Gorgon Gas Development Fourth Train Proposal:

Public Environmental Review – Environmental Scoping Document

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Revision Approvals

	Name	Signature	Date
Prepared:	Colette Curran		
Checked:	Daley Welch		
Approved:	David Lee		
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19.	Chevron Australia Pty Ltd	Dirk Manson
20.	Chevron Australia Pty Ltd	Russel Lagdon
21.	Chevron Australia Pty Ltd	Steve Vellacott
22.	Chevron Australia Pty Ltd	Brendan Privilege

Additional Approval Page

Endorsed by *(if required)*

	Name	Signature	Date
☐ Legal	Paul Evans		
☐ PGPA	Norm Taylor		

Additional Approvals *(if required)*

	Name	Signature	Date
☐ Expansion Project Manager	John Dagleish		
☐ General Manager Greater Gorgon	Colin Beckett		

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1.0 Introduction

Chevron Australia Pty Ltd (Chevron Australia) seeks approval to enable production from the Gorgon Gas Development Foundation Project (Foundation Project) to be expanded from the approved 15 million tonnes per annum (MTPA) to 20 MTPA through the development of the Gorgon Gas Development Fourth Train Expansion Proposal (Fourth Train Proposal).

The Foundation Project, which incorporates three Liquefied Natural Gas (LNG) processing trains on Barrow Island using gas gathered from the Gorgon and Jansz–Io fields in the Greater Gorgon Area, is currently under construction. Since receiving approval for the Foundation Project, the opportunity for progressing a fourth LNG train was identified after additional hydrocarbon resources in the Greater Gorgon Area were discovered.

The Fourth Train Proposal involves the installation of facilities for gathering gas from these new offshore fields in the Greater Gorgon Area, transporting the gathered gas to, and processing it through a fourth LNG train on Barrow Island. Figure 1-1 shows the location of the various components of this Fourth Train Proposal and defines the geographical extent of the Fourth Train Proposal Area (Proposal Area). The regional context of the Fourth Train Proposal is described in Section 4.1.

1.1 Purpose of this Document

The Fourth Train Proposal was referred to the Western Australian (WA) Environmental Protection Authority (EPA) under section 38 of the *Environmental Protection Act 1986* (WA) (EP Act) on 27 April 2011 (Chevron Australia 2011). It was also referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) on the same date, as required under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Chevron Australia 2011a).

On 23 May 2011, the WA EPA determined that the Fourth Train Proposal requires assessment and set the level of assessment at a Public Environmental Review (PER) with an eight-week public review period (EPA Assessment No: 1889). The EPA requested that Chevron Australia prepare this Environmental Scoping Document.

On 3 June 2011, SEWPaC deemed that the Fourth Train Proposal was a Controlled Action requiring assessment and approval under the EPBC Act and set the level of assessment as an Environmental Impact Statement (EIS) (SEWPaC reference EPBC 2011/5942). SEWPaC have provided Chevron Australia with Tailored Guidelines describing the required scope of the Draft EIS (provided in Appendix 3 for information).

Chevron Australia intends to present a combined PER/Draft EIS document for public review, addressing both EPBC Act and EP Act requirements. This combined document approach has been endorsed by both the EPA and by SEWPaC.

This Environmental Scoping Document specifically describes the scope of works required to satisfy Schedule 2 of the EPA's Environmental Impact Assessment Administrative Procedures 2010 (EPA 2010). It has been prepared in accordance with the Guide to Preparing an Environmental Scoping Document (EPA 2010a). The purpose of this Environmental Scoping Document is to:

- develop specific guidelines on the key environmental issues in State jurisdiction relevant to the Fourth Train Proposal that will be addressed in the PER/Draft EIS
- identify the necessary impact predictions for the Fourth Train Proposal, and the information on the environmental setting required to carry out the assessment.

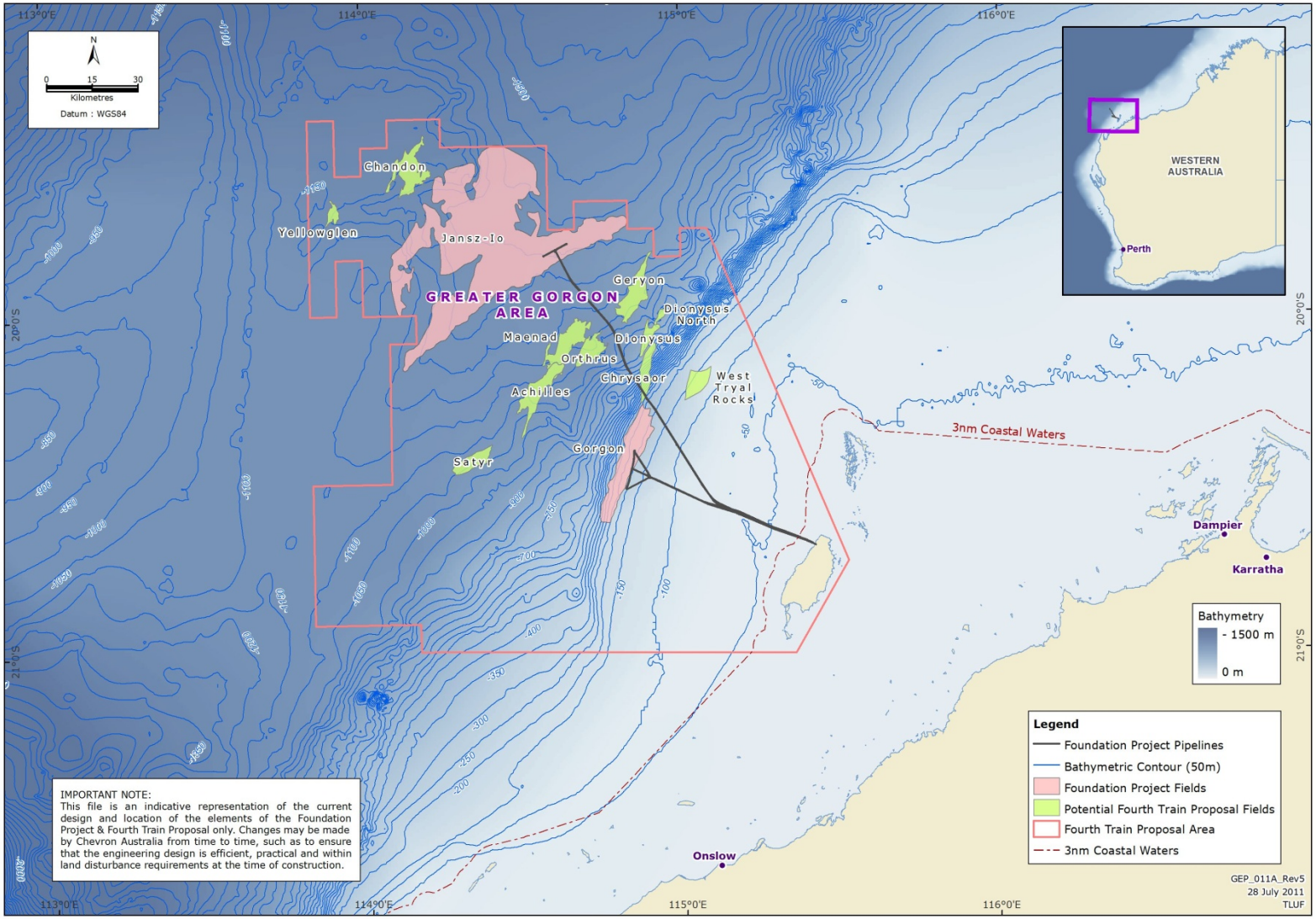

Figure 1-1 Fourth Train Proposal Area

1.2 Proponent Details

Chevron Australia is the proponent for the Fourth Train Proposal on behalf of the following companies, collectively known as the Gorgon Joint Venturers (GJVs):

- 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
- Chubu Electric Power Gorgon Pty Ltd.

Proponent postal address	GPO Box S1580 Perth WA 6000
Key proponent contact for the proposal	Mr David Lee Government Approvals Manager, Gorgon Expansion Project 250 St Georges Terrace Perth WA 6000 Phone: (08) 9216 4144 Email: DavidLee@chevron.com

1.3 Project History

1.3.1 Overview

The Fourth Train Proposal is related to the following Chevron Australia projects, which are together referred to as the Foundation Project:

- the 10 MTPA initial Gorgon Gas Development
- the Revised and Expanded Gorgon Gas Development
- the Jansz Feed Gas Pipeline.

Section 1.3.2 details the approvals history of these projects.

The Foundation Project comprises a range of offshore and terrestrial components to recover gas from the Gorgon and Jansz–Io gas fields; transport the recovered gas by a Feed Gas Pipeline System to Barrow Island; and process the recovered gas at, and ship it from, a Gas Treatment Plant currently under construction on Barrow Island (see Figure 1-1 and Figure 2-1).

1.3.2 Approvals History

1.3.2.1 Strategic Evaluation

In late 2001, the Government of Western Australia determined that a strategic level evaluation of the proposed (now approved) Gorgon Gas Development was required to allow it to make an informed decision on whether to provide in-principle approval for the restricted use of Barrow Island for a Gas Treatment Plant and associated infrastructure.

This evaluation consisted of an Environmental, Social and Economic (ESE) Review, which was submitted for Government consideration in February 2003. The WA Government sought advice on environmental matters from the WA EPA, and social, economic and strategic aspects of the plan from the WA Department of Industry and Resources (DoIR). Advice was also sought from the Conservation Commission of WA, in which the Barrow Island Nature Reserve is vested.

In-principle support for the Gorgon Gas Development was granted by the WA Government in August 2003, as expressed in the Gorgon Gas Processing and Infrastructure Project Agreement (the State Agreement) and its ratifying Act, the *Barrow Island Act 2003* (WA) (Barrow Island Act) (see Section 3.2).

The State Agreement and the Barrow Island Act document the undertakings between the GJVs and the WA Government resulting from the ESE Review process and the granting of in-principle access to Barrow Island. A wide range of conditions and obligations are stipulated in the State Agreement.

1.3.2.2 Environmental Approvals

The initial Gorgon Gas Development was assessed through an Environmental Impact Statement/Environmental Review and Management Programme (EIS/ERMP) assessment process (Chevron Australia 2005, 2006). It was approved by the WA State Minister for Environment on 6 September 2007 by way of Ministerial Implementation Statement No. 748 (Statement No. 748) and the Commonwealth Minister for the Environment and Water Resources on 3 October 2007 (EPBC Reference: 2003/1294).

In September 2008, Chevron Australia sought both State and Commonwealth approval through a Public Environmental Review (PER) assessment process (Chevron Australia 2008) for the Revised and Expanded Gorgon Gas Development to make some changes to 'Key Proposal Characteristics' of the initial Gorgon Gas Development, as outlined below:

- addition of a five 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
- extension of the causeway and the Materials Offloading Facility (MOF) into deeper water.

The WA State Minister for Environment approved the Revised and Expanded Gorgon Gas Development on 10 August 2009 by way of Ministerial Implementation Statement No. 800 (Statement No. 800). Statement No. 800 also superseded Statement No. 748 as the approval for the initial Gorgon Gas Development. Statement No. 800 therefore provides approval for both the initial Gorgon Gas Development and the Revised and Expanded Gorgon Gas Development. A subsequent amendment to Statement No. 800 was issued to the GJVs by the WA State Minister for Environment on 7 June 2011 under Ministerial Implementation Statement No. 865 (Statement No. 865). Statement No. 865 specifically amends certain conditions in Statement No. 800 relating to dredging and dredged spoil disposal. Other conditions in Statement No. 800 remain unaffected by Statement No. 865.

On 26 August 2009, the Commonwealth Minister for the Environment, Heritage and the Arts issued approval for the Revised and Expanded Gorgon Gas Development (EPBC Reference: 2008/4178), and varied the conditions for the initial Gorgon Gas Development (EPBC Reference: 2003/1294).

The Jansz Feed Gas Pipeline was assessed via Environmental Impact Statement/Assessment on Referral Information (ARI) and EPBC Referral assessment processes (Mobil Australia 2005, 2006). It was approved by the WA State Minister for Environment on 28 May 2008 by way of Ministerial Implementation Statement No. 769 (Statement No. 769) and the Commonwealth Minister for the Environment and Water Resources on 22 March 2006 (EPBC Reference: 2005/2184). Proponentship of the Jansz Feed Gas Pipeline was transferred from Mobil Australia to Chevron in 2009.

Since the Foundation Project was approved, further minor changes that are not expected to have a significant impact on the environment in addition or different to that approved by the Ministers for Environment, have been made and approved. Further changes to the Foundation Project may also be made in the future and where relevant, subsequent approvals sought.

1.4 Structure of this Document

Table 1-1 summarises where the requirements under the WA EP Act are addressed in this document.

Table 1-1 Adherence to EPA's Environmental Scoping Document Requirements

EPA Requirement [1]	Section Reference in this Document
Describe the purpose of this document	Section 1.1
Identify the proponent including Joint Venture partnership arrangements and proponent's name, address and nominated contact	Section 1.2
Provide a summary description of the proposal including maps at regional and local scales	Section 2.0 Figure 1-1 illustrates the location of the proposal
Present the project and assessment target timeline	Section 8.1
Provide the basis for justifying proposal and selecting preferred option	Section 2.5
Describe the regional setting of the proposal in a regional biophysical and social context	Section 4.0
Describe the tenure of land to be used in the proposal	Section 2.3
Summarise the potential environmental impacts, their significance and management responses	Section 5.0 and Appendix 5 Note that an environmental risk assessment to determine the level of risk will be undertaken for and documented in the PER/Draft EIS
Describe the proposed studies and investigations	Section 6.0
Identify the key environmental factors and principles for this proposal	Section 5.0, Appendix 5 and Appendix 6
Describe the applicable legislation	Section 3.0
Describe the community and other stakeholder consultation programmes including list of stakeholders that have been identified for inclusion	Section 7.0
Define how the PER document will undergo peer review	Section 8.3
Present the PER study team	Section 8.2
List the references used to prepare the Environmental Scoping Document	Appendix 1
Provide a table relating environmental factors and principles to the scope of investigations	Appendix 5 and Appendix 6

[1] Requirements as defined in EPA 2010a.

2.0 Summary Description of the Proposal

2.1 Proposal Overview

The Fourth Train Proposal comprises additions to several elements of the Foundation Project. Additional subsea wells and gas gathering systems, a new Feed Gas Pipeline System, and a fourth LNG train will be constructed. Existing LNG and condensate export facilities (constructed as part of the Foundation Project) will be used where practicable to export products generated by this Fourth Train Proposal from Barrow Island. Table 2-1 summarises the scope of the Fourth Train Proposal as compared to the scope examined in the environmental assessment documentation of the Foundation Project.

