Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L9102/2017/1
Licence Holder	Chevron Australia Pty Ltd
ACN	ACN 086 197 757
File Number	DER2017/001839
Premises	Gorgon LNG Project BARROW ISLAND, WA Legal description – Part of Crown Lease L077431 Certificate of Title Volume 3158 Folio 477, Part of CO2 Injection Wells Licence 00564-2009-A1744377, and Portion of Lot 3000 on Deposited Plan 91514, being the subject of Easement shown on Deposited Plan 70903 As defined by the premises boundary coordinates and premises map in Schedule 1 of the Amended Licence
Date of Report	30 August 2021
Decision	Revised licence granted

1. Decision summary

Licence L9102/2017/1 is held by Chevron Australia Pty Ltd (Chevron, licence holder) for the Gorgon LNG Project (the premises), located on Barrow Island. The delegated officer has determined to amend the licence to include operation of a permanent wastewater treatment plant and concrete batching plant, allow for wastes generated outside the premises boundary to be managed at the premises waste management facilities and revise the prescribed premises categories relating to these changes.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges from the premises. As a result of this assessment, revised licence L9102/2017/1 has been issued pursuant to section 59 and 59(B) of the *Environmental Protection Act 1986* (EP Act).

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the Department of Water and Environmental Regulation (DWER, the department) has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Amendment summary

Chevron holds licence L9102/2017/1 for the Gorgon LNG Project (the premises). The premises is located on Barrow Island, an A-Class Nature Reserve (Crown Reserve 11648) situated 85 km north-west of Onslow. The licence authorises operation of a three train gas treatment plant (GTP) including supporting infrastructure, reservoir carbon dioxide (CO_2) injection infrastructure, a bridging wastewater treatment plant (WWTP), liquid waste facility, diesel storage facility, waste concrete storage area and waste transfer station under categories 10, 34, 52, 54, 62 and 73 of the *Environmental Protection Regulations 1987* (EP Regulations).

On 23 December 2020, the licence holder submitted an application to the department to amend licence L9102/2017/1 under section 59 and 59B of the EP Act (the application). The amendments are being sought are as follows.

1) Inclusion of the Permanent Wastewater Treatment Plant (PWWTP) constructed and commissioned under works approval W5097/2011/1 on the licence.
2) Inclusion of category 77: Concrete batching or cement products manufacturing on the licence and an existing Concrete Batching Plant (CBP) located on the premises due to concrete from the plant needing to be used outside the GTP premises boundary.
3) Update of the premises boundary to include the PWWTP and CBP locations.
4) Inclusion of category 61: Liquid waste facility on the licence to authorise the acceptance of potentially contaminated wastewater (liquid waste) from locations outside the premises boundary for disposal via deep well injection at the permanent wastewater disposal (PWD) and Temporary Wastewater Injection Plant (TWIP) wells on the premises.
5) Removal of Category 62: Solid waste depot from the licence and replacement with category 61A: Solid waste facility, which is more applicable due to the rotary food dryers on the premises receiving putrescible waste from outside the premises boundary.

6) Allowance for wastes generated by Chevron activities outside the GTP premises boundary to be accepted for storage at the premises Waste Transfer Station prior to removal to the mainland for disposal at licensed premises.

7) Inclusion of special waste type 3 (as per the '*Landfill Waste Classification and Waste Definitions 1996 (as amended 2019*') as a specified waste type generated on the premises and managed at the Waste Transfer Station.

8) Amendment to monitoring requirements for CO_2 discharges from Drill Centre A to C Injection Wells to include allowance for weekly sampling of hydrocarbon when the analysers at Train 1 to 3 are not available continuously.

Table 1 below outlines the prescribed premises categories specified on the licence and proposed changes to these.

Table 1: Proposed design capacity changes

Category	Current design capacity	Proposed design capacity	Description of proposed amendment
10: Oil or gas production from a well	LNG: 18 million tonnes per annual period DomGas: 300 TJ/day Condensate: 1 million tonnes per annual period	No change	NA
34: Oil or gas refining			
73: Bulk storage of chemicals	1,090 m^3		
52: Electrical power generation	584.5 MW		
54: Sewage facility	1,385 m^3/day	1,768 m^3/day	Inclusion of the PWWTP on the licence with a design capacity of 383 m^3/day.
61: Liquid waste facility	NA	750,000 tonnes per annual period	The premises will accept liquid wastes from locations outside the premises boundary for disposal via deep well injection.
61A: Solid waste facility	NA	240,000 tonnes of concrete waste per annual period 111,840 tonnes of other solid waste per annual period	Add in place of category 62 Solid waste production capacity increased to align with peak monthly waste volume handled at the WTS.
62: Solid waste depot	240,000 tonnes of stockpiled concrete Waste per annual period 52,050 tonnes of other solid Waste per annual period	NA	Remove and replace with category 61A
77: Concrete batching or cement products manufacturing	NA	75,000 tonnes per annual period	Existing concrete batching plant to be included in the licence as concrete will be used at locations

Further details of each of the proposed amendments are included in the following sections. Details have been taken from the application and related works approval application and assessment documents.

2.2.1 *Permanent wastewater treatment plant*

The PWWTP has a design capacity of 383 m^3/day and was constructed and commissioned under works approval W5097/2013/1. The licence holder submitted a compliance document and commissioning report to the department which confirmed that the PWWTP was constructed and commissioned in accordance with the works approval conditions.

Raw effluent from the GTP, Barrow Island accommodation and other supporting facilities on Barrow Island is pumped to the PWWTP Flow Equalisation Tank where mixing and aeration occur to reduce odour formation. Raw effluent is piped from the Flow Equalisation Tank to the PWWTP where it is treated using membrane bioreactor (MBR) technology. At the PWWTP the raw effluent passes through inlet screens to remove residuals >2mm. The residuals are collected in a screenings bins and transported to the mainland for disposal at a licensed facility. Screened effluent is then processed through a series of process tanks including:

- a pre-anoxic tank (68,200L);
- an aeration tank (120,000L);
- a post anoxic tank (51,900L);
- MBR filtration (via a Norit Membrane System using ultrafiltration at 0.03 µm); and
- disinfection via a 23,500L chlorine contact tank and 19,200L treated backwash tank.

Waste activated sludge from the MBR tank is piped to an aerobic digester tank then centrifuge and is dewatered, packaged in bulka bags, and stored prior to removal from the island for disposal at a licensed facility on the mainland. The PWWTP includes a chemical dosing system to manage water quality, prevent build up, minimise odour and provide disinfection. Chemicals used include chlorine, citric acid, sodium hypochlorite, polymer, biocide, scale inhibitor, sucrose, ferric sulfate, magnesium hydroxide and sodium hydroxide.

A schematic of the treatment process is included in Figure 1

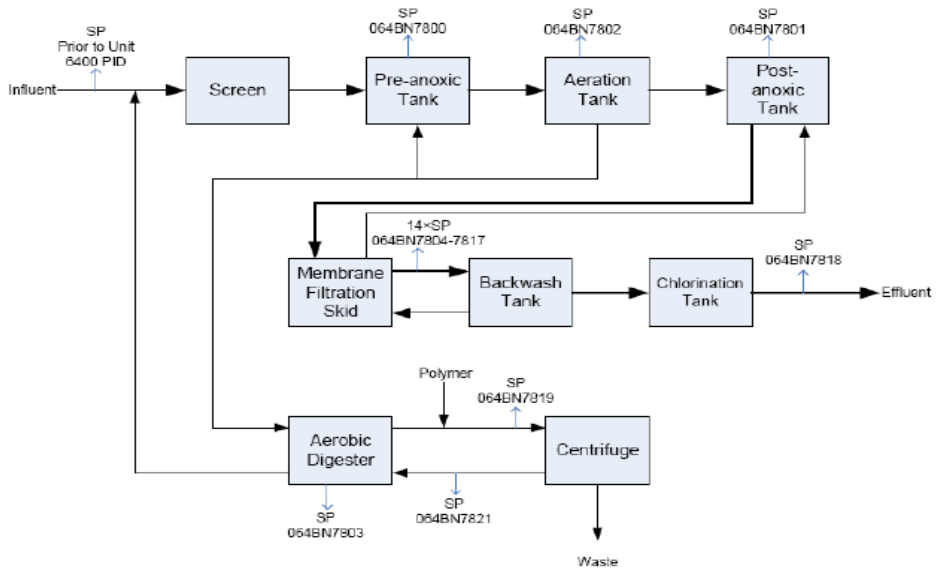

Figure 1 Gorgon PWWTP flow diagram (Chevron 2011)

