



Gorgon Gas Development and Jansz Feed Gas Pipeline

Solid and Liquid Waste Management Plan

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1.0 Introduction

1.1 Proponent

Chevron Australia Pty Ltd (Chevron Australia) is the proponent and the person taking the action for the Gorgon Gas Development on behalf of the following companies (collectively known as the Gorgon Joint Venturers):

- Chevron Australia Pty Ltd
- Chevron (TAPL) Pty Ltd
- Shell Development (Australia) Pty Ltd
- Mobil Australia Resources Company Pty Limited
- Osaka Gas Gorgon Pty Ltd
- Tokyo Gas Gorgon Pty Ltd
- JERA Gorgon Pty Ltd.

1.2 Project

Chevron Australia is developing the gas reserves of the Greater Gorgon Area. The gas will be processed in a gas treatment plant on Barrow Island, which is located off the Pilbara coast 85 km north-north-east of Onslow in Western Australia (WA) (Figure 1-1).

Subsea gathering systems and pipelines deliver feed gas from the Gorgon and Jansz–Io gas fields to the west coast of Barrow Island. The underground feed gas pipeline system then traverses Barrow Island to the east coast where the Gas Treatment Plant (GTP) is located. The GTP includes natural gas trains that produce liquefied natural gas (LNG), as well as condensate, and domestic gas. Carbon dioxide, which occurs naturally in the feed gas, is separated during the production process and injected into deep rock formations beneath Barrow Island. The LNG and condensate is loaded onto tankers from a jetty and then transported to international markets. Gas for domestic use is exported by pipeline from Barrow Island to the domestic gas collection and distribution network on the WA mainland.

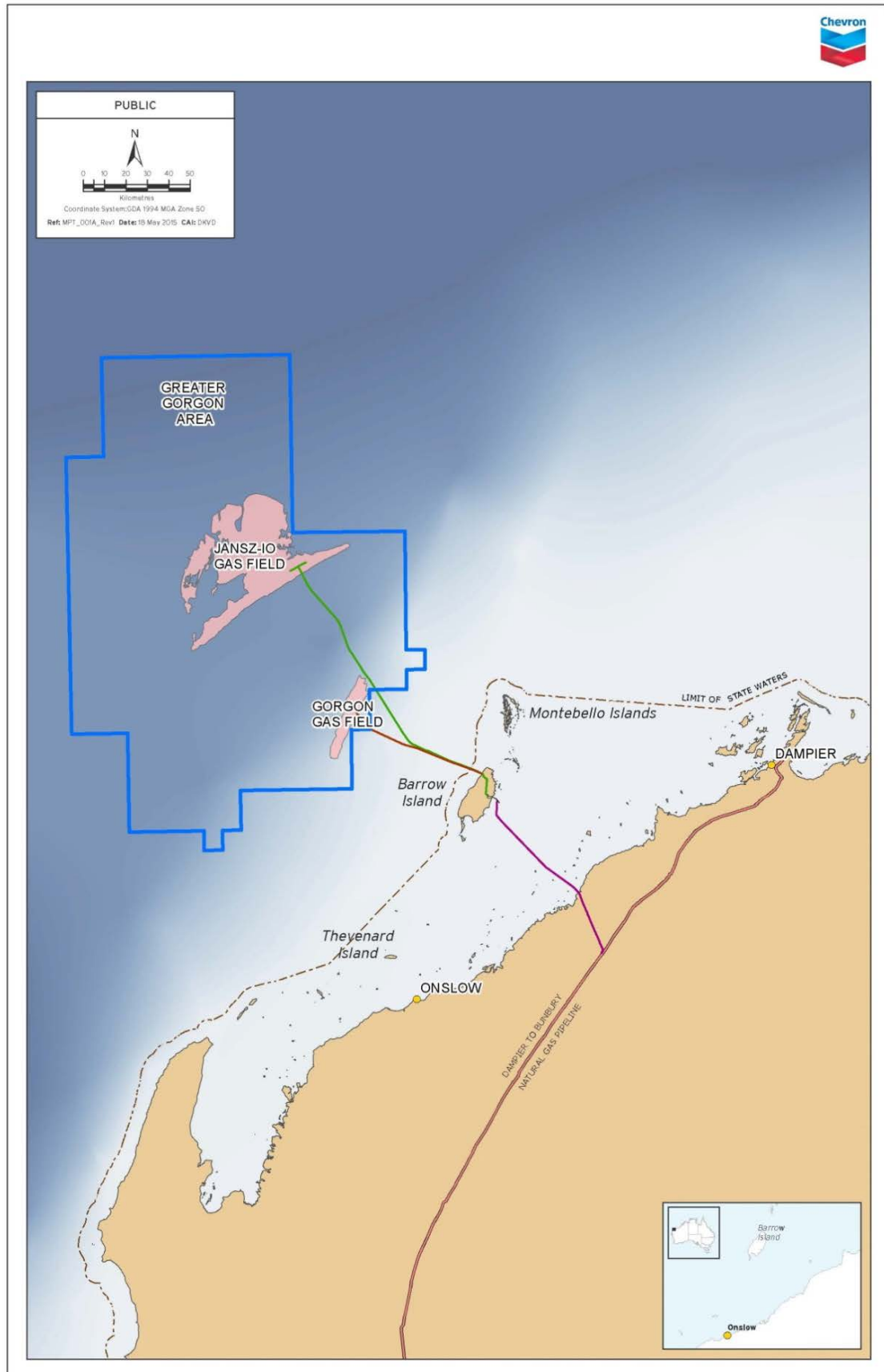


Figure 1-1: Location of Barrow Island and the Greater Gorgon Area

1.3 Environmental Approvals

Table 1-1 describes State and Commonwealth approvals for the components of the Gorgon Gas Development.

These approvals, and projects as approved under these approvals, have been and may continue to be amended (or replaced) from time to time.

Table 1-1: State and Commonwealth Approvals

Project Approval Stage	State	Commonwealth
Jansz Feed Gas Pipeline	Ministerial Statement (MS) 769 (Ref. 1). 28 May 2008	EPBC Reference: 2005/2184 (Ref. 2). 22 March 2006
Initial Gorgon Gas Development (2 LNG Trains)	Initial Gorgon Gas Development comprising two LNG Trains – MS 748 (Ref. 4). This was superseded by MS 800. 6 September 2007	Initial Gorgon Gas Development comprising two LNG Trains – EPBC Reference: 2003/1294 (Ref. 6). 3 October 2007
Revised and Expanded Gorgon Gas Development (3 LNG Trains)	MS 800 (Ref. 3) provides approval for both the initial Gorgon Gas Development and the Revised and Expanded Gorgon Gas Development (comprising three LNG Trains), which together are known as the Gorgon Gas Development. This statement supersedes MS 748. 10 August 2009	The Revised and Expanded Gorgon Gas Development (EPBC Reference: 2008/4178 [Ref. 5]) was approved, and the conditions for the initial Gorgon Gas Development (EPBC Reference: 2003/1294 [Ref. 6]) were varied. 26 August 2009
Dredging Amendment	MS 865 (Ref. 8) provides approval to establish a restart mechanism in the event of a project-attributable coral health management trigger. This statement is an amendment to Conditions 18, 20, and 21 of MS 800. 8 June 2011	N/A
Additional Support Area	MS 965 (Ref. 7) applies the conditions of MS 800 to an Additional Support Area. 2 April 2014	The conditions for the initial Gorgon Gas Development (EPBC Reference: 2003/1294) [Ref. 6]) and for the Revised and Expanded Gorgon Gas Development (EPBC Reference: 2008/4178) [Ref. 5]) were varied. 15 April 2014
Gorgon Gas Development Fourth Train Expansion ¹	MS 1002 (Ref. 9) applies the conditions of MS 800 to the Fourth Train Expansion, and has additional conditions. 30 April 2015	EPBC Reference: 2011/5942. 27 May 2016

¹ This Plan will apply to the Fourth Train Expansion once this scope commences..

1.4 Purpose of this Plan

1.4.1 Requirement for this Plan

This Plan outlines the management of solid and liquid waste generated within Barrow Island and surrounding waters during the construction and operation of the Gorgon Gas Development.

1.4.1.1 State Environmental Approval Requirement

This Plan is required under Condition 30.1 of MS 800:

Prior to commencement of construction of the terrestrial facilities listed in Condition 6.3, the Proponent shall submit a Solid and Liquid Waste Management Plan (this Plan) to the Minister that meets the objectives of Condition 30.2 and the requirements of Condition 30.3, unless otherwise allowed in Condition 30.1A, as determined by the [State] Minister to cover all solid wastes, waste from the wastewater treatment plant and other liquid waste.

This Plan is also required under Condition 16.1 of MS 769:

Prior to commencement of construction of the Terrestrial Facilities listed in Condition 6.3, the Proponent shall submit a Solid and Liquid Waste Management Plan (this Plan) to the Minister that meets the objectives of Condition 16.2 and the requirements of Condition 16.3 as determined by the Minister to cover all solid wastes, waste from the wastewater treatment plant and other liquid waste.

1.4.1.2 Commonwealth Environmental Approval Requirement

This Plan satisfies the requirements of Condition 20.1 of EPBC Reference: 2003/1294 and 2008/4178:

Prior to commencement of construction of the terrestrial facilities listed in Condition 5.2, the Proponent shall submit a Solid and Liquid Waste Management Plan (this Plan) to the Minister that meets the objectives of Condition 20.2 and the requirements of Condition 20.3, unless otherwise allowed in Condition 20.1A, as determined by the [Commonwealth] Minister to cover all solid wastes, waste from the wastewater treatment plant and other liquid waste.