Table 2-1 Scope of Foundation Project and Fourth Train Proposal

Scope of the Foundation Project – as covered in:		Fourth Train Proposal
EIS/ERMP and Jansz–Io ARI	**Revised and Expanded PER**	
Construction, commissioning and operation of: • Subsea gas wells in the Gorgon and Jansz–Io gas fields • Two Feed Gas Pipeline Systems from the Gorgon and Jansz–Io gas fields to and across Barrow Island, using Horizontal Directional Drilling (HDD) as the method to cross the Barrow Island shore at North Whites Beach • A 10 MTPA, two LNG train Gas Treatment Plant on the east coast of Barrow Island • Marine offloading facilities and a 3.1 km jetty from the east coast of Barrow Island to export the processed LNG and condensate • Dredging of access channels to the jetty • A Domestic Gas Treatment Plant on Barrow Island and associated Domestic Gas pipeline system from Barrow Island to the mainland to connect to the Dampier to Bunbury Natural Gas Pipeline • Onshore wells into the Dupuy Formation under Barrow Island for the reinjection of reservoir	Construction, commissioning and operation of: • One additional 5 MTPA LNG train at the Gas Treatment Plant on Barrow Island bringing the total processing capacity of the plant to 15 MTPA using three LNG trains • Changes to the reservoir Carbon Dioxide Injection System to allow for an increased injection rate associated with the addition of one LNG train, increasing the number of injection wells and surface drill centre locations on Barrow Island • Revision of the causeway and the Materials Offloading Facility (MOF) designed to access deeper water to avoid hard rock material and the need for an extensive drilling and blasting program.	Construction, commissioning and operation of: • Subsea wells in new gas fields in the Greater Gorgon Area (other than Gorgon and Jansz–Io) – see Figure 1-1 • A new Feed Gas Pipeline System from the new gas fields to the Gas Treatment Plant on Barrow Island. To the extent practicable, this will follow the route of the approved Foundation Project's Feed Gas Pipeline Systems as it approaches Barrow Island. Similar to the approved Foundation Project, the shore crossing is to be constructed using HDD techniques. An area of approximately 10 ha of uncleared land may be required for the purpose of the HDD site and the exit of the Feed Gas Pipeline System from this site. The remainder of the onshore section of the Feed Gas Pipeline System will be constructed within the same corridor approved for the Foundation Project's Feed Gas Pipeline Systems and

Scope of the Foundation Project – as covered in:		Fourth Train Proposal
EIS/ERMP and Jansz–Io ARI	**Revised and Expanded PER**	
CO_2 removed from the Gorgon feed gas • Ancillary facilities and utilities to support the construction and operational phases including construction village, operations workforce accommodation, road upgrades, airport modifications, water supply, waste water systems etc.		will be approximately 14 km long (see Figure 2-1) • One additional 5 MTPA LNG train and associated facilities within the existing approved Foundation Project Footprint (see Figure 2-1) bringing the total design processing capacity of the plant to 20 MTPA using four LNG trains • Use of, and possible modification to, ancillary facilities and utilities provided by the Foundation Project to support the construction and operational phases, including construction village, operations workforce accommodation, road upgrades, airport modifications, water supply, waste water systems etc.

The new elements of the Fourth Train Proposal are described in Sections 2.2.1 to 2.2.3. Wherever practicable, the new elements will use the design and the existing infrastructure and facilities of the Foundation Project. In addition, some supporting infrastructure and facilities built and operated as part of the Foundation Project may be shared and may require modification and/or addition to accommodate the requirements of the Fourth Train Proposal (see Section 2.2.3).

2.2 Key Characteristics of the Fourth Train Proposal

2.2.1 Subsea Gathering System

Upstream facilities will be installed to access the Feed Gas and gas condensate reserves in gas fields located in the Greater Gorgon Area and to supply these reserves to the new Feed Gas Pipeline System. These upstream facilities will be located in the Commonwealth waters, in water depths ranging from approximately 140 m to 1500 m (Figure 1-1).

The final design of the field development program will determine the total number of subsea production wells required for the Fourth Train Proposal, which is currently estimated to be between approximately 38 and 63 wells. Initially, gas and gas condensate will be produced from between approximately 10 and 16 production wells located in fields shown in Figure 1-1 (not including the Gorgon or Jansz–Io fields). Additional gas reserves will be developed over the life of the Fourth Train Proposal to supply the required quantity of Feed Gas for the four

LNG trains, requiring between approximately 28 and 47 further production wells in the fields shown in Figure 1-1 (not including Gorgon and Jansz–Io).

Several activities will be undertaken, including:

- drilling and completion of production wells and installation of subsea wellhead trees
- installation and operation of a subsea gathering system, injection lines, and control/power umbilical lines
- remote operation of the wells and subsea facilities from the Gas Treatment Plant on Barrow Island
- provision of offshore support, including the provision of construction materials and maintenance, from existing mainland support facilities where practicable.

It is anticipated that offshore compression may be needed during the latter stages of the Fourth Train Proposal field lives. Future offshore compression facilities are not in scope for the Fourth Train Proposal.

2.2.2 Feed Gas Pipeline System

A Feed Gas Pipeline System will be constructed as part of the Fourth Train Proposal to transport gas, gas condensate, and produced water from the gas fields to the gas processing facilities on Barrow Island (see Figure 1-1). The Feed Gas Pipeline System will traverse Commonwealth and State waters to Barrow Island, then traverse approximately 14 km across Barrow Island to the Gas Treatment Plant.

The proposed route of the marine component of the Feed Gas Pipeline System will be finalised following the completion of technical, environmental, safety, and economic performance evaluations, but it will be located within the Fourth Train Proposal Area shown in Figure 1-1. The terrestrial component of the Feed Gas Pipeline System will be located within the approved Foundation Project's Feed Gas Pipeline System corridor (see Figure 2-1).

The marine component of the Feed Gas Pipeline System will be installed on the seabed. Rock armouring or alternative support material may be used for pipeline stabilisation, where required.

The Feed Gas Pipeline System will cross the shore onto Barrow Island adjacent to the existing Foundation Project's Feed Gas Pipeline Systems shore crossings at North Whites Beach. Like the Foundation Project, the shore crossing will be constructed using horizontal directional drilling (HDD) to reduce disturbance.

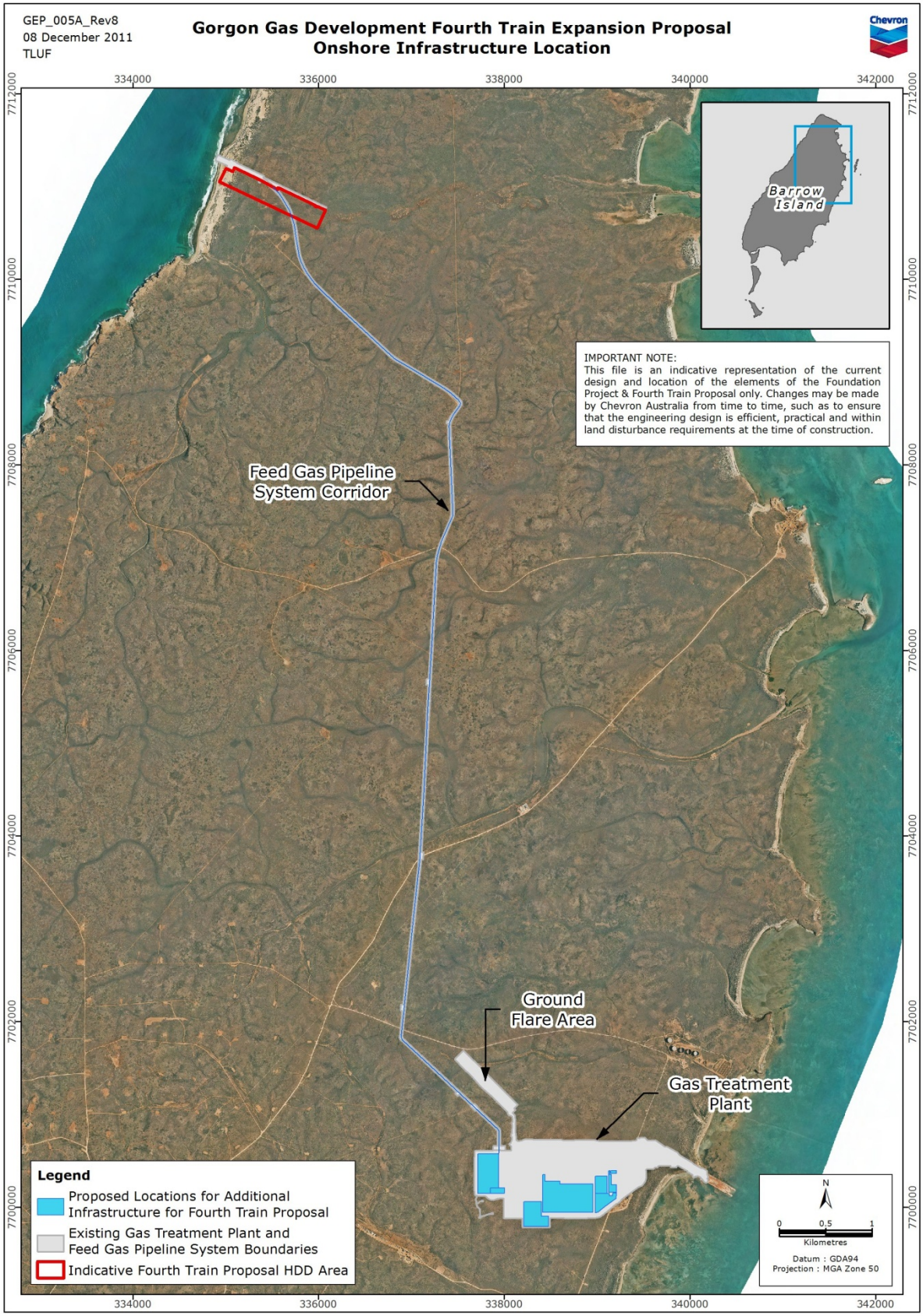

Figure 2-1 Location of Terrestrial Infrastructure on Barrow Island

2.2.3 Gas Treatment Plant

Downstream facilities will process the Feed Gas gathered from the subsea wells (see Section 2.2.1). A nominal five MTPA LNG train will be constructed, supported by the Foundation Project's infrastructure and facilities, where practicable. The construction of additional facilities for the Fourth Train Proposal may include:

- one LNG train with associated facilities
- monoethylene glycol (MEG) processing/regeneration equipment
- inlet receiving facilities
- condensate stabilisation capabilities
- acid gas removal unit
- LNG storage facilities
- additional pipe racks
- underground services
- Boil-off Gas (BOG) System
- utilities (either additional or extension of existing)
- power generation facilities.

Chevron Australia anticipates that all new Gas Treatment Plant facilities required for this Fourth Train Proposal will be located within the approved Foundation Project Gas Treatment Plant area (see Figure 2-1).

It is envisaged that the fourth LNG train will process gas from any of the fields supplying the Gas Treatment Plant, including gas from the Gorgon and Jansz–Io fields.

2.2.4 Marine Facilities and Operations

LNG and condensate produced through the addition of the fourth LNG train will be exported via existing facilities already approved under the Foundation Project, where practicable. Depending on fleet configuration, the Fourth Train Proposal may increase the number of ship loadings from the LNG Jetty at Town Point from approximately 290 to 300 shipments per year (under the Foundation Project) to approximately 350 to 360 per year once the Fourth Train Proposal is operational.

2.2.5 Supporting Infrastructure

A number of facilities on Barrow Island may be required to support the construction and operation of the Fourth Train Proposal, including:

- airport
- access roads
- supply bases
- Construction Village
- Operations Workforce Accommodation
- Administration and Operations Complex
- communication facilities
- flare system
- solid waste management facilities

- waste water disposal facilities
- carbon dioxide injection system
- off-plot utilities, such as seawater intake, reverse osmosis (RO) plant, brine disposal equipment
- Materials Offloading Facility (MOF)
- LNG Jetty
- Barge Landing
- warehousing facilities
- quarantine facilities
- condensate and LNG storage and loading facilities.

These facilities have been assessed and approved as part of the Foundation Project; a number of these facilities are illustrated in Figure 2-2.

In addition, some facilities that have been assessed and approved as part of the Foundation Project may require modification and/or addition for the purposes of this Fourth Train Proposal. These facilities may include:

- storage facilities for chemicals, fuel, and materials etc.
- in-plant roads
- temporary lay-down areas for construction.

The PER/Draft EIS will describe the supporting Foundation Project infrastructure that is expected to be used during both the construction and operation of the Fourth Train Proposal (see Section 6.6 for further details).

Figure 2-2 Gorgon Gas Development Foundation Project Infrastructure on and adjacent to Barrow Island

2.3 Fourth Train Proposal Footprint on Barrow Island

The Fourth Train Proposal Footprint refers to the areas of cleared and uncleared terrestrial land that will be required for the construction and operation of the Fourth Train Proposal.

Barrow Island is reserved under the Western Australian *Conservation and Land Management Act 1984* (WA) (CALM Act) as a Class A nature reserve for the purposes of 'Conservation of Flora and Fauna'. However, the Barrow Island Act makes provision for land on Barrow Island to be used for gas processing purposes. The Barrow Island Act limits to 300 ha the amount of uncleared land on Barrow Island that may be the subject of leases, licences, and easements for gas processing purposes.

Approximately 73 ha of land is anticipated to be required for the Fourth Train Proposal facilities, which are all located on Barrow Island. This area is described as follows:

- Up to 50 ha of land, which has already been cleared under the Foundation Project's Gas Treatment Plant, will be occupied by the fourth LNG train and associated construction activities (Figure 2-1).
- The proposed terrestrial component of the Feed Gas Pipeline System will require approximately 13 ha of land for which clearing has already been approved for the Foundation Project. This is approximately one-third of the Foundation Project's Feed Gas Pipeline System easement (Figure 2-1).
- The Fourth Train Proposal may require an easement over an additional approximately 10 ha of uncleared land for HDD purposes and the terrestrial component of the Feed Gas Pipeline System.

The approximately 73 ha of land anticipated to be required for the Fourth Train Proposal is encompassed within the 300 ha area of uncleared land available for gas processing purposes under the Barrow Island Act.

2.4 Construction Schedule and Workforce

Subject to the outcome of current feasibility studies and approvals, the indicative start date for construction of the Fourth Train Proposal is 2014. Meanwhile, the Foundation Project is expected to start operation of its first LNG train in 2014 with trains 2 and 3 subsequently becoming operational in 2015. Therefore, construction of the Fourth Train Proposal may overlap with both construction and operational phases of the Foundation Project.

Chevron Australia does not anticipate the workforce needed to construct and commission the Fourth Train Proposal infrastructure will exceed the peak workforce approved for construction of the Foundation Project. The construction workforce for the Fourth Train Proposal will be accommodated in the same Construction Village on Barrow Island that has been assessed and approved for the Foundation Project.

2.5 Justification for Selected Option and Alternative Options Considered

Chevron Australia also considered these alternatives to taking the proposed action:

- processing the gas in an alternative location, such as existing or proposed gas processing facilities in the Pilbara area
- deferring the development of the newly discovered gas reserves until capacity in the Foundation Project's Gas Treatment Plant becomes available (i.e. when hydrocarbon reserves in the Foundation Project's Gorgon and Jansz–Io fields decline).

