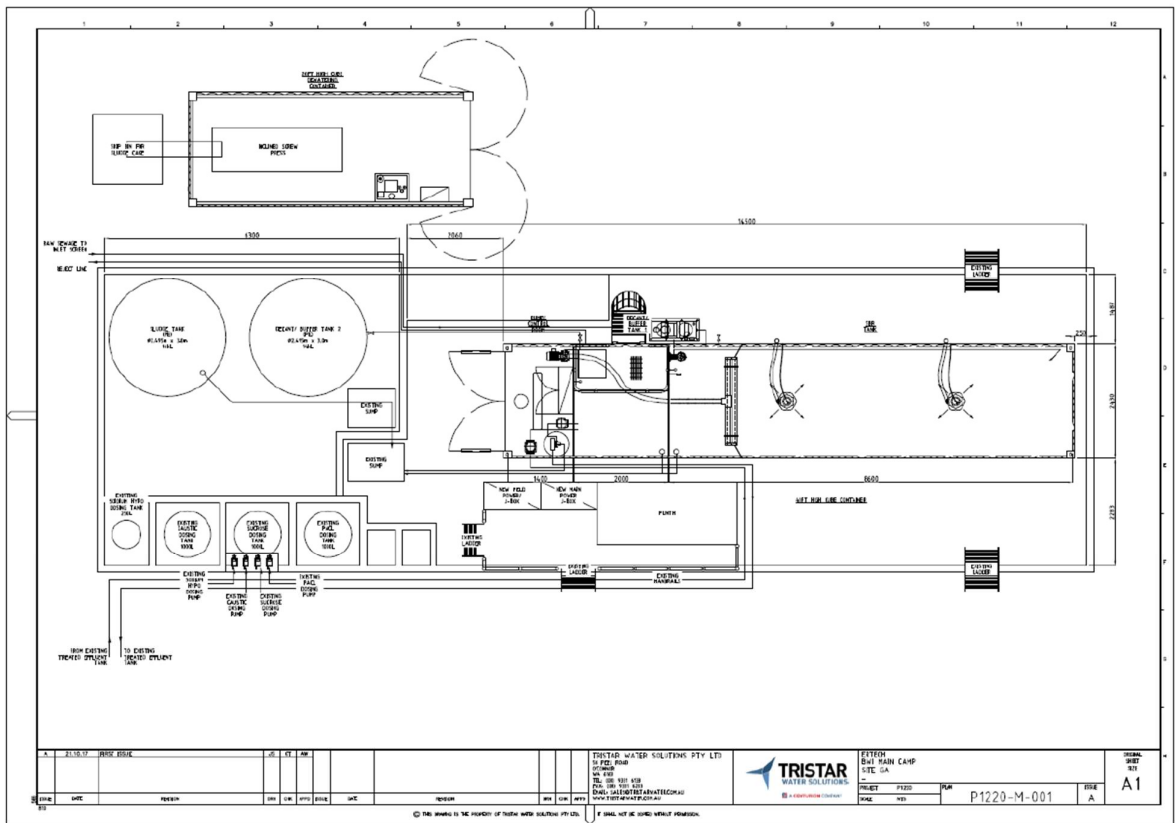


Figure 5: New Sewage Facility General Arrangement

4.1.4 Bioremediation Facility

Initial earthworks have been completed on a new BF that was approved in February 2013 under Works Approval W5261/2012/1 (now expired). Due to resource constraints, construction of the BF has not been finished and the Licence Holder is seeking approval via this licence amendment Application to vary the original design, finalise construction and commence operation of the facility.

The BF has been designed to treat low level hydrocarbon contaminated soils from leaks, spills and legacy sites associated with the WA Oil operations. No liquid hydrocarbon wastes or tank

bottom sludge will be treated at the BF. The facility is already bunded, and will be lined with a geosynthetic liner system including an impermeable stormwater management system. The permeability of the BF liner will be less than 2×10^{-10} m/s.

Runoff from the treatment cells will flow to the stormwater management system that will be located on the eastern side of the facility within the bund wall. The stormwater management system has been designed for a 1 in 20 year Average Recurrence Interval 72 hour storm event plus the 90 percentile wet season rainfall. The surface of the stormwater management system will allow for bobcat access to remove any silt or solids that may build up.

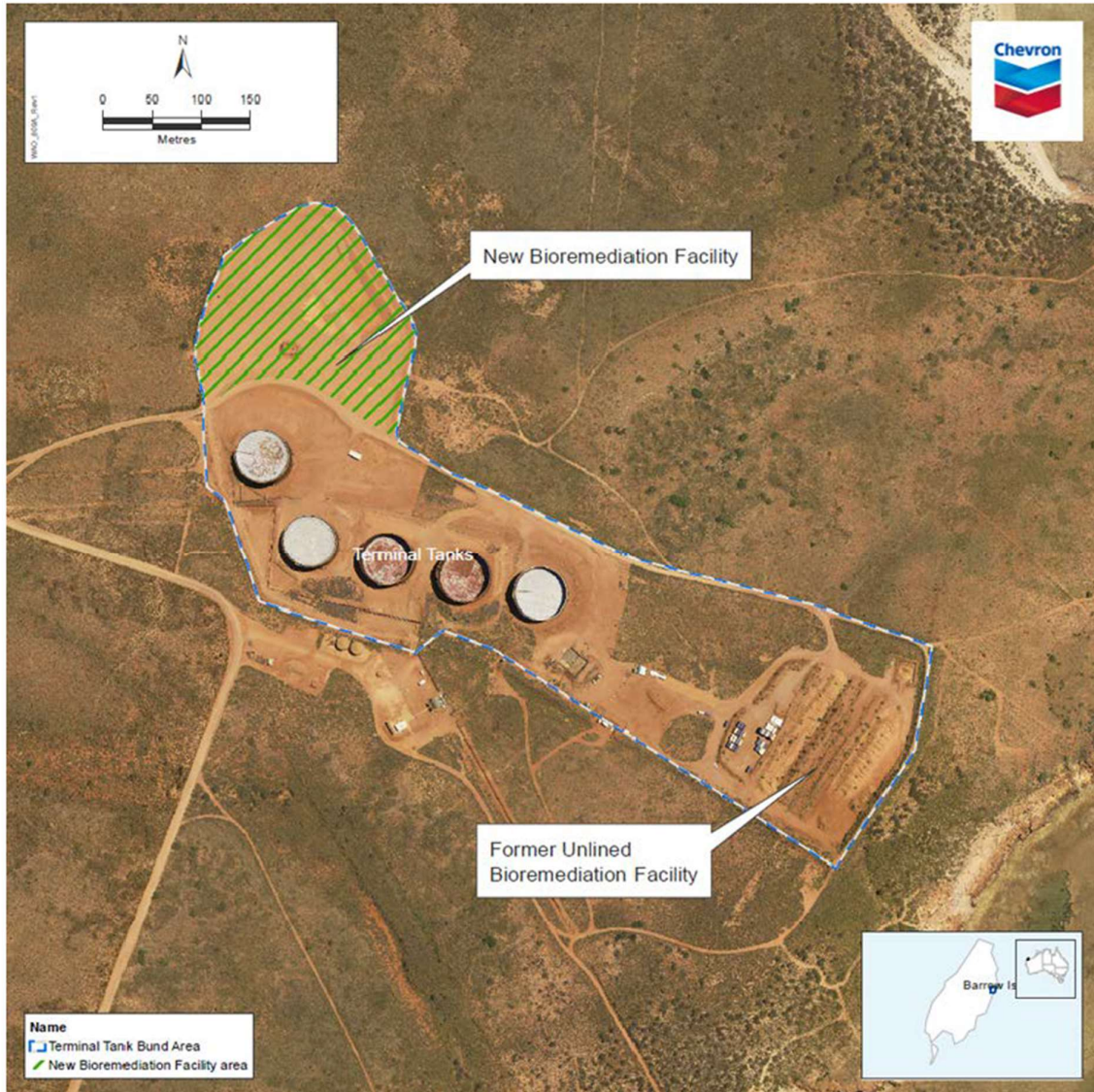


Figure 6: Location of new Bioremediation Facility on Barrow Island

4.2 Infrastructure

The Barrow Island Oil and Gas Facility infrastructure, as it relates to Category 10, 57 and 85 activities, is detailed in Table 4 and with reference to the Site Plan (attached in the Revised Licence).

Table 4 lists infrastructure associated with each Prescribed Premises Category.