1.4.2 Objectives of this Plan

The stated objectives of this Plan in Condition 30.2 of MS 800, Condition 16.1 of MS 769, and Condition 20.2 of EPBC Reference: 2003/1294 and 2008/4178 are to:

- *Ensure all Proposal [action]-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*

The stated objectives of this Plan in Condition 30.2 of MS 800, and Condition 20.2 of EPBC Reference: 2003/1294 and 2008/4178 are to:

- *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 [Western Australian] Minister; and*
- *Ensure any deep well injection of Proposal [action]-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.*

As per Condition 30.2 of MS 800, and Condition 20.2 of EPBC Reference: 2003/1294 and 2008/4178, approval of this Plan acts as the authorisation by the WA Minister for

the Environment for discharges from any wastewater treatment plant (WWTP), reverse osmosis (RO) plant, or other process water not disposed of via deep well injection.

1.4.3 Contents of this Plan

Table 1-2 lists the State and Commonwealth Condition requirements of this Plan and the sections in this Plan that fulfil them.

Table 1-2: Condition Requirements Addressed in this Plan

Note: This requirements text is based on MS 800. Additional words in these requirements from MS 769 are contained in [square brackets]; additional words in the requirements from EPBC Reference: 2003/1294 and EPBC Reference: 2008/4178 are contained in (parentheses), except when they are abbreviations.

Approval Decision	Condition No.	Condition Requirement	Section in this Plan
MS 800	30.3i	The Plan shall include a description of the facilities to be provided and management measures to be implemented to ensure wastes are managed to meet the objectives set in this Condition.	Section 2.2.3
EPBC Refs: 2003/1294 and 2008/4178	20.3i		Section 4.0
MS 769	16.2		
MS 800	30.2i	Ensure all Proposal [action]-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	Section 2.2.3
EPBC Refs: 2003/1294 and 2008/4178	20.2i		Section 4.0
MS 769	16.1		
MS 800	30.2ii	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 [Western Australian] Minister; and	Section 2.2.3
EPBC Refs: 2003/1294 and 2008/4178	20.2ii		Section 2.3 Approval of this Plan
MS 800	30.2iii	Ensure any deep well injection of Proposal [action]-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.	Section 2.3.2
EPBC Refs: 2003/1294 and 2008/4178	20.2iii		Section 4.0
MS 800	30.3ii	Performance Standards against which achievement of the objectives of this Condition can be determined.	Section 5.0
EPBC Refs: 2003/1294 and 2008/4178	20.3ii		
EPBC Refs: 2003/1294 and 2008/4178	3.2.1	A description of the EPBC Act listed species and their habitat likely to be impacted by the components of the action which are the subject of that plan.	Section 3.2; Appendix D; Appendix E
EPBC Refs: 2003/1294 and 2008/4178	3.2.2	An assessment of the risk to these species from the components of the action the subject of that plan, relevant to that plan.	Section 3.2; Appendix D; Appendix E

Approval Decision	Condition No.	Condition Requirement	Section in this Plan
EPBC Refs: 2003/1294 and 2008/4178	3.2.3	Details of management measures proposed in relation to these species if it is a requirement of the Condition requiring that plan.	Section 4.0
EPBC Refs: 2003/1294 and 2008/4178	3.2.5	Performance standards in relation to that species if it is a requirement of the Condition requiring that plan	Section 5.0

Any matter specified in this Plan is relevant to the Gorgon Gas Development only if that matter relates to the specific activities or facilities associated with that particular development.

The sections in this Plan listed in Table 1-2 to meet the conditions of EPBC Reference: 2003/1294 and 2008/4178 shall be read and interpreted as only requiring implementation under EPBC Reference: 2003/1294 and 2008/4178 for managing the impacts of the Gorgon Gas Development on, or protecting, Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) matters. The implementation of matters required only to meet the requirements of MS 800 and MS 769 are not the subject of the EPBC Reference: 2003/1294 and 2008/4178.

2.0 Waste Management

This Plan applies to all solid and liquid wastes generated during construction and operation of the Gorgon Gas Development (except those managed as per Table 2-1). This Plan is a high-level document intended to meet the requirements and objectives outlined in Sections 1.4.2 and 1.4.3. It provides general management actions for the storage, treatment, and disposal of waste generated on Barrow Island and its surrounding waters.

Table 2-1: Management of Waste Implemented in other Plans

Scope	Legislative Requirement	Regulatory Plan ¹
Management of RO brine discharge from the Permanent and Bridging RO facilities within the GTP. Note this stand-alone document has now been incorporated into this Plan and the MEQMP.	Condition 30 of MS 800 Condition 20 of EPBC Reference: 2003/1294 and 2008/4178	Reverse Osmosis Brine Disposal via Ocean Outfall Environmental Management and Monitoring Plan (Ref. 10)
Management of construction dredge spoil	Condition 20 of MS 800 Condition 14 of EPBC Reference: 2003/1294 and 2008/4178	Dredging and Spoil Disposal Management and Monitoring Plan (Ref. 11)
Management of quarantine-risk material and the discharge of ballast water from marine vessels	Condition 10 of MS 800 Condition 8 of EPBC Reference: 2003/1294 and 2008/4178	Terrestrial and Marine Quarantine Management System (Ref. 12)
Management of the drainage system and waste entering the drainage system prior to disposal Management of hazardous waste in line with other hazardous materials	Condition 7 of MS 800 Condition 6 of EPBC Reference: 2003/1294 and 2008/4178	Terrestrial and Subterranean Environmental Protection Plan (TSEPP) (Ref. 14)
Management of waste that is disposed of via sea dumping	<i>Environment Protection (Sea Dumping) Act 1981</i> (Cth)	Relevant Sea Dumping Permit
Management of fire that is generated from waste	Condition 7 of MS 800 Condition 12 of EPBC Reference: 2003/1294 and 2008/4178	Fire Management Plan (Ref. 13)
Monitoring of the marine environment for effects of waste discharges and inputs on water and sediment quality	Condition 23A of MS 800	Marine Environmental Quality Management Plan (MEQMP) (Ref. 27)
Management of impacts and risks associated with commissioning, start-up, and operation of the DomGas and Feed Gas Pipeline Systems	<i>Petroleum (Submerged Lands) Act 1982</i> (WA) <i>Petroleum Pipelines Act 1969</i> (WA)	Environment Plans for DomGas and Feed Gas Pipelines
Monitoring program to detect any Material or Serious Environmental Harm to ecological elements	Condition 8 of MS 800 Condition 7 of EPBC Reference: 2003/1294 and 2008/4178	Terrestrial and Subterranean Environmental Monitoring Program (Ref. 28)

¹ Environmental Management Plan titles as amended or supplemented from time to time

2.1 Waste Streams

Various wastes are generated during the construction and operation phases of the Gorgon Gas Development. These wastes can be broadly classified under the categories of general waste, putrescible waste, recyclable waste, solid and liquid hazardous waste, and quarantine-risk material; each is defined in Section 6.0 of this Plan.

Some wastes fall outside the scope of this Plan and are managed under other environmental management plans (Table 2-1).

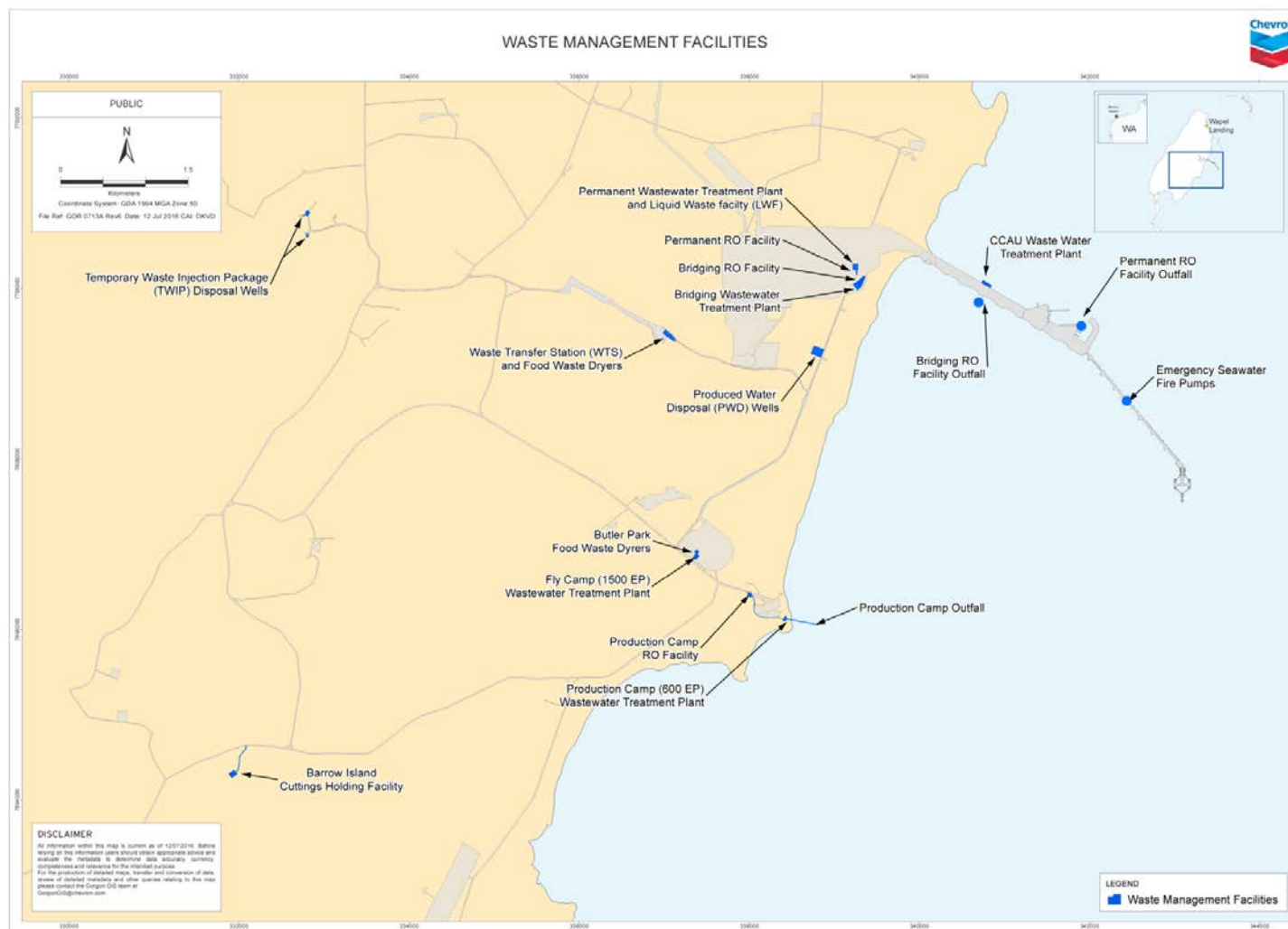


Figure 2-1: Indicative Location of Gorgon Gas Development Waste Management Facilities on Barrow Island

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2.2 Waste Management Facilities

The waste facilities described in this Plan are limited to permanent and/or long-term waste facilities store, treat, or dispose of solid and/or liquid waste generated on Barrow Island and its surrounding waters (Figure 2-1). Temporary waste facilities and facilities that store, treat, and dispose of waste as a secondary purpose are not included in the facility descriptions below.