The Barrow Island option has been selected for processing the gas because it uses the infrastructure and facilities that are already being constructed on Barrow Island for the Foundation Project. This offers synergies that reduce the overall physical footprint of the Fourth Train Proposal compared to a newly developed site.

The primary impact of not developing the Fourth Train Proposal is ultimately a loss of the associated economic benefits to the nation, state, and region that are expected to contribute to general economic growth and sustain regional development. The economic benefits include those derived by the Government (e.g. direct payment of taxes by the GJVs and by the workers and businesses associated with the Proposal) and from employment and business/service income generated by the Proposal.

3.0 Key Legislation

Table 3-1 lists the key environmental and activity-specific primary legislation applicable to the assessment of Fourth Train Proposal impacts. The PER/Draft EIS will also reference associated secondary legislation, where relevant. While this Environmental Scoping Document focuses on the State environmental approvals process, the Fourth Train Proposal will also be required to comply with Commonwealth legislative requirements. Therefore, both State and Commonwealth legislation relevant to the Proposal are listed.

Table 3-1 Primary Legislation Relevant to the Assessment of Fourth Train Proposal Impacts

State	Commonwealth
• *Aboriginal Heritage Act 1972* • *Barrow Island Act 2003* • *Bushfires Act 1954* • *Conservation and Land Management Act 1984* • *Contaminated Sites Act 2003* • *Dangerous Goods Safety Act 2004*[Note 1 • *Environmental Protection Act 1986* • *Fish Resources Management Act 1994* • *Heritage of Western Australia Act 1990* • *Land Administration Act 1997* • *Litter Act 1979* • *Local Government Act 1995* • *Marine and Harbours Act 1981* • *Maritime Archaeology Act 1973* • *Petroleum (Submerged Lands) Act 1982* • *Petroleum Act 1967* • *Petroleum Pipelines Act 1969* • *Planning and Development Act 2005* • *Pollution of Waters by Oil and Noxious Substances Act 1987* • *Shipping and Pilotage Act 1967* • *Soil and Land Conservation Act 1941* • *Western Australian Marine (Sea Dumping) Act 1981* • *Wildlife Conservation Act 1950*	• *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* • *Australian Heritage Council Act 2003* • *Clean Energy Act 2011* • *Energy Efficiency Opportunities Act 2006* • *Environment Protection and Biodiversity Conservation Act 1999* • *Environment Protection (Sea Dumping) Act 1981* • *Historic Shipwrecks Act 1976* • *National Greenhouse and Energy Reporting Act 2007* • *Navigation Act 1912* • Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 • Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011 • *Offshore Petroleum and Greenhouse Gas Storage Act 2006* • *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* • *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* • *Quarantine Act 1908*

Note 1: A preliminary Quantitative Risk Assessment will be submitted to the Department of Mines and Petroleum (DMP), as required under subsidiary regulations of this Act, prior to the end of the third quarter of 2013.

3.1 Environmental Protection Act (WA)

The *Environmental Protection Act 1986* (EP Act) is the principal statute that provides for environmental protection in Western Australia. It sets out to 'prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection enhancement and management of the environment'.

Part IV of the EP Act governs the assessment of development proposals. Part V provides for the control and licensing of potentially polluting activities.

3.2 Barrow Island Act (WA)

In-principle support for the Gorgon Gas Development was granted by the WA Government in August 2003 and expressed in the State Agreement and the Barrow Island Act. The Barrow Island Act and the State Agreement set out the rights and obligations of both the GJVs and the State Government in regard to the development of gas processing facilities on Barrow Island. In particular, these regulatory instruments:

- allow for the authorisation of proposals to undertake offshore production of natural gas and petroleum, and for processing this gas on Barrow Island
- make provision for land on Barrow Island to be used for gas processing purposes
- allow for the authorisation of underground disposal of carbon dioxide recovered during gas processing on Barrow Island
- have regard for the need to minimise environmental disturbance on Barrow Island and provide support for conservation programs.

3.3 Environment Protection and Biodiversity Conservation Act (Commonwealth)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the principal statute for the protection of environmental matters of National Environmental Significance (matters of NES). The key objectives of the EPBC Act are to:

- provide for the protection of the environment, especially those aspects of the environment that are matters of NES
- promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources
- conserve Australian biodiversity
- enhance the protection and management of important natural and cultural places
- promote a cooperative approach to the protection and management of the environment involving governments, the community, landholders, and indigenous peoples
- assist in the cooperative implementation of Australia's international environmental responsibilities
- provide a streamlined national environmental assessment and approvals process.

While not addressed in this Environmental Scoping Document, the Fourth Train Proposal will be required to meet the requirements of the EPBC Act. The Commonwealth Department of Sustainability, Environment, Water, People and Communities (SEWPaC) has provided Chevron Australia with separate guidelines to meet the environmental approvals under the EPBC Act (these guidelines are reproduced in Appendix 3 for information).

Chevron Australia intends to present a combined PER/Draft EIS document to address the requirements of both the EP Act and the EPBC Act.

3.4 Policies and Guidelines

A number of international treaties and conventions, Commonwealth and State policies, position statements, guidance statements, environmental guidelines, and codes of practice may relate to the assessment of impacts associated with this Fourth Train Proposal, including those listed below.

International:

- Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (commonly referred to as the China–Australia Migratory Bird Agreement or CAMBA) (CAMBA 1986)
- Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (commonly referred to as the Japan–Australia Migratory Bird Agreement or JAMBA) (JAMBA 1974)
- Agreement between the Government of Australia and the Government of Republic of Korea for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (commonly referred to as the Republic of Korea–Australia Migratory Bird Agreement or ROKAMBA) (ROKAMBA 2006)
- Convention on Biological Diversity 1992 (ratified by Australia in 1993)
- Convention on the Conservation of Migratory Species of Wild Animals 1979 (known as the Bonn Convention)
- International Convention on Oil Pollution Preparedness, Response and Co-operation 1990
- International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 73/78)
- United Nations Convention on the Law of the Sea, 1982 (UNCLOS)

Commonwealth:

- National Strategy for Ecologically Sustainable Development 1992
- Intergovernmental Agreement on the Environment 1992
- National Strategy for Conservation of Australia's Biological Diversity 1996
- National Environment Protection (Ambient Air) Measure (as varied) 2003
- National Environment Protection (Air Toxics) Measure 2004
- National Environment Protection (National Pollutant Inventory) Measure 1998
- National Environment Protection (Movement of Controlled Waste between States and Territories) Measure (as varied) 2010
- National Waste Policy: Less Waste, More Resources 2009
- National Water Quality Management Strategy: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2). Stormwater harvesting and reuse 2009
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000.

State (Western Australia):

- Western Australia State Sustainability Strategy 2003
- The 100-Year Biodiversity Conservation Strategy for Western Australia (Draft) 2006
- State Environmental (Ambient Air) Policy 2009 (Draft)

- Western Australian Environmental Offsets Policy 2011
- Environmental Assessment Guidelines No. 3 – Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment 2009
- Environmental Assessment Guidelines No. 4 – Towards Outcome-based Conditions (Draft) 2009
- Environmental Assessment Guidelines No. 5 – Environmental Assessment Guidelines for Protecting Marine Turtles from Light Impacts 2010
- Guidance Statement No. 12 – Minimising Greenhouse Gas Emissions 2002
- Guidance Statement No. 19. – Environmental Offsets – Biodiversity 2008
- Guidance Statement No. 20 – Sampling of Short Range Invertebrate Fauna for Environmental Impact Assessment in Western Australia 2009
- Guidance Statement No. 33 – Environmental Guidance for Planning and Development 2008
- Guidance Statement No. 41 – Assessment of Aboriginal Heritage 2004
- Guidance Statement No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia
- Guidance Statement No. 54 – Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia 2003
- Guidance Statement No. 54a – Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia 2007
- Guidance Statement No. 55 – Implementing Best Practice in Proposals submitted to the Environmental Impact Assessment Process 2003
- Guidance Statement No. 56 – Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia 2004
- Pilbara Coastal Waters Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives
- State Water Quality Management Strategy No. 6
- Cultural Heritage Due Diligence Guidelines, Parts 1 and 2, 2011.

4.0 Environmental Setting

A considerable amount of baseline information is available from the approvals and compliance assurance process for the Foundation Project. This information will be relied upon for the Fourth Train Proposal environmental approvals, where relevant. As such, only highlights of the environmental setting are provided here. Further details are available in Chevron Australia documents (Chevron Australia 2006, 2008, 2009, 2009a, 2009b, 2010, 2010a, 2010b and 2010c).

4.1 Regional Setting

The Fourth Train Proposal will be developed in Commonwealth and State waters and on Barrow Island within the geographical Proposal Area illustrated in Figure 1-1.

The gas fields to be developed are in the Greater Gorgon Area, located in the Carnarvon Basin on the North West Shelf of Australia, more than 130 km off the north-west coast of Western Australia in water depths up to 1500 m. This area falls under Commonwealth jurisdiction.

Barrow Island is located off the Pilbara coast 85 km north-north-east of the town of Onslow and 140 km west of Karratha. It is approximately 25 km long and 10 km wide and covers 23 567 ha. Barrow Island is the largest of a group of islands, which include the Montebello and Lowendal Islands. It has been the site of a large terrestrial oilfield since 1967 and is a Class A Nature Reserve gazetted under the *Land Administration Act 1997* (WA) and the CALM Act.

4.2 Physical Environment

4.2.1 Climate

The southern portion of the North West Shelf (NWS), including Barrow Island, is characterised by an arid, subtropical climate. The summer season occurs from October to March, with mean daily maximum temperatures reaching 34 °C, and mean daily minimum temperatures averaging 20 °C. During winter (June–August), mean daily maximum temperatures reach 26 °C, with mean daily minimum temperatures of 17 °C. The months of April, May and September are considered a transition season (Chevron Australia 2005).

The mean wind speed around Barrow Island under prevailing non-cyclonic conditions during the summer period is 6.6 m/s, with a maximum of 16.2 m/s (Kellogg Joint Venture Gorgon [KJVG] 2008). The dominant directions during summer are from the south-west and west. During winter, winds approach from the east, south, and south-west, with a mean speed of 5.8 m/s and a maximum speed of 19.4 m/s (Asia Pacific Applied Science Associates [APASA] 2009).

Barrow Island is in a region of high tropical cyclone frequency, with an average of four cyclones passing within 400 nautical miles (nm) of the Island each year. Under extreme cyclone conditions, winds can reach more than 250 km/h (APASA 2009).

4.2.2 Terrestrial Environment

4.2.2.1 Landforms and Topography

Barrow Island has relatively low elevation (up to 60 m above sea level) and is characterised by gentle undulations, eroded ridges, valley floor flood plains, and some incised creek channels. The Fourth Train Proposal terrestrial components are located in an area protected from wave action and with a slight land gradient to the ocean. The coastline is characterised by vegetated sand dunes and expansive tidal flats.

4.2.2.2 Geology and Soils

Barrow Island is a geological extension of the Cape Range Peninsula, which became separated from mainland Australia between 6000 and 8000 years ago as a result of rising sea levels. Barrow Island is composed of coastal deposits overlying tectonically folded limestone.

The soils of Barrow Island vary from duplex to coarse textural uniform depending upon their topographic position and geological parent rock (Lewis and Grierson 1990). On the western side, soil texture is typically silty clay with alluvial watersheds dominated by silty clays and clayey loam textures (Lewis and Grierson 1990). On the eastern slopes, the soils are much coarser with coarse clayey sands, sandy loams, and sandy clays dominating. In the lower-lying areas, duplex soils are present (Lewis and Grierson 1990). The location of the Feed Gas Pipeline System shore crossing (North Whites Beach) comprises coastal sands overlaying shoreline limestone platforms. An outcrop of limestone forms an extensive rock platform between the water and the sand, and runs parallel to the sandy beach. The primary dunes are steep and comprise coastal sand.

4.2.2.3 Surface Hydrology

There are no permanent creeks on Barrow Island. The surface hydrology on Barrow Island is characterised by:

- unpredictable, but sometimes very intense rainfall resulting in substantial run-off in some areas and short-term ponding
- consistently high rates of evaporation resulting in extremely low soil moisture content
- high infiltration capacities of the surface sands and limestones, which is conducive to the recharge of relatively deep groundwater aquifers.

The hydrological regime of Barrow Island is split by a water divide running north to south along a central, elevated ridge (Chevron Australia 2008).

Permanent surface water sources occur in freshwater seeps, which are located more than 5 km from the terrestrial component of the Feed Gas Pipeline System. The nearest ephemeral freshwater seep is situated approximately 500 m south of the North Whites Beach Feed Gas Pipeline System shore crossing (Chevron Australia 2008).

4.2.2.4 Groundwater

There are two aquifers below Barrow Island – a deep, brackish aquifer found at depths below 900 m, and a shallow unconfined aquifer containing a fresher water lens at depths typically between 9 m and 53 m, floating upon denser, saline groundwater (Chevron Australia 2008).

4.2.2.5 Air Quality

Sources of atmospheric emissions on Barrow Island are the existing WA Oil operations (Sinclair Knight Merz [SKM] 2005) and emissions associated with the construction and future operation of the Foundation Project. Key emissions include oxides of sulphur (SO_x), oxides of nitrogen (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), greenhouse gases, and particulate matter (PM).

At a regional level (i.e. the west Pilbara airshed) air quality is likely to be influenced by major industrial sources in the Karratha, Dampier, Onslow, and Cape Lambert regions. Relevant major industrial sources in this area are listed in Appendix 7.

4.2.3 Marine Environment

4.2.3.1 Oceanography

The shallow, coastal waters off Barrow Island are well mixed with little evidence of stratification (Chevron Australia 2010). Surface water temperatures off Barrow Island vary between 22 °C and 31 °C.

The prevailing oceanic conditions in the Barrow Island region are governed by a combination of sea and swell waves (Chevron Australia 2005). Sea waves are shorter-period waves generated by local winds, whereas swell waves are generated by distant storms. Local wind-generated seas have variable wave heights, typically ranging from 0 to 4 m under non-tropical cyclone conditions (APASA 2009). Typically, wave heights at Barrow Island are within the range 0.2 to 0.5 m, with peak periods of two to four seconds (RPS MetOcean 2008). Maximum wave heights are mostly a result of tropical cyclones, which can generate waves in a radial direction out from the storm centre and may therefore generate swell from any direction, with wave heights ranging from 0.5 to 9.0 m (APASA 2009).

4.2.3.2 Water Quality

In the shallow, nearshore waters off the west coast of Barrow Island, turbidity and concentrations of suspended sediments are generally low (<5 mg/L) and indicative of clear water environments (Chevron Australia 2005).

However, wave activity is important in contributing to local resuspension of sediments, resulting in elevated turbidity and suspended sediment concentrations. Therefore, extreme weather events, such as tropical cyclones, have a strong influence on water quality (Chevron Australia 2010).