Treated effluent from the PWWTP is transferred via an above ground glass fibre reinforced pipeline to the disposal water tanks located at the premises liquid waste facility (LWF), or to the Temporary Wastewater Injection Plant (TWIP) located 6 km west of the GTP. At the LWF the treated effluent is comingled with other liquid wastes in the disposal water tanks and then transported by a high pressure pipeline to the PWD wells for disposal through deep well

injection to the confined Flaccourt subsurface geological formation at a depth of more than 1,000 m below the surface of Barrow Island. Effluent transferred to the TWIP is also disposed to the Flaccourt formation via deep well injection through two wells. The PWD wells are the primary injection point for liquid wastes from the premises and the TWIP wells provide additional capacity when required. During temporary shutdowns or breakdowns at the PWWTP untreated and partially treated sewage will also be disposed of via deep well injection. The licence holder anticipates such events to be irregular and of short duration.

Regular monitoring of treated effluent from the PWWTP has occurred during commissioning (weekly) and operation (monthly) in accordance with conditions of works approval W5097/2013/1. The monitoring results and comparison with target criteria for the treated effluent are included in Table 2.

Table 2: Summary of PWWTP treated effluent monitoring results and comparison with water quality criteria (June 2018 to March 2021)

Parameter	Unit	Water quality design criteria (optimal performance)[1]	Water quality target criteria[2]	Treated water quality results range	Comments
Biochemical Oxygen Demand	mg/L	20	<30	<2-45	One target exceedance during early stage commissioning, remainder of results within design criteria
Total Suspended Solids	mg/L	30	<40	<5-8	No target or design criteria exceedances
Total Nitrogen	mg/L	5	<50	0.1-45.8	No target exceedances. >70% results exceeded design criteria
Total Phosphorous	mg/L	0.5	<12	0.001-2.3	No target exceedances. >50% results exceeded design criteria
E. coli	CFU/100mL	<10	$<10^6$	<1-70	No target exceedances. One design criteria exceedance.
Anionic surfactants	mg/L	NA	<5	<0.1-0.7	No target exceedances
Oil and grease	mg/L	NA	<10	<0.1-13	Two target exceedances

Note 1: Design criteria for the PWWTP under normal operating conditions at an optimal level of performance specified. The criteria may not be consistently achievable. (Chevron 2011)

Note 2: From W5097/2011/1 originally issued on 19 April 2012. Targets were based on the *Guidelines for the non-potable uses of recycled water in Western Australia* (Department of Health 2011) and *Australian guidelines for sewerage systems, effluent management* (Australian and New Zealand Environment and Conservation Council 1997)

2.2.2 *Concrete batching plant*

The CBP was initially commissioned in 2016 for construction of the Gorgon LNG Project. The CBP was not considered a category 77 concrete batching or cement products manufacturing premises at this time as concrete was being used within the Gorgon LNG project premises. The licence holder now proposes to use concrete from the CBP at locations outside the premises boundary therefore the facility will be considered a category 77 concrete batching or cement products manufacturing premises. The CBP has a capacity of 60 m^3 per hour and is located adjacent to the premises Waste Transfer Station. The facility comprises:

- two aggregate hoppers;
- one cement hopper;
- a loading bay;
- a 70 tonne cement silo
- a recycled water tank;
- a power supply area comprising a self bunded diesel generator and storage tank (20m^3) on a concrete hardstand draining to a sump and oil water separator;
- an aggregate wash plant and screen deck;
- five aggregate/sand storage bays with water sprays (raw materials are also stored in ground stockpiles);
- a truck wash area including a washstand and washout sump;
- a settlement pond which receives runoff and wastewater from the CBP, loading bay, truck wash area, power supply area and loading bay and overflows via a weir to a second pond (snake pit); and
- a stormwater pond which receives runoff from the aggregate/sand storage area. Overflow from the pond is discharged to land via a stormwater culvert.

The CBP is located on a concrete hardstand and includes a recycled water system. Collection sumps and ponds settle suspended solids from wastewater streams with collected water being directed to a recycled water tank for reuse in concrete batching and truck washout. Collected sediment from the ponds and sumps is transported to stockpiles near the LNG facility for eventual reuse on Barrow Island.

The licence holder has advised the CBP design features ensure the facility complies with the *Environmental Protection (Concrete Batching) Regulations 1998* (Concrete Batching Regulations). Further details of the CBP emission controls are in Table 4.

2.2.3 *Category 61 Liquid waste facility*

The licence holder receives potentially contaminated wastewater (liquid waste) from wash down bays, sumps and other ad hoc sources (such as drilling and well workover activities conducted on Barrow Island) at locations outside the premises boundary. Liquid wastes are collected from the various sources, sampled to confirm they meet disposal specifications, and are transported to the disposal water tanks at the premises LWF to be disposed by deep well injection via the PWD wells or to the TWIP wells.

The licence holder will also generate liquid and solid waste streams from solids removal packages which have been established at the CO_2 Pressure Management Drill Centres (DC-D and DC-E) (located outside the premises boundary). Each drill centre comprises two production wells which are used to extract water from the Dupuy Formation and an injection well used to inject the produced water into the overlying Barrow Group saline aquifer. Solid removal packages have been installed to remove sand from the produced water prior to

injection as its presence can impact on injectivity of the water. The recovered sand will be transported to the premises Waste Transfer Station for storage prior to removal from the island for disposal at a licensed facility on the mainland. Liquid waste from the solid removal packages will be transferred via vacuum trucks to the LWF to be disposed by deep well injection via the PWD wells. Liquid waste from this source is Dupuy Formation water therefore is typically brackish with contaminants including hydrocarbons. The solids removal package activities are approved in the *Gorgon Project Carbon Dioxide Injection System Pipeline and Wells Operations Environmental Management Plan* regulated by the Department of Mines, Industry Regulation and Safety (DMIRS).

The premises LWF was established to collect, store and treat various liquid waste streams generated from the Gorgon Operation including produced formation water from the Gorgon and Jansz gas fields, process wastewater, contaminated stormwater, treated sewage effluent, and various other process and utilities wastewater. Liquid wastes transferred to the LWF are dominated by produced water from the Gorgon and Jansz gas fields. They are combined in two 1,300 m^3 disposal water tanks prior to disposal by deep well injection via the PWD wells.

As liquid wastes are being transferred from locations outside the premises, to the premises LWF and TWIP for disposal, this infrastructure will meet the definition of a category 61: Liquid waste facility. The capacity to receive liquid waste is limited by the PWD wells and TWIP wells injection capacity which is in excess of 5.4 million tonnes per year. The licence holder expects to receive up to 750,000 tonnes per year of liquid waste onto the premises to be disposed via deep will injection. Disposal of liquid waste via deep well injection on the premises was assessed for the grant of L9102/2017/1 with conditions included on the licence relating to the activity. The assessment included consideration of effluent from the PWWTP and other sources not directly connected to the LWF such as from oily water separators and stormwater containment bunds.

2.2.4 *Replace category 62 with category 61A*

The premises Waste Transfer Station receives, stores, and handles solid and liquid wastes generated by Chevron on Barrow Island. This includes solid wastes generated at locations outside the premises boundary which are transferred to the Waste Transfer station for consolidation and/or storage prior to removal from the island for disposal at appropriate facilities on the mainland. Putrescible wastes are either refrigerated, compacted or processed through two rotary food waste dryers to reduce odour and volume. Processed waste is transferred into sealed containers pending disposal.

The Waste Transfer Station is specified on the licence as a category 62: Solid waste depot however better meets the definition of a category 61A: Solid waste facility as the facility receives wastes from outside the premises, and putrescible wastes are processed prior to their removal from the premises.