Table 4: Barrow Island Oil and Gas Facility infrastructure

	Infrastructure	Site Plan Reference
	Prescribed Activity Category 10	
Oil and gas from wells separated and processed to produce oil and gas		
1	Approximately 450 Lufkin Oil wells and 271 injection wells	Figure 7
2	4 water source wells	Not shown
3	8 oil, gas and PFW separator stations	Figure 7
4	Waterflood stations and injectors	Figure 7
5	Terminal Tanks Facility: 5 crude bulk storage tanks (3 in use)	Figures 6 and 7
6	Central Processing Facility and flare	Figure 7
7	J Station flare	Figure 7
8	Central Power System (gas powered)	Not shown
9	Production flowlines, Waterflood flowlines	Not shown
10	Produced Water Disposal (PWD): 14 disposal wells with 2 currently in service	Figure 7
11	PFW Unit	Not shown
12	L71 Liquid Waste Disposal Facility	Figure 7
13	Terminal Stormwater Receiver	Not shown
	Prescribed Activity Category 57	
Used Tyre Storage of up to 300 tyres on the Premises		
1	Tyres will be stored in transportable waste receptacles and removed off the Island for recycling as required	Figure 3
	Prescribed Activity Category 85	
206EP WWTP to treat sewage generated by camp facilities		
1	Inlet pump and lift station	Figures 4 and 7
2	Balance/equalisation tank	
3	Raw sewage pump	
4	Chemical storage and metering systems	
5	Concrete bunds	
6	Treated effluent holding tank	

	Infrastructure	Site Plan Reference
7	Ocean discharge pipeline	
	Directly related activities	
Bioremediation facility to treat hydrocarbon contaminated soils associated with operation of the Premises		
1	Geosynthetic lined and banded bioremediation facility (3ha footprint) with associated stormwater management system	Figures 3 and 7
	Other activities	
1	WAPET Barge Landing and jetty	Figures 2 and 7
2	Accommodation camp facilities	Figures 2 and 7
3	Airport	Figures 2 and 7

L4467 PREMISES BOUNDARY

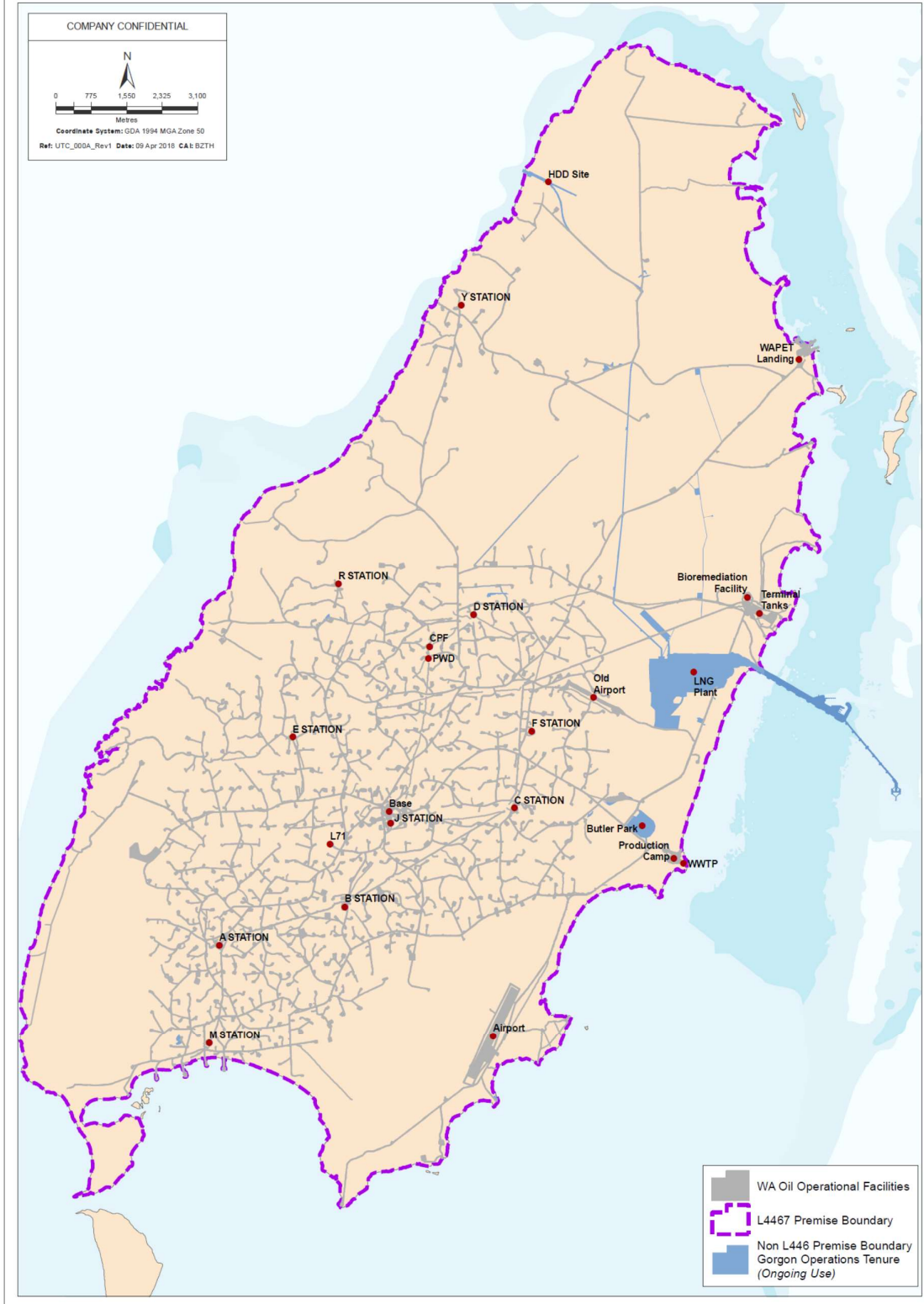


Figure 7: Barrow Island Oil and Gas Facility – Premises site plan

4.3 Exclusions to the Premises

As discussed above, the GGD operates under separate approvals and is therefore not considered in this assessment report. Activities associated with the airport, WAPET Barge Landing and accommodation facilities do not meet the definition of Prescribed Premises and are not considered further in this report.

5. Legislative context

Table 5 summarises approvals relevant to the assessment.

Table 5: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
<i>Petroleum and Geothermal Energy Resources Act 1967</i>	Petroleum Lease L1H(R2), Exploration Permits EP61(R7) and EP62(R7), Production Licence L10(R1) and Retention Lease R4	Department of Mines, Industry Regulations and Safety (DMIRS)	Titles for petroleum exploration and production in WA (onshore or internal waters) issued under this Act. Barrow Island Joint Venture Environment Plan (Rev. 16) approved by DMIRS on 15 May 2014.
<i>Petroleum (Submerged Lands) Act 1982</i>	Production Licence TL/3, Pipeline Licence TPL/9(R1) and Retention Lease TR/6	DMIRS	Titles for petroleum exploration and production in WA state waters issued under this Act.
<i>Environmental Protection Act 1986</i>	Licence L4467/1972/14		Prescribed premises licence issued under Part V of the EP Act
	Vegetation Clearing Permits CPS 123 for oilfield operations and maintenance; CPS 1422 and CPS 3802 both for infill drilling activities; and CPS 5083 for the asphalt batch plant.		Clearing Permits are issued under Part V of the EP Act for the clearing of native vegetation.

5.1 Contaminated sites

BWI was reported to the then DEC prior to the commencement of the *Contaminated Sites Act 2003*. The site classification is based on information submitted to the then DEC between December 1997 and November 2006. BWI is a Class A Nature Reserve (Reserve No. 11648) which has been the site of an active oilfield since 1964, an industry that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2001).

Historical practices within the oil BWI Island have resulted in a number of areas across the Island impacted by hydrocarbon contamination. DWER is aware of a number of contamination assessments for the 13 known areas of hydrocarbon soil and groundwater contamination on Barrow Island as a result of the BWI oilfield operations and there is the potential for other areas of the Island to be impacted by the operations.

5.2 Other relevant approvals

5.2.1 Department of Mines, Industry Regulation and Safety

DMIRS regulates onshore petroleum activities via administration of the *Petroleum and*

Geothermal Energy Resources Act 1967 (PGER Act), the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* (PGER Regulations) and the *Petroleum Pipelines Act 1969* (PP Act). In accordance with this legislation, oil and gas operators must submit an Environment Plan (EP) to DMIRS for approval. An EP is a management document designed to demonstrate that all environmental risks and impacts associated with a petroleum activity are reduced to As Low As Reasonably Practicable, and at all times carried out in a manner consistent with the principles of ecologically sustainable development.

DMIRS has approved the *Barrow Island Joint Venture Environment Plan (Revision 16)* (Chevron 2014) which is implemented by the Applicant in accordance with the above mentioned legislation.

The disposal of PFW is regulated under the PGER Regulations and is therefore managed by DMIRS as appropriate.

5.2.2 Department of Biodiversity, Conservation and Attractions

Department of Biodiversity and Conservation Attractions (DBCA) is responsible for administering the *Conservation and Land Management Act 1984* (CALM Act) and the *Wildlife Conservation Act 1950*. The CALM Act applies to Nature Reserves, including BWI, which is gazetted as a Class A Nature Reserve for the protection of native flora and fauna. The DBCA manages the Nature Reserve on behalf of the Conservation Commission of Western Australia.