4.2.3.3 Coastal Processes

The Barrow Island coast has predominantly been developed by the effects of wind and water. Coastal erosion of the rocky headlands and weathering of the intertidal shore platform provides a source of sediment for the beach faces. Tropical cyclones potentially create the most dramatic changes to beach profiles as storm surges raise water levels and expose wave influence to higher parts of the beach not normally vulnerable to waves (Chevron Australia 2006).

4.2.3.4 Bathymetry and Seabed Features

The State waters around Barrow Island lay over an area of the continental shelf. The bathymetry of the continental shelf is characterised as a broad, flat to gently undulating sea floor with areas of moderate relief in water depths of less than about 175 m (Gorgon Upstream Facilities Team [GUFT] 2009).

4.2.3.5 Marine Surficial Sediments

Surficial sediments in State waters off the west coast of Barrow Island are unconsolidated, overlaying a cemented calcarenite substrate. These sediments are mostly calcareous, dominated by sand, and contain shells and shell fragments (Chevron Australia 2005). Off North Whites Beach, outcropping cemented sediments and prominent sand ripples are present (Chevron Australia 2010).

4.3 Biological Environment

4.3.1 Terrestrial Ecology

4.3.1.1 Flora and Vegetation

A total of 226 plant taxa have been confirmed on Barrow Island (Chevron Australia 2009). None of these are Declared Rare Flora species under subsection (2) of section 23F of the *Wildlife Conservation Act 1950* (WA) (Wildlife Conservation Act) and as listed by the Western Australian Department of Environment and Conservation (DEC) (Chevron Australia 2009). Nineteen weed species are documented as currently occurring on Barrow Island (Chevron Australia 2009).

Three Priority Flora species have been collected on Barrow Island (*Helichrysum oligochaetum, Corchorus congener* and *Mukia* sp. Barrow Island (D.W. Goodall 1264)[1] (Chevron Australia 2009). Priority Flora is a non-legislative category aimed at managing those plant taxa listed by the DEC on the basis that they are known from only a few collections, or a few sites, but which have not been adequately surveyed. Such flora may be rare or threatened, but cannot be considered for declaration as rare flora until further survey work has been undertaken.

Mattiske (1993) mapped and described 34 vegetation formations on Barrow Island that are grouped into eight habitats. To date, more detailed mapping of the vegetation has included descriptions of 263 vegetation associations (excluding 16 disturbed units) over 11% of Barrow Island. None of these associations occur entirely within the areas identified as Foundation Project or Fourth Train Proposal locations (Chevron Australia 2009).

4.3.1.2 Terrestrial Mammals

Fifteen species of terrestrial mammals have been recorded on Barrow Island (Chevron Australia 2009). Six species are protected under the Wildlife Conservation Act (see Appendix 3); these are:

- Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*)
- Barrow Island Euro (*Macropus robustus isabellinus*)
- Spectacled Hare-wallaby (*Lagorchestes conspicillatus conspicillatus*)
- Barrow Island Golden Bandicoot (*Isoodon auratus barrowensis*)
- Boodie (*Bettongia lesueur*)
- Water rat (*Hydromys chrysogaster*).

With the exception of the Black-flanked Rock-wallaby, which inhabits the west coast of Barrow Island, all are likely to occur in or near the terrestrial component of the Fourth Train Proposal.

There are no fauna habitats unique to the combined Foundation Project and Fourth Train Proposal Footprints (Chevron Australia 2005).

4.3.1.3 Terrestrial Reptiles and Amphibians

Forty-five terrestrial reptile species have been recorded on Barrow Island (Chevron Australia 2009). One amphibian species – a single species of burrowing frog (*Cyclorana maini*) – has been recorded on Barrow Island.

None of the terrestrial reptile species on Barrow Island are listed as Threatened Species under the Wildlife Conservation Act.

4.3.1.4 Avifauna

Of the 119 bird species recorded on Barrow Island, two are protected under the Wildlife Conservation Act (the Australian Bustard and the White-winged Fairy-wren [Barrow Island]) (see Appendix 3). The White-winged Fairy-wren (Barrow Island) is known to be present in the area likely to be affected by the Fourth Train Proposal (see Appendix 3).

4.3.1.5 Terrestrial Invertebrates

At least 1261 terrestrial invertebrate species have been identified to date on Barrow Island, none of which are listed as requiring special protection under the Wildlife Conservation Act, or listed as priority species by the DEC (Chevron Australia 2009). Most terrestrial invertebrate species appear to be more abundant on Barrow Island during the wet season when there is a flush of growth in dominant plant forms.

[1] *Mukia* sp. Barrow Island has since been renamed *Cucumis* sp. Barrow Island (D.W. Goodall 1264).

Several species of terrestrial invertebrates have been identified as short-range endemics (SREs) on Barrow Island (Chevron Australia 2009a) but surveys have shown that most of these species are widespread on Barrow Island.

4.3.1.6 Subterranean Fauna

A total of 13 troglobitic and 43 stygofauna taxa have been recorded on Barrow Island (Chevron Australia 2009b). Subterranean fauna taxa, along with their conservation status, are listed in Appendix 3. The Subterranean Blind Snake (*Ramphotyphlops longissimus*) is listed by the DEC as a Priority 2 species and is likely to be endemic and restricted to Barrow Island since it is known from only one specimen collected on Barrow Island (see Appendix 3) (Chevron Australia 2009).

4.3.1.7 Ecological Communities

No Threatened Ecological Communities (TECs), as listed in the DEC's TEC Database (DEC 2010), have been recorded or are known to occur on Barrow Island. However, the DEC has listed three Priority 1 Ecological Communities (PECs) on Barrow Island as:

- Barrow Island Subterranean Fauna
- Barrow Island Creekline Vegetation
- Coastal dune soft spinifex grassland.

By definition, this means that the DEC considers these communities are:

> '*poorly-known with apparently few, small occurrences, all or most of which are not actively managed for conservation (e.g. active mineral leases) and for which current threats exist; or if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, appear to be under immediate threat from known threatening processes across their range'* (DEC 2010).

4.3.2 Marine Ecology

4.3.2.1 Marine Habitats (in State Waters)

Nearshore benthic habitats are characterised by limestone platform covered with a veneer of unvegetated sand. Macroalgal assemblages dominate off the west coast of Barrow Island, with macroalgal taxa common within the local area and region. Small, sparse patches of seagrass occur on sand veneers at a few locations and at low levels of percentage cover (Chevron Australia 2010b). Corals are present in low abundances and as sparsely scattered colonies of species (e.g. the hard coral *Turbinaria* spp.) (Chevron Australia 2010b).

Further offshore, benthic habitats are characterised by unvegetated or bare sand. Macroalgal assemblages represent the dominant ecological element, with seagrass and coral colonies rarely present (Chevron Australia 2010b).

4.3.2.2 Marine Reptiles

Of the six marine turtle species known to occur in north-western Australian waters, Green (*Chelonia mydas*), Flatback (*Natator depressus*) and, to a lesser extent, Hawksbill (*Eretmochelys imbricate*) Turtles are commonly found at Barrow Island. All three turtle species are protected under State legislation (see Appendix 3). Barrow Island is a regionally important nesting area for Green and Flatback Turtles, whilst Hawksbill Turtles nest at low densities on Barrow Island (Chevron Australia 2005).

4.3.2.3 Marine Mammals

Three whale species that are listed as specially protected under the provisions of the Wildlife Conservation Act may be present in State waters off the coast of Barrow Island (see Appendix 3). The Humpback Whale is the most common whale species in the region, migrating annually

between their feeding grounds in Antarctic waters and their calving grounds in Pilbara/Kimberley waters from June to October (Chevron Australia 2005). Northbound Humpback Whales tend to remain on or within 200 m water depth, while southbound whales tend to come closer to Barrow Island and generally occur between 50 m and 200 m water depth (Jenner *et al.* 2001).

Dugongs (*Dugong dugon*) are Specially Protected under Schedule 4 of the Wildlife Conservation Act (see Appendix 3). Dugongs are not expected to frequent the locations where Fourth Train Proposal activities will occur, owing to the absence of well-developed seagrass habitats on which they feed (Chevron Australia 2005). However, dugongs may travel through the shallow coastal waters to other areas in the region (Chevron Australia 2010).

4.3.2.4 Fish

Populations of demersal fish species are present in the Proposal Area. These populations are not protected under the Wildlife Conservation Act, but may include commercially important species such as snapper, emperor, and grouper (Chevron Australia 2010b).

Whale Sharks, the world's largest species of fish, may pass through the deeper waters off Barrow Island occasionally; however, they do not aggregate there given the apparent absence of upwelling or other habitats thought to encourage aggregations (Chevron Australia 2005).

4.3.3 Protected/Conservation Areas

Barrow Island is reserved under the Western Australian *Conservation and Land Management Act 1984* (CALM Act) as a Class A nature reserve. The Boodie, Double and Middle Islands Nature Reserve was gazetted in 1984 (Reserve 38728, other than Class A) and covers an area of 586.7 ha. Both reserves extend to the low water mark and are set aside for the purpose of 'conservation of flora and fauna'. They are collectively known as the Barrow Group, and are zoned 'Conservation, Recreation and Nature Land' under the Shire of Ashburton Town Planning Scheme No. 7.

Adjoining Barrow Island are the Barrow Island Marine Park – a significant breeding and nesting area for marine turtles and coral reefs – and the Barrow Island Marine Management Area (Figure 4-1). The Barrow Island Marine Management Area is unzoned, with the exception of the Bandicoot Bay Conservation Area. The Bandicoot Bay Conservation Area, established for benthic fauna and seabird protection, is located on the south coast of Barrow Island. The Barrow Island Marine Park and the Barrow Island Marine Management Area are reserved under the CALM Act. The Barrow Island Marine Management Area is listed on the Western Australian Register of Heritage Places.

Further afield, the Ningaloo Marine Park and Muiron Islands Marine Management Area have also been established as reserves under the CALM Act. The Ningaloo Marine Park, a 'Class A' reserve and listed as a World Heritage Site in 2011, is located off the North West Cape of Western Australia, as shown in Figure 4-1. The boundaries of the Ningaloo Marine Park are approximately 80 km south-west of the Proposal Area and 130 km south-west of Barrow Island at their closest points. The Ningaloo Marine Park extends for about 300 km and covers an area of approximately 263 300 ha. It is located within a 40 m strip above the high water mark in State waters, and includes Ningaloo Reef, the largest fringing reef in Australia (Department of Conservation and Land Management [CALM] 2005).

The Muiron Islands Marine Management Area, located adjacent to the north-east boundary of the Ningaloo Marine Park, covers an area of approximately 28 600 ha. Three conservation areas for flora and fauna protection have been established in the Muiron Islands Marine Management Area. These conservation areas cover a total area of approximately 7% of the Marine Management Area; the remaining 93% of the total area is unclassified (CALM 2005).

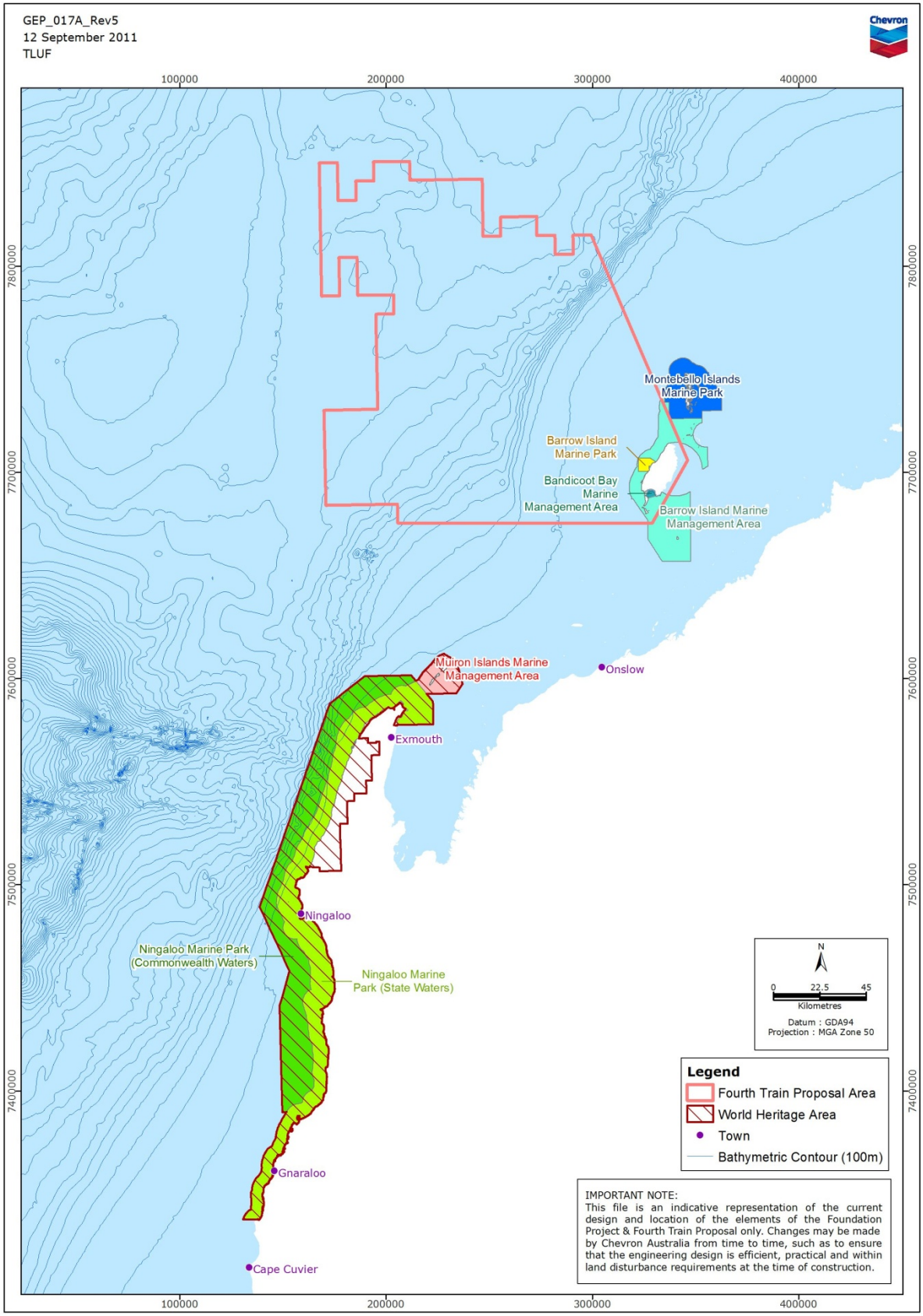

Figure 4-1 Marine Protected Areas in the Vicinity of the Proposal Area

4.4 Human Environment

4.4.1 Land and Sea Use

Barrow Island is vested in the Conservation Commission of Western Australia and is managed on its behalf by the DEC. The nature reserve is also listed on the Commonwealth Register of the National Estate.

Petroleum lease L1H, which has been actively used for petroleum exploration and production purposes since 1964, extends over the land mass of Barrow Island. The Barrow Island Act provides that no more than 300 ha in total of uncleared land is to be leased, or is to be the subject of licences or easements, for gas processing projects.