2.2.5 *Storage of Special Waste Type 3 at the Waste Transfer Station*

The licence holder uses firefighting foams on the premises which contain Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS). Use of these foams during fire incidents or emergencies can generate PFAS contaminated waste, defined as Special waste type 3 (solid waste, including soils and other solid wastes impacted by PFAS) under the Landfill Definitions. As PFAS contaminated waste may be generated on the premises, requiring handling, storage and transport off the premises for disposal, the licence holder has requested Special waste type 3 be included on the licence as a waste type which will be managed at the premises Waste Transfer Station.

2.2.6 *CO_2 discharge monitoring*

Reservoir CO_2 is removed from the incoming gas to the GTP and is injected into the Dupuy

Formation 2,000 to 2,300 m below the surface of Barrow Island by the premises CO_2 injection system via a series of nine injection wells. The conditions of L9102/2017/1 authorise the discharge of the reservoir CO_2 to land subject to limits on the volume and composition of the reservoir CO_2. The licence also includes requirements for monitoring of the volume and composition of the reservoir CO_2 discharged to land via the reservoir CO_2 injection wells in order to verify compliance with the limits specified in the licence. The monitoring requirements include continuous monitoring for hydrocarbon (including BTEX). Monitoring is undertaken by online analysers on GTP Trains 1 to 3 which measure the composition fed into the CO_2 compression unit. The licence defines continuous as 'operates with an availability greater than 90 percent on a calendar monthly basis'.

The licence holder reported a non-compliance with the requirement for continuous monitoring of hydrocarbon (including BTEX) discharged to land in 2019 as the availability of the online analysers was periodic during the initial period of operation of the reservoir CO_2 injection system. For the period that the availability of the CO_2 analysers was below the required 90%, the licence holder implemented weekly manual sampling and analysis of hydrocarbon (including BTEX) discharged to land via the reservoir CO_2 injection wells. The licence holder proposes that weekly manual sampling and analysis for hydrocarbon (including BTEX) be specified in the licence as a contingency requirement for periods when the CO_2 analysers are not continuously available.

2.3 Legislative context

2.3.1 *Part IV of the EP Act*

The proposal to construct and operate the two processing train Gorgon Gas Development was referred to the Western Australian Environmental Protection Authority (EPA) and the then Commonwealth Department of Environment and Heritage in 2003. A bilateral assessment of the proposal was undertaken under part IV of the EP Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through a draft EIS/ERMP.

Ministerial Approval for the Gorgon Gas Development was granted on 6 September 2007 subject to conditions outlined in Ministerial Statement 748 (MS 748). Subsequently, in September 2008, both State and Commonwealth approval was sought through a Public Environment Review (PER) assessment process for the revised and expanded Gorgon Gas Development, which included:

- addition of a five million tonne per annum (mtpa) LNG train, increasing the number of LNG trains from two to three;
- expansion of the CO_2 injection system, increasing the number of injection wells and surface drill locations to account for increased reservoir CO_2 production due to the addition of a third LNG train; and
- extension of the causeway and the materials off-loading facility into deeper water.

Ministerial Approval for the revised and expanded Gorgon Gas Development was granted on 10 August 2009 subject to conditions outlined in MS 800. MS 800 superseded MS 748 for the initial proposal, providing approval for both the initial, and the revised and expanded Gorgon Gas Development.

The approval authorises the construction and operation of three 5 mtpa LNG processing trains, associated infrastructure and a CO_2 injection system to inject reservoir CO_2 into the Dupuy Formation on Barrow Island.

Since the revised and expanded Gorgon Gas Development was approved, further minor changes have also been made and/or approved and updates to MS 800 made as necessary. This includes updates to MS 800 via MS 1002 which approve a fourth LNG train.

MS 800 contains conditions that need to be considered in the assessment of emissions and discharges from the premises and the imposition of regulatory controls. Ministerial conditions relevant to the assessment of emissions and discharges and the imposition of regulatory controls associated with the amendment are summarised in Table 3.

Table 3: Consideration of MS 800 conditions relevant to this application

Overview	Delegated officer considerations
Condition 5 - requires submission of an annual Environmental Performance Report which includes reporting on the terrestrial and subterranean environment state. Information to be included in the report is specified in Schedule 3 and includes monitoring results and any measurable impacts as well as any mitigation measures applied.	The delegated officer noted that the licence holder is required to report the results of monitoring required by the conditions of MS 800 and any measurable impacts including changes from baseline for the terrestrial and subterranean environment state.
Condition 7 - requires the submission and implementation of a Terrestrial and Subterranean Environmental Protection Plan (TSEPP) which outlines management measures, including design commitments, to control potential impacts to the terrestrial and subterranean environment. The objectives of the plan are '*to reduce the adverse impacts from the construction and operation of the terrestrial facilities as far as practicable and to ensure that construction and operation of the terrestrial facilities does not cause Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint, including below the surface of the land*.' The condition also requires reporting of any Material or Serious Environmental Harm detected outside the Terrestrial Disturbance Footprint.	The delegated officer has reviewed the TSEPP and noted that the plan sets out management measures to minimise environmental impacts including but not limited to solid and liquid waste management, surface water management, leak and spill management, and light, noise and vibration management. The Plan identifies that the management of solid and liquid waste (with the exception of stormwater) is covered by the Solid and Liquid Waste Management Plan and that the management and monitoring of noise, vibration and light are detailed in the Long Term Marine Turtle Management Plan. Management measures specified in the plan are not duplicated in the licence conditions.
Condition 8 - requires the submission and implementation of a Terrestrial and Subterranean Environmental Monitoring Program (TSEMP). The objective of the TSEMP is to '*establish a statistically valid ecological monitoring program to detect any Material or Serious Environmental Harm to the ecological elements outside the Terrestrial Disturbance Footprint*'. Monitoring results are required to be reported within the Annual Environmental Performance Report as per the requirements of Condition 5.	The delegated officer has reviewed the TSEMP and noted that the plan specifies biennial vegetation monitoring, annual fauna (mammals and land birds) and surface water landform monitoring and twice-yearly groundwater (superficial aquifer) monitoring requirements. The plan specifies monitoring locations, criteria, management triggers and reporting. MS 800 and the TSEMP is the primary instrument for regulating monitoring of the terrestrial and subterranean environment. The environmental monitoring requirements described in the TSEMP have been considered in the determination of risk associated with potential emissions and discharges associated with the amendment. Conditions relating to environmental monitoring (e.g. flora, fauna or groundwater monitoring) will not be included on the licence to avoid duplication with MS 800.

Overview	Delegated officer considerations
Condition 11 - requires the submission and implementation of a *Short Range Endemics and Subterranean Fauna Monitoring Plan* (SRESFMP). The objective of the SRESFMP is to '*establish a statistically valid ecological monitoring program to detect any Material or Serious Environmental Harm to the ecological elements outside the Terrestrial Disturbance Footprint'*. Monitoring results are required to be reported within the Annual Environmental Performance Report as per the requirements of Condition 5.	MS 800 and the SRESFMP is the primary instrument for regulating monitoring of short range endemics and subterranean fauna therefore monitoring for SRE and subterranean fauna will not be included on the licence to avoid duplication with MS 800.
Condition 16 - requires the submission and implementation of a Long-term Marine Turtle Management Plan. The objectives of the plan are to '*address long term management of marine turtles, establish population baseline information, establish a monitoring program and specify design features, management measures and operating controls to manage and avoid adverse impact to marine turtles with specific reference to reducing light and noise emissions as far as practical*'.	The delegated officer has reviewed the Long-term Marine Turtle Management Plan and noted that the plan specifies design features, management measures and operating controls to minimise lighting, noise and vibration emissions as far as practicable to prevent adverse impact on marine turtles. The plan also specifies an annual monitoring program to detect impacts on turtle populations as well as management triggers and reporting requirements. The delegated officer considers the primary instrument for regulating the impacts on marine turtles from light, noise and vibration emissions is MS 800 and the Long-term Marine Turtle Management Plan. As such, to avoid regulatory duplication, no further assessment or management is required under Part V of the EP Act.
Condition 29 - requires the submission and implementation of an Air Quality Management Plan (AQMP). The purpose of the AQMP is to '*ensure that air quality meets appropriate standards for the protection of human health and does not cause environmental harm to flora and fauna on the island'*.	The delegated officer has reviewed the AQMP and noted that the plan includes monitoring programs for ambient air quality (including PM_{10}) and major point source emissions, along with management measures, targets and performance standards. The results of monitoring conducted under the plan are required to be reported within the Annual Environmental Performance Report as per the requirements of Condition 5. MS 800 and the AQMP is the primary instrument for regulating air quality. The management measures and monitoring requirements for air quality detailed in the plan have been considered in the determination of risk associated with air emissions related to the amendment application. Conditions relating to ambient air quality monitoring will not be included on the licence to avoid duplication with MS 800.