5.3 Part V of the EP Act

5.3.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Licence Duration (August 2016)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

5.3.2 Clearing

Approximately 40m² (0.004 ha) of vegetation may need to be cleared for the upgraded sewage facility (for the sludge digester and dewatering area). If required, vegetation clearing will be undertaken in accordance with existing clearing permit CPS123/7. No clearing is approved under this Licence amendment.

6. Consultation

DWER sought comment from registered stakeholders associated with L4467/1972/14, including the Shire of Ashburton, DBCA, DMIRS and Environs Kimberley on 12 February 2018. The following comments were received:

- DBCA responded on 19 February 2018 indicating no concerns or objections to the Licence Holder's application to amend L4467/1972/14;
- DMIRS responded on 6 March 2018 advising that the Licence Holder:

- has obligations under the PGER Regulations requiring them to implement an approved Environment Plan specifying the maximum permissible concentration of PFW that is injected or re-injected into wells as a result of petroleum activities;
 - is required under regulation 34(2) and 34(3) of the PGER Regulations to monitor all emissions and discharges to any land, air, marine, seabed, sub-seabed, groundwater, sub-surface or inland waters environment either continuously, or at specified intervals (in accordance with the environment plan for the activity);
 - will be required to revise the Barrow Island Joint Venture Environment Plan (Revision 16, 030240006) to include the used tyre storage modifications, WWTP modifications and operation of the BF (as outlined in the licence amendment application), and submit this to DMIRS for assessment; and
 - DMIRS received the Barrow Island Joint Venture Environment Plan Bridging Document – Bioremediation Facility Construction (ABU170800792, Revision 2.0) on 9 January 2018 detailing the construction of the proposed facility. The bridging document has been assessed by DMIRS and was approved on the 5 February 2018.
- No other responses from stakeholders were received.

A copy of the draft Decision Report and Licence were provided to the Licence Holder for comment on 26 March 2018.

7. Location and siting

7.1 Siting context

BWI is located approximately 1,300km north of Perth and 56km from the mainland. Barrow, Boomerang, Mushroom, Pelican and Prince Islands form the BWI nature reserve. Boodie, Double and Middle Islands are a separate nature reserve that exists within close vicinity to BWI.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 6.

Table 6: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises	The closest residence is Mardie Station homestead located on the mainland approximately 70km south east of Barrow Island

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 7. Table 7 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has also been modified to align with the *Guidance Statement: Environmental Siting* (DER, 2016a).

Table 7: Environmental values

Specified ecosystems	Distance from the Premises
DBCA Legislated Lands and Waters	BWI is in itself a Class A Nature Reserve, as a result of its high conservation values. BWI is bordered to the west and south by Marine Park and Marine Management Areas.
Threatened Ecological Communities and Priority Ecological Communities	Multiple threatened Ecological Sites are registered on BWI.
Biological component	Distance from the Premises
Threatened/Priority Flora	There are several areas on BWI supporting Threatened/Priority flora species.
Threatened/Priority Fauna	There are multiple reptile, bird and mammal species occurring throughout BWI that are declared as Priority Fauna; including fauna listed as threatened: endangered, vulnerable, migratory birds protected under international agreements, conservation dependent and other specially protected fauna.
Other relevant ecosystem values	Distance from the Premises
Barrow Island Marine Park (high value ecosystem)	Bordering the mid-western portion of BWI.
Barrow Island Marine Management Area (high value ecosystem)	Bordering the western and southern portions of BWI.

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 8.

Table 8: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Watercourses/waterbodies	<p>Multiple medium and minor scale, non-perennial watercourses occur throughout BWI.</p> <p>Four areas subject to inundation (permanent freshwater seeps) occur on BWI, one in the north, one in the mid-west and two in the southern areas of the Island.</p>	<p>Water courses act as drainage lines during rainfall events.</p> <p>Permanent freshwater seeps are an important source of water for fauna throughout the year.</p>
Groundwater	<p>Two aquifers are located below BWI: the Flacourt Sands Aquifer which is a confined, saline aquifer located between 900m and 1,200m below ground level; and a shallow unconfined aquifer located within Tertiary limestone. The two aquifers are hydraulically separated from one another by a thick sequence of low permeability material (lower Gearle siltstone).</p>	<p>Water from the shallow unconfined aquifer if used for potable uses.</p> <p>Water from the confined Flacourt Sands Aquifer is used for process water.</p> <p>BWI is not in a proclaimed area under the <i>Rights in Water and Irrigation Act 1914</i>, as such no licence to take water is</p>

	<p>The shallow unconfined aquifer occurs across most of BWI and forms a lens of less saline groundwater floating upon denser, more saline seawater. Depth to this aquifer varies across the island to a maximum depth of approximately 53m below ground level in the centre of the Island.</p> <p>Source: Chevron 2018.</p>	<p>required.</p>
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7.5 Meteorology

7.5.1 Regional climatic aspects

BWI experiences an arid subtropical climate with very hot summers and moderate winters. Summer (October to March) experiences high temperatures (20–34°C), high humidity and predominantly southwest winds. Winter months (June to August) are characterised by moderate temperatures (17–26°C), fine weather and predominantly strong north-east to south-east winds. Tropical cyclones occur from November to April in the region with an average of two cyclones per year experienced on BWI (source: Chevron 2014).

7.5.2 Rainfall and temperature

Rainfall on BWI varies significantly from year-to-year and is dependent on rain-bearing low pressure systems, thunderstorms and tropical cyclone activity. The historic annual average rainfall for the area is 320mm.

During winter months rainfall is received from frontal systems passing to the south, and account for approximately 35 per cent of annual rainfall. In summer, cyclonic events range from storms of 300mm rainfall to milder 30mm rainfall events.

The annual evaporation rate is approximately 3,500mm for the region (based on records from the Dampier Salt Weather Station). Daily evaporation rates range from about 11mm/day during the summer months to 7mm/day during the winter months (source: Chevron 2014).

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Tables 9 and 10.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 9 and 10 below.

Table 9. Identification of emissions, pathway and receptors during construction

Risk Events					Continue to detailed risk assessment	Reasoning		
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
Construction of Bioremediation Facility	The Bioremediation Facility is partially constructed, with minor earthworks, placement of the liner system and formation of internal stormwater diversion bunds remaining.	Noise	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	The Delegated Officer has reviewed the design specifications and operational controls for the Bioremediation Facility which was previously approved for construction under works approval W5261/2012/1. The Delegated Officer considers that the environmental risks associated with the remaining works have not materially changed since the works approval was issued. Conditions will be included on the amended licence approving the remaining construction activities for the facility, including specifications for the liner system and stormwater management.	
		Dust						
	Construction, positioning and commissioning of WWTP	Noise	No residences or other sensitive receptors in proximity	Air / wind dispersion	Amenity impacts			No
		Dust						

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Construction of new modularised category 85 sewage facility	infrastructure	Discharges to water: during the commissioning period treated effluent will be discharged to the ocean via the existing outfall	Marine species inhabiting area surrounding outfall discharge pipe	Direct discharge to marine surface waters	Adverse impacts on the marine environment. During the commissioning phase seeding and establishment of biological processes will need to occur and effluent may not meet specified discharge water quality criteria targets.	Yes	See section 8.8

Table 10: Identification of emissions, pathway and receptors during operation

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Category 10: oil or gas production from wells	Production of oil from wells, separation and processing of oil	Discharge to Land: spills/leaks of oil	Ecosystems, soils and groundwater on the premises. Barrow Island Reserve is a specified ecosystem supporting a diverse range of flora and fauna, including a range of priority species and threatened communities. Depth to groundwater is approximately 53 mbgl.	Direct discharge to soils, seepage to groundwater	Contamination of soils. Reduction in groundwater quality / availability for dependent fauna and/or Vegetation.	Yes See section 8.4
	Separation and processing of gas; Flaring of excess gas	Discharge to air: discharges of gas	No residences or other sensitive receptors in proximity. Closest residence is 70km southeast.	N/A	None	No No receptor present.
	Separation and processing of PFW	Discharge to land: spills or leaks of PFW. Injection well failure	Ecosystems, soils and groundwater on the premises. Barrow Island Reserve is a specified ecosystem supporting a diverse range of flora and fauna, including a range of priority species and threatened communities.	Direct injection	Contamination of soils. Reduction in groundwater quality / Availability for dependent fauna and/or vegetation.	No Outside of scope. This activity is regulated by DMIRS under the <i>Petroleum and Geothermal Energy Resources (Environment) Regulations 2012</i>
	Operation of pumps and separators	Noise	No residences or other sensitive receptors in	Air / wind dispersion	Public health and amenity impacts	No No receptor present The EP Noise Regulations apply to noise