Temporary waste storage areas may be established at key waste generation locations, including work areas, offices, accommodation facilities, and away from waste generation locations where appropriate. Where practicable, these temporary waste storage areas support the segregation of waste at source by the workforce.

For offshore works associated with the scope of this Plan, temporary waste storage areas are provided on all vessels.

Section 4.0 (Table 4-1) describes the management measures associated with the waste management facilities described below.

2.2.1 Waste Storage Facilities

The facilities described below are limited to primary waste facilities, which are dedicated to the storage of solid and/or liquid waste on Barrow Island and within its surrounding waters (Figure 2-1).

2.2.1.1 Barrow Island Cuttings Holding Facility

The Barrow Island Cuttings Holding Facility may be used by the Gorgon Gas Development to store drilling cuttings, drilling fluids, and excess cement from Gorgon drilling programs. The Cuttings Holding Facility was purpose-built by WA Oil in 2012 to temporarily store and dry drilling cuttings.

2.2.1.2 Waste Transfer Station

A Waste Transfer Station (WTS) receives, stores, and handles solid and liquid wastes generated by the Gorgon Gas Development. The facility contains general waste, recyclables, hazardous (solid and liquid), and quarantine-risk wastes, and allows for the segregation of non-compatible hazardous wastes.

2.2.1.3 Liquid Waste Facility

The Liquid Waste Facility (LWF) for the Gorgon Gas Development receives and stores effluent, process water, and produced water prior to disposal.

2.2.2 Waste Treatment Facilities

The facilities described below are limited to primary waste facilities, which are dedicated to the treatment of solid and/or liquid waste on Barrow Island and surrounding waters (Figure 2-1).

2.2.2.1 Oil/Water Separators

Oily water treatment systems such as oil/water separators and skimmers treat various sources of hydrocarbon-contaminated water (including hydrocarbon-contaminated stormwater) on Barrow Island. These are located within the drainage system and LWF (Section 2.2.1.3).

2.2.2.2 Wastewater Treatment Plants

Effluent is treated in the Barrow Island WWTPs at the camps and within the GTP footprint. The Causeway Construction Accommodation Units (CCAUs) WWTPs also treat effluent. Figure 2-1 shows the locations of the WWTPs.

During Gorgon Gas Development activities, facilities at the existing and extended WA Oil camp site are required to be shared, including using the camp site's WWTP facilities.

2.2.2.3 Food Waste Dryers

Food waste dryers treat putrescible solid wastes and putrescible-contaminated materials, which are generated from various sources across Barrow Island. No hazardous materials are to be treated in the food waste dryers.

Food waste dryers are located adjacent to the accommodation messes (where most food waste is generated), with additional units located at the WTS (Section 2.2.1.2).

2.2.2.4 Marine Vessels

Waste treatment systems used on marine vessels associated with the scope of this Plan and operating within the waters surrounding Barrow Island may include wastewater treatment systems in accordance with MARPOL (Ref. 16), where applicable.

2.2.2.5 Incineration Facility

This information is only relevant if an incinerator is installed on Barrow Island.

An incinerator may be used to treat putrescible solid wastes and putrescible-contaminated materials generated from activities associated with the Gorgon Gas Development. Specific requirements for incineration of waste, including management measures, are defined in secondary approvals required under Part V of the Western Australia *Environmental Protection Act 1986* (EP Act).

Ash and particulate residue generated by the incineration facility are disposed of as per Section 2.2.3.

2.2.3 Waste Disposal Facility

2.2.3.1 Deep Well Injection

The deep well injection facility disposes liquid waste from Barrow Island and its surrounding waters. This facility is described in Section 2.3.2.

2.3 Waste Disposal Options

Responsible waste management can be achieved through the hierarchical application of re-use, recycling/recovery, treatment, and responsible disposal practices. Where practicable, the following waste disposal hierarchy is to be adopted for the construction and operation of the Gorgon Gas Development:

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.

Implementation of the waste disposal hierarchy allows for a holistic approach to environmental management and resource efficiency. If waste is suitable for re-use, recycling, and deep well injection, those alternatives are preferred over the option to remove it off Barrow Island. This is because the environmental footprint generated from

removal activities would far exceed the environmental benefit of removing it. In addition, the re-use, recycling, or deep well injection options reduce the risk to the environment caused by delayed disposal and decrease the resources required for removing waste from Barrow Island and transporting it to a final disposal location. The cost of transporting and disposing of waste at a third-party facility is disproportional to the environmental risk being managed. Instead, Chevron Australia has focused on management measures relating to deep well injection to ensure Material or Serious Environmental Harm is not caused.

By re-using and recycling suitable waste streams on Barrow Island the requirement to produce, transport, and later dispose of additional material is reduced. Reducing the additional production, transport, and disposal processes helps conserve natural resources, prevents pollution, saves energy, and reduces greenhouse gas emissions.

7.0 Appendix A gives an example of the decision flow for the waste hierarchy and environmental assessment process used to determine appropriate disposal options for waste streams.

2.3.1 Waste Re-use and Recycling on Barrow Island

2.3.1.1 Liquid Waste Streams

In accordance with the waste hierarchy outlined in Section 2.3, re-using and recycling liquid waste is preferred over other disposal options, where practicable. Potential re-use opportunities for liquid waste on Barrow Island include, but are not limited to:

- drilling activities
- rehabilitation and remediation
- compaction
- dust suppression
- hydrotesting.

Re-using and recycling liquid waste streams (e.g. treated effluent, produced water, process water) will be assessed in accordance with the environmental assessment process described in Section 2.3.4.

Re-use may also be regulated under Part V of the EP Act and/or criteria in Department of Health (WA) approvals.

2.3.1.2 Solid Waste Streams

In accordance with the waste hierarchy outlined in Section 2.3, re-using and recycling solid waste is preferred over other disposal options, where practicable.

Various solid waste streams (e.g. clean fill, waste concrete, drilling cuttings) from the Gorgon Gas Development may be re-used or recycled. An environmental assessment will be conducted to minimise the potential environmental risks to as low as reasonably practicable (ALARP), and to ensure no Material or Serious Environmental Harm will result from the re-use or recycling of solid wastes. This assessment considers factors such as:

- characteristics of the waste
- characteristics of the receiving environment
- run-off and sedimentation impacts, such as erosion
- potential to cause pollution (as defined by Section 72 of the EP Act)
- chemical interaction and combustion impacts

- air emissions
- potential impacts to fauna, flora, and fauna habitats
- potential impacts resulting from the degradation of the solid waste.

Solid waste may be re-used if the risk assessment process determines that the potential environmental impacts resulting from re-use are ALARP and no pollution or Material or Serious Environmental Harm is expected.

Potential uses of solid waste on Barrow Island include, but are not limited to:

- fill material
- demarcation between pedestrian paths and roads.

2.3.2 Deep Well Injection

Liquid wastes are injected into the Barrow Group geological formation through the Produced Water Disposal (PWD) wells or the Temporary Waste Injection Package (TWIP) disposal wells (Figure 2-1). The liquid waste is injected to a depth of more than 1000 m beneath Barrow Island, which is substantially below the lower limit of the stygofauna habitat in the superficial aquifer, which is approximately 50 m below ground level. This formation is geologically isolated from much shallower surface formations and the watertable that contains the subterranean fauna and their habitats. As a result, the disposal of liquid waste on Barrow Island via deep well injection is not expected to cause Material or Serious Environmental Harm to subterranean fauna and their habitats. Liquid waste is transported to the PWDs via a dedicated services corridor to reduce the risk of impact from vehicles and penetration.

If liquid waste cannot be re-used (as per Section 2.3.1.1), it may be disposed of via deep well injection, if practicable. Additional requirements for deep well injection of liquid waste are defined in the operating licence obtained under Part V of the EP Act and TSEPP, where applicable.

Factors that could cause potential environmental effects during deep well injection include:

- mechanical integrity failure in wells
- fracturing of the receiving formations and overlying confining units
- injection into a receiving environment that is not isolated from shallower aquifers by adequate confining layers.

2.3.2.1 Maintaining Well Integrity

To maintain well integrity, it is important to avoid corrosion or scaling of the well, blocking well screens, clogging formation porosity, and to maintain interconnected permeability. Parameters such as pH, Total Suspended Solids (TSS), and Total Petroleum Hydrocarbons (TPH) are monitored to ensure the correct and efficient operation of the injection wells.

To prevent infrastructure failure resulting in an emission to the surface or near-surface groundwater where stygofauna are known to be present, the wells are designed to ensure mechanical integrity is maintained and failures are identified.

Liquid waste from the Gas Treatment Plant is disposed off via the PWD wells and is managed under a Part V EP Act licence. The design of the PWD wells allows for the injection of the maximum expected rate, including infrequent cyclonic rainfall (described in the Part V licence). Operational redundancy is designed into the system, with each well capable of injecting the entire system load if the other well is out of service. Additionally, the disposal water tanks have sufficient capacity to provide a buffer against minor process upsets.

2.3.2.2 Avoiding Fracturing of the Overlaying Confining Units

Fracturing the overlaying confining units has the potential to allow liquid waste to migrate out of the receiving aquifer and into sensitive environments.