A number of Western Australian and Commonwealth commercial fisheries operate in the Montebello/Lowendal/Barrow Island region.

4.4.2 Local and Regional Economy

4.4.2.1 State Economy

The value of Western Australia's mineral and petroleum industry reached a record AU$91.6 billion in 2010. Iron ore remained the State's most valuable resource in 2010, accounting for AU$48.5 billion or 53% of all mineral and petroleum sales (Department of Mines and Petroleum [DMP] 2010).

Petroleum, which includes crude oil, condensate, LNG, natural gas, liquefied petroleum gas (LPG), butane, and propane, is Western Australia's second largest sector, accounting for AU$22.9 billion or 25% of total mineral and petroleum sales (DMP 2010).

In 2010, LNG production increased by 8% to 16.5 million tonnes with the value of sales increasing by 39% to AU$8.8 billion. This elevated LNG to become the second most valuable commodity in the State (DMP 2010).

Mineral and petroleum resources dominate the State's exports, contributing a substantial 91% towards the State's total merchandise exports in 2010. Western Australia maintained its status as Australia's leading exporter in 2010, contributing a record 44% towards Australia's merchandise export earnings (DMP 2010).

4.4.2.2 Regional Economy of the Pilbara

The Pilbara economy is dominated by the mining and petroleum industries, with iron ore, oil and condensate, LPG, LNG, and natural gas among WA's largest export revenue earners. Commercial activities in the Pilbara exist primarily to service the resources sector. Such activities include engineering, surveying, personnel, and equipment hiring services (Pilbara Development Commission 2006). The Pilbara's rapid economic growth is predicted to continue over an extended period as major new resource projects and expansions are commissioned. In particular, the iron ore and oil and gas production sectors will continue to develop and expand to meet the increasing demand from China and the rest of Asia. As a result, the Pilbara is expected to remain an area of strategic significance to both the State and national economies for some time into the future (Pilbara Development Commission 2010).

During the 2006 Census, the mining and construction sectors employed 29.4% and 10.7% of the Pilbara's workforce, respectively. The manufacturing sector, comprising mainly small businesses supplying the regional market, had an estimated sales income of AU$309 million during the period 2004 to 2005 and employed up to 4.3% of the region's workforce (Pilbara Development Commission 2006). The population has increased by 15% over the past seven years, primarily due to development within the resources sector (Pilbara Development Commission 2010).

4.4.3 Local Community

There is no resident population on Barrow Island. Barrow Island has been actively used for petroleum exploration and production purposes since 1957 and access to the Island is restricted to personnel associated with oilfield operations, construction of the Foundation Project, and the DEC's activities.

Barrow Island and its surrounds are located within the Shire of Ashburton in the Pilbara region of Western Australia. The Shire of Ashburton covers an area of approximately 105 650 km^2 (predominantly mainland) and includes the towns of Onslow, Tom Price, Paraburdoo, and Pannawonica. Tom Price is the Shire's largest town and its administration centre. The mainland resident population of the Shire was estimated to be approximately 6730 in 2010 with an estimated growth rate of 0.8% per annum since 2005 (Australian Bureau of Statistics [ABS] 2011). The primary employer in the Shire in the 2006 census was mining, employing more than 50% of residents over 15 years old (ABS 2008). The Shire is home to a large indigenous population, some of whom reside in or near Onslow.

4.4.4 Culture and Heritage

Archival sources suggest that a number of important vessels have been lost in the Onslow/Barrow Island region, and there is potential for lugger shipwreck sites to occur near Barrow Island (Chevron Australia 2005). The earliest known shipwreck of European origin within Australian waters (The Trial) is located approximately 45 km north of Barrow Island.

The existence of any residual wreckage (which would constitute an archaeological site) can only be determined if it is discovered. The Foundation Project's Feed Gas Pipeline System shore approaches, the MOF, and the shore areas around the Gas Treatment Plant area were examined by a marine heritage expert and no shipwreck sites were discovered (Chevron Australia 2008).

The Department of Indigenous Affairs (DIA) Register of Aboriginal Sites lists 13 archaeological but no ethnographic sites for Barrow Island. Archaeologists, anthropologists, and indigenous stakeholders examined areas associated with the Foundation Project in 2006 and 2007; no new indigenous cultural sites or materials were discovered in areas likely to be disturbed by the Foundation Project (Chevron Australia 2008).

5.0 Preliminary Environmental Analysis of the Fourth Train Proposal

5.1 Introduction and Purpose

An environmental risk assessment will be conducted for the PER/Draft EIS, which will consider environmental receptors (or 'environmental factors') that the Fourth Train Proposal may impact. A preliminary environmental analysis of the Fourth Train Proposal was completed by Chevron Australia for the purpose of this Environmental Scoping Document. The objectives of this preliminary analysis were to:

- identify *environmental stressors* (hazards/threats to the environment, such as the release of air emissions to the atmosphere) and *environmental factors* (receptors such as flora and fauna) likely to be of relevance for the Fourth Train Proposal
- identify *environmental factors* that require additional baseline data collection to support the assessment of impacts in State jurisdiction
- identify *environmental stressors* that require additional study to predict potential impacts on environmental factors.

5.2 Methodology

As the design and execution of the Fourth Train Proposal is expected to be very similar to that of the Foundation Project, the methodology adopted for this preliminary environmental analysis has drawn extensively on the results of the environmental risk assessments conducted for the Foundation Project (see Section 1.3.2). These environmental risk assessments identified the environmental stressors and factors of relevance for the Foundation Project (see Section 5.3.1).

The methodology used for the preliminary environmental analysis was:

- Compare the scope of activities associated with the Fourth Train Proposal to those examined for the Foundation Project.
- Make preliminary identification of the likely stressors, environmental factors, and associated potential impacts relevant to the construction and operation of the Fourth Train Proposal. This process used the results of the environmental risk assessments completed for the Foundation Project. It also reflected the consultations that Chevron Australia has held with government stakeholders about the Fourth Train Proposal.
- Review the available baseline information to support an assessment of identified environmental impacts and the identification of information gaps for which additional baseline data collection or additional studies need to be undertaken to support the assessment of impacts in State jurisdiction.

Environmental stressors and factors relevant to the Fourth Train Proposal were determined on the basis that they may:

- pose additional or different adverse impacts from those of the approved Foundation Project and therefore will need to be avoided, reduced, and/or managed
- be of high community/public interest
- lead to, or be affected by, cumulative impacts in the local or regional area.

5.3 Results

5.3.1 Comparison with the Foundation Project

The key environmental issues identified and examined in detail in the environmental risk assessments for the Foundation Project (Chevron Australia 2005, 2008) were:

- biodiversity and conservation values of Barrow Island and its surrounding waters, with a particular focus on:
  - clearance of native vegetation and associated fauna habitats
  - damage to sensitive coastal and nearshore habitats, including beaches, dune systems, and coral communities
  - protected terrestrial fauna, including short-range endemics, subterranean fauna, protected mammals, avifauna, and reptiles
  - protected marine fauna, including marine turtles and marine mammals
- quarantine management given the need for considerable transfers of people, equipment, and materials to Barrow Island
- disposal of reservoir CO_2 by injection into the Dupuy Formation beneath Barrow Island.

To the extent practicable, the Fourth Train Proposal will mirror the activities and designs used for the Foundation Project. It will also use land, infrastructure and facilities already approved for the Foundation Project (see Table 2-1 for a summary comparison of the scope of activities for the Fourth Train Proposal and the Foundation Project). As such, the scope of activities that could lead to potential environmental impacts is anticipated to be considerably less for the Fourth Train Proposal when compared with the Foundation Project. In particular, the following activities, considered as key activities for the Foundation Project from an environmental perspective, are **not in scope** for this Fourth Train Proposal:

- Construction of marine facilities on the east coast of Barrow Island (e.g. Marine Offloading Facility and LNG Jetty), and associated dredging and dredged spoil disposal. This activity was an important focus of the environmental risk assessment studies conducted for the Foundation Project given the potential for dredging and dredged spoil disposal to impact coastal processes, coastal morphology, water quality, and marine flora and fauna (including corals) around Barrow Island. Other than upstream subsea gathering systems and a Feed Gas Pipeline System, additional marine facilities and dredging are not anticipated for the Fourth Train Proposal.
- Clearance of native vegetation at the Gas Treatment Plant and along the onshore section of the Feed Gas Pipeline System. The majority of land required for the Fourth Train Proposal infrastructure has already been approved for clearance under the Foundation Project (see Section 2.3). The Fourth Train Proposal may only require clearance of approximately 10 ha of land at the HDD site (consideration of which will be included in the environmental risk assessment of the PER/Draft EIS).
- Development of further onshore sites for the injection of reservoir CO_2. The Foundation Project included a pipeline (approximately 10 km long) and injection wells, plus additional pressure management wells drilled into the Dupuy Formation beneath Barrow Island. Key direct impacts associated with this included vegetation clearance, habitat loss, and fauna disturbance (including protected species). No significant change to the CO_2 injection system is anticipated for the Fourth Train Proposal regardless of the reservoir CO_2 management option selected.
- Changes to the Domestic Gas system infrastructure. This system included a Domestic Gas processing facility at the Gas Treatment Plant on Barrow Island and a pipeline system of approximately 91 km from Barrow Island across to the mainland and interconnection into the

existing Dampier to Bunbury Natural Gas Pipeline. This activity was identified in the environmental risk assessments conducted for the Foundation Project as resulting in physical disturbance to the seabed and requiring clearing of 75 ha of terrestrial and intertidal vegetation communities on the Pilbara mainland. No change to the infrastructure of this approved Domestic Gas system is anticipated for the Fourth Train Proposal.

- Construction of ancillary facilities and utilities to support construction and operational phases. Construction of facilities such as the Construction Village, Operations Workforce Accommodation, road upgrades, airport modifications, water supply, waste water systems etc. contributed to the total area of land cleared of native vegetation under the Foundation Project. The Fourth Train Proposal intends to use these existing facilities to the extent practicable, thereby reducing its overall Footprint.

While noting that the scope of activities associated with the Fourth Train Proposal is smaller than that already assessed and approved for the Foundation Project, the Fourth Train Proposal will still introduce additional stressors (hazards or threats) to the environment. These stressors may impact environmental factors (receptors) in the same or in different geographical areas, and/or may extend the time period over which stressors already examined by the Foundation Project will be experienced. Table 5-1 summarises the environmental stressors and factors that were examined in the EIS/ERMP and PER for the Foundation Project and comments on their likely relevance to the Fourth Train Proposal.

Table 5-1 Stressors and Environmental Factors Identified and Examined for the Foundation Project

Foundation Project (EIS/ERMP and PER)[1]		**Relevance to the Fourth Train Proposal**
Project Stressors	**Associated Environmental Factors**	
Site disturbance/ excavation (onshore)	• Soil and landforms • Air quality • Surface water and groundwater quality • Flora and vegetation communities • Terrestrial fauna • Subterranean fauna	Development of the Fourth Train Proposal may require up to approximately 10 ha of land to be cleared of vegetation on Barrow Island at the HDD site. This is considerably less than the land approved for clearance under the Foundation Project. In addition, earthworks will be required at the Gas Treatment Plant over an area of ~42 ha (already approved for clearance under the Foundation Project). This compares to the substantially greater area of earthworks for the Foundation Project. Impacts are restricted to Barrow Island.
Physical presence (of infrastructure)	• Air quality • Surface water and groundwater quality • Terrestrial fauna • Subterranean fauna • Seabed • Foreshore • Benthic primary producers (marine flora and corals) and habitats • Marine fauna • Livelihoods and	New infrastructure will be added to the seabed and on Barrow Island by the Fourth Train Proposal. The duration of likely construction impacts on identified environmental factors associated with the Foundation Project may be extended to cater for construction of the Fourth Train Proposal infrastructure on Barrow Island. Foundation Project impacts on the foreshore were related to the construction and presence of the Domestic Gas system, the MOF, and the LNG jetty. As the Fourth Train Proposal will not be altering this infrastructure, this factor is not considered relevant to the Fourth Train Proposal.

Foundation Project (EIS/ERMP and PER)[1]		Relevance to the Fourth Train Proposal
Project Stressors	**Associated Environmental Factors**	
	lifestyles • Land and sea use and tenure • Native title • Cultural heritage • Historical and maritime heritage • Landscape and aesthetics • Workforce and public health and safety	
Physical interaction	• Terrestrial fauna • Marine fauna • Land and sea use and tenure	This stressor is relevant during both the construction and operation stages of the Fourth Train Proposal. During construction, similar types of potential impacts to those associated with the construction of the Foundation Project may be expected, with the exception that no dredging is foreseen for the Fourth Train Proposal. Once operational, the Fourth Train Proposal is expected to result in an increased frequency of LNG and condensate vessel visits to the jetty on Barrow Island (see Section 2.2.3).
Physical disturbance	• Seabed substrates • Foreshore • Benthic primary producers (marine flora and corals) and habitats • Marine fauna	In State waters, laying of the Feed Gas Pipeline System and HDD activities for the Fourth Train Proposal will cause this stressor. The type and nature of potential impacts associated with these activities are likely to be similar to those of the Foundation Project, as a similar sea area will be affected. However, no dredging and no change to the MOF or LNG Jetty are anticipated for the Fourth Train Proposal (these were key contributors to this stressor in the Foundation Project). Therefore, impacts to the foreshore are not expected for the Fourth Train Proposal.
Atmospheric emissions, excluding dust	• Air quality • Flora and vegetation communities • Terrestrial fauna • Workforce and public health and safety	This stressor is relevant during both the construction and operation of the Fourth Train Proposal. Emission types during construction are likely to be similar to those of the Foundation Project; however, quantities will reflect the smaller size of the Fourth Train Proposal. Emissions from the Fourth Train Proposal construction will be occurring at the same time that the Foundation Project is finishing construction and becomes fully operational. The Fourth Train Proposal will generate additional operational emissions. The total emissions from the Gas Treatment Plant (i.e. including the Foundation Project) will increase once the Fourth Train Proposal is operational.
Dust	• Flora and vegetation communities • Terrestrial fauna • Landscape and	This stressor is relevant during the construction of the Fourth Train Proposal. However, dust quantities are expected to be smaller than for the Foundation Project as the area of earthworks for the Fourth Train Proposal is considerably smaller and many of the

Foundation Project (EIS/ERMP and PER)[1]		Relevance to the Fourth Train Proposal
Project Stressors	**Associated Environmental Factors**	
	aesthetics	roads are already sealed.
Solid and liquid waste disposal	• Soil and landforms • Surface water and groundwater quality • Seabed substrates • Water quality (marine) • Benthic primary producers (marine flora and corals) and habitats • Marine fauna • Workforce and public health and safety	This stressor is relevant during the construction and operation of the Fourth Train Proposal. The type and nature of potential impacts are likely to be similar to those of the Foundation Project although volumes of waste are likely to be proportionately less and there is no requirement in the Fourth Train Proposal to dispose of dredged spoil (a key contributor to this stressor in the Foundation Project). Additional wastes (i.e. from the Fourth Train Proposal in addition to those assessed and approved for the Foundation Project) may also be relevant.
Waste water	• Soil and landforms • Surface water and groundwater quality • Subterranean fauna • Seabed substrates • Water quality (marine) • Benthic primary producers (marine flora and corals) and habitats • Marine fauna • Workforce and public health and safety	This stressor is relevant during the construction and operation of the Fourth Train Proposal. The type and nature of potential impacts are likely to be similar to those of the Foundation Project, although discharge volumes are likely to be proportionately less. Additional waste water volumes (i.e. from the Fourth Train Proposal in addition to those assessed and approved for the Foundation Project) may also be relevant.
Creation of heat/ cold	• Flora and vegetation communities • Terrestrial fauna	This stressor is relevant during the construction and operation of the Fourth Train Proposal and relates to the creation or loss of shade used by terrestrial flora and fauna. The type and nature of potential impacts are expected to be similar to those of the Foundation Project, although the area affected is likely to be proportionately less.
Noise and vibration	• Terrestrial fauna • Subterranean fauna • Marine fauna	This stressor is relevant during the construction and operation of the Fourth Train Proposal. The type and nature of potential impacts may be similar to those of the Foundation Project. Additional disturbances (i.e. from the Fourth Train Proposal in addition to those assessed and approved for the Foundation Project) may also be relevant.
Creation of light or shade	• Flora and vegetation communities • Terrestrial fauna • Marine fauna • Landscape and aesthetics	This stressor is relevant during the construction and operation of the Fourth Train Proposal. The type and nature of potential impacts may be similar to those of the Foundation Project. Additional light or shade (i.e. from the Fourth Train Proposal in addition to those assessed and approved for the Foundation Project) may also be relevant.