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
			proximity. Closest residence is 70km southeast.				emissions.
	Operation of Terminal Tanks Facility	Breach of containment causing hydrocarbon discharge to land	Ecosystems, soils, groundwater and marine environment adjacent to storage area. Barrow Island Reserve is a specified ecosystem supporting a diverse range of flora and fauna, including a range of priority species and threatened communities.	Direct discharge, seepage to groundwater and marine environment.	Soil contamination inhibiting vegetation growth and survival and health impacts to fauna. Groundwater contamination. Hydrocarbon discharge to marine environment.	Yes	See section 8.5
	L71 Liquid Waste Disposal Facility	Discharge to Land: spills / leaks / seepage of oily water to soils and groundwater in the area	Ecosystems, soils, groundwater and marine environment adjacent to storage area. Barrow Island Reserve is a specified ecosystem supporting a diverse range of flora and fauna, including a range of priority species and threatened communities.	Direct discharge, seepage to groundwater and marine environment	Soil contamination inhibiting vegetation growth and survival and health impacts to fauna. Groundwater contamination.	Yes	See section 8.6
	Bioremediation Facility	Discharge to land: spills / leaks / seepage of hydrocarbon contaminated stormwater to soils and groundwater		Direct discharge, seepage to groundwater and marine environment	Hydrocarbon (oily water) discharge to marine environment.	Yes	
Category 57 Used tyre storage	Storage of up to 300 used tyres in containers on the	Smoke from potential	No residences or other sensitive receptors in proximity	Air / wind dispersion	Amenity and public health impacts.	No	No receptor present.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Premises	fire (upset conditions)					
Category 85 Waste Water Treatment Plant operation	Treatment of sewage	Odour	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present
	Sewage pipes and holding tanks	Rupture of pipes / overtopping of holding tanks resulting in sewage discharge to land	Vegetation adjacent to discharge area	Direct discharge	Soil contamination inhibiting vegetation growth and survival	Yes	See section 8.7
	Disposal of treated effluent to marine environment via outfall	Treated effluent to marine environment	Marine species inhabiting area surrounding outfall discharge pipe	Direct discharge to marine surface waters	Adverse impacts on the marine environment and / or surface water drainage systems	Yes	See section 8.8

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 11 below.

Table 11: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 12 below.

Table 12: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> onsite impacts: catastrophic offsite impacts local scale: high level or above offsite impacts wider scale: mid-level or above Mid to long-term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> onsite impacts: high level offsite impacts local scale: mid-level offsite impacts wider scale: low level Short-term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> onsite impacts: mid-level offsite impacts local scale: low level offsite impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> onsite impacts: low level offsite impacts local scale: minimal offsite impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> onsite impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

[^] Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting*.

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines*.

“onsite” means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 13 below:

Table 13: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Discharge to land: spills / leaks of oil

8.4.1 Description of Discharge to land: spills / leaks of oil

Failure of oil production wellheads, pipelines carrying oil and spills or leaks from processing and separation equipment on the Premises may result in direct discharges of oil to land.

8.4.2 Identification and general characterisation of emission

Crude oil is a toxic substance, comprised mainly of hydrocarbons and other constituents including heavy metals, monocyclic aromatic hydrocarbons (BTEX) and polycyclic aromatic compounds (PAH's).

8.4.3 Description of potential adverse impact from the emission

Spills or leaks of these substances as a result of abnormal operating conditions could potentially cause contamination of soils and infiltrate groundwater, degrading the quality of groundwater and impacting beneficial uses as well as harming dependent vegetation and / or fauna in the area. There are multiple threatened and priority ecological communities, flora and fauna found on BWI.

8.4.4 Criteria for assessment

Relevant land and groundwater quality criteria include:

- Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000) provides fresh and marine water criteria; and
- Assessment and Management of Contaminated Sites (DER 2014) provides ecological and

human health assessment levels for soil.

8.4.5 Licence Holder controls

The Licence Holder implements an Asset Integrity Management System (AIMS) which provides the framework for integrity programs necessary to achieve a level of assurance with respect to containment and integrity. Programs covered by the AIMS include Corrosion Management, Pipeline Integrity and Well Integrity. This includes flow and pressure monitoring and flowline integrity testing at regular intervals.

In addition to the AIMS, the Licence Holder has in place the following engineering and management controls to reduce and manage potential discharges of oil to land which are set out in Table 14 below.

Table 14: Licence Holder controls for managing the risk of discharges to land: spills / leaks of oil.

Control	Description ¹
Engineering	<ul style="list-style-type: none"> • All PFW tanks, oil storage tanks and chemical storage areas are banded with impervious lining (HDPE or concrete). Bunds are sized to accommodate 110% of the capacity of the largest tank in the bund; • Storage areas and tanks comply with Australian Standard 1940:2017: <i>The storage and handling of flammable and combustible materials</i>; • Pipelines are installed above ground and positioned along access tracks enabling leaks to be readily detected (with the exception at road crossings or Gorgon right of way crossings where lines are wrapped and buried to a minimum of 300mm); and • Each well is situated in an open area, on a cleared and compacted gravel pad.
Management / Procedures	<ul style="list-style-type: none"> • Any spills of oil or chemicals from within banded areas are recorded / reported as appropriate and immediately cleaned up; • Any contaminated soil is removed and stored in an impervious bund or appropriate container, prior to being taken offsite for disposal at a licensed facility; • Spill kits are located on site to clean up any spills/leaks of hazardous materials; • Flow and pressure monitoring and flowline integrity testing are conducted at regular intervals; • Each well is tested monthly and a well failure and maintenance history is maintained; • Quarterly groundwater monitoring for Total Recoverable Hydrocarbons and additional parameters is conducted across the Premises to detect any potential impacts from petroleum operations; and

Control	Description ¹
	<ul style="list-style-type: none"> Any contaminated stormwater generated within bunds or sumps is either treated through oil/water separators (Stormceptors) or removed by vacuum truck and taken to the L71 Evaporation Ponds for treatment.

Note 1: Information sourced from the Application (Chevron 2018) and Environment Plan (Chevron 2014).

8.4.6 Key findings

The Delegated Officer has reviewed the information regarding discharges to land: spills / leaks of oil and has found:

The Licence Holder has comprehensive engineering and management controls to reduce the potential for direct discharges of oil to the environment. These controls will be captured on the licence in accordance with DWER's *Guidance Statement: Risk Assessments* (DER 2017a) which specifies that a Licence Holder's controls will be conditioned as they lower the assessed likelihood of the risk event.

8.4.7 Consequence

The Delegated Officer considers that leaks or spills of oil have the potential to result in localised soil contamination, terrestrial vegetation impacts and groundwater impacts (mid-level on-site impacts). BWI is a Class A Nature Reserve with significant conservation values. Therefore, the Delegated Officer considers the consequence to be **moderate**.

8.4.8 Likelihood of Risk Event

The Delegated Officer considers the likelihood of hydrocarbons and chemicals impacting on receptors as a result of a spill or containment failure is **unlikely** when the Licence Holder's controls are implemented.

8.4.9 Overall rating of spills or leaks of oil

The Delegated Officer has compared the consequence and likelihood ratings described above for the Risk Criteria (Table 11) and determined that the overall rating for the risk of Discharges to land on sensitive receptors during operation is **medium**.

8.5 Risk Assessment – Breach of containment: Terminal Tanks Facility

8.5.1 Description of breach of containment: Terminal Tanks Facility

The TTF was constructed in the 1960's to enable storage of processed crude oil pending load-out to offshore tankers for export shipment. Historical operation of the TTF has resulted in contamination of the soils and groundwater in the local area.

Of the five tanks at the TTF, only three tanks, T301, T304 and T305 are currently used to store crude oil. The three tanks in use each have a capacity of 31,800,000L giving a total combined storage capacity of up to 95,400,000L.

Breach of containment at the TTF may result in a significant release of large volumes of hydrocarbons into the surrounding environment, exacerbating existing contamination levels.

8.5.2 Identification and general characterisation of emission

Crude oil is a toxic substance, comprised mainly of hydrocarbons and other constituents including heavy metals, monocyclic aromatic hydrocarbons (BTEX) and polycyclic aromatic compounds (PAH's).

8.5.3 Description of potential adverse impact from the emission

Spills or leaks of these substances as a result of breach of the containment infrastructure at the TTF could potentially cause additional contamination of soils and infiltrate groundwater, degrading the quality of groundwater and impacting beneficial uses as well as dependent vegetation and / or fauna. There are multiple threatened and priority ecological communities, flora and fauna found on BWI. The location of the TTF (~500 m from the marine environment and adjacent to turtle nesting beaches / mangrove areas) could also cause adverse impacts to the marine environment and associated ecosystem values as a result of direct discharge via overland spills, or through discharge of contaminated groundwater to the marine environment.

8.5.4 Criteria for assessment

Relevant land and groundwater quality criteria include:

- Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000) provides fresh and marine water criteria; and
- Assessment and Management of Contaminated Sites (DER 2014) provides ecological and human health assessment levels for soil.

The TTF has been classified by the former DER as 'Contaminated – remediation required' under the *Contaminated Sites Act 2003*. Historical oil storage practices at the TTF have resulted in localised impacts to groundwater (contamination) requiring management in accordance with DER's Contaminated Sites Management Series guidance. A monitoring regime for the TTF is conducted in accordance with the 'Barrow Island Terminal Tanks - Site Management Plan' (Chevron/Golder Associates 2015) (SMP) which has been endorsed by the Licence Holder's accredited Contaminated Sites Auditor.