Fracturing is not expected in the Barrow Group Formation under normal operating conditions of the LWF and PWD wells. High permeability of the receiving formation prevents pressure build-up, further reducing the risk of fracturing of the receiving environment under normal operating conditions. Furthermore, if fractures occur, they are expected to be contained within the completion intervals, in the receiving formation, not in the overlaying confining units.

2.3.2.3 Ensuring the Receiving Environment is Isolated

The Barrow Group Formation characteristics (large pore space and extent over a large regional area) ensures its suitability for injecting liquid waste. The sands within the formation behave as a single hydraulically connected unit that extends well beyond Barrow Island. The mineralogy of the formation is stable, with very low potential for adverse reactions between the injected waste and the sandstone. Porosity and permeability of the formation are not expected to be reduced through precipitation or deposition of minerals from the injected waste.

The formation is hydraulically separated from any permeable formations and has been used for water supply and disposal for WA Oil asset on Barrow Island for several decades.

2.3.3 Waste Disposal at Third-party Facilities

In line with the waste hierarchy, solid and liquid waste streams that are not re-used, recycled, or disposed of via deep well injection (as described in Sections 2.3.1 and 2.3.2), are to be sent to an appropriately licenced facility off Barrow Island for recycling, treatment, or disposal, where practicable. If this is not practicable, such waste may be discharged to the terrestrial environment or into the marine environment as per Sections 2.3.4 and 2.3.5.

2.3.4 Discharge to Terrestrial Environment

During periods where it is not practicable to re-use effluent, produced water, and process water, or to dispose of via the deep well injection facilities, or transport them to a third-party facility, waste may be discharged to the terrestrial environment on Barrow Island. The requirements for discharge to the terrestrial environment are defined in the operating licence obtained under Part V of the EP Act, where applicable.

Where disposal of liquid waste is not managed under Part V of the EP Act, discharges to the terrestrial environment will be assessed in accordance with this Plan. An environmental assessment will be conducted to minimise potential environmental risks to ALARP and to ensure no pollution or Material or Serious Environmental Harm is caused. This assessment considers factors such as:

- characteristics of the waste
- characteristics of the receiving environment
- potential to cause pollution (as defined by Section 72 of the EP Act)
- potential impacts to fauna, flora, and fauna habitats
- potential run-off and sedimentation impacts, such as erosion.

2.3.5 Disposal to Marine Environment

2.3.5.1 Ocean Outfall from Existing Facilities Shared with WA Oil

Gorgon Gas Development employees and/or contractors are required to share facilities at the existing Production Camp Accommodation, including using the WWTP and RO facilities. Both the WWTP and RO unit discharge waste via ocean outfall. Therefore, approval is requested through this Plan for the continuation of ocean outfall discharge of treated water from these shared facilities, because it is impracticable to separate these wastes into those generated by WA Oil and the Gorgon Gas Development. Requirements for disposal of liquid waste from the Production Camp WWTP outfall pipeline (Figure 2-1) are defined in the operating licence obtained under Part V of the EP Act.

2.3.5.2 Marine Vessel Discharge

Discharge of domestic vessel waste, including sewage and putrescibles, occurs in accordance with the requirements of MARPOL 73/78 (Ref. 16) as amended, and the Commonwealth *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, as amended. Greywater is not regulated under MARPOL 73/78, so untreated greywater is discharged from vessels, as per standard marine practice.

Marine vessels operating within the waters surrounding Barrow Island discharge brine from vessel RO units to the marine environment. Sea water is used for engine cooling and is discharged immediately after use.

Hydrocarbon-contaminated drainage from decks and work areas is managed in accordance with MARPOL 73/78 (Ref. 16), or is stored for onshore disposal.

There are no reception facilities for receiving oily waste, residues of noxious liquid substances, sewage, garbage, exhaust gas cleaning residues, and ozone-depleting substances from vessels at the port of Barrow Island LNG and condensate export berths.

2.3.5.3 Wastewater Marine Discharge

Wastewater may be disposed to the marine environment in accordance with the waste hierarchy and environmental assessment process. The requirements for discharge to the marine environment are defined in the operating licence obtained under Part V of the EP Act, where applicable.

Where discharge of wastewater to the marine environment does not trigger management under Part V of the EP Act, an environmental assessment will be conducted prior to the discharge of wastewater to minimise potential environmental risks to ALARP and to ensure no pollution or Material or Serious Environmental Harm is caused. This assessment considers factors such as:

- water treatment chemicals must go through a desktop selection and assessment process to choose chemicals that are technically acceptable and least hazardous to the marine environment; chemical use should be minimised, where practicable
- the selection of disposal methods and locations must consider sensitive receptors and aim to discharge at deep, well-flushed offshore locations
- the disposal location of liquid waste is to be within the Marine Disturbance Footprint and at the same location used for disposal of other liquid waste, where practicable.

The assessment of risk to Environmental Values (EVs) and Environmental Quality Objectives (EQOs), monitoring and adaptive management of discharges to the marine environment is described in the MEQMP (Ref. 27). If the environmental assessment determines a waste stream is suitable for discharge to the marine environment, and

represents a significant increase in risk to the EVs or to achieving EQOs (either through a new or altered waste stream), this may trigger a review of the risk assessment in the MEQMP (Ref. 27) to determine whether the existing monitoring regime is suitable.

Note that RO discharges were previously managed under a separate Plan—the Reverse Osmosis Brine Disposal via Ocean Outfall Environmental Management and Monitoring Plan (ROBOEMMP Revision 3, Amendment 1, Ref. 10)—that outlined the process and justification for selecting water supply, treatment and brine disposal options, the characteristics of the selected option, risk and environmental impact assessment of brine disposal, and environmental monitoring programs.

The discharge of RO brine to the marine environment is now incorporated into this Plan, under wastewater discharge. Routine monitoring against specific Environmental Quality Criteria and adaptive management actions are defined in the MEQMP (Ref. 27).

2.3.5.4 Sea Dumping

Sea dumping may be considered for disposal of waste such as discharges from CCAU WWTPs and maintenance dredging spoil. Sea dumping may be considered if the other options in the waste hierarchy (as outlined in Section 2.3) are not available.

The *Environment Protection (Sea Dumping) Act 1981* (Cth) requires Chevron Australia to consult with relevant authorities regarding approval requirements prior to any sea dumping activities.

3.0 Risk Assessment

Risk is the combination of the potential consequences arising from an environmental stressor, together with the likelihood of the stressor occurring and resulting in the consequence. Chevron Australia has developed an internal risk management process using the Chevron Integrated Risk Prioritization Matrix (7.0Appendix B). Table 3-1 summarises the risk assessments undertaken to date, which have provided input to this Plan.

Table 3-1: Risk Assessments Relevant to this Plan

Scope of Risk Assessment	Documentation
Waste management for the Gorgon Gas Development	Solid and Liquid Waste Management Plan (2009 [Ref. 17]) Solid and Liquid Waste Management Plan (2010 [Ref. 18]) Solid and Liquid Waste Management Plan (2011 [Ref. 19]) Solid and Liquid Waste Management Plan (2014 [Ref. 20]) This Plan Reverse Osmosis Brine Disposal via Ocean Outfall Environmental Management and Monitoring Plan (2015 [Ref. 10]) Marine Environmental Quality Management Plan (2016 [Ref. 27])

3.1 Methodology

The main components of the internal Chevron Australia risk assessment methodology include:

- **Specify causes:** Identify possible causes or conditions resulting in a stressor.
- **Determine potential consequences:** Determine the level of harm that could be associated with the stressor.
- **Identify and evaluate safeguards:** Identify design features and operating controls that either manage the stressor or otherwise prevent exposures that can result in harm.

Apply the Integrated Risk Prioritization Matrix: Using the Chevron Integrated Risk Prioritization Matrix (7.0Appendix B), assign consequence magnitude and likelihood indices to obtain the residual risk (

- Table 3-2), and a risk-priority ranking:
 - **Consequence magnitude index:** Maximum level of harm that could be associated with the stressor – safeguards *are not* taken into account.
 - **Likelihood index:** Expected frequency of the consequence magnitude occurring – safeguards *are* taken into account.
- **Recommend further study or risk mitigation:** Apply qualitative risk criteria and risk management guiding principles to guide further risk reduction actions, if required.

Table 3-2: Residual Risk Categories

Residual Risk Level	Risk-priority Ranking	Further Risk Reduction
1, 2, 3, 4	Intolerable	Short-term, interim risk reduction required. Long-term risk reduction plan must be developed and implemented
5	Tolerable (if ALARP and long-term risk reduction)	Risk is tolerable if reasonable safeguards/management systems are confirmed to be in place and additional long-term risk reduction is undertaken.
6	Tolerable (if ALARP)	Risk is tolerable if reasonable safeguards/management systems are confirmed to be in place.
7, 8, 9, 10	Tolerable	No further risk reduction necessary.

Risk-priority rankings were used in the development of this Plan to determine whether the stressors are considered ALARP, or whether further mitigation and safeguards are required. If it is demonstrated that the cost² of implementing further control measures is disproportionate to the benefit gained, the risk is considered to be ALARP.

3.2 Risk to Matters of National Environmental Significance

Condition 3.2.1 of EPBC Reference: 2003/1294 and 2008/4178 require a description of the EPBC Act listed species and their habitat that are likely to be impacted by the components of the action that is the subject of this Plan. Those species are listed in:

- Identification of Terrestrial and Subterranean Matters of National Environmental Significance (NES) and their Habitat; as amended from time to time (Ref. 21, Appendix D)
- Identification of Marine Matters of National Environmental Significance (NES and their Habitat, as amended from time to time (Ref. 22, Appendix E).

Condition 3.2.2 of EPBC Reference: 2003/1294 and 2008/4178 require an assessment of the risk to the EPBC Act listed species. The risks identified in Table 3-3 are inclusive of the risks to the listed species in these documents (Ref. 21; Ref. 22).