Foundation Project (EIS/ERMP and PER)[1]		Relevance to the Fourth Train Proposal
Project Stressors	**Associated Environmental Factors**	
Fire	• Flora and vegetation communities • Terrestrial fauna	Fire remains a potential stressor for the Fourth Train Proposal (due to the presence of fuel, hot works, vehicle exhausts etc.).
Leaks or spills	• Soil and landforms • Surface water and groundwater quality • Flora and vegetation communities • Subterranean fauna • Seabed substrates • Water quality (marine) • Benthic primary producers (marine flora and corals) and habitats • Marine fauna	This stressor is relevant during the construction and operation of the Fourth Train Proposal. Consequences are likely to be similar to those of the Foundation Project; however, the likelihood may be altered given that the Fourth Train Proposal will be developed at the same time as the Foundation Project is completing construction and becoming fully operational.

[1] Source: Chevron Australia 2005, 2006 and 2008.

5.3.2 Environmental Factors Relevant to the Fourth Train Proposal

Drawing on the information presented in Table 5-1 and the preliminary analysis of the activities associated with the Fourth Train Proposal, Table 5-2 lists the environmental factors identified as being of particular relevance to the Fourth Train Proposal. Figure 5-1 and Figure 5-2 illustrate the likely interactions between stressors and environmental and socio-economic factors respectively, which are expected to be relevant to the Fourth Train Proposal.

Table 5-2 Environmental Factors Relevant to the Fourth Train Proposal

Environmental Factor Type [1]	Relevant Environmental Factors [1] [2]	Change Introduced by the Fourth Train Proposal compared to impacts assessed for the approved Foundation Project (see further detail in Appendix 5)
Terrestrial Environment	• Soils and landforms • Surface and groundwater • Terrestrial flora and vegetation communities • Terrestrial fauna • Subterranean fauna	The duration, spatial area, and/or magnitude of impacts predicted for the Foundation Project may be extended or changed as a result of the construction and operation of the Fourth Train Proposal. However, no impacts are anticipated for the Western Australian mainland.
Coastal and Nearshore Environment	• Marine fauna and benthic communities (except benthic primary producers) • Marine benthic primary producers and their	The duration, spatial area, and/or magnitude of impacts predicted for the Foundation Project may be extended or changed as a result of the construction and operation of the Fourth Train Proposal. However, as no dredging or

Environmental Factor Type [1]	Relevant Environmental Factors [1] [2]	Change Introduced by the Fourth Train Proposal compared to impacts assessed for the approved Foundation Project (see further detail in Appendix 5)
	habitats • Marine water quality • Seabed	changes to the MOF or LNG Jetty are anticipated for the Fourth Train Proposal, construction phase impacts are expected to be limited to the west coast of Barrow Island associated with installation of the Feed Gas Pipeline System.
Pollution Management	• Atmospheric emissions • Emissions of greenhouse gases • Generation of dust • Creation of light or shade • Discharges to sea (including run-off) • Noise and vibration • Leaks and spills	Additional emissions, discharges, and wastes will be generated by the Fourth Train Proposal, which may change the magnitude of resulting impacts on terrestrial and coastal and nearshore environmental factors and/or the area of influence. The total emissions from the Foundation Project and Fourth Train Proposal will increase. During construction, the duration of stressors will be extended beyond that envisaged for the Foundation Project.
Social Surrounds	• Public health and safety • Cultural heritage • Conservation areas • Land and sea use • Livelihoods • Local communities • Local and regional economy	The duration of impacts anticipated for the Foundation Project may be extended by construction of the Fourth Train Proposal.

[1] Term used by the EPA to broadly denote environmental receptors (EPA 2010b). The environmental factors presented are derived from those used in the Foundation Project approvals documents (Chevron Australia 2005, 2008).

[2] Relevant environmental factors are identified for areas in State jurisdiction only including coastal and nearshore waters, Barrow Island, and the nearby Pilbara coast that could be affected by construction and operation of the following components of the Fourth Train Proposal: the marine component of the Feed Gas Pipeline System within nearshore waters; the HDD site; the terrestrial component of the Feed Gas Pipeline System; the fourth LNG train at the Gas Treatment Plant and its associated utilities; supply vessel operations at the MOF and/or WAPET Landing; and the loading of LNG and condensate on to off-take vessels at the LNG Jetty. Environmental factors relevant to Commonwealth jurisdiction are identified in SEWPaC's Tailored Guidelines (presented for information in Appendix 3).

Environmental Factor	Potential Consequence	Stressor																													
		Atmospheric emissions (except dust)		Dust		Creation of light or shade		Discharges to Sea (incl. runoff)		Noise and vibration emissions		Creation of heat/cold		Generation & disposal of solid waste (to land)		Physical disturbance (seabed or foreshore)		Physical Presence (of infrastructure)		Physical interaction		Introduction/ spread of non-indigenous species		Site disturbance / excavation (onshore)		Vegetation clearing		Spills & leaks		Fire	
		C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
Atmosphere																															
Air Quality	Local air quality Regional air quality	■	■	■																										■	
Global concentrations of GHG in the atmosphere	Global concentrations of GHG in the atmosphere	■	■																											■	
Terrestrial Environment																															
Soil and landforms	Soil contamination Soil characteristics Landform													■	■									■		■		■	■	■	
Surface and groundwater	Water quality Hydrological patterns Groundwater recharge													■	■			■	■					■		■		■	■		
Terrestrial flora & vegetation communities including restricted flora	Impact to species or community Loss of species or community Habitat integrity		■	■		■	■															■	■	■		■		■	■	■	
Terrestrial fauna including protected species	Species behaviour Population size and viability Habitat integrity		■	■		■	■			■	■	■	■							■	■	■	■	■		■		■	■	■	
Subterranean fauna including protected species	Species behaviour Population size and viability Habitat integrity									■												■	■	■		■		■	■		
Marine Environment																															
Marine fauna including protected species and benthic communities (excl. BPPs)	Species behaviour Population size and viability Habitat integrity		■			■	■	■	■	■	■					■			■	■	■	■	■					■	■		
Marine benthic primary producers (BPPs) and their habitats	Impact to species or community Loss of species or community							X	X							■	X		■	■								■	■		
Marine water quality	Water quality		■					■	■							■	■											■	■		
Foreshore	Stability and integrity of beaches															X	X	X	X												
Seabed (sub-tidal and inter-tidal)	Benthic landforms Sediment physical characteristics Sediment contamination							■								■	X		■									■	■		

Key:

■ Interaction (impact or benefit) anticipated for the Fourth Train Proposal

X Denotes an interaction that was relevant to the scope of the Foundation Project but is not relevant for the Fourth Train Proposal (i.e. dredging, Domestic Gas Pipeline and construction of the MOF and LNG Jetty)

C Refers to the Construction Phase

O Refers to the Operational Phase

Figure 5-1 Summary of Likely Interactions between Stressors and Environmental Factors for the Fourth Train Proposal

Socio-economic Factor	Potential Consequence	Stressor																	
		Atmospheric emissions (except dust)		Dust		Physical Presence (of infrastructure)		Physical interaction		Introduction/ spread of non-indigenous species		Site disturbance / excavation (onshore)		Vegetation clearing		Spills & leaks		Fire	
		C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
Society and Economy																			
Public health and safety	Public health, safety and wellbeing Access to health care services		■													■	■		
Cultural heritage	Historical and cultural associations Aboriginal and non-indigenous heritage											■							
Conservation Areas and national / world heritage places	Environmental and heritage values		■	■						■	■	■		■		■	■	■	
Land and Sea Use	Economic impact on other uses of the land or sea (e.g. shipping, fishing, recreation)					■	■	■	■							■	■		
Livelihoods	Employment and skills					■	■												
Local communities	Social, cultural and community structure and infrastructure of host communities					■	■												
Local and regional economy	Alignment with national, state and local socio-economic development policies and plans Economic development					■	■												

Key:

■ Interaction (impact or benefit) anticipated for the Fourth Train Proposal

C Refers to the Construction Phase

O Refers to the Operational Phase

Figure 5-2 Summary of Likely Interactions between Stressors and Socio-Economic Factors for the Fourth Train Proposal

Based on the results of the preliminary environmental analysis presented in Table 5-2, Figure 5-1 and Figure 5-2, impacts on the following environmental and socio-economic factors are identified as requiring further examination in the PER/Draft EIS for the Fourth Train Proposal:

- the terrestrial environment of Barrow Island, including impacts on the physical environment (i.e. soils and landform, air quality, ambient noise levels, light spill, surface and ground water quality and quantity) and on the biological environment (e.g. to terrestrial and subterranean fauna and to flora and vegetation communities). With the exception of air quality, impacts are expected to be restricted to Barrow Island. Impacts resulting from operational atmospheric emissions of the Fourth Train Proposal may extend to the Pilbara airshed.
- the State waters surrounding Barrow Island, including impacts on the physical characteristics of the seabed, marine water quality, marine fauna and marine benthic primary producers (BPPs; i.e. mangroves, seagrass, macroalgae, and corals) and their habitats. Similar to the terrestrial environment, impacts are expected to be restricted to State waters surrounding Barrow Island except for non-routine events.
- the society and economy of the State and the Pilbara region, including impacts on public health and safety, land and sea use, cultural heritage, conservation areas, local communities and their livelihoods and lifestyles.

Potential impacts of the Fourth Train Proposal on these factors are summarised in Appendix 5.

Notwithstanding the results of this preliminary environmental analysis, the Fourth Train Proposal will undergo an environmental risk assessment for the PER/Draft EIS during which the identified environmental stressors, environmental factors, and potential impacts will be revisited, confirmed, and/or amended.

5.3.3 Baseline Data

The baseline for the Fourth Train Proposal is the as-built and operational Foundation Project. This status takes into account other activities already operational on Barrow Island (i.e. WA Oil operations).

There is a considerable amount of data available from the Foundation Project to describe the pre-Foundation Project baseline condition of the marine and terrestrial environment. The Foundation Project has also generated numerous predictions about the status of the environment once it becomes operational (e.g. in its impact assessment reports and in modelling studies conducted as part of detailed engineering design [see Sections 5.3.5 and 6.7.6 for further details]).

Chevron Australia has considered the availability, geographical coverage, and validity of baseline data available from the Foundation Project to support the PER/Draft EIS for the Fourth Train Proposal. This preliminary environmental analysis for the Fourth Train Proposal concluded that sufficient, up-to-date, and valid information with appropriate spatial coverage is available to support the assessment of impacts on environmental factors in the PER/Draft EIS (see Appendix 5). However, for socio-economic factors, it was concluded that available data will need to be supplemented with more up-to-date secondary information (e.g. on shipping movements, fishing etc.; see Appendix 5 for further details).

5.3.4 Cumulative Impacts

In addition to impacts associated with the Foundation Project, the Fourth Train Proposal may result in cumulative impacts in two further ways:

- impacts that are additive on one environmental receptor. For example, flora and fauna may be subject to potential environmental effects from a number of different stressors of the Fourth Train Proposal and the Foundation Project including dust emissions, air emissions, vehicular and personnel movements, vegetation clearing, and spills and leaks. Such impacts are likely to be localised to Barrow Island and its surrounding waters.

- impacts of the Fourth Train Proposal and Foundation Project in addition to those of other developments. Locally (i.e. on Barrow Island), relevant developments include WA Oil operations. At a regional level (i.e. Barrow Island and the neighbouring Pilbara coast), the Wheatstone Project and other developments along the Pilbara coast will be relevant particularly for social receptors and with respect to air quality.

5.3.5 Potential Limitations

The environmental risk assessments for the Foundation Project provide a solid basis on which to frame the assessment of potential impacts for the Fourth Train Proposal. However, construction of the Foundation Project is currently in progress; therefore, relying on the conclusions and recommendations of the Foundation Project, and its approved mitigation and management mechanisms presents potential limitations for the Fourth Train Proposal. These include:

- impacts that may result from the Foundation Project that were either not previously anticipated, or are different to those predicted (i.e. better or worse than predicted)
- stress to environmental factors that may not result in a detectable impact for some time
- impacts to environmental factors by stressors not attributable to the Foundation Project (e.g. by natural events) that may make factors more vulnerable to impacts resulting from the Fourth Train Proposal.

Limited monitoring data are expected to be available within the timeframe of the Fourth Train Proposal's PER/Draft EIS. Experience and lessons from the implementation of construction-phase mitigation and management measures proposed for the Foundation Project and from site observations and audits will also be considered in the PER/Draft EIS, where relevant.

6.0 Proposed Studies and Investigations for the PER/Draft EIS

Chevron Australia, as proponent for the Fourth Train Proposal, is required to prepare a PER of the Fourth Train Proposal in accordance with the EPA's Guidelines for Preparing a Public Environmental Review (EPA 2010c) to address EP Act requirements.

As the Fourth Train Proposal is also subject to assessment by the Commonwealth Government under the EPBC Act (SEWPaC reference EPBC 2011/5942), Chevron Australia intends to present a combined PER/Draft EIS document for public review, which will also address matters of National Environmental Significance (NES). The scope of the assessment relevant to the EPBC Act is presented in SEWPaC's Tailored Guidelines (Appendix 3).

The remainder of this section focuses specifically on the scope of studies required to meet the EPA's requirements for PER.