The Contaminated Sites Auditor has produced a Mandatory Auditor's Report (Senversa, July 2016) that provides a review of the TTF contamination and monitoring reports, including the SMP. As a result of the Auditor's recommendations in the MAR, the Licence Holder applied to amend L4467/1972/13 to update groundwater monitoring requirements to reflect the SMP. DWER amended L4467/1972/14 in March 2017 to reflect the SMP based on conclusions by the Auditor that the contamination status of the Terminal Tanks Facility has been thoroughly characterised and verified through many years of monitoring, and that under current conditions and site use, there are no unacceptable risks to human or environmental receptors as a result of existing contamination on the Premises.

8.5.5 Licence Holder controls

This assessment has reviewed the controls set out in Table 15 below.

Table 15: Licence Holder's controls for operation of Terminal Tanks Facility

Site infrastructure	Description
Terminal Tanks Facility	TTF is located within a compacted earthen bund with permeability of approximately 1×10^{-4} m/s.
	Regular inspection of tank liners and pipelines – a tank leak detection and level monitoring system is in place in addition to regular flow and

Site infrastructure	Description
	pressure monitoring of the piping and flowline integrity testing.
	TTF designed to withstand a Category 5 Region D cyclone.
	<p>TTF Stormwater management:</p> <ul style="list-style-type: none"> • Each tank is fitted with hoses which connect stormwater drain receptors on the roof to a sump at the bottom of each tank. Stormwater collected in the sumps flows to the Terminal Stormwater Receiver (TSR) via gravity. The TSR is a concrete pond and has bird-proof netting and a stock proof fence; • Contaminated stormwater from the TSR is then taken to the L71 Evaporation Ponds via vacuum truck; and • Uncontaminated (clean) stormwater in the TSR is released to the environment, in accordance with site procedures.
	<p>Barrow Island Terminal Tanks - Site Management Plan</p> <p>The SMP is an overarching document outlining the strategy and management structure for monitoring change and managing existing Phase Separated Hydrocarbons (PSH) removal activities associated with contaminated groundwater at the site. The revised monitoring regime comprises:</p> <ul style="list-style-type: none"> • Biannual monitoring of 18 monitoring wells with monitoring events conducted at the end of the wet season (May) and at the end of the dry season (November); • Measurement of depth to groundwater and the presence / absence of PSH using an oil / water interface probe; • Where PSH is not present, representative groundwater samples are collected using a methodology in general accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended in April 2013) (the 'NEPM'); • Analysis of groundwater samples by a NATA accredited laboratory for Total Recoverable Hydrocarbons (TRH) and Poly Aromatic Hydrocarbons (PAH) if TRH is reported at concentrations above the Limit of Reporting; and • Annual reporting of groundwater monitoring to DWER.

8.5.6 Key findings

The Delegated Officer has reviewed the information regarding operation of Terminal Tanks Facility and has found:

1. Existing contamination at the TTF is being managed generally in accordance with the requirements of the *Contaminated Sites Act 2003*;
2. The groundwater monitoring regime in place (as recommended by independent auditor) was reviewed by the former DER Industry Licensing function to determine that it is appropriate to detect impacts from ongoing operations;
3. The Existing Licence was amended in March 2017 to incorporate updated groundwater monitoring regime; and

4. The Licence Holder implements regular inspection and testing of flowlines at the TTF and the rest of the Premises.

8.5.7 Consequence

The Delegated Officer notes the existing contamination status of the TTF which has been well characterised by the Licence Holder in collaboration with an independent Contaminated Sites Auditor. However, if a major breach of containment from the TTF was to occur, then this may cause short-term impact to an area of high conservation value or special significance. Therefore, the Delegated Officer considers the consequence of breach of containment from the TTF on BWI to be **major**.

8.5.8 Likelihood of Risk Event

The Delegated Officer has determined that a breach of containment from the TTF will probably not occur in most circumstances, due to the Licence Holder's controls outlined in Table 15 above. Therefore, the Delegated Officer considers the likelihood of breach of containment from the TTF to be **unlikely**.

8.5.9 Overall rating of breach of containment: Terminal Tanks Facility

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 11) and determined that the overall rating for the risk of breach of containment from the TTF is **medium**.

8.6 Risk Assessment – spills or leaks of oily water / contaminated stormwater

8.6.1 Description of spills or leaks of oily water / contaminated stormwater

Operation of the L71 Liquid Waste Disposal Facility and the Stormwater Management System within the Bioremediation Facility may result in discharges of oily water / stormwater during abnormal operating conditions. Wastewater / stormwater storage facilities could overflow during high rainfall events or liners could fail resulting in discharge of low levels of hydrocarbons to soils and groundwater in the local area. Similarly, oil processing areas and workshops on the Premises may generate hydrocarbon contaminated stormwater from minor leaks / spills of oil over time.

8.6.2 Identification and general characterisation of emission

Oily waters and contaminated stormwater generated within oil processing areas and the BF would comprise mainly water containing some hydrocarbons and other substances including heavy metals, Monocyclic Aromatic Hydrocarbons (BTEX) and Polycyclic Aromatic Compounds (PAH's) which are known toxicants. Contaminated stormwater is also likely to contain sediment.

8.6.3 Description of potential adverse impact from the emission

Discharges of oily water / contaminated stormwater as a result of abnormal operating conditions could potentially cause contamination of soils and infiltrate groundwater, degrading the quality of groundwater and impacting beneficial uses and may also harm dependent vegetation and / or fauna.

8.6.4 Criteria for assessment

Relevant land and groundwater quality criteria include:

- Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000) provides fresh and marine water criteria; and
- Assessment and Management of Contaminated Sites (DER 2014) provides ecological and human health assessment levels for soil.

8.6.5 Licence Holder controls

This assessment has reviewed the controls set out in Table 16 below.

Table 16: Licence Holder's controls for spills / leaks of oily water / contaminated stormwater

Site infrastructure	Description
Processing areas, including workshops and washdown facilities	Stormwater pollution interceptors (Stormceptors) are in place to manage drainage from the Base facilities and direct drainage to the L71 Evaporation Ponds. Potentially contaminated stormwater from the J Station Processing Facilities, the Compressor Station, Base Area workshops and vehicle washdown facilities flows through a drainage system to the Stormceptors and then onto the J Station interceptor (which is also a Stormceptor). Stormceptors separate oil from water and trap the oil inside the vessel, including in high rainfall events.
L71 Liquid Waste Facility	Comprised of two 20m x 40m x 2m deep, fenced evaporation ponds (total storage capacity 1,990m ³ excluding freeboards). The ponds are lined with two HDPE layers (bottom layer is 1mm thick; top layer is 1.5mm thick). A water collection mesh is located between the two layers.
	The evaporation ponds were designed according to expected evaporation rates, rainfall and liquid waste quantities. Water levels are maintained with a minimum of 900 mm freeboard to ensure they do not overflow during cyclonic rain events.
	Liquids from Pond 1 can be disposed back into the production process through the L61 Production Flowline and back to J Station. Here they mix with the oil and water from the Separator Stations before being pumped to the CPF. This process can also be employed during high rainfall events to avoid overtopping. Water is pumped from Pond 2 to Pond 1 and then transferred to J Station.
	Groundwater monitoring wells are located around the L71 facility and are samples and analysed quarterly for hydrocarbons and metals.
	A Spray Ramp measuring 10m x 20m and is located between the two ponds and is used for aeration to enhance evaporation of the oily wastewater.
	A washdown pad with silt trap and oil/water separator is located at the L71 facility. All liquids on the washdown pad flow into the trench which is directed to the sand pit of the oil/water separator. A concrete bund collects sediment wastes and sludge from the silt trap which are removed by a front-end loader and tested prior to mainland disposal. Any separated oil is removed by vacuum

Site infrastructure	Description
	<p>tanker and injected into the production process at the CPF.</p> <p>Vacuum tankers discharge their loads to a 200bbl tank which acts as a balance storage tank. The tank is fitted with a level indicator to prevent overfilling.</p>
Bioremediation Facility	<p>The base and bunding of the BF will be lined to achieve a permeability of less than 2×10^{-10} m/s in accordance with <i>Water Quality Protection Note 26: Liners for containing pollutants, using synthetic membranes</i> (WQPN 26) (Department of Water, 2009). The liner will be placed in an anchor trench within the crest of the peripheral bund to maintain integrity and ensure the liner is securely fixed.</p> <p>Runoff from the BF treatment cells will flow to an impermeable (lined) stormwater management facility designed to contain a 1:20 year average recurrence interval (ARI) 72 hour storm event, with a minimum 0.5m freeboard. Water from the BF stormwater will not be used for irrigation, rather in the interim operation period will be tested for suitability of reuse.</p> <p>Groundwater monitoring of existing down-gradient wells (GW82, GW83 and GW85) will be monitored annually for depth to groundwater and analysis hydrocarbons (including BTEX and PAH).</p>

The Delegated Officer has reviewed the design specifications and operational controls for the BF which was approved for construction under works approval W5261/2012/1. The Delegated Officer notes the Licence Holder is requesting to operate the BF under an Interim operational methodology for approximately 12 months to allow assessment of watering requirements for optimal moisture content and to inform the permanent irrigation system design. A variety of chemical and organic (liquid and solid) fertilisers will be trialled to enhance microbial treatment of contaminated material and facility layout and windrow arrangements may be adjusted over time to optimise facility operation. During the Interim operations monthly tilling of windrows will occur and hydrocarbon degradation rates will be monitored.