A detailed definition and description of the significant ecological elements on Barrow Island, which include relevant matters of NES, is contained in:

- Terrestrial and Subterranean Baseline State and Environmental Impact Report (Ref. 23)
- Coastal and Marine Baseline State and Environmental Impact Report (Ref. 24)
- Draft Environmental Impact Statement/Environmental Review and Management Programme (Ref. 25).

Section 4.0 includes mitigation measures developed to manage these risks.

3.3 Outcomes

Table 3-3 summarises the outcomes of the risk assessment process, including waste management activities that could potentially result in a risk to key ecological elements. The risk assessment found that with appropriate design and management, including the

² Cost includes financial cost, time or duration, effort, occupational health and safety risks, or environmental impacts associated with implementing the control.

measures described in Section 4.0, the residual risk from construction and operation of the Gorgon Gas Development is low and reduced to a level that is ALARP.

As per Table 2-1, waste risks that are managed under other environmental management plans required by MS 800, MS 769, and EPBC Reference: 2003/1294 and 2008/4178, were not considered in this assessment.

An objective of this Plan is to 'ensure waste disposal does not cause Material or Serious Environmental Harm to Barrow Island and its surrounding waters' (see Section 1.4.2). Therefore, although the risk assessment conducted as part of this Plan applies to the general environment, this Plan focuses on managing the ecological elements as these are at risk of Material or Serious Environmental Harm.

The ecological elements listed in Conditions 6.1 and 14.2 of MS 800 at risk from waste management activities are:

- Terrestrial and subterranean:
 - flora
 - vegetation
 - fauna (including subterranean fauna)
 - groundwater.
- Marine:
 - surficial sediment characteristics
 - water quality (including measures of turbidity and light attenuation).

Acceptable declines or changes in ecological elements inside the Terrestrial Disturbance Footprint are established as quantified performance standards in the Terrestrial and Subterranean Environment Protection Plan (Ref. 14). These performance standards are set below the threshold at which Material or Serious Environmental Harm occurs.

Discharges to the marine environment are risk assessed against EVs and EQOs in the MEQMP (Ref. 27), as required under Condition 23 of MS 800.

Table 3-3: Summary of Residual Risk Assessment

Waste Management Activity	Waste Type	Source	Potential Worst-case Environmental Impacts	Management Measures (Table 4-1 Ref No.)	Risk Priority Ranking
Storage, handling, and transport (on Barrow Island)	All waste streams	Failure to effectively segregate recyclable wastes from non-recyclable wastes at source on Barrow Island	Waste management/disposal required (increase in waste management requirements)	1, 2, 4, 9, 10	Tolerable
	All waste streams	Failure to effectively segregate wastes prior to using the waste dryers on Barrow Island	Waste management/disposal required (increase in waste management requirements)	1, 2, 4, 9, 10, 14	Tolerable
	General waste	Failure to appropriately store, handle, and/or transport general waste on Barrow Island (includes GTP and WTS)	Fauna injury/casualty (entrapment, ingestion)	1, 2, 3, 4, 5, 9, 10, 11	Tolerable
	Solid hazardous waste (all types)	Failure to appropriately store, handle, and/or transport solid hazardous waste on Barrow Island (includes GTP and WTS)	Soil, surface, and groundwater impact (contamination from unintentional releases)	1, 2, 3, 4, 5, 6, 9, 11	Tolerable
	Solid hazardous waste* (biological sludge)	Loss of containment of solid hazardous wastes during storage, handling, and/or transportation on Barrow Island	Soil, surface, and groundwater impact (contamination)	1, 2, 3, 4, 5, 9, 12, 13	Tolerable
	Liquid hazardous waste	Failure to appropriately store, handle, and/or transport liquid hazardous waste on Barrow Island (includes GTP and WTS)	Soil, surface, and groundwater impact (contamination from unintentional releases)	1, 2, 3, 4, 5, 6, 7, 9, 12, 13	Tolerable
	Liquid hazardous waste	Fire, explosion, or hazardous emissions from liquid hazardous wastes	Fauna/flora community alteration (bushfire)	1, 2, 4, 5, 7, 9, 11, 12	Tolerable
	Liquid hazardous waste* (stored in permanent tanks)	Loss of containment of liquid hazardous wastes during storage, handling, and/or transportation on Barrow Island	Soil, surface, and groundwater impact (contamination)	1, 2, 3, 4, 5, 7, 9, 11, 12, 13	Tolerable
	Liquid hazardous waste* (stored in temporary tanks)	Loss of containment of liquid hazardous wastes during storage, handling, and/or transportation on Barrow Island	Soil, surface, and groundwater impact (contamination)	1, 2, 3, 4, 5, 11, 12	Tolerable
	Liquid hazardous	Loss of containment of liquid hazardous	Soil, surface, and groundwater	1	Tolerable

Waste Management Activity	Waste Type	Source	Potential Worst-case Environmental Impacts	Management Measures (Table 4-1 Ref No.)	Risk Priority Ranking
	waste* (transported in permanent service corridors)	wastes during storage, handling, and/or transportation on Barrow Island	impact (contamination)		
Storage, handling, and transport (off Barrow Island/marine)	All waste streams	Failure to appropriately handle (including loading/unloading), and storage waste and/or unauthorised discharges overboard into Barrow Island waters from vessels carrying waste from Barrow Island to an off-island facility	Fauna injury/casualty (entrapment, ingestion, dropped objects, water quality changes)	1, 12, 16, 17	Tolerable
Disposal (on Barrow Island)	All waste streams	Unauthorised disposal of waste on Barrow Island	Soil, surface, and groundwater impact (contamination)	1, 2, 4, 5, 9, 10	Tolerable
	General Waste – Liquid (treated or uncontaminated)	Planned Activity – Re-use or Recycling	Soil, surface, and groundwater impact (contamination, erosion)	1, 2, 3, 13, 18, 19, 22	Tolerable
	General Waste – Solid (treated or uncontaminated)	Planned Activity – Re-use or Recycling	Soil, surface, and groundwater impact (contamination)	1, 18, 19, 22	Tolerable
	Liquid hazardous waste* (cement waste and washout)	Unauthorised disposal of liquid hazardous wastes on Barrow Island	Soil, surface, and groundwater impact (contamination)	1, 2, 12, 20	Tolerable
	Liquid hazardous waste* (deep well injection)	Migration of injected wastewater to the near-surface environment (subterranean fauna habitat) because of well failure	Soil, surface, and groundwater impact (contamination)	1, 2, 3, 13, 18	Tolerable
	Liquid Waste – Wastewater	Unauthorised/inappropriate disposal of liquid hazardous and/or controlled wastes on Barrow Island	Water quality (reduction in marine water quality)	1, 2, 21	Tolerable
	Liquid Waste – Wastewater	Planned Activity – Marine Disposal	Water quality (reduction in marine water quality)	1, 2, 21, 22 MEQMP (Ref. 27)	Tolerable

Waste Management Activity	Waste Type	Source	Potential Worst-case Environmental Impacts	Management Measures (Table 4-1 Ref No.)	Risk Priority Ranking
	Liquid Waste – RO Facilities - Wastewater	Planned Activity – Marine Disposal	Water quality (reduction in marine water quality)	3, 21, 22 MEQMP (Ref. 27)	Tolerable
	All waste streams (marine waste)	Planned activity – Marine Disposal	Water quality (reduction in marine water quality)	1, 12, 16, 17	Tolerable
Disposal (off Barrow Island)	All hazardous waste (solid and liquid)	Failure to appropriately identify and/or segregate hazardous and/or controlled wastes from general waste streams on Barrow Island	Soil, surface, and groundwater impact (contamination from unintentional releases)	1, 2, 4, 9	Tolerable

* This waste type is not included in the overarching category, as it requires different safeguards.

4.0 Management Measures

Specific management measures (Table 4-1) were identified to help achieve the Gorgon Gas Development waste management objectives and to manage the risks associated with waste to an acceptable level.

The management measures detailed in Table 4-1 include those that apply to the matters of NES identified in Appendix D and Appendix E (Ref. 21; Ref. 22).

Measures to manage waste that are being implemented to address other legislative requirements are not included in Table 4-1 as compliance with these requirements is managed outside this Plan; for example:

- waste managed under other environmental management plans required by MS 800, MS 769, and EPBC Reference: 2003/1294 and 2008/4178 (Table 2-1)
- waste management measures for individual waste facilities and discharges that are regulated under Part V Division 3 of the EP Act
- storing and handling hazardous wastes in accordance with the requirements of the *Dangerous Goods Safety Act 2004 (WA)*
- resource efficiency and waste management under the *Waste Avoidance and Recovery Act 2007 (WA)*.

Physical design features that are in place to manage wastes are also not included in Table 4-1; for example:

- instrumentation to detect abnormal operating conditions
- instrumentation to detect high levels on tanks
- waste storage facilities and disposal wells are appropriate for the waste properties
- equipment used for RO brine discharge, such as:
 - RO outfall diffusers are designed to achieve the required dilutions to meet 99% species protection (calculated via ecotoxicity testing) in the initial (near-field) dilution zone
 - diffuser performance has been verified by sustained field measurements
 - Permanent RO outfall pipe diffusers are located within two caissons and are designed to discharge near the surface of the ocean at lowest astronomical tide.