6.1 Objectives of the PER/Draft EIS

The objectives of the PER/Draft EIS to meet the EPA's requirements are to:

- place the Fourth Train Proposal in the context of the local and regional environment
- describe components of the Fourth Train Proposal, so that the State Minister for Environment can consider approval of a well-defined project
- provide the basis of Chevron Australia's environmental management program for the Fourth Train Proposal, which shows that the environmental impacts resulting from the Fourth Train Proposal, including cumulative impacts, are reduced and managed to a level that is as low as reasonably practicable (ALARP)
- communicate clearly with stakeholders (including the public and government agencies), so that the EPA can obtain informed comment to assist in providing advice to the State Minister for Environment
- provide comprehensive documentation that sets out the reasons why the Fourth Train Proposal should be deemed to be environmentally acceptable by the State Minister for Environment.

6.2 Scope of the Assessment

The PER/Draft EIS will consider potential direct and indirect impacts of construction, commissioning, and operation of the Fourth Train Proposal on the environmental and socio-economic factors identified for assessment in Section 5.3.2. It will also identify impacts reasonably expected from the decommissioning of the Fourth Train Proposal, although this will be in outline only given the current stage of development.

The PER/Draft EIS will examine how the Fourth Train Proposal affects the impacts predicted in the various impact assessments conducted by the Foundation Project. A risk assessment process will be used to evaluate residual impacts (see Section 6.7).

The activities examined in the PER/Draft EIS will include those undertaken within State jurisdiction in the Fourth Train Proposal area (illustrated in Figure 1-1). Impacts will be examined within the area of influence noted in the preliminary environmental analysis results in Appendix 5.

6.3 Assessment Framework

The assessment of impacts in the PER/Draft EIS will be undertaken within the legal framework outlined in Section 3.0 of this Environmental Scoping Document. Impacts on environmental factors will also be examined in the context of the environmental objectives provided in Appendix 5 and the environmental principles discussed in Appendix 6. Where relevant and applicable, likely environmental consequences will be predicted and assessed in accordance with established guidelines and policies, as referenced in Section 3.4.

6.4 Project Description and Alternatives

The PER/Draft EIS will include a description of the Fourth Train Proposal in sufficient detail to support the subsequent discussion of environmental impacts. This will include:

- relevant maps, charts, and plans of the location and design of the Proposal
- the key characteristics of the Proposal in State (and Commonwealth) jurisdiction and how these relate to existing, approved activities (i.e. the Foundation Project)[2]
- a description of the supporting infrastructure and utilities that the Proposal may use, including any modifications to Foundation Project facilities[3] that are necessary to accommodate the Fourth Train Proposal
- a description of the nature and extent of the works proposed to construct, commission, and, in outline, to decommission the Fourth Train Proposal
- a description of how the Fourth Train Proposal will be operated, including:
    - a process flow/indicative mass balance diagram and associated description of the operational process, including the primary inputs, outputs, and waste/emissions streams that are expected during normal operation
    - a description of non-routine events and how these are proposed to be managed
- the proposed schedule for implementing the Proposal, including the expected design life of the Proposal
- workforce requirements
- management of other aspects related to the Proposal such as waste management and disposal[4].

Explanation will be provided to demonstrate how the Fourth Train Proposal has been designed to reflect forecast climatic conditions and constraints within the design life of the Proposal (i.e. associated with reasonably foreseeable climate change).

To provide context for the Proposal, the PER/Draft EIS will also include a description of the alternatives considered, including location, technology, and technique options. This will reflect the justification provided in Section 2.5 of this Environmental Scoping Document and the various engineering design studies being conducted for the Fourth Train Proposal.

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[2] As the Fourth Train Proposal is an expansion of the Foundation Project, the key characteristics of the Proposal will be summarised in a table along with those of the Foundation Project; this will allow readers to understand the nature and scale of the Proposal.

[3] 'Modifications to Foundation Project facilities' includes altering the basis upon which they were approved; e.g. extending their duration of use, changing their frequency of use, and/or changing the nature of their use beyond that covered in their existing approval.

[4] Note that none of the Fourth Train Proposal sites contain land requiring remediation under the *Contaminated Sites Act 2003 (*WA).

6.5 Baseline

The PER/Draft EIS will include a description of the existing environment (the 'baseline') in a local and regional context covering the environmental factors identified in Section 5.3.2. This will include a description of:

- physical environment and processes
- terrestrial biodiversity, ecosystems, and ecosystem processes
- coastal and nearshore biodiversity, ecosystems, and ecosystem processes[5]
- relevant socio-economic characteristics, including heritage values and other users of the Fourth Train Proposal area who could be impacted by, or who could impact, the Fourth Train Proposal.

Where relevant, the description of the baseline will consider known or predicted changes to the environment that may occur irrespective of, but in the design life of, the Fourth Train Proposal. For example, changes brought about by reasonably foreseeable climate change to the extent that data are publicly available.

The baseline for the Fourth Train Proposal is the status of the environment with an as-built and operational Foundation Project. This status takes into account other activities already operational on Barrow Island (i.e. WA Oil operations).

The baseline will be established using:

- data gathered as part of the Foundation Project impact assessment studies, subsequent Environmental Management Plans and Monitoring Programs (see Section 4.0 for a summary)[6]
- predictions about the status of the environment with an operational Foundation Project taken from Foundation Project impact assessment studies and Environmental Management Plans, and from modelling studies that reflect the most up-to-date knowledge on the design of the Foundation Project (e.g. for air quality, noise, light, etc.)
- secondary information available in the public domain (e.g. for shipping movements, fishing etc.). Environmental factors likely to require more up-to-date baseline data are identified in the 'Additional Studies' column of Appendix 5.

6.6 Emissions, Discharges and Wastes from the Proposal

The PER/Draft EIS will describe how the Fourth Train Proposal will change the emissions, discharges, and wastes assessed and approved for the Foundation Project and will outline how these will be managed and, where relevant, disposed of. This will include atmospheric emissions, noise and vibration, light spill, and solid and liquid wastes reasonably expected from the construction and commissioning activities, routine and non-routine operation of the Fourth Train Proposal, and its future decommissioning.

Emissions, discharges and wastes will be discussed in the PER/Draft EIS in context with those generated, or predicted to be generated, by the Foundation Project. Where the Fourth Train Proposal could use utilities or infrastructure already approved under the Foundation Project, the

[5] Coastal and nearshore areas are those within State jurisdiction. The PER/draft EIS will also examine impacts on the marine environment (i.e. in Commonwealth jurisdiction) as required in SEWPaC's Tailored Guidelines for draft EIS (Appendix 3).

[6] Note: These data take into account other existing activities in the area, including WA Oil operations on Barrow Island.

PER/Draft EIS will document how the inclusion of the Fourth Train Proposal will affect the emissions, discharges and wastes already predicted and approved for the Foundation Project. If inclusion of the Fourth Train Proposal results in a significant change in associated impacts on environmental factors compared to the impacts assessed for the approved Foundation Project, the incremental and additional change will be evaluated further.

Where emissions, discharges, and wastes are expected to be significant (e.g. during routine and non-routine operations), they will be quantified and, where relevant, predicted using mathematical modelling/calculation. Based on the results of the preliminary environmental analysis, the following predictive modelling studies are anticipated:

- atmospheric emissions from the operational Gas Treatment Plant covering both routine and non-routine operations
- noise emissions from the operational Gas Treatment Plant covering both routine and non-routine operations
- light spill from the operational Gas Treatment Plant
- hydrocarbon spills during construction and operation of the Fourth Train Proposal.

Sections 6.6.1 to 6.6.5 provide more detail on the scopes of these modelling studies. Results from these modelling studies will be used to interpret potential impacts on relevant terrestrial and marine environmental factors.

With the exception of reject brine, wastewater generated by the Fourth Train Proposal's terrestrial facilities is expected to be injected below ground using infrastructure approved by the Foundation Project. The PER/Draft EIS will explain that wastewater volumes generated for injection by the Fourth Train Proposal and the Foundation Project can be accommodated in the subsurface aquifer. The Fourth Train Proposal will use the Foundation Project's reverse osmosis facilities; reject brine generated in support of the Fourth Train Proposal is expected to be discharged into the coastal and nearshore environment. Chevron Australia will justify that the volumes of fresh water required for the Fourth Train Proposal can be provided by the Foundation Project's reverse osmosis facilities and will not exceed the approved Foundation Project levels or levels that the Foundation Project is seeking approval for, in the case of the permanent reverse osmosis facilities. As such, the results from the relevant Foundation Project technical studies will be included in the PER/Draft EIS, and no additional modelling of wastewater discharges is currently anticipated specifically for the Fourth Train Proposal.

As the discharges and potential environmental impacts associated with the Foundation Project's reverse osmosis facilities are to be approved by Foundation Project, the Fourth Train Proposal will request to extend the duration of use of these facilities in the PER/Draft EIS. In the event that the quality or quantity of discharges is found to change significantly from the Foundation Project as a result of the implementation of the Fourth Train Proposal, modelling will be used to predict associated water quality and ecological impacts.

Significant operational solid and liquid waste that is predicted to result from the implementation of the Fourth Train Proposal (e.g. as illustrated in Table 6-1) will be outlined in the PER/Draft EIS, with a description of how it will be managed. Note that the predicted volumes shown in Table 6-1 are indicative and remain subject to change during engineering design.

Table 6-1: Indicative Operational Solid and Liquid Waste Volumes for the Fourth Train Proposal and the Fourth Train Proposal and Foundation Project combined

Waste Stream	Fourth Train Proposal Volume (tonnes/year)	Fourth Train Proposal and Foundation Project Volume (tonnes/year)
Contaminated sludge	600	2300
Molecular sieve	150	600
Mercury removal beds	50	200
Spent filters (hazardous)	50	200
Spent filters (non-hazardous)	5	20
Glycol solution	1400	5600

The management of solid and liquid waste will be outlined in the PER; briefly waste management will occur through a hierarchical application of measures including:

1. Source reduction
2. Re-use
3. Recycling
4. Recovery
5. Treatment
6. Responsible disposal.

For non-routine events such as spills, LNG train start-up, and upset operating conditions, the PER/Draft EIS will include a discussion on the likely frequency of such events when discussing associated emissions, discharges, and wastes. This discussion will be in the context of the Foundation Project approvals; i.e. if the frequency or duration of non-routine flaring is expected to increase as a result of the Fourth Train Proposal, the impact of that increase on environmental factors will be further assessed.

6.6.1 Atmospheric Pollutant Emissions

Atmospheric emissions of key atmospheric pollutants (NO_x, SO_x, CO and particulate matter [PM]), as well as the formation of secondary atmospheric pollutants such as ozone (O_3), will increase as a result of the extra energy requirements and process emissions generated by the operation of the Fourth Train Proposal. Ambient concentrations of these pollutants are anticipated to increase under routine and non-routine operating conditions compared to the air quality predictions made for the Foundation Project's emissions of these pollutants.

Emissions of acid gas during routine and non-routine operation of the Fourth Train Proposal are also expected to increase concentrations of air toxics such as benzene, toluene and ethyl-benzene and xylene (BTEX) and hydrogen sulfide (H_2S) in the ambient environment.

Dispersion modelling studies will be conducted to predict whether ambient concentrations of these atmospheric pollutants and air toxics are expected to be within acceptable regulatory limits, such that residual impacts on the flora and fauna of Barrow Island and of communities in the surrounding Pilbara region can be reduced to ALARP. Impacts of atmospheric pollutants and air toxics on the flora and fauna of Barrow Island will be assessed with reference to Ecological Risk Assessments conducted for the Foundation Project and reported in its Air

Quality Management Plan (Chevron Australia, 2011b). These Ecological Risk Assessments used the following criteria to assess impacts:

- Human exposure limits established in the National Environment Protection (Ambient Air Quality) Measure, the National Exposure Standards [NOHSC:1003–1995] (as amended – Safe Work Australia [SWA] 1995), the World Health Organisation (WHO)'s Air Quality Guidelines for Europe (WHO, 2000) (for fauna)
- Acid deposition and ozone criteria for vegetation established by the World Health Organisation (WHO, 2000).
- Published research data on reference concentrations and observed effect levels (e.g. Chilgren 1979 and Murray et al., 1994).

6.6.1.1 Purpose and Objectives

The purpose and objectives of the dispersion modelling and consequent air quality study includes:

- predicting the ambient airborne concentrations of the key atmospheric pollutants (i.e. NO_x, SO_x, CO, PM, and O_3) and air toxics (i.e. H_2S and BTEX) that may increase as a result of the operation of the fourth LNG train and associated infrastructure within the Gas Treatment Plant, under routine and non-routine operating conditions
- assessing the impacts on local and regional air quality against established air quality standards, or maximum allowable concentrations of air toxics at sensitive receptor locations and determining if the associated community and ecological impacts are acceptable.

Sensitive receptor locations will reflect the location of communities, the flora and fauna of Barrow Island, and protected areas in the surrounding West Pilbara region.

6.6.1.2 Scope

The scope of the atmospheric emissions modelling will include air emissions sources reasonably expected from the routine and non-routine operation of the fourth LNG train at the Gas Treatment Plant, and of emissions reasonably expected from additional condensate offloading and LNG shipping.

Quantities of fugitive air emissions (such as VOCs) from the Fourth Train Proposal, Foundation Project and existing sources on Barrow Island (i.e. WA Oil operations) will be included in an inventory of emissions in the PER/Draft EIS, but will not be included in modelling. This is because fugitive emissions from the Fourth Train Proposal and the Foundation Project combined are not expected to be significant, contributing approximately 0.3% of total emissions from the Combined Gorgon Gas Development. This will be justified in the PER/Draft EIS.

The air quality study will assess the atmospheric pollutant emissions of the Fourth Train Proposal in combination with those of the Foundation Project and other existing industrial emissions sources on Barrow Island (i.e. WA Oil operations). In addition, a regional study will assess the cumulative emissions of the Fourth Train Proposal and Foundation Project, together with other emissions from Barrow Island (i.e. WA Oil operations) and emissions sources on the nearby Pilbara mainland (see below), for regionally significant emissions, i.e. NO_x and O_3 (with volatile organic compounds as a precursor).

Finally, a separate study will assess the air toxics emissions (i.e. of H_2S and BTEX) of the Fourth Train Proposal in combination with those of the Foundation Project. The selection of H_2S and BTEX were identified as potentially significant emissions from the Fourth Train Proposal and were included in the air toxics modelling. Chevron Australia do not intend to include WA Oil air toxics emissions in this study because these were found to be not significant compared to those anticipated for the Foundation Project and Fourth Train Proposal combined (Table 6-2). The justification for omitting WA Oil emissions from this air toxics study will be provided in the PER/Draft EIS.

Table 6-2 Comparison of Air Toxics (BTEX) Emissions

Air Toxic	Annual Emissions (tonnes)	
	WA Oil [1]	Predicted Foundation Project and Fourth Train Proposal [2]
Benzene	2.50	~ 150.00
Toluene	1.40	~ 350.00
Ethylbenzene	0.12	~ 2.00
Xylenes	0.35	~ 110.00

[1] WA Oil figures are from data presented for the most recent National Pollutant Inventory reporting period (200910) available at: http://www.npi.gov.au/npidata/action/load/emission-by-individual-facility-result/criteria/state/null/year/2010/jurisdiction-facility/WA0014.