Overview	Delegated officer considerations
Condition 30 - requires the submission and implementation of a Solid and Liquid Waste Management Plan (SLWMP). The objectives of the Plan are to - *ensure all proposal-related solid and liquid wastes are either removed from Barrow Island or, if not, that all practicable means are used to ensure that waste disposal does not cause Material or Serious Environmental Harm to Barrow Island and its surrounding waters';* - *ensure discharges from any waste water treatment plant, reverse osmosis plant, or other process water are disposed of via deep well injection, unless otherwise authorised by the Minister; and* - *ensure any deep well injection of Proposal related liquid wastes is conducted in a manner that will not cause Material or Serious Environmental Harm to subterranean fauna and their habitats on Barrow Island.*	The delegated officer has reviewed the SLWMP and noted that the plan specifies the following hierarchy for solid and liquid waste management: 1. Re-use and recycling 2. Disposal via deep well injection 3. Disposal to a third-party facility 4. Disposal to the terrestrial or marine environment. The plan specifies management measures which will be applied to achieve the waste management objectives. Measures relevant to the assessment of the application include: • the LWF being used to receive and store effluent, produced water and process water prior to disposal by deep well injection; • the Waste Transfer Station being used to receive and store general, recyclable, hazardous (solid and liquid) and quarantine risk wastes; • spill response procedures being in place for hazardous waste storage; • use of WWTPs to treat effluent prior to disposal; and • regular monitoring of liquid waste disposed on Barrow Island. The plan identifies that liquid wastes which cannot be reused will be injected into the Barrow Group geological formation more than 1,000 m below the surface through the PWD wells or TWIP wells. The delegated officer notes that the plan references the Part V licence as a regulatory instrument for injection of liquid waste via deep well disposal and identifies the key factors which could cause potential environmental effects during injection as: • mechanical integrity failure in wells; • fracturing of the receiving formation and overlying confining units; and • injection into a receiving environment that is not isolated from shallower aquifers by adequate confining layers. The waste management measures detailed in the plan have been considered in the determination of risk associated with waste management related to the application. Waste management measures specified in the plan will not be included on the licence to avoid duplication with MS 800.

2.3.2 *Barrow Island Act 2003*

The *Barrow Island Act 2003* (BI Act) authorises offshore production of natural gas and other petroleum together with a gas processing and infrastructure project on Barrow Island. Chevron was granted approval under section 13 of the BI Act to dispose of reservoir CO_2 by injection into the subsurface formation on Barrow Island by the BI Act Minister in September 2009 (BI Act Section 13 Approval). The approval includes conditions which restrict the composition, daily and annual injection rate, and maximum volume of reservoir CO_2 which can be injected into the Dupuy Formation

The BI Act Section 13 Approval conditions require Chevron to comply with a CO_2 Disposal

Management Plan. The CO_2 Disposal Management Plan specifies monitoring of the operational performance of the CO_2 infrastructure as well as composition and injection rates. The plan also specifies monitoring of the injection reservoir and movement of the CO_2 plume.

The licence holder has submitted a revised CO_2 Disposal Management Plan the Department of Jobs, Tourism, Science and Innovation for approval under the BI Act. Updates to the plan which are relevant to the application include aligning the hydrocarbon composition monitoring with that specified in the licence such that continuous monitoring (with an availability greater than 90% on a calendar monthly basis) is required and in instances where the analysers are not continuously available weekly manual sampling will occur.

Further details of the scope of the BI Act are included in the 2019 L9102/2017/1 Amendment report.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020a).

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.

3.1 Source-pathways and receptors

3.1.1 *Emissions and controls*

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Amendment Report are detailed in Table 4 below. Table 4 also details the control measures the licence holder has proposed in the application, or the relevant prior works approval application (W5097/2012/1 and W4818/2010/1), to assist in controlling these emissions, where necessary. Controls which align with commitments made in the MS 800 management plans referred to in Table 3 will not be replicated in the licence as per the *Guidance Statement: Setting Conditions* (DER 2015).

Table 4: Proposed licence holder controls

Emission	Sources	Potential pathways	Proposed controls
Potentially contaminated water (untreated or partially treated effluent or stormwater) with elevated nutrients	PWWTP • process tanks • transfer pipelines • containment bund • connections	Containment breach (overtopping of storage tanks, pipeline or connection leak/rupture) causing direct discharge to land and infiltration to groundwater or overland flow to surface receptors.	• The PWWTP is located within a 1.35m concrete bund with impervious flooring. The bund is sized to contain the contents of the largest storage tank in the event of a failure and a 1:100 year, 24 hour rainfall event. • The bund is connected to the premises stormwater drainage system via a locked valve so spills or potentially contaminated stormwater can be transferred to the GTP stormwater drainage system or collected for removal. • Monitoring devices include: - control panel LED indicators to monitor tanks levels and when pumps are on; - high level alarms on all tanks; and - inflow and outflow flowmeters. • The PWWTP uses MBR treatment technology operated via Programmable Logic Control (PLC) system designed to optimise performance within target parameters. • The PWWTP includes a chemical dosing system to manage water quality, assist in backwashing/dewatering, disinfection, and remove build up from pipes and tanks. • Effluent transfer to the LWF is via an above-ground glass fibre pipeline. • Regular inspections of the PWWTP and pipelines, sampling to monitor wastewater treatment performance and maintenance are carried out and recorded in a maintenance log. • Periodic testing of wastewater pipes and fittings for integrity.
Wastewater treatment	PWWTP	Direct discharge to land from storage/containment or	• Sludge is dewatered through a centrifuge, stablished, packaged and stored in 2m^3 sludge bins or equivalent at the Waste Transfer Station

Emission	Sources	Potential pathways	Proposed controls
sludges		disposal of sludges and infiltration to groundwater	pending transport to the mainland for disposal at a licensed facility.
Wastewater treatment chemicals	PWWTP • chemical storage tanks • containment bund	Containment breach (spill or leaks from storage tanks) causing direct discharge to land and infiltration to groundwater or overland flow to surface receptors.	• PWWTP chemicals are stored within separate concrete bunds within the PWWTP 1.35 m concrete bund (tertiary containment). • The bund is connected to the premises stormwater drainage system via a locked valve so spills and/or potentially contaminated stormwater can be transferred to the GTP Stormwater Holding Pond or collected for removal.
Odour	PWWTP	Air/wind dispersion	• Magnesium hydroxide dosing at the effluent sources upstream of the PWWTP to limit the generation of volatile sulphides (H_2S) in the sewers. • Mixing and aeration of effluent in a Flow Equalisation tank prior to treatment. • PWWTP uses MBR treatment technology operated via a PLC system designed to optimise treatment and including a chemical dosing system.
Potentially contaminated wastewater (elevated nutrients, hydrocarbons, sediment, low pH, chemicals)	Deep well injection of: – treated effluent from the PWWTP; and – liquid waste (including from washdown bays, sumps, and CO_2 pressure management solids removal packages) via the PWD wells	Mechanical integrity failure of the disposal wells causing direct discharge to the near surface aquifer. Fracturing of the receiving formation and overlying confining units leading to penetration into the near surface aquifer. Fracturing is not likely to occur except when the water temperature is under 10ºC.	• The disposal water tank contains oil separation devices and allow for settlement of solids. • Wastewater passes through filters prior to deep well injection. • The disposal water tanks are fitted with chemical injection packages (e.g. biocide, scale inhibitor) to prevent blockages. • The disposal water tanks have high pressure pumping capacity to inject liquid waste into the injection wells. • Injection wells have been constructed of highly corrosion resistant material. • Well construction includes multiple barriers to fluid loss including tubing, casing (three cemented strings), cement, packer and a ‘Christmas tree’ assembly. • PWD wells have been constructed with real-time continuous