Table 4-1: Risk Management Measures

Ref No.	Management Measure	Phase
General		
1.	Personnel, contractors, and visitors to the Gorgon Gas Development will be made aware of waste management requirements including correct waste segregation.	All phases
2.	Inspections will be undertaken on waste management facilities on Barrow Island, outlined in Section 2.2. This will include, but is not limited to, inspection for dedicated and signposted bins/receptacles (for segregation) and ensuring waste chemicals are stored and handled as per the Safety Data Sheet (SDS).	All phases
3.	Regular maintenance will be performed on the waste management facilities outlined in Section 2.2.	All phases
4.	A dedicated waste management resource will be available for Barrow Island waste management.	All phases

Ref No.	Management Measure	Phase
5.	Routine and non-routine waste collection will be conducted on Barrow Island.	All phases
6.	Unidentified wastes will be regarded as hazardous waste for storage, treatment, and disposal.	All phases
Storage		
7.	The Cuttings Holding Facility will be used to store some drilling cuttings, drilling fluids, and excess cement from Gorgon drilling programs.	All phases
8.	The LWF will be used to receive and store effluent, produced water, and process water. This facility will contain skimmers and filters to reduce oil-in-water and solids content respectively, prior to disposal.	All phases
9.	A WTS will be used to receive and store general, recyclable, hazardous (solid and liquid), and quarantine-risk wastes. This facility will allow for the segregation of non-compatible hazardous wastes.	All phases
10.	Crib rooms will be provided to localise putrescible waste generation and storage.	All phases
11.	Waste receptacles and/or tanks that may attract fauna or generate windblown rubbish will be covered or closed.	All phases
12.	Spill response procedures and equipment will be in place for hazardous liquid waste storage.	All phases
Treatment		
13.	WWTPs will be used to treat effluent prior to disposal on Barrow Island.	All phases
14.	Food waste dryers will be used to treat some putrescible solid wastes and putrescible-contaminated materials. Waste streams will be assessed prior to treatment in the food waste dryer to assess suitability.	All phases
15.	Hazardous materials will not be treated in the incineration facility.	All phases
Disposal		
16.	Wastes will be securely stored and contained during transport from Barrow Island.	All phases
17.	Chevron Australia will require treatment and discharge from vessels to comply with the requirements of MARPOL 73/78 (Ref. 16) and the Commonwealth <i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i> .	All phases
18.	Regular monitoring of liquid waste streams will be undertaken for waste being disposed of on Barrow Island.	All phases
19.	Re-use water will only be applied to previously disturbed areas.	All phases
20.	Washout of concrete trucks will only occur in designated areas.	All phases
21.	When discharging wastewater to the marine environment, the dosing level of harmful chemicals will be assessed and minimised to ensure Material or Serious Environmental Harm does not result.	All phases
22.	Controls that prevent pollution or Material or Serious Environmental Harm (as identified during the environmental assessment process for re-use and recycling of solid waste, and marine and terrestrial discharge) will be implemented prior to disposal.	All phases

5.0 Performance Objectives and Standards

Environmental performance is ‘the measurable results of an organisation’s management of its environmental aspects’ (Ref. 26). Chevron Australia measures environmental performance through:

- **Environmental performance objectives** – the objectives of the Plan as defined by Condition 30.2 of MS 800 and Condition 20.2 of EPBC Reference: 2003/1294 and 2008/4178
- **Environmental performance standards** – the measures Chevron Australia uses to assess whether or not it is meeting its environmental performance objectives.

Table 5-1 lists the environmental performance objectives and standards that were developed to enable Chevron Australia to assess environmental performance for solid and liquid waste. Condition 30.3ii in MS 800 requires Performance Standards against which achievement of the objective of this Condition can be determined.

The standards in Table 5-1 were developed for assessing performance, not compliance. Failure to meet the standards does not represent failure to implement this Plan; rather, it indicates that a performance objective may not have been met and management action or a review of the environmental performance objectives and standards may be needed.

Table 5-1: Objectives and Performance Standards

Objectives	Performance Standards
Ensure all solid and liquid wastes for the Gorgon Gas Development and Jansz Feed Gas Pipeline are 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	<ol style="list-style-type: none"> 1. All solid and liquid waste (except those streams covered in Sections 2.3.1, 2.3.2, 2.3.4, and 2.3.5 of this Plan) is removed from Barrow Island. 2. All re-use or recycling of liquid and solid waste complies with the requirements in Section 2.3.1. 3. All marine and terrestrial disposal of waste complies with the requirements outlined in Sections 2.3.4 and 2.3.5.
For the Gorgon Gas Development, discharges from any wastewater treatment plant, reverse osmosis plant, or other process water are disposed of via deep well injection, unless otherwise authorised by the Western Australian Minister	<ol style="list-style-type: none"> 4. All discharges from any wastewater treatment plant, RO plant, or other process water are disposed of via deep well injection, unless authorised by the WA Minister.
Ensure any deep well injection of liquid wastes for the Gorgon Gas Development is conducted in a manner that will not cause Material or Serious Environmental Harm to subterranean fauna and their habitats on Barrow Island	<ol style="list-style-type: none"> 5. Deep well injection of liquid wastes does not cause Material or Serious Environmental Harm to subterranean fauna and their habitats on Barrow Island (monitored under the Terrestrial and Subterranean Environmental Monitoring Program (Ref. 28)).

6.0 Terminology

Terminology used in this document is listed in Table 6-1. These terms align with those defined in:

- Schedule 2 of MS 800
- Schedule 2 of MS 769
- EPBC Reference: 2003/1294 and 2008/4178.

Table 6-1: Terminology

Term	Definition
Additional Support Area	Gorgon Gas Development Additional Construction, Laydown, and Operations Support Area
ALARP	As low as reasonably practicable—where it is demonstrated that the cost of implementing further control measures is disproportionate to the benefit gained, the risk is considered to be ALARP. Cost includes financial cost, time or duration, effort, occupational health and safety risks, or environmental impacts associated with implementing the control.
All waste streams	All waste generated during the construction and operation phases of the Gorgon Gas Development. These wastes can be broadly classified under the categories of general waste, recyclable waste, solid and liquid hazardous waste, and quarantine-risk material.
At risk	Being at risk of Material Environmental Harm or Serious Environmental Harm and/or, for the purposes of the EPBC Act relevant listed threatened species, threatened ecological communities and listed migratory species, at risk of Material Environmental Harm or Serious Environmental Harm.
CCAU	Causeway Construction Accommodation Unit; a temporary accommodation vessel installed at the Materials Offloading Facility Causeway within the Marine Disturbance Footprint.
Clean Fill	Material comprising uncontaminated rocks or soil arising from the excavation of undisturbed material
Construction	Construction includes any Proposal-related construction and commissioning activities within the Terrestrial and Marine Disturbance Footprints, excluding investigatory works such as, but not limited to, geotechnical, geophysical, biological and cultural heritage surveys, baseline monitoring surveys and technology trials.
Cth	Commonwealth of Australia
Deep wells	In the context of liquid waste disposal, refers to injection wells completed in the Barrow Island Group (a well-defined geological formation approximately 1000 to 1800 m below the surface).
Effluent	Wastewater—treated or untreated—that originates from a treatment plant or sewer, such as sewage treatment plant discharge.
Environmental Harm	Has the meaning given by Part 3A of the <i>Environmental Protection Act 1986</i> (WA).
Environmental Quality Criteria	Numerical values or narrative statements that serve as benchmarks to determine whether a more detailed assessment of environmental quality is required, or whether a management response is required.
EQO	Environmental Quality Objective. A specific management goal for a part of the environment; it is either ecologically based by describing the desired level of health of the ecosystem or socially based by describing the environmental quality required to maintain specific human uses.

Term	Definition
EV	<p>Environmental Values.</p> <p>As per the definition in the <i>Environmental Protection Act 1986 (WA)</i>: a beneficial use; or an ecosystem health condition.</p> <p>In the context of the Environmental Quality Framework developed by the EPA: Particular value or use of the marine environment that is important for a healthy ecosystem or for public benefit, welfare, safety, or health and which requires protection from the effects of pollution, waste discharges, and waste deposits.</p>
EP Act	Western Australian <i>Environmental Protection Act 1986</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPBC Reference: 2003/1294	Commonwealth Ministerial Approval (for the Gorgon Gas Development) as amended or replaced from time to time.
EPBC Reference: 2005/2184	Commonwealth Ministerial Approval (for the Jansz Feed Gas Pipeline) as amended or replaced from time to time.
EPBC Reference: 2008/4178	Commonwealth Ministerial Approval (for the Revised Gorgon Gas Development) as amended or replaced from time to time.
General waste	Waste material that is free of any apparent or actual pathological/infectious, radioactive, or hazardous chemical contamination.
Gorgon Gas Development	The Gorgon Gas Development and Jansz Feed Gas Pipeline as approved under MS 800, MS 769, and EPBC Reference: 2003/1294 and 2008/4178 as amended or replaced from time to time.
GTP	Gas Treatment Plant
Hazardous waste	Components of the waste stream that pose a threat or risk to public health, safety, or the environment (includes substances that are toxic, infectious, mutagenic, carcinogenic, teratogenic, explosive, flammable, corrosive, oxidising, and radioactive)
Hazardous waste – Liquid	Used or waste liquids that have the potential to harm the environment or living organisms. Examples include, but are not limited to, oil, lubricants, paint, acids, mercury, paint, sewage, and coolants.
Hazardous waste – Solid	Used or waste solids that have the potential to harm the environment or living organisms. Examples include, but are not limited to, oily rags, mercury contaminated material, and hydrocarbon-contaminated soil.
HES	Health, Environment, and Safety
km	Kilometre
LNG	Liquefied Natural Gas
LWF	Liquid Waste Facility
m	Metre
Marine Disturbance Footprint	The area of the seabed to be disturbed by construction or operations activities associated with the Marine Facilities listed in Condition 14.3 of MS 800 and Condition 12.3 of MS 769, and Condition 11.3 in EPBC Reference: 2003/1294 and 2008/4178 (excepting that area of the seabed to be disturbed by the generation of turbidity and sedimentation from dredging and dredge spoil disposal) as set out in the Coastal and Marine Baseline State Report required under Condition 14.2 of MS 800, Condition 12.2 of MS 769, and Condition 11.2 of EPBC Reference: 2003/1294 and 2008/4178.
MARPOL	The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. Also known as MARPOL 73/78.
Material Environmental Harm	Environmental harm that is neither trivial nor negligible