The Licence Holder has proposed annual monitoring of groundwater for hydrocarbons and groundwater levels at the BF. The Delegated Officer has reviewed the design capacity and location of the facility and notes there is some uncertainty as to the volumes and concentrations of contaminated material that will be treated at the BF each year. The Delegated Officer considers annual monitoring of groundwater proposed by the Licence Holder is not sufficient to detect any potential issues with the liner or stormwater management systems in a timely manner. The Delegated Officer considers that quarterly monitoring of groundwater is more appropriate for initial operations in order to validate the effectiveness of the pollution controls (liner and stormwater management systems) and to detect any potential impacts to groundwater from possible (but unlikely) discharges of hydrocarbon contaminated stormwater or leachate from the new BF. Validation monitoring is a standard requirement for new pollution control equipment approved under EP Act works approvals and licences and is in accordance with DER *Guidance Statement: Setting Conditions* (DER 2015b).

Quarterly monitoring is also consistent with the frequency of monitoring conducted at other liquid waste / chemical storage facilities on the Premises, such as the L71 Liquid Waste Facility and the Warehouse and adjacent hazardous materials storage. Once the period of Interim operations has finished, and the Licence Holder can validate the effectiveness of the BF liner and stormwater management systems via groundwater monitoring data, the Licence

Holder may choose to apply to DWER to amend licence L4467/1972/14 to reduce the groundwater monitoring frequency at the BF.

8.6.6 Key findings

The Delegated Officer has reviewed the information regarding spills or leaks of oily water / contaminated stormwater and has found:

1. Comprehensive internal procedures have been put in place by the Licence Holder to manage oily water and contaminated stormwater, in addition to appropriately constructed and maintained facilities.
2. The Bioremediation Facility will be operated for the first year under an Interim methodology to serve as a field trial for determining optimal facility layout and effective bioremediation processes. The Delegated Officer has reviewed the design capacity and location of the BF and considers quarterly monitoring of groundwater is warranted to validate the effectiveness of the pollution controls to be installed at the new facility.

8.6.7 Consequence

If spills or leaks of oily water or contaminated stormwater discharge occurs on the Premises, then the Delegated Officer has determined that the impact of will be low-level on-site impacts and minimal off-site impacts. Therefore, the Delegated Officer considers the consequence of spills or leaks of oily water or contaminated stormwater to be **minor**.

8.6.8 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of spills or leaks of oily water or contaminated stormwater discharges occurring will probably not occur in most circumstances, as a result of the Licence Holders controls. Therefore, the Delegated Officer considers the likelihood of spills or leaks of oily water / contaminated stormwater to be **unlikely**.

8.6.9 Overall rating of spills or leaks of oily water / contaminated stormwater

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 11) and determined that the overall rating for the risk of spills or leaks of oily water / contaminated stormwater discharge is **medium**.

8.7 Risk Assessment – Rupture of pipes, overflows from sewage treatment tanks

8.7.1 Description of rupture of pipes, overflows from sewage treatment tanks

Sewage pipelines feeding the WWTP or transferring treated effluent from the WWTP to the ocean outfall may fail due to a mechanical problem with the pipeline or due to damage incurred from mobile mechanical plant.

Process control errors or faults, or blocked screens due to poor maintenance may result in overtopping of individual tanks within the WWTP. The tanks of the Sequence Batch Reactor WWTP are part of a containerised system. Balance tanks are also available to provide extra capacity where there are spikes in water use.

8.7.2 Identification and general characterisation of emission

Sewage from the accommodation camp facilities will be treated in the WWTP. The capacity of the WWTP is 45.3 m³ per day and the raw wastewater meets the typical composition of domestic sewage; that being, Total Nitrogen (TN) concentrations at around 73mg/L, Total Phosphorus (TP) concentrations at around 12mg/L, Biochemical Oxygen Demand (BOD) at around 248mg/L and Total Suspended Solids (TSS) at around 197mg/L.

8.7.3 Description of potential adverse impact from the emission

Partially or completely untreated sewage that may be released from overtopping of the WWTP tanks may cause localised soil contamination.

Pipeline failures may also release untreated or treated sewage to land, inundating the soil. As native vegetation has adapted to thrive in low nutrient environments, the impact of a discharge to vegetation would likely be adverse as a result of high nutrient levels in the sewage.

8.7.4 Criteria for assessment

The Licence Holder has used treated effluent targets defined in the Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, *Australian Guidelines for Sewerage Systems – Effluent Management* (ARMCANZ/ANZECC 1997).

8.7.5 Licence Holder controls (from Application)

This assessment has reviewed the controls set out in Table 17 below.

Table 17: Licence Holder’s controls for rupture of pipes, overflows from sewage treatment tanks

Site infrastructure	Description
New WWTP	All tanks have secondary containment to capture any leaks / spills / overflows. Tanks are either located within a concrete bund, or those that form part of the SBR process are located within a sea container providing some internal secondary containment.
	The WWTP has a 115kL balance / equalisation tank to provide buffering capacity fitted with a submersible pressure transmitter for online monitoring of sewage level in the tank.
	A submersible level transmitter continuously monitors sewage levels in the treated wastewater storage tank.
	A screw compactor screening system is in place to screen material greater than 2mm diameter. The WWTP will be programmed to automatically clear the screen (via the screw mechanism) to remove solids from the screen. An emergency manual bypass screen is also available in the event that the main screen becomes blocked.
	The WWTP will be commissioned for 3 months to allow testing, calibration and inspection of all equipment. This process will ensure the WWTP is effectively treating the wastewater and that no discharges from any component is likely to occur. A commissioning report will be submitted to DWER within 6 weeks of completion of commissioning.

8.7.6 Consequence

If release of partially or untreated effluent to land occurs, native vegetation may be impacted with possible impacts to birds or other fauna if they come into contact with the effluent. The Delegated Officer has determined that the impact of the discharge will be **moderate**.

8.7.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of discharge of untreated, partially treated or treated effluent to land occurring will be **unlikely**.

8.7.8 Overall rating of rupture of pipes, overflows from sewage treatment tanks

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 11) and determined that the overall rating for the risk posed by failure of sewage pipelines and overtopping from the WWTP is **medium risk**.

8.8 Risk Assessment – Disposal of treated effluent to marine environment

8.8.1 Description of disposal of treated effluent to marine environment

The WWTP will treat sewage generated from accommodation and office facilities on BWI for discharge to the marine environment via an ocean discharge pipeline. The discharge point is located approximately 300m offshore from Camp Point on the eastern side of BWI.

Under normal operating conditions, treated effluent targets are expected to meet discharge quality specifications cited in *Australian Guidelines for Sewage Systems – Effluent Management* (AARMCANZ/ANZECC 1997), shown in Table 18 below. The Licence Holder has adopted 'Category C' treatment process category specified in these guidelines which is generally suitable for discharge to marine waters.

Table 18: WWTP treated effluent targets (from Application)

Parameter	Units	Effluent Targets^
BOD	mg/L	<20
TN	mg/L	<50
TP	mg/L	<12
TSS	mg/L	<40
pH	pH units	6.5-8.5
E Coli	Cfu/100ml	<10 ⁶
Chlorine	mg/L	n/a

Commissioning: after the WWTP has been constructed the Licence Holder will commission the system for a period of three months to allow testing and calibration of the infrastructure and development of the biological treatment processes. The WWTP module will be manufactured and tested in Perth prior to shipment to BWI. Based on advice from the contractor, WWTPs typically reach steady state operations between 4-8 weeks of start-up.

However, the Licence Holder has requested a three month commissioning period to ensure sufficient time to rectify any issues which may arise. During this time it is possible that the treated effluent may not meet the effluent quality treatment targets adopted by the Licence

Holder.

During the commissioning phase the Licence Holder will sample treated effluent from the WWTP on a weekly basis for analysis by a NATA accredited laboratory. If targets treatment levels are exceeded, additional samples will be collected to verify the results. If the problem cannot be rectified the wastewater will be transferred to the Harry Butler Accommodation Village for disposal to the Butler WWTP until the issue can be corrected.

A commissioning report will also be submitted to DWER six weeks post commissioning. The Commissioning Report will include the effluent sampling results during commissioning summarised against the design treatment targets and if the design specifications are not met, measures proposed (including timeframes) for meeting the design specifications.

DWER will review the Commissioning Report to ensure the discharge meets the effluent quality targets outlined in Table 18.

Operation: once the WWTP has been commissioned and the treatment process has reached steady state, it is expected treated wastewater quality will meet Category C treatment levels suitable for discharge to the marine environment.