Emission	Sources	Potential pathways	Proposed controls
	or TWIP wells.		pressure and temperature transducer/indicators to measure annulus pressures, tubing pressures and temperature, and detect deviations from expected well behavior. • A high-pressure alarm threshold for the A annulus pressure in the PWD wells is set to quickly identify and address deviations from target pressure. • The TWIP wells wellhead pressure and A Annualus pressure indicators which are checked and recorded daily. • The temperature of the injection water is expected to be approximately 40ºC. • For deep well disposal of treated effluent the monitoring program will include TN, TP, E.coli, BOD, TSS, anionic surfactants, and oil and grease. • The Flacourt formation (within the Barrow Group) the injection wells have been drilled into is suitable for injecting liquid waste due to it; – being confined (from the surface formation in which subterranean fauna and fresh water occur) and extending over a large regional area; – having high permeability allowing for pressure dissipation to minimise the risk of fractures; – having stable mineralogy with low potential for adverse reactions between the injected water and sandstone matrix reducing the likelihood of porosity and permeability being reduced through precipitation or deposition of minerals. • The system includes operational redundancy to ensure one well is capable of injecting the entire system load.
Contaminated water (sediment laden, alkaline, hydrocarbon contaminated)	CBP • CBP area • power supply	Direct discharge to land and infiltration to groundwater or overland flow to surface receptors	• CBP and truck wash are located in concrete hardstand areas that drain to collection sumps allowing settlement of solids. • Aggregate wash area is located in a hardstand area that drains to collection sumps allowing settlement of solids/fines.

Emission	Sources	Potential pathways	Proposed controls
	area • truck wash area • aggregate wash area • settlement and stormwater ponds		• The diesel generator and storage tank are both self-bunded and located within a concrete hardstand that drains to a collection sump with an oil separator. • Wastewater from the collection sumps is directed into a settlement pond which overflows by a weir into a second pond. The second pond has a float level indicator and pump to manage the pond level by pumping to a recycled water tank for use in concrete batching and truck washout. • The total capacity of the wastewater collection sump and pond is 82m^3 with the recycled water tank providing additional capacity to this. • Sediments are removed from the collection sumps as needed and transferred to the Waste Transfer Station for storage pending offsite disposal to the mainland.
Dust	CBP • hoppers • raw material storage bays and stockpiles, • cement silo • transfer points	Air/wind dispersion	• Storage bays for aggregate and sand have water sprays and ground stockpiles are covered or kept damp via water sprays. • Transfer systems for cement and additives are enclosed. • Cement storage silo is fitted with a high-level alarm to prevent overfill and has an overpressure release valve. • The CBP silo has an air cleaning system which complies with Regulation 7 of the Concrete Batching Regulations. • The CBP includes a washstand to wash concrete residue from trucks and an aggregate wash plant.
PFAS contaminated wastes or contaminated water	Waste Transfer Station	Direct discharge to land Infiltration to groundwater or overland flow to surface receptors Ingestion by fauna	• The Waste Transfer Station was constructed with cut-off berms and grading to divert clean stormwater around the facility. • Hazardous materials will be stored within concrete bunds with a collection sump, or in portable bunds. • Waste containers are clearly identified with their designated waste stream.

Emission	Sources	Potential pathways	Proposed controls
			• The Waste Transfer Station is enclosed by a 2.4m high fauna proof fence including gates that are locked at night to restrict access. • Inspections of the facility are undertaken.

3.1.2 *Receptors*

In accordance with the *Guideline: Risk Assessments* (DWER 2020a), the delegated officer has excluded employees, visitors and contractors of the applicant from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation. Relevant to this assessment the Butler Park and Production Accommodation Camps on Barrow island are operated by the licence holder and therefore have not been considered as receptors in the risk assessment.

Table 5 below provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises associated with the amendment (*Guideline: Environmental Siting* (DWER 2020b)).

Table 5: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	**Distance from prescribed activity**
Varanus Island oil and gas facility (including workers accommodation camp)	18 km north east of the GTP
Residential premises (Onslow)	~85 km south-west of the GTP
Environmental receptors	**Distance from prescribed activity**
Managed Lands and Waters	The Gorgon Gas Project is located within the Barrow Island Nature Reserve (BINR), a Class A Nature Reserve Marine waters surrounding the north, west and south sides of Barrow Island form part of the Barrow Island Marine Management Area (including the Bandicoot Bay Conservation Area ~13 km to the south of the GTP). An exclusion zone exists on the east side of the island adjacent to the GTP for the Barrow Island Port Area. The Barrow Island Marine Park is located on the west side of the island (~10 km from the GTP) and incorporates the Western Barrow Island Sanctuary Area.
Threatened Ecological Communities and Priority Ecological Communities	The BINR is listed as a Priority Ecological Community. Smaller areas identified as Priority Ecological Communities are located at the GTP site as well as to the north, south and west of the premises.
Threatened / priority flora	Three species of priority flora are located on Barrow Island west of the premises.
Threatened / priority fauna (terrestrial and marine)	A considerable number of threatened and priority fauna are known to occur on Barrow Island including a number species that are listed under the *Biodiversity Conservation Act 2016* (WA) (BC Act) and the Threatened (Vulnerable) Species list of the EPBC Act. Some of these species are known to occur within or adjacent to the premises. Green and flatback turtles (both listed as vulnerable under the BC Act and EPBC Act) nest on Barrow Island. Flatback turtle rookies are recorded near the premises (300 m away).

Environmental receptors	Distance from prescribed activity
Threatened / priority fauna (subterranean)	Barrow Island is recognized as being of high conservation significance for subterranean fauna communities at state, national and international levels. The subterranean fauna demonstrates high level of endemicity and species diversity and includes one of only two stygal vertebrate species occurring in Australia (Blind Gudgeon). Twelve of the species are listed under the *BC Act* and the Blind Gudgeon is listed as vulnerable under the EPBC Act. 13 stygofauna taxa were recorded in monitoring bores at the terminal tanks (approximately 1 km north of the GTP and 2.5 km north of the PWD wells). The karstic limestone layer which is believed to be Giralia Calcarenite is known to contain many cavities and solution tubes that provide habitat for stygofauna. It is located beneath the surficial soil layer at the premises. Beneath this layer is a band of siliceous silty sand which creates a barrier for subterranean fauna as there are no cavities or large pore spaces to allow movement. It is considered unlikely to encounter populations of subterranean fauna beneath this layer.
Groundwater	There is one shallow unconfined freshwater aquifer predominantly within Tertiary limestone on Barrow Island. This freshwater aquifer forms a lens of relatively fresher groundwater floating upon denser, saline ground water at depths between 9 m and 53 m. The aquifer supplies domestic water for oil and gas operations and supports subterranean. The groundwater system is linked to the marine ecosystem (<100 m from the premises).
Barrow Group Formation	The Barrow Group Formation is an underground confined saline aquifer situated at depths between 1,200 m and 1,900 m below the surface and is divided into three separate formations: the Flacourt, Malouet and Flag Sandstone. The components of the Barrow Group Formation behave as a single, hydraulically connected unit; however, the Barrow Group Formation is hydraulically separated from the shallow unconfined Tertiary limestone by a thick sequence (more than 1,000 m) of low permeability material (lower Gearle siltstone). Water quality is highly alkaline and saline (total dissolved solids approximately >30,000 mg/L) and is considered to be saturated with hydrocarbons therefore does not support any significant environmental values. It is generally characterised as containing stable minerals with a very low proportion of soluble metals. The aquifer provides process water for oil field operations on Barrow Island.

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and take into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 6.