Term	Definition
MEQMP	Marine Environmental Quality Management Plan
MOF	Materials Offloading Facility
MS	(Western Australian) Ministerial Statement
MS 1002	Western Australian Ministerial Statement 1002, issued for the Gorgon Gas Development Fourth Train Expansion Proposal, as amended from time to time.
MS 748	Western Australian Ministerial Statement 748 (for the Gorgon Gas Development) as amended from time to time [superseded by Ministerial Statement 800].
MS 769	Western Australian Ministerial Statement 769 (for the Jansz Feed Gas Pipeline) as amended from time to time.
MS 800	Western Australian Ministerial Statement 800, issued for the Revised and Expanded Gas Development, as amended from time to time. MS 800 supersedes the Gorgon Gas Development as originally approved by MS 748. The conditions of MS 800 also apply to the Additional Support Area under MS 965, and the Fourth Train Expansion Proposal under MS 1002.
MS 865	Western Australian Ministerial Statement 865, issued to establish a restart mechanism for dredging, as amended from time to time.
MS 965	Western Australian Ministerial Statement 965, issued for the Additional Support Area, as amended from time to time.
MSEH	Material or Serious Environmental Harm
NES	[Matters of] National Environmental Significance, as defined in Part 3, Division 1 of the EPBC Act.
Operations	In relation to MS 800 and EPBC Reference: 2003/1294 and 2008/4178, for the respective LNG trains, this is the period from the date on which the Gorgon Joint Venture participants issue a notice of acceptance of work under the Engineering, Procurement and Construction Management contract, or equivalent contract entered into in respect of that LNG train of the Gas Treatment Plant; until the date on which the Gorgon Joint Venturers commence decommissioning the LNG train.
Performance standards	Are matters that are developed for assessing performance, not compliance, and are quantitative targets or where that is demonstrated to not be practicable, qualitative targets, against which progress towards achievement of the objective of conditions can be measured.
pH	Measure of acidity or basicity of a solution
Practicable	For the purposes of MS 769 and MS 800 means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge. For the purposes of EPBC Reference: 2003/1294 and 2008/4178, when considering whether the plan meets the requirements of these conditions, the Commonwealth Minister will determine what is 'practicable' having regard to local conditions and circumstances including, but not limited to, personnel safety, weather or geographic conditions, costs, environmental benefit, and the current state of scientific and technical knowledge.
Process water	Hydrocarbon contaminated water managed by the oil recovery system at the plant site.
Produced water	Water that is produced as a by-product during the recovery of gas from the gas fields.
Putrescible waste	Component of the waste stream likely to become putrid. Examples include, but are not limited to, food scraps and green waste.

Term	Definition
Putrescible-contaminated materials	Waste that is contaminated with components that are likely to become putrid. Examples include, but are not limited to, food-contaminated paper.
PWD	Produced Water Disposal
Quarantine-risk material	Any material that has a higher probability than general freight and cargo of harbouring non-indigenous species
Recyclable waste	Waste material that is re-used in the same or another process after being reprocessed, or its calorific value is recovered. Examples include, but are not limited to, plastic, paper, aluminium.
RO	Reverse Osmosis
ROBDOOEMMP	Reverse Osmosis Brine Disposal via Ocean Outfall Environmental Management and Monitoring Plan
SDS	Safety Data Sheet
Serious Environmental Harm	Environmental harm that is: <ul style="list-style-type: none"> • irreversible, of a high impact or on a wide scale; or • significant or in an area of high conservation value or special significance and is neither trivial nor negligible.
TAPL	Texaco Australia Pty Ltd
Terrestrial Disturbance Footprint	The area to be disturbed by construction or operations activities associated with the Terrestrial Facilities listed in Condition 6.3 of MS 800, Condition 6.3 of MS 769, and Condition 5.2 in EPBC Reference: 2003/1294 and 2008/4178.
Terrestrial Facilities	In relation to MS 800 and EPBC Reference: 2003/1294 and 2008/4178, the terrestrial facilities are the: <ul style="list-style-type: none"> • GTP • Carbon Dioxide Injection System • Associated Terrestrial Infrastructure forming part of the Proposal • Areas impacted for seismic data acquisition • Onshore Feed Gas Pipeline System and terrestrial component of the Shore Crossing. Terrestrial Facilities also include those defined in Schedule 1 of MS 965 (the Additional Support Area).
TPH	Total Petroleum Hydrocarbons
TSEPP	Terrestrial and Subterranean Environmental Protection Plan
TSS	Total Suspended Solids
TWIP	Temporary Waste Injection Package
WA	Western Australia
Waste Management Facility	Permanent and/or long-term waste facilities that store, treat, or dispose of solid and/or liquid waste generated on Barrow Island and its surrounding waters.
Wastewater	Liquid wastes originating as stormwater or associated with construction or operation activities. Examples include, but are not limited to, hydrotest water, RO brine, chlorinated seawater from the emergency fire system, and condensate water.

Term	Definition
Waters surrounding Barrow Island	The waters of the Barrow Island Marine Park and Barrow Island Marine Management Area (approximately 4169 ha and 114 693 ha respectively) as well as the port of Barrow Island representing the Pilbara Offshore Marine Bioregion, which is dominated by tropical species that are biologically connected to more northern areas by the Leeuwin Current and the Indonesian Throughflow resulting in a diverse marine biota that is typical of the Indo-West Pacific flora and fauna.
WTS	Waste Transfer Station
WWTP	Wastewater Treatment Plant

7.0 References

The following documentation is directly referenced in this document.

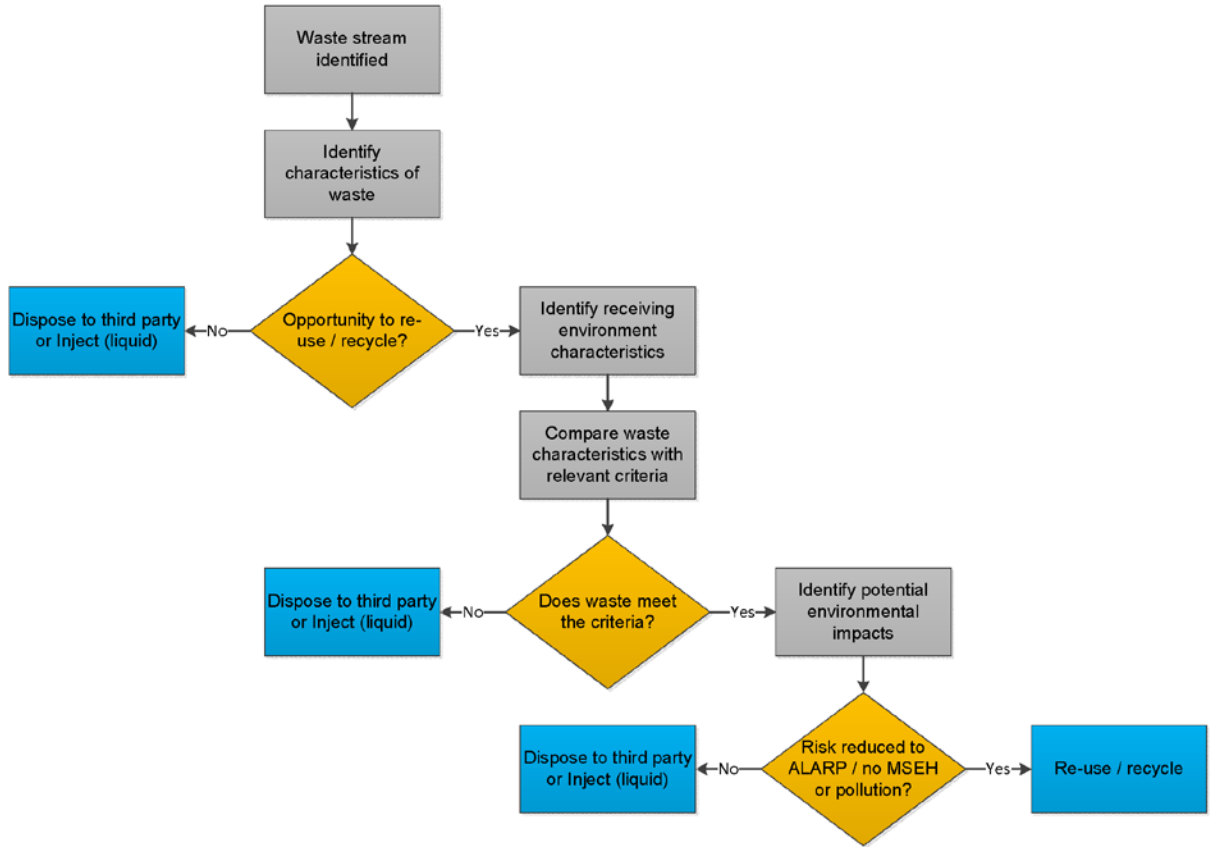
Table 7-1: References

Ref. No.	Description
1.	Government of Western Australia, Minister for the Environment, David Templeman MLA. 2008. <i>Statement that a Proposal may be Implemented – Jansz Feed Gas Pipeline: Barrow Island Nature Reserve (Ministerial Statement 769)</i> , 28 May 2008. Perth, Western Australia.
2.	Commonwealth Government of Australia, Assistant Secretary Environmental Assessment Branch, Anne-Marie Delahunt. 2006. <i>Decision to Approve the taking of an Action – Jansz Feed Gas Pipeline (EPBC Reference: 2005/2184)</i> , 22 March 2006. Canberra, Australian Capital Territory.
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26.	Standards Australia/Standards New Zealand. 2004. <i>ISO 14001:2004 Environmental Management Systems – Requirements with Guidance for Use</i> . Standards Australia/Standards New Zealand, Sydney/Wellington.
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Appendix A Decision Flow – Waste Hierarchy and Assessment

Example: Re-use / recycling of a hazardous liquid waste stream.