8.8.2 Identification and general characterisation of emission

Typical water quality of untreated sewage flows to the WWTP will include TN concentrations around 73mg/L, TP concentrations around 12mg/L, BOD around 248mg/L and TSS at around 197mg/L. Up to 45.3m³ per day will be treated and discharged from the WWTP. Under normal operating conditions, treated wastewater is expected to meet water quality criteria outlined in Table 18.

8.8.3 Description of potential adverse impact from the emission

If the WWTP is not operated and maintained correctly, the discharge of effluent may not meet the expected water quality criteria. If effluent discharged is of poor quality there may be impacts to adjacent surface water drainage systems or impacts to marine species inhabiting area surrounding outfall discharge pipe. Impacts may occur as a result of high nutrients in the discharge (localized eutrophication) or from high levels of bacteria (*E. coli*) or other toxicants (e.g. from chlorine or alum dosing) potentially impacting on marine biota.

8.8.4 Criteria for assessment

The Applicant has used treated effluent targets defined in the Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, *Australian Guidelines for Sewerage Systems – Effluent Management* (ARMCANZ/ANZECC 1997). Wastewater treated to Category C levels (secondary treatment) are generally suited for discharge to coastal waters nearshore.

8.8.5 Licence Holder controls

This assessment has reviewed the Licence Holder's controls set out in Table 19 below.

Table 19: Licence Holder's proposed controls for disposal of treated effluent to marine environment

Site infrastructure	Description
206 EP WWTP	Sequence Batch Reactor process can cope with variable untreated effluent flow conditions and maintain effective treatment processes

Site infrastructure	Description
	Phosphorus precipitated via automatic addition of Poly-Aluminium Chloride
	Sewage sludge is regularly and automatically transferred to sludge storage tank to maintain capacity in treatment tanks and optimal levels for treatment to occur. Sludge will be taken to the mainland for disposal to a licensed facility.
	Three month commissioning period to enable testing and calibration of the WWTP components and to allow time for steady state operations to be reached
	Quarterly testing of treated effluent for parameters listed in Table 18.

8.8.6 Key findings

The Delegated Officer has reviewed the information regarding disposal of poorly treated effluent to marine environment and has found:

1. The Applicant will commission and operate the WWTP to produce treated effluent which is capable of meeting class C (secondary treatment) levels, which is minimum standard of treatment recommended for disposal to the marine environment in the *Australian Guidelines for Sewerage Systems – Effluent Management* (ARMCANZ/ANZECC 1997).
2. Effluent quality will be monitored on a quarterly basis to ensure the quality continues to meet class C at point of discharge.
3. Additional potential contaminants of concern may be present in the wastewater, including aluminium (an additive used for precipitation of phosphorus), oil and grease and anionic surfactants (found in cleaning products). The Delegated Officer therefore considers that these parameters should be monitored in the discharge, in addition to those parameters outlined in Table 18.

8.8.7 Consequence

Should the treated wastewater discharged to the marine environment not meet Category C (secondary treatment) levels (as outlined in Table 18), then the Delegated Officer has determined that the impact of this will be low level offsite impacts at the local scale. Therefore, the Delegated Officer considers the consequence to be **moderate**.

8.8.8 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of the discharge not meeting Category C (secondary treatment) levels to marine environment occurring will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **unlikely**.

8.8.9 Overall rating of Disposal of treated effluent to marine environment

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 11) and determined that the overall rating for the risk of disposal of poorly treated effluent to marine environment is **medium**.

8.9 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 20 below. Controls are described further in section 9.

Table 20: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway/ Receptor (Impact)			
1.	Discharge to land: spills / leaks of oil	Failure of oil production wellheads, pipelines carrying oil and spills or leaks from processing and separation equipment	Adverse impacts to ecosystems, soils and groundwater on the premises.	Infrastructure and management controls.	Moderate consequence Unlikely Medium risk	Acceptable subject to proponent controls conditioned
2.	Terminal Tanks Facility – discharge of crude oil	Breach of containment	Adverse impacts to ecosystems, soils and groundwater on the premises.	Infrastructure and management controls.	Major consequence Unlikely Medium risk	Acceptable subject to proponent controls conditioned
3.	Spills or leaks of oily water / contaminated stormwater	Oily water / contaminated stormwater from within bunds and sumps	Direct discharge to soils, seepage to groundwater	Concrete hardstands, bunded areas, impervious liners, drains and Stormceptors	Minor consequence Unlikely Medium Risk	Acceptable.
4.	Untreated / partially treated sewage	Rupture of pipes, overflows from sewage treatment tanks	Direct discharge to soils, impacts to vegetation health from high nutrients	Concrete hardstands, bunded areas, containerised SBR system, commissioning process, regular inspections	Moderate consequence Unlikely Medium risk	Acceptable subject to proponent controls conditioned
5.	Discharge of treated effluent to marine environment	New WWTP	Direct discharge to marine environment causing impacts to adjacent surface water drainage systems and / or marine species inhabiting the area	Quarterly treated effluent monitoring	Moderate consequence Unlikely Medium risk	Acceptable subject to proponent controls conditioned

9. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 21. The risks are set out in the assessment in section 8 and the controls are detailed in this section. DWER will determine controls having regard to the adequacy of controls proposed by the Licence Holder (DER 2017a). The conditions of the Licence will be set to give effect to the determined regulatory controls.

Table 21: Summary of regulatory controls to be applied

		Controls (references are to sections below, setting out details of controls)			
		9.1.1 Infrastructure and equipment	9.1.2 Specified action - WWTP	9.1.3 Monitoring	9.1.4 Reports
Risk Items (see risk analysis in section 8)	Discharge to land: spills / leaks of oil	●		●	●
	Terminal Tanks Facility – discharge of crude oil	●		●	●
	Spills or leaks of oily water / contaminated stormwater	●		●	●
	Untreated / partially treated sewage	●	●	●	●
	Discharge of treated effluent to marine environment		●	●	●

9.1 Licence controls

9.1.1 Spill infrastructure and equipment

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for oil spill and contaminated stormwater management:

- Quarterly groundwater monitoring for Total Recoverable Hydrocarbons (TRH) and additional parameters is conducted across the Premises to detect any potential impacts from petroleum operations;
- Any contaminated stormwater generated within bunds or sumps is either treated through oil/water separators (Stormceptors) or removed by vacuum truck and taken to the L71 Evaporation Ponds for treatment; and
- The L71 Evaporation Ponds must be operated such that:
 - Overtopping of the ponds does not occur;

- A freeboard equal to, or greater than, 300mm is maintained; and
- The integrity of the containment infrastructure is maintained.

The following environmental controls, infrastructure and equipment should be maintained and operated at the TTF:

- TTF is located within a compacted earthen bund with permeability of approximately 1×10^{-4} m/s;
- Six-monthly groundwater monitoring for Phase Separated Hydrocarbons (PSH) of 19 bores around the TTF is required under licence conditions. If no PSH is detected, a suite of standard ions as well as TRH is required to be performed. Should TRH be present, then Licence Holder is also required to sample for Poly Aromatic Hydrocarbons (PAH).

The following environmental controls, infrastructure and equipment should be maintained and operated at the L71 Evaporation Ponds:

- Two HDPE lined evaporation ponds operated such that:
 - Overtopping of the ponds does not occur;
 - A freeboard equal to, or greater than, 300mm is maintained; and
 - The integrity of the containment infrastructure is maintained.

9.1.2 Wastewater Treatment Plant – Commissioning and Operation

The Licence Holder will be required to submit a Commissioning Report to DWER to enable an assessment of the environmental performance of the WWTP once operational. The WWTP shall be operated and maintained such that overtopping of tanks does not occur and the integrity of containment infrastructure is maintained.

9.1.3 Monitoring requirements

The following monitoring will be required to detect potential adverse impacts to groundwater from operations at the premises:

- Quarterly groundwater monitoring for Total Recoverable Hydrocarbons and additional parameters will be conducted across the Premises (including the new BF) to detect any potential impacts from petroleum operations.

The following monitoring will be required to detect potential adverse impacts to surface water from treated effluent at the Premises:

- Treated effluent discharged from the WWTP shall be sampled quarterly and analysed at a NATA registered laboratory for water quality parameters as listed in Table 18 of this Decision Report.

9.1.4 Reporting requirements

The following reporting to DWER will be required via an Annual Environmental Report:

- Ambient groundwater quality monitoring - Tabulated groundwater monitoring data results and an interpretation of monitoring data results including comparison of historical data to determine trends;
- WWTP inputs (volumetric); and
- Point source emissions to surface water (treated effluent quality) - Tabulated surface water monitoring data results and an interpretation of monitoring data results including comparison of historical data to determine trends.

Reporting of the results of monitoring is required to inform future risk assessments.

10. Determination of Licence conditions

The conditions in the issued Licence have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The *Guidance Statement: Licence Duration* (DER, 2016b) has been applied and the issued licence expires in 12 years from date of issue.