Revised licence L9102/2017/1 that accompanies this Amendment Report authorises emissions associated with the operation of the premises inclusive of activities within the scope of the application. The conditions in the issued licence, as outlined in Table 6 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

The delegated officer has previously considered the risk of impacts to receptors associated with noise, odour and light emissions from the premises activities when assessing the application L9102/2017/1 (DER 2018). The delegated officer determined that there is sufficient separation distance to human receptors (the closest being at Varanus Island) for there to be no source-pathway-receptor link for noise and odour emissions. The delegated officer also determined that potential noise and light impacts on marine turtles are sufficiently regulated under MS 800 through the Long Term Marine Turtle Management Plan. These emissions have therefore not been considered further in Table 6.

Table 6: Risk assessment of potential emissions and discharges from the premises during operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of licence	Reasoning
Source/ Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Operation of the PWWTP	Potentially contaminated water (untreated or partially treated effluent or stormwater) with elevated nutrients WWTP chemicals (hazardous materials)	Containment breach (overtopping of storage tanks, pipeline or connection leak/rupture) causing direct discharge to land and infiltration to groundwater or overland flow leading to contamination of soil, groundwater and/or surface water (marine), or health impacts to flora and fauna.	Flora and fauna within the Class A Nature Reserve Marine environment ~ 400m Groundwater ~9m below surface	Refer to Table 4	**Low risk** C=Minor, low level onsite impact and minimal offsite impact at a local scale L= Rare, may only occur in exceptional circumstances	N	Condition 1 (infrastructure operation) **Condition 14 (process monitoring)** Existing condition 19 & 20 (Annual compliance and monitoring reporting)	Infrastructure controls in the design and construction of the PWWTP minimise the likelihood of containment breaches being discharged into the environment therefore the delegated officer considers the risk of contamination and health impacts to flora and fauna associated with operation of the PWWTP to be low. The delegated officer considers the licence holder's WWTP alarm system a key control to minimise the likelihood of containment breaches and has included it in the licence conditions. The delegated officer considers routine monitoring of treated effluent key to verifying effective operation of a WWTP. The SLWMP includes a management measure to undertake "regular monitoring of liquid waste streams for waste being disposed of on Barrow Island" but does not specify details. The delegated officer therefore specified wastewater treatment monitoring to verify its continued effectiveness with results being reported in the Annual Environmental Report (AER). The delegated officer noted the licence had no operational or monitoring controls for the bridging WWTP therefore applied the same controls to it for consistency.

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of licence	Reasoning
Source/ Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	Wastewater treatment sludges	Direct discharge to land from storage/ containment or disposal of sludges and infiltration to groundwater, leading to contamination of soil and/or groundwater, or health impacts to flora and fauna.	Flora and fauna within the Class A Nature Reserve Groundwater ~9m below surface	Refer to Table 4	**Low risk** C=Slight, minimal onsite impact L= Rare, may only occur in exceptional circumstances	NA	Existing condition 10	The delegated officer does not consider additional conditions necessary for the management of wastewater treatment sludges as existing conditions allow for putrescible waste (i.e. biosolids from wastewater treatment) to be managed at the Waste Transfer Station.
Deep well injection of treated effluent from the PWWTP and miscellaneous liquid wastes (including from washdown bays, sumps and CO_2 pressure management solids removal package)	Potentially contaminated water (elevated nutrients, hydrocarbons, sediment, low pH, chemicals)	Fracturing of the receiving formation and overlying confining unit or loss of well integrity causing discharge to the fresh-water aquifer potentially leading to reduced groundwater quality and/or health impact to subterranean fauna.	Groundwater within shallow fresh-water aquifer Groundwater dependent ecosystems Subterranean fauna	Refer to Table 4	**Medium risk** C=Major, short-term impact to an area of high conservation value or special significance L= Rare, may only occur in exceptional circumstances	Y	Condition 1 (infrastructure operation) **Existing condition 7 (authorised discharges to land)** Existing condition 9 (monitoring of discharges to land) Condition 14 (process monitoring) Existing condition 19 & 20 (Annual compliance and monitoring reporting)	The risk of deep well injection impacting the shallow freshwater aquifer and subterranean fauna has been previously assessed for the grant of L9102/2017/1. The liquid wastes proposed to be disposed are within the scope of liquid wastes considered by the previous assessment. The delegated officer considers the risk associated with the activity has not materially changed and is therefore acceptable. In addition to the existing licence conditions the delegated officer included the PWD and TWIP wells as authorised discharge to land locations to authorise the discharge into the Barrow Formation via the wells. The delegated officer has also split the deep well injection monitoring condition into separate discharge to land and process monitoring conditions for both the PWD and TWIP wells to distinguish between monitoring of the waste being discharged

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of licence	Reasoning
Source/ Activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
								and the well infrastructure. The delegated officer also included some of the licence holder's operational controls relating to deep well injection as conditions in the licence where they are key to minimising the risk of contaminated water impacting the freshwater aquifer. These include alarm systems on the LWF and on the PWD wells and pressure monitoring for the PWD wells and TWIP wells.
Receipt, handling and storage of PFAS contaminated waste at the Waste Transfer Station prior to offsite disposal	PFAS contaminants or contaminated water	Direct discharge to land and infiltration to groundwater leading to contamination of soil or groundwater Ingestion by fauna leading to health impact	Flora and fauna within the Class A Nature Reserve Groundwater ~9m below surface Subterranean fauna	Refer to Table 4	**Medium risk** C=Minor, low level onsite impact and minimal offsite impact at a local scale L= Unlikely, will probably not occur in most circumstances	*N*	**Condition 1 (infrastructure operation)** Existing conditions 10, 11 &12 (Waste management and monitoring) Existing condition 19 & 20 (Annual compliance and monitoring reporting)	PFAS contaminated wastes will be generated in association with emergency events, and on occasion during maintenance involving equipment containing PFAS foams, therefore the delegated officer considers this waste type will be generated on an ad hoc basis but there could be potentially large quantities dependent on the size of the emergency event. Appropriate waste storage is a key control to prevent discharge of PFAS, which is known to be a highly mobile contaminant, into the environment. The delegated officer included the licence holder's storage controls (labelling of waste and storage in a bunded area) as conditions in the licence. The delegated officer included an additional requirement to store hazardous waste within enclosed vessels to minimise the likelihood of discharge to the environment occurring and fauna accessing the waste. A definition for enclosed vessel was also included on the

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of licence	Reasoning
Source/ Activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
								licence to clarify requirements. It was noted the SLWMP has a similar commitment however it was targeted at preventing windblown waste and fauna access, and was not specific to hazardous waste therefore the delegated officer does not consider the condition to be regulatory duplication. To allow for storage of PFAS contaminated wastes (special waste type 3) at the Waste Transfer Station the delegated officer included the waste type in the licence together with associated monitoring and reporting requirements. The delegated officer considers that while it is unlikely PFAS will be discharged from storage, there is potential for stormwater at the Waste Transfer Station to be contaminated with PFAS as a result of special waste type 3 being stored. Stormwater from the Waste Transfer Station can potentially be collected and discharged into the premises stormwater drainage system when not reused at the facility. The delegated officer has included an operational requirement preventing stormwater collected within the Waste Transfer Station being discharged to the premises stormwater drainage system as discharge to the environment occurs from this system. It is anticipated that stormwater from the Waste Transfer Station is instead discharged to the LWF or PWWTP and disposed via the deep wells if it is not reused.

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of licence	Reasoning
Source/ Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Operation of the Concrete batching plant	Dust	Air/windborne dispersion causing health impacts to flora and fauna (smothering, etc)	Flora and fauna within the A class nature reserve	Refer to Table 4	**Medium risk** C=Minor, low level onsite impact and minimal offsite impact at a local scale L= Unlikely, will probably not occur in most circumstances	Y	Condition 1 (infrastructure operation) Existing condition 19 (Annual compliance report)	The delegated officer considers that operation of the CBP is adequately regulated through the *Environmental Protection (Concrete Batching) Regulations 1999* therefore further controls relating to concrete batching are not required. The delegated officer determined to include the operational freeboard used by the licence holder to manage the stormwater ponds to minimise the risk of overflow as it is the most significant source of contaminated water which could potentially be discharged in association with concrete batching activities.
	Contaminated water (sediment laden, alkaline, hydrocarbon contaminated)	Direct discharge to land and infiltration to groundwater leading to contamination of soil or groundwater. Direct discharge to land and overland flow impacting the health of flora or fauna	Flora and fauna within the Class A Nature Reserve Groundwater ~9m below surface Subterranean fauna					

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

4. Decision

The delegated officer has determined that subject to the regulatory controls outlined in Table 6 the proposed amendments are unlikely to result in a material change to the overall risk of the premises. With reference to the application detailed in section 2.2 and Table 7 below the delegated officer has granted the following amendments to the licence.