Appendix B Chevron Integrated Risk Prioritization Matrix

Likelihood Descriptions & Index (with confirmed safeguards)		Legend							
Likelihood Descriptions	Likelihood Indices		Legend applies to identified HES risks (see guidance documents for additional explanations)						
	1	2	1, 2, 3, 4 - Short-term, interim risk reduction required. Long term risk reduction plan must be developed and implemented. 5 - Additional long term risk reduction required. If no further action can be reasonably taken, SBU management approval must be sought to continue the activity. 6 - Risk is tolerable if reasonable safeguards / management systems are confirmed to be in place and consistent with relevant requirements of the Risk Mitigation Closure Guidelines. 7, 8, 9, 10 - Manage risk. No further risk reduction required. Risk reduction at management / team discretion.						
Consequence can reasonably be expected to occur in life of facility	1	Likely	6	5	4	3	2	1	
Conditions may allow the consequence to occur at the facility during its lifetime, or the event has occurred within the Business Unit	2	Occasional	7	6	5	4	3	2	
Exceptional conditions may allow consequences to occur within the facility lifetime, or has occurred within the OPCO	3	Seldom	8	7	6	5	4	3	
Reasonable to expect that the consequence will not occur at this facility. Has occurred several times in industry, but not in OPCO	4	Unlikely	9	8	7	6	5	4	
Has occurred once or twice within industry	5	Remote	10	9	8	7	6	5	
Rare or unheard of	6	Rare	10	10	9	8	7	6	
Consequence Descriptions & Index (without safeguards)	Consequence Indices		Decreasing Consequence/Impact						
			6	5	4	3	2	1	
			Incidental	Minor	Moderate	Major	Severe	Catastrophic	
	Consequence Descriptions		Safety Workforce: Minor injury such as a first-aid. AND Public: No impact	Workforce: One or more injuries, not severe. OR Public: One or more minor injuries such as a first-aid.	Workforce: One or more severe injuries including permanently disabling injuries. OR Public: One or more injuries, not severe.	Workforce: (1-4) Fatalities OR Public: One or more severe injuries including permanently disabling injuries.	Workforce: Multiple fatalities (5-50) OR Public: multiple fatalities (1-10)	Workforce: Multiple fatalities (>50) OR Public: multiple fatalities (>10)	
		Health (Adverse effects resulting from chronic chemical or physical exposures or exposure to biological agents) Workforce: Minor illness or effect with limited or no impacts on ability to function and treatment is very limited or not necessary AND Public: No impact	Workforce: Mild to moderate illness or effect with some treatment and/or functional impairment but is medically manageable OR Public: Illness or adverse effect with limited or no impacts on ability to function and medical treatment is limited or not necessary.	Workforce: Serious illness or severe adverse health effect requiring a high level of medical treatment or management OR Public: Illness or adverse effects with mild to moderate functional impairment requiring medical treatment.	Workforce (1-4): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR Public: Serious illness or severe adverse health effect requiring a high level of medical treatment or management.	Workforce (5-50): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR Public (1-10): Serious illness or chronic exposure resulting in fatality or significant life shortening effects.	Workforce (>50): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR Public (>10): Serious illness or chronic exposure resulting in fatality or significant life shortening effects.		
		Environment Impacts such as localized or short term effects on habitat, species or environmental media.	Impacts such as localized, long term degradation of sensitive habitat or widespread, short-term impacts to habitat, species or environmental media	Impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species or environmental media	Impacts such as significant, widespread and persistent changes in habitat, species or environmental media (e.g. widespread habitat degradation).	Impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.	Loss of a significant portion of a valued species or loss of effective ecosystem function on a landscape scale.		
The above legend applies only to HES risks, where risk levels 1-6 are actionable and mandatory. For risks that may result in facility damage, business interruption, loss of product, the "Assets" category below should be used. Asset risk reduction is at the discretion of management. Under no circumstances may a direct or indirect translation of Asset loss to HES consequences, or between any discrete categories of HES consequences be inferred.									
Consequence Descriptions & Index (without safeguards)	Consequence Indices		6	5	4	3	2	1	
	Consequence Descriptions		Assets (Facility Damage, Business Interruption, Loss of Product) Minimal damage. Negligible down time or asset loss. Costs < \$100,000.	Some asset loss, damage and/or downtime. Costs \$100,000 to \$1 Million.	Serious asset loss, damage to facility and/or downtime. Costs of \$1-10Million.	Major asset loss, damage to facility and/or downtime. Cost >\$10 Million but <\$100 Million.	Severe asset loss or damage to facility. Significant downtime, with appreciable economic impact. Cost >\$100MM but <\$1billion.	Total destruction or damage. Potential for permanent loss of production. Costs >\$1billion	
This matrix is endorsed for use across the Company. It is not a substitute for, and does not override any relevant legal obligations. Under no circumstances should any part of this matrix be changed or modified, adapted or customized. This matrix identifies health, safety, environmental and asset risks and is to be used only by qualified and competent personnel. Where applicable it is to be used within the Riskman2 structure and governance of an OE Risk Management Process. If applied outside of these Processes, it is also mandatory to manage identified intolerable risks and comply with the Risk Mitigation Closure Guidelines.									

Appendix C Compliance Reporting Table

Section No.	Actions	Timing
2.3.1.1	Re-using and recycling liquid waste streams (e.g. treated effluent, produced, and process water) will be assessed in accordance with the environmental assessment process described in Section 2.3.4.	All Phases
2.3.1.2	<p>Various solid waste streams (e.g. clean fill, waste concrete, and drilling cuttings) from the Gorgon Gas Development may be re-used or recycled. An environmental assessment will be undertaken to minimise the potential environmental risks to ALARP and to ensure no Material or Serious Environmental Harm will result from the re-use or recycling of solid wastes. This assessment considers factors such as:</p> <ul style="list-style-type: none"> • characteristics of the waste • run-off and sedimentation impacts, such as erosion • potential to casue pollution (as defined by Section 72 of the EP Act) • chemical interaction and combustion impacts • air emissions • potential impacts to fauna, flora, and fauna habitats • potential impacts resulting from the degradation of the solid waste. 	All Phases
2.3.4	<p>Where liquid waste is not managed under Part V of the EP Act, discharges to the terrestrial environment will be assessed in accordance with this Plan. An environmental assessment will be conducted to minimise potential environmental risks to ALARP and to ensure no pollution or Material or Serious Environmental Harm is caused. This assessment considers factors such as:</p> <ul style="list-style-type: none"> • characteristics of the waste • characteristics of the receiving environment • potential to casue pollution (as defined by Section 72 of the EP Act) • potential impacts to fauna, flora, and fauna habitats • potential run-off and sedimentation impacts, such as erosion. 	All Phases
2.3.5.3	<p>Where discharge of wastewater to the marine environment does not trigger management under Part V of the EP Act, an environmental assessment will be conducted prior to the discharge of wastewater to the marine environment to minimise potential environmental risks to ALARP and to ensure no pollution or Material or Serious Environmental Harm is caused. This assessment considers factors such as:</p> <ul style="list-style-type: none"> • water treatment chemicals must go through a desktop selection and assessment process to choose chemicals that are technically acceptable and least hazardous to the marine environment; chemical use should be minimised, where practicable • the selection of disposal methods and locations must consider sensitive receptors and aim to discharge at deep, well-flushed offshore locations • the disposal location of liquid waste is to be within the Marine Disturbance Footprint and at the same location used for disposal of other liquid waste, where practicable. 	All Phases
Table 4-1	All personnel, contractors, and visitors to the Gorgon Gas Development will be made aware of waste management requirements including correct waste segregation.	All Phases
Table 4-1	Inspections will be undertaken on waste management facilities on Barrow Island, as outlined in Section 2.2. This will include, but is not limited to, inspection for dedicated and signposted bins/receptacles (for	All Phases

Section No.	Actions	Timing
	segregation)and ensuring chemicals are stored and handled as per the SDS.	
Table 4-1	Regular maintenance will be performed on waste management facilities, as outlined in Section 2.2.	All Phases
Table 4-1	A dedicated waste management resource will be available for Barrow Island waste management.	All Phases
Table 4-1	Routine and non-routine waste collection will be conducted on Barrow Island.	All Phases
Table 4-1	Unidentified wastes will be regarded as hazardous waste for storage, treatment, and disposal.	All Phases
Table 4-1	The Cuttings Holding Facility will be used to store some drilling cuttings, drilling fluids, and excess cement from Gorgon drilling programs.	All Phases
Table 4-1	The LWF will be used to receive and store effluent, produced, and process water. This facility will contain skimmers and filters to reduce oil-in-water and solids content respectively, prior to disposal.	All phases
Table 4-1	A WTS will be used to receive and store general, recyclable, hazardous (solid and liquid), and quarantine-risk wastes. This facility will allow for the segregation of non-compatible hazardous wastes.	All Phases
Table 4-1	Crib rooms will be provided to localise putrescible waste generation and storage.	All Phases
Table 4-1	Waste receptacles and/or tanks that may attract fauna or generate windblown rubbish will be covered or closed.	All Phases
Table 4-1	Spill response procedures and equipment will be in place for hazardous liquid waste storage.	All Phases
Table 4-1	WWTPs will be used to treat effluent prior to disposal on Barrow Island.	All Phases
Table 4-1	Food waste dryers will be used to treat some putrescible solid wastes and putrescible-contaminated materials. Waste streams will be assessed prior to treatment in the food waste dryer to assess suitability.	All Phases
Table 4-1	Hazardous materials will not be treated in the incineration facility.	All Phases
Table 4-1	Wastes will be securely stored and contained during transport from Barrow Island.	All Phases
Table 4-1	Chevron Australia will require treatment and discharge from vessels to comply with the requirements of MARPOL 73/78 (Ref. 16) and the Commonwealth <i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i> .	All Phases
Table 4-1	Regular monitoring of liquid waste streams will be undertaken for waste being disposed of on Barrow Island.	All Phases
Table 4-1	Re-use water will only be applied to previously disturbed areas.	All phases
Table 4-1	Washout of concrete trucks will only occur in designated areas	All phases
Table 4-1	When discharging wastewater to the marine environment, the dosing level of harmful chemicals will be assessed and minimised to ensure Material or Serious Environmental Harm does not occur.	All phases
Table	Controls that prevent Material or Serious Environmental Harm (as identified during the environmental assessment process for re-use and recycling of	All phases

Section No.	Actions	Timing
4-1	solid wastes, and marine and terrestrial discharge) will be implemented prior to disposal.	

Appendix D Identification of Terrestrial and Subterranean Matters of NES and their Habitat

Appendix E Identification of Marine Matters of NES and their Habitat