Table 22 provides a summary of the conditions to be applied to this licence.

Table 22: Summary of conditions to be applied

Condition Ref	Grounds
Emissions Condition 1	Environmental compliance is a valid, risk-based condition to ensure appropriate linkage between the licence and the EP Act.
Works and Construction Compliance Conditions 2, 3,4, 5, 6 and 7	
Infrastructure and Equipment Condition 8	These conditions are valid, risk-based and contain appropriate controls.
Emissions to Surface Water Condition 9	This condition is valid, risk-based and consistent with the EP Act.
Ambient Groundwater Monitoring Condition 10,	
Emissions to Surface Water Monitoring Conditions 11, 12, 13 and 14	
Record Keeping Conditions 15 and 16	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.
Reporting Conditions 17, 18 and 19	

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the licence under the EP Act.

11. Licence Holder's comments

Amendment 17 January 2018: The Licence Holder was provided with the draft Decision Report and draft issued Licence on 26 March 2018. The Licence Holder provided comments which are summarised, along with DWER's response, in Appendix 2.

Amendment 18 October 2018: The Licence Holder was provided with the draft amended Decision Report and draft amended Licence on 29 November 2018. The Licence Holder provided comments which are summarised, along with DWER's response, in Appendix 2.

12. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Revised Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Caron Goodbourn
A/MANAGER, PROCESS INDUSTRIES

Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Licence L4467/1972/14 - Barrow Island Oil and Gas Facility	L4467/1972/14	accessed at www.der.wa.gov.au
2.	Works Approval W5261/2012/1	W5261/2012/1	DWER records (A540867)
3.	Mandatory Auditors Report, Barrow Terminal Tanks (Senversa, July 2016)	Senversa 2016	DWER records (A1374364)
4.	Barrow Island Terminal Tanks - Site Management Plan (Chevron/Golder Associates, 30 June 2015)	Chevron/Golder Associates 2015	DWER records (A1374433)
5.	Barrow Island Joint Venture - Barrow Island Environment Plan Revision 16 (Chevron, 30 April 2014)	Chevron 2014	DWER records (A1074950)
6.	DER, July 2015. <i>Guidance Statement: Regulatory principles.</i> Department of Environment Regulation, Perth.	DER 2015a	accessed at www.dwer.wa.gov.au
7.	DER, October 2015. <i>Guidance Statement: Setting conditions.</i> Department of Environment Regulation, Perth.	DER 2015b	
8.	DER, November 2016. <i>Guidance Statement: Environmental Siting.</i> Department of Environment Regulation, Perth.	DER 2016a	
9.	DER, August 2016. <i>Guidance Statement: Licence duration.</i> Department of Environment Regulation, Perth.	DER 2016b	
10.	DER, February 2017. <i>Guidance Statement: Risk Assessments.</i> Department of Environment Regulation, Perth.	DER 2017a	
11.	DER, February 2017. <i>Guidance Statement: Decision Making.</i> Department of Environment Regulation, Perth.	DER 2017b	
12.	DER, December 2014. <i>Guideline: Assessment and Management of Contaminated Sites: Contaminated Sites Guidelines.</i> Department of Environment	DER, 2014	

	Document title	In text ref	Availability
	Regulation, Perth.		
13.	<i>National Water Quality Management Strategy: Paper No. 4. Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000)</i>	ANZECC ARMCANZ 2000	http://www.agriculture.gov.au/water/quality/nwqms/nwqms-australian-guidelines-water-quality-monitoring-reporting

Appendix 2: Summary of Licence Holder’s comments on risk assessment and draft conditions

Amendment 17 January 2018		
Condition	Summary of Licence Holder comment	DWER response
8	There is an incomplete reference to the Australian Standards for the Bioremediation Facility in Table 5: Infrastructure and equipment controls Table. Can DWER please confirm if the maintenance of bund liner is to be in accordance with AS 1940:2017?	The reference to AS1940:2017 has been completed.
10	<p>Table 7: Monitoring of ambient groundwater quality indicates that quarterly monitoring is to be undertaken for groundwater quality for the Bioremediation Facility. Chevron proposed annual monitoring as the monitoring of groundwater conditions at the bioremediation facility on an annual basis is considered to be justified on the basis that the risk of contamination to groundwater from the lined facility is low to negligible, groundwater in the vicinity of the site has been impacted by historical operations and the seasonal variation of this existing groundwater impact has been previously well characterised over many years of monitoring. The risk of groundwater impact from activities within the bioremediation facility is considered low to negligible given that:</p> <ul style="list-style-type: none"> • The facility is fully lined to prevent leaching of contaminants to groundwater. • The liner system has been designed and will be operated and maintained to prevent damage to the liner from operational equipment. • The facility will be operated in a “dry” condition, with sufficient water added only to maintain a moisture content within the windrows. 	<p>The Delegated Officer has reviewed the risk assessment in relation to possible discharges of hydrocarbon contaminated stormwater and / or seepage of leachate associated with operation of the Bioremediation Facility.</p> <p>The Delegated Officer maintains that there is a medium risk of the risk event occurring and impacting the environment. In accordance with DWER’s <i>Guidance Statement: Risk Assessments</i> (February 2017), a risk criteria of “medium” is considered acceptable, generally subject to regulatory controls.</p> <p>The Delegated Officer has considered the additional comments received from the Licence Holder, as well as the design capacity, controls and the Interim operating conditions that the Bioremediation Facility will be operated under for the first 12 months or so.</p> <p>The Delegated Officer has also had regard for the sensitivity of the receiving environment in which the Bioremediation Facility is located, being a Class A Nature Reserve. The Delegated Officer</p>

	<ul style="list-style-type: none"> • Saturation of the windrows and/or presence of water in the SMF would only occur in response to high rainfall events. There will be no discharge of stormwater outside of the facility. The facility has been designed to contain a 1:20 year ARI storm event in the SMF and a 1:100 year storm event within the bunded BRF area. Groundwater monitoring at the Terminal Tanks has been on-going for over 20 years, and groundwater conditions at the site have been well characterised, including assessment of seasonal variation and comprehensive risk assessment (Reference: Barrow Island Terminal Tanks – Site Management Plan (2015) ABU120200099). • The separate-phase plume has been demonstrated to be stable during ambient and transient conditions. • The dissolved-phase plume has been demonstrated to be stable during ambient conditions. • The downgradient extent of the dissolved-phase plume does vary in response to high rainfall events. However, the upgradient and cross gradient extents of the dissolved-phase plume remain relatively stable even during transient conditions. The bioremediation facility is located at the upgradient extent of the existing groundwater plume. • Baseline groundwater conditions in the immediate vicinity of the bioremediation facility have been characterised through monitoring completed between 2012 and 2017, including the collection of biannual data from 2012-2015. Pre-existing groundwater impact (TRH) is present below the site of the bioremediation facility. Trends in TRH concentrations at downgradient well GW83 over this period have shown a variation over an approximate 2 year cycle. On-going monitoring on an annual basis is considered sufficient to monitor any changes to groundwater conditions. 	<p>considers that quarterly monitoring of groundwater (for the parameters TPH, BTEX and PAH (if TRH is present), as well as depth to groundwater) in the vicinity of the Bioremediation Facility is warranted in order to validate the effectiveness of the liner and stormwater management systems and to detect any potential (additional) impacts to groundwater from possible (but unlikely) discharges of hydrocarbon contaminated stormwater or leachate in a timely manner.</p> <p>Quarterly monitoring is also consistent with monitoring at other liquid waste / chemical storage facilities on the Premises. Once the facility has been commissioned, the BF has reached steady state operations and the Licence Holder can validate the effectiveness of pollution control systems, the Licence Holder may elect to apply to DWER for a licence amendment to reduce groundwater monitoring frequency.</p>
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10	Table 7: Monitoring of ambient groundwater quality – request removal of several duplicated references to wells	Agreed and completed
11	Request removal of (draft) Condition 11 and Table 8: Monitoring of ambient groundwater quality – Trigger bores. This condition and table were deleted in a previous Amendment Notice dated 9 March 2017	Agreed and completed
13	Can DWER clarify the trigger values in Table 10: Monitoring of point source emissions to surface water. It is proposed to change the following trigger values: <ul style="list-style-type: none"> • pH: <6.5 or >8.5 • Total phosphorus: >12mg/L • E. Coli >106 cfu/100mL • Anionic surfactants: >5mg/L • Oil and grease: >10mg/L 	This Table (now Table 9) has been updated to clarify trigger values for point source emissions to surface water.
Schedule 2	Schedule 2: Primary Activities, Table 13: Infrastructure and equipment. Item 10 in Table 13 states there are 14 disposal wells. Please change this to 4 disposal wells.	Completed
Amendment 18 October 2018		
Condition	Summary of Licence Holder comment	DWER response
N/A	Comments received from Licence Holder on 11 December 2018: Chevron have reviewed the documents and have no further comment on either the draft licence or the draft decision report. As such we wish to wave the consultation period and request that the amended licence is issued as soon as possible.	Noted. Licence amendment to be finalised and issued.