1) Inclusion of the PWWTP on the licence and associated increase to the design capacity for category 54: Sewage facility.
2) Inclusion of the CBP and category 77: Concrete batching or cement products manufacturing on the licence.
3) Update of the premises boundary to include the PWWTP and CBP locations. Premises maps were also updated to illustrate the change and include new infrastructure, discharge and monitoring locations.
4) Inclusion of category 61: Liquid waste facility on the licence to authorise the acceptance of liquid waste from locations outside the premises boundary for disposal via deep well injection. The assessed production capacity has been specified on the licence and is based on the expected volume of wastewater which will be accepted onto the premises from sources on Barrow Island outside the premises boundary.
5) Replacement of Category 62: Solid waste depot with category 61A: Solid waste facility together with changes to waste management conditions to allow for wastes generated outside the premises to be stored, processed and managed at the Waste Transfer Station prior to removal to the mainland for disposal.
6) Inclusion of special waste type 3 as a specified waste type that can be managed at the Waste Transfer Station subject to storage requirements and monitoring of volumes.

As per the assessment of the application for L9102/207/1, the delegated officer considers that the TSEMP required by MS 800 includes adequate monitoring of groundwater, fauna, flora, and surface and has not included any monitoring requirements related to these receptors in the amended licence.

The delegated officer determined not to amend the monitoring requirements for CO_2 discharges from Drill Centre A to C Injection Wells to include allowance for weekly sampling of hydrocarbon when the analysers at Train 1 to 3 are not available continuously. Continuous monitoring was specified in the licence to verify that the licence emission limits are being met. The delegated officer does not consider it necessary to include a contingency for when the continuous hydrocarbon analyser is not available as such a contingency could provide a disincentive to ensuring the continuous analyser is appropriately maintained for continuous monitoring. The delegated officer notes that conditions of the licence do not restrict the licence holder from implementing contingency monitoring and that a commitment to undertake such monitoring has been included in the revised CO_2 Disposal Management Plan, which must be implemented in accordance with the BI Act.

As part of this amendment the delegated officer also determined to make a number of minor amendments to the licence conditions to improve clarity and align them with the current licence condition format. This included removal of the general Authorised Emissions table from the licence, minor changes to condition and definition wording and amending references to total petroleum hydrocarbons to total recoverable hydrocarbons to align with terminology in the *National Environment Protection (Assessment of Site Contamination) Measure 1999*. Table 7 below provides a summary of all amendments incorporated into the amended licence and will act as a record of implemented changes.

Table 7: Summary of licence amendments

Condition no.	Amendments
Cover page	Categories 61, 77 have been added with relevant assessed design capacities, category 62 has been replaced with category 61A and the design capacity for category 54 has been increased to include the capacity of the PWWTP.
Table 1 Definitions	Included definitions for enclosed vessel, PFAS, PWD, TWIP, Special Waste Type 3 and WWTP
Previous Condition 1 Table 2 (Emissions)	Removed the Primary Activities Authorised Emissions table. Condition is no longer used and duplicates requirements of the EP Act and other authorised discharge point conditions in the licence.
Condition 1 Table 2	Infrastructure and equipment operation condition changed from 14 to 1. Operational requirements added for the WTS, BWWTP, PWWTP, concrete batching plant settlement pond and PWD wells. Wording update to requirements of the Stormwater Holding Pond and Oily Water Sump for clarity.
Condition 2 Table 3	Minor wording update for authorised discharge points to air condition to align with current condition format.
Condition 7 Table 4	Amended to include PWD and TWIP wells as authorised discharge points to land for wastewater.
Condition 8 Table 5	Total petroleum hydrocarbons amended to total recoverable hydrocarbons to align with terminology in the *National Environment Protection (Assessment of Site Contamination) Measure 1999*.
Condition 10 Table 6	Amended to reference the Waste Transfer Station to allow waste from outside the premises to be received. Removed reference to disposal of liquid waste by deep well injection which is covered by condition 7. Included special waste type 3 as a waste type to be managed and revised the wording of hazardous waste for clarity.
Condition 11 & 12	Included special waste type 3 as a waste type to be recorded, revised the title of tables and reference to hazardous wastes for clarity.
Condition 13	Included a requirement to record the total amount of liquid waste being received onto the premises which will be disposed at the LWF or TWIP.
Condition 14 Table 9	Previous condition 13. With the exception of discharge water quality, deep well monitoring requirements previously in Schedule 3 Table 15 moved into Table 9, and updated to include TWIP monitoring requirements, and referred to as process monitoring. Deep well discharge water quality monitoring moved to Schedule 3 Table 14 monitoring of discharges to land. New requirement for monitoring of treated effluent quality for the PWWTP and BWWTP.

Condition no.	Amendments
Condition 15 and 16	Previous condition 15 (Records), split into condition 15 and 16 with minor wording updates in line with current condition format.
Condition 18	Previous condition 17 (Complaints management), condition wording updated in line with current condition format.
Condition 19	Previous condition 18 (Annual Audit Compliance Report), condition updated in line with current condition format.
Condition 20 Table 10	Reporting for monitoring of deep disposal wells updated to reporting for process monitoring and liquid waste receival monitoring included. Requirement specified for waste reporting.
Schedule 1	Premises map, site layout map, map of discharge point to land and monitoring locations, and boundary coordinates updated to include the infrastructure and discharge points relevant to the application.
Schedule 2 Table 12	Primary activity infrastructure and equipment table updated to include infrastructure relevant to the application.
Schedule 3 Table 14	Water quality monitoring requirements for the PWD and TWIP wells moved from the previous Schedule 3 Table 15 (Waste output monitoring) to Table 14 (Monitoring of discharges to land). Total petroleum hydrocarbons amended to total recoverable hydrocarbons to align with terminology in the *National Environment Protection (Assessment of Site Contamination) Measure 1999*.
Previous Schedule 3 Table 15 Waste output monitoring	Table removed and requirements moved into Tables 9 and 14.

5. Consultation

The licence holder was provided with the draft amended licence and amendment report on 11 June 2021. The licence holder responded on 6 August 2021. A summary of the licence holder's comments together with the delegated officer's consideration of these is included in Appendix 1

6. Conclusion

Based on the assessment in this Amendment Report, the delegated officer has determined that an amended licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Caron Goodbourn
Manager, Process Industries
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia
2. Department of Water and Environmental Regulation (DWER) 2018, *Decision Report, L9102/2017/1, Gorgon LNG Project,* Perth, Western Australia
3. DWER 2019, *Guideline: Decision Making*, Perth, Western Australia
4. DWER 2020a, *Guideline: Risk Assessments*, Perth, Western Australia
5. DWER 2020b, *Guideline: Environmental Siting*, Perth, Western Australia.
6. Department of Environment and Conservation (DEC) 2012, *Environmental Assessment Report W5097/2011/1 Gorgon Gas Permanent Wastewater Treatment Plant*, Perth, Western Australia.
7. Chevron Australia Pty Ltd (Chevron) 2011, *Permanent Wastewater Treatment Plant Works Approval Application under the Environmental Protection Act 1986 for the Gorgon Project Barrow Island LNG Plant*, Perth, Western Australia.
8. Chevron 2015, *Gorgon Project: LNG Wastewater Disposal Well Injection Operations Regulatory Compliance Manual*, Perth, Western Australia.
9. Chevron 2019, *Gorgon Project: Commissioning Report for the Permanent Wastewater Treatment Plant Works Approval W5097/2013/1*, Perth, Western Australia.
10. Chevron 2020, *L9102/2017/1 Amendment Application and addendum*, Perth, Western Australia.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
pg 1 – prescribed premises descriptions	Assessed capacity for liquid waste to be specified individually for the PWD wells and the TWIP wells based on their disposal capacity as this is the maximum amount the premises can theoretically receive and inject. Actual receipt of liquid wastes onto the premises will be significantly less than this. Assessed production capacity for other solid waste increased to 111,840 tpa so it is based on the peak monthly volume which can be held at the WTS rather than average, aligning with Table 6.	The Delegated Officer accepted the assessed production capacity for the WTS should be increased to align with the maximum monthly capacity which can be received. As the LWF and TWIP will primarily receive wastewater from within the premises for disposal, rather than from sources external to the premises, the Delegated Officer determined to specify the production rather than design capacity for receiving liquid waste onto the premises. The production capacity specified is based on the maximum amount of liquid waste expected to be received onto the premises each year.
Table 1 Definitions	Definitions added for PWD and TWIP	Definitions acceptable and included in the amended licence.
1, Table 2	Requested the following changes to the table: • 'where practicable' be added to storage requirements for the waste transfer station • Remove requirement for an alarm for pump faults as this was not included in the design of the WWTPs • Separate requirements for PWD and TWIP wells as the TWIP wells were constructed separately from the PWD wells and therefore have different construction and are not connected into the Gorgon online control system.	• The Delegated Officer considers the proposed change would impact the enforceability of the condition and therefore has not made the requested change, rather has defined the term 'enclosed vessel' to provide clarity. • The requirement for an alarm for pump faults was removed as it was not part of the design and other alarms are considered suitable to mitigate the risk of discharge to the environment. • The suggested operational requirement for daily manual checks of TWIP well A annulus pressure has not been included in the place of a high pressure alarm as this is incorporated in the monitoring requirements in Table 13. Operational requirements have not been included for the TWIP wells.
10, Table 6	Requested Special Waste Type 3 specification align with Special Waste Type 1 and solid hazardous waste rather than Liquid hazardous waste, which requires waste to be stored within a bunded area. Requested order of conditions relating to waste management are changed so those relating to the Waste Transfer Station are in sequence.	Due to the mobility and hazardous nature of PFAS the Delegated Officer does not consider it appropriate to store Special Waste Type 3 outside a bunded area and therefore has retained the requirement. The order of the waste management conditions has been revised as requested.
14, Table 9	Requested separate monitoring requirements for PWD and TWIP wells as their design and construction differs therefore their monitoring capability also differs. Specifically, there is no	The Delegated Officer considered it appropriate to specify separate monitoring requirements for the disposal wells on the basis of their design

Condition	Summary of applicant's comment	Department's response
	choke installed, continuous online monitoring or pressure gauge on the B annulus and this is filled with cement for the TWIP wells. Flow to the TWIP wells is also controlled via positive displacement pumps.	features therefore revised the monitoring requirements accordingly.
Schedule 1 Maps	Updated maps (and premises boundary coordinates) provided to update the prescribed premises boundary (now includes discharge point L1)	Updated maps and premises boundary coordinates included in the amended licence.
Schedule 2 Primary Activities	Minor changes to infrastructure descriptions for the PWWTP, LWF and CBP.	Proposed changes provide clarity therefore were incorporated into the amended licence.
Table 14	Clarified wording for monitoring of stormwater pond such that monitoring occurs prior to discharge to L1 as discharge to PWD wells can also occur. Clarified wording for WDW1 and WDW2 monitoring location.	Proposed changes provide clarity to monitoring requirements therefore were incorporated into the amended licence.

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY					
Application type					
Works approval	☐				
Licence	☒	Relevant works approval number:		None	☐
		Has the works approval been complied with?		Yes ☐ No ☐	
		Has time limited operations under the works approval demonstrated acceptable operations?		Yes ☐ No ☐ N/A ☐	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?		Yes ☐ No ☐	
		Date Report received:			
Renewal	☐	Current licence number:			
Amendment to works approval	☐	Current works approval number:			
Amendment to licence	☒	Current licence number:	L9102/2017/1		
		Relevant works approval number:	W5097/2011/1 (only relevant to Cat 54 inclusion)	N/A	☐
Registration	☐	Current works approval number:		None	☐
Date application received					
Applicant and Premises details					
Applicant name/s (full legal name/s)		Chevron Australia Pty Ltd			
Premises name		Gorgon LNG Project			
Premises location		Barrow Island (premises location description as per existing licence with only coordinates requiring amending)			
Local Government Authority		Shire of Ashburton			
Application documents					
HPCM file reference number:		DER2017/001839-1~7			
Key application documents (additional to application form):		Application form with the following attachments: Prescribed premises map; Prescribed premises coordinates; Infrastructure and equipment map; Infrastructure and equipment table; and Emission and monitoring points map.			
Scope of application/assessment					

Summary of proposed activities or changes to existing operations.	Licence amendment to include operation of infrastructure not yet included in the Gorgon licence (and associated amendment to the premises boundary). Infrastructure proposed for inclusion on the licence includes: • Permanent Wastewater Treatment Plant (constructed, commissioned and operated in accordance with W5097/2011/1 which expires on 28 April 2021) (commissioning report on file received 29 January 2019); and • An existing concrete batching plant. The licence holder has also requested inclusion of Cat 61 on the licence as liquid waste received on the premise is likely to exceed the category threshold. Liquid waste will be generated from solid removal packages at the CO_2 pressure management drill centres (located outside the premises boundary) and will be disposed on the premises via deep well injection (Permanent Wastewater Disposal wells on the licence). The licence holder has requested special waste type 3 be specified in the licence as an additional waste type that can be stored at the premises waste transfer station to account for PFAS impacted waste which may be generated through fire fighting activities. The licence holder has requested inclusion of allowance for weekly sampling of hydrocarbon for CO_2 injection via the Injection wells when the analysers are not available continuously. The licence currently requires continuous monitoring of hydrocarbons. The licence holder has requested Cat 62 be replaced by Cat 61A to more accurately reflect the premises activities.

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 54: Sewage facility	1,385 m^3/day	1,768 m^3/day (PWWTP has a design throughput of 383 m^3/day)
Category 77: Concrete batching and cement products manufacturing	NA	75,000 tpa
Category 61: Liquid waste facility	NA	2,500,000 tpa (design capacity is based on the capacity of the produced water disposal wells which receive liquid waste for injection)
Category 61A: Solid Waste Facility	240,000 tonnes of stockpiled concrete waste per annual period 52,050 tonnes of other solid waste per annual period	No change to specified capacity only a change from Category 62 to 61A
No changes to Categories 10, 34, 52 or 73 have been sought		

Legislative context and other approvals		
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes ☐ No ☒	Referral decision No: Managed under Part V ☐ Assessed under Part IV ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☒ No ☐	Ministerial statement No: MS 748 and MS800 EPA Report No: 1221 and 1323
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☒ No ☐	Reference No: EPBC 2003/1294, EPBC 2008/4178
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☐ General lease ☒ Expiry: Mining lease / tenement ☐ Expiry: Other evidence ☐ Expiry: Leases previously provided for past amendments, no changes to those comprising the premises
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☒	Approval: Expiry date: If N/A explain why? All infrastructure subject to the amendment is existing.
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☐ No ☒	CPS No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☐ No ☒	Application reference No: Licence/permit No: Licence / permit not required.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☐ No ☒	Name: N/A Type: Has Regulatory Services (Water) been consulted? Yes ☐ No ☐ N/A ☐ Regional office:

Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes ☐ No ☐ N/A ☒
Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)	Yes ☒ No ☐	*Dangerous Goods Safety Act 2004* *Dangerous Good Safety (Major Hazard Facilities) Regulations 2007* *Barrow Island Act 2003* *Petroleum Pipelines Act 1969*
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☒ No ☐	Barrow Island Nature Reserve (BINR) is currently registered under the CS Act as Contaminated – remediation required. There are a number of areas on the BINR where contamination exists as a result of existing infrastructure, most significantly the terminal tank facility (operated as part of the Barrow Island Oil & Gas Processing Facility) located 1 km north of the Premises.