[2] Predicted Foundation Project and Fourth Train Proposal BTEX emissions reflect anticipated emissions due to acid gas venting.

6.6.1.3 Methodology

Air quality modelling for atmospheric pollutants will be consistent with the Western Australian Department of the Environment's (now DEC) Air Quality Modelling Guidance Notes (Department of the Environment 2006). The air quality modelling will:

- review, analyse, and describe local meteorology, addressing long-term trends for temperature, wind speed, wind direction, humidity, and rainfall
- present a load inventory for National Pollutant Inventory (NPI) substances emitted to air by the Fourth Train Proposal during routine and non-routine operations (including both point and fugitive sources)
- develop an emissions inventory for the region incorporating major industrial sources, including the Karratha, Dampier, Onslow, and Cape Lambert regions. Anticipated major industrial sources likely to be included are listed in Appendix 7. Information on these major industrial sources will be included, where available, from data obtained from the NPI, or information supplied to, or by Chevron Australia. Existing Chevron Australia operations on Barrow and Thevenard Islands will also be included. The impact of fires in the Pilbara and their impact on ozone formation will also be considered
- undertake local modelling of NO_2, SO_2, CO, and PM for the Fourth Train Proposal (covering the Fourth Train Proposal emissions in addition to those of the Foundation Project and WA Oil operations)
- undertake regional modelling of the concentrations of O_3 and nitrogen dioxide NO_2 (as representative for nitrogen oxides) for a number of scenarios.

Results of this modelling will be presented in an air quality modelling study report as:

- contour plots for the pollutants of concern, both for regional and local modelling
- tables showing the change from the baseline for both regional and local modelling cases
- a comparison with relevant air quality criteria for human health and environmental (flora and fauna) receptors, including a justification of the appropriateness of the selected criteria.

Assumptions made in determining emissions rates, volumes, and pollutant constituents, and the level of certainty in the results obtained will be reported in the PER/Draft EIS. Furthermore, the

PER/Draft EIS will include information on the smokeless performance of the Gas Treatment Plant flares, and the scenarios under which this performance may be compromised. Information will be provided on the expected frequency of those scenarios and smoke mitigation measures.

Dispersion modelling studies will also be conducted to predict the ground-level concentrations of air toxics reasonably expected from acid gas venting events from all four LNG trains at the Gas Treatment Plant. Incremental and additional impacts on ground-level concentrations of H_2S and BTEX from the operation of four LNG trains will be predicted and will include a frequency assessment component.

As the Gas Treatment Plant for the Foundation Project is under construction, no monitoring data will be available from the Foundation Project to verify the emissions and air quality predictions in the PER/Draft EIS.

The air quality and dispersion modelling results will inform the assessment of impacts on the flora and fauna of Barrow Island, and of sensitive human and ecological receptors on the West Pilbara mainland. The results will also feed into detailed design work to maintain air quality impacts within acceptable risk levels.

6.6.2 Greenhouse Gas Emissions

The Fourth Train Proposal will result in emissions of greenhouse gases from a range of sources including:

- construction activities on Barrow Island and offshore in the Fourth Train Proposal Area associated with the installation, construction, and commissioning of the offshore wells, the Feed Gas Pipeline System and the Gas Treatment Plant
- gas turbine exhausts used to drive electrical generators and liquefaction compressors
- vents and flares
- reservoir carbon dioxide
- fugitive sources such as compressor seals, storage tanks, valves, etc.
- stand-by generators and pumps
- provision of infrastructure support.

The annual greenhouse gas emissions from the Fourth Train Proposal are yet to be determined but are anticipated to be between approximately 1.8 and 3.7 MTPA carbon dioxide equivalent (CO_2e). This range reflects the current stage of proposal development – there is still uncertainty as to the exact nature of the development concept. Chevron Australia is undertaking technical studies with the objective of narrowing the range of possible development options, and therefore the range in emissions estimates, for inclusion in the PER/Draft EIS.

Chevron Australia has undertaken extensive assessments examining emissions reduction and greenhouse gas management as part of the Foundation Project. Where relevant, these existing studies and technical evaluations will be used to inform the Greenhouse Gas Management Assessment for the Fourth Train Proposal PER/Draft EIS.

6.6.2.1 Purpose and Objectives

The objective of the Greenhouse Gas Management Assessment will be to demonstrate that emissions from the Fourth Train Proposal have been reduced to a level that is ALARP, taking into account the obligations under the Barrow Island Act, the State Agreement and the approvals for the Foundation Project.

6.6.2.2 Scope

Given this Proposal's development stage, Chevron Australia is investigating a range of viable options for greenhouse gas emissions management. This range of development and management options will be presented and evaluated in the PER/Draft EIS, together with:

- average anticipated reservoir CO_2 content for the Fourth Train Proposal gas fields
- total greenhouse gas emissions reasonably expected from each credible development and design option for the Fourth Train Proposal.

The PER/Draft EIS will discuss and evaluate a range of credible design options for managing both process and reservoir CO_2 emissions, and will examine the full scope of emissions from the Fourth Train Proposal, including:

- technical options for the management of reservoir CO_2, such as injection of reservoir CO_2 and venting
- the use of aero derivative gas turbines, industrial gas turbines, or electric drives to power the liquefaction compressors
- the use of aero derivative or industrial gas turbines for electrical power generation either in open cycle or combined cycle configuration
- opportunities to recover and use waste heat and pressure let down
- opportunities to recover and use, or otherwise manage, emissions from vent streams that would otherwise be vented to the atmosphere
- where vents cannot be redirected into the process stream, the opportunity to reduce the environmental impact of these vents
- opportunities to reduce and eliminate fugitive emissions streams.

The evaluation will draw on relevant assessments undertaken as part of the Foundation Project and complemented by additional studies. These additional studies include the detailed assessment of subsurface injection of reservoir CO_2 under Foundation Project approved parameters. The PER/Draft EIS will include the estimated volume of reservoir CO_2 generated as a result of the implementation of the Fourth Train Proposal and the results of CO_2 Dupuy Simulation Modelling predicting the behaviour of injected CO_2 from the Fourth Train Proposal and the Foundation Project in the Dupuy Formation. The level of assurance of the Fourth Train Proposal, in addition to the Foundation Project CO_2 plume migration in the Dupuy Formation over time will also be presented in the PER/Draft EIS.

Emissions profiles, as incremental (i.e. Fourth Train Proposal alone) and in combination with the Foundation Project, will be presented for each viable design option. The timing of Foundation Project and Fourth Train Proposal emissions will be described on the basis of each LNG train coming online. The PER/Draft EIS will also include an account of any technical, health, safety, environmental, or economic constraints reasonably expected for each viable option.

The emissions intensity estimates for the Fourth Train Proposal will be benchmarked against emissions from other comparable projects in Australia and a number of recent international projects (where data are publicly available). Life cycle emissions estimates will also be provided against a range of competing fuel types. To demonstrate the use of currently available best practice technologies, a benchmark comparison of process technologies included in the Fourth Train Proposal with technologies used in other recent comparable Australian and international projects will be included in the PER/Draft EIS, drawing on publicly available information.

Chevron Australia has a clear objective to focus its efforts on reducing emissions of greenhouse gases from the Fourth Train Proposal as opposed to seeking to offset those emissions; however, consideration will be given to the role that practicable, cost-effective, technically feasible, and operationally compatible greenhouse gas offsets might play in managing emissions from the Fourth Train Proposal.

Consideration will also be given to the role that a national legislative framework for managing greenhouse gas emissions, including the *Clean Energy Act 2011* (Cth), may have on the range of greenhouse gas management options assessed in the PER/Draft EIS.

6.6.2.3 Methodology

The technical, economic, and environmental practicality of greenhouse gas management options will be assessed using the following criteria:

- health and safety risk (using Chevron Australia's internal standards)
- economic (using Chevron Australia's estimate of Australia's forward emissions price curve)
- operability and reliability (using Chevron Australia's internal standards)
- other environmental impacts (e.g. impacts on key atmospheric pollutants [e.g. NO_x, SO_x, CO, PM, and O_3], water usage, land requirements).

The assessment will be undertaken with reference to the commitments on the Gorgon Joint Venturers within the Barrow Island Act, the State Agreement, previous approvals for the Foundation Project and the EPA's Guidance Statement No. 12 for Minimising Greenhouse Gas Emissions (EPA 2002). Greenhouse Gas Emissions estimates will be compiled using the factors and methodologies defined in the *National Greenhouse and Energy Reporting Act 2007* (Cth).

6.6.3 Noise Emissions

The addition of a fourth LNG train and associated equipment at the Gas Treatment Plant could change the noise profile of the operational Gas Treatment Plant compared to that predicted for the Foundation Project. Noise emissions may change as a result of routine and non-routine operations.

The change in noise emissions reasonably expected with the addition of the Fourth Train Proposal will be calculated and the resulting predicted noise profile modelled.

6.6.3.1 Purpose and Objectives

The noise emissions study will update predictions of noise levels from the Foundation Project to account for the addition of the Fourth Train Proposal infrastructure. Results will be used to determine impacts on terrestrial and marine fauna on and around Barrow Island.

6.6.3.2 Scope

The noise study will predict noise levels from the operating Foundation Project and Fourth Train Proposal infrastructure at the Gas Treatment Plant during normal operating conditions and also during start-up of the Fourth Train Proposal infrastructure. Both incremental (i.e. Fourth Train Proposal alone) and additional (i.e. Fourth Train Proposal in addition to the approved Foundation Project) noise emissions will be predicted for the operational Gas Treatment Plant.

6.6.3.3 Methodology

The noise study will be undertaken in accordance with EPA Guidance Statement No. 8 – The Assessment of Environmental Factors, Environmental Noise (EPA 2007) and other guidelines or legislation as applicable. The study will update the predictions of noise levels made in the most recent Foundation Project noise study.

Recognised modelling software will be used (e.g. SoundPlan) to calculate and graphically present both in-plant and surrounding noise levels generated by the Gas Treatment Plant. In-plant and surrounding noise predictions will be performed using the International Organization for Standardization's (ISO) 9613 prediction methods (International Organization for Standardization 1993, 1996).

Predicted noise levels at noise sensitive receptors on Barrow Island will be benchmarked against the Environmental Protection (Noise) Regulations 1997 to assess the impacts on human (worker) health. Noise impacts on terrestrial fauna will be assessed with reference to a 50 dB(A) contour, consistent with the approach used by the Foundation Project and published research. Noise impacts on marine fauna will be assessed with reference to published research

(e.g. OSPAR 2009, NRC 2003, Simmonds et al. 2004, Simmonds et al. 2005 and Southall et al. 2007).

As the Gas Treatment Plant for the Foundation Project is under construction, no data will be available from the Foundation Project to verify the noise calculations in the PER/Draft EIS.

6.6.4 Light Spill

The lighting systems and operational controls for the Fourth Train Proposal will be designed to reflect the Long-term Marine Turtle Management Plan prepared for the Foundation Project (Chevron Australia 2010d). However, the proposed changes to the Foundation Project's Gas Treatment Plant in the Fourth Train Proposal include the following elements that may contribute to an increase in light spill:

- the physical presence of the new Fourth Train Proposal infrastructure at the Gas Treatment Plant
- potential for additional non-routine flaring reasonably expected with the operation of the fourth LNG train.

6.6.4.1 Purpose and Objectives

The light spill modelling outputs produced will be used to inform an assessment of impacts on terrestrial fauna and marine turtles from the operation of the Fourth Train Proposal's Gas Treatment Plant. However, as noted in the EPA's Environmental Assessment Guideline on Protecting Marine Turtles from Light Impacts (EPA 2010d), 'while modelling can be useful to compare the relative effects of different lighting designs, the actual behaviour of marine turtle hatchlings is a much more reliable guide to the impact of light on marine turtles than measurements and modelling based on standard light meter readings'.

6.6.4.2 Scope

The scope of the modelling study will include lighting in all areas inside the Gas Treatment Plant site where practicable, including:

- all lit process facilities
- ground flares
- Boil-off Gas flares
- utilities
- wavelength of luminaires
- shielding and screening effects of structures.

The PER/Draft EIS will include an explanation of the selection of areas and facilities included in the light modelling.

Where practicable, it will also take into consideration the effects of the following factors on light levels:

- topography (including dune heights)
- cloud cover.

6.6.4.3 Methodology

Light spill modelling will be undertaken for a number of scenarios, including the operation of the four LNG trains under normal operating conditions and under maintenance conditions where work is being carried out on one of the trains and/or the LNG tanks. Both the incremental change caused by the Fourth Train Proposal and the total light spill caused by the Foundation Project and the Fourth Train Proposal will be predicted and presented using light contours.

Results of the modelling will be used to compare the light spill attributable to the operation of the Fourth Train Proposal with predicted light spill levels for the Foundation Project. In particular, comparisons will be made of how the Fourth Train Proposal and Foundation Project together could alter the natural light regime. Light modelling results will also be used to test the design of lighting systems at the Gas Treatment Plant, and demonstrate the effectiveness of light management controls in reducing light spill to levels that are as low as reasonably practicable.

As the Gas Treatment Plant for the Foundation Project is under construction, no data will be available from the Foundation Project to verify light spill predictions in the PER/Draft EIS.

Ultimately, reasonably expected light spill impacts on marine turtles will be managed through the Long-term Marine Turtle Management Plan prepared for the Foundation Project (Chevron Australia 2010d), which will be updated to reflect the Fourth Train Proposal.

6.6.5 Hydrocarbon Spills

Accidental releases of hydrocarbons into the marine or terrestrial environment may occur during the construction, commissioning, operation, and future decommissioning of the Fourth Train Proposal.

6.6.5.1 Purpose and Objectives

Hydrocarbon spill modelling will be undertaken to predict the behaviour of marine hydrocarbon spills under different spill and environmental conditions and to understand the likelihood of a spill occurring and subsequently impacting sensitive receptors. The results will be used to assess impacts of accidental releases of hydrocarbons to the marine and coastal environment and any change in likelihood due to the Fourth Train Proposal compared to that assessed and approved for the Foundation Project. They will also be used to help determine the need for, and design of, mitigation measures so that the risk of spills occurring, and the impact they may have if they do occur, is reduced.

6.6.5.2 Scope

A series of hydrocarbon spill scenarios covering incidents during the construction and operation of the Fourth Train Proposal will be developed and assessed. Relevant scenarios will be identified as part of the environmental risk assessment associated with the preparation of the PER/Draft EIS; these are likely to include:

- well blowouts
- pipeline ruptures
- vessel collisions or groundings.

The scope of the study will cover accidental releases occurring at sea.

The likelihood of spills occurring in the terrestrial environment as a result of the Fourth Train Proposal will also be assessed relevant to that assessed for the approved Foundation Project. However, this is outside the scope of the hydrocarbon spill modelling.

6.6.5.3 Methodology

Hydrocarbon spill modelling will be undertaken to predict the behaviour of a spill in the marine environment. Selected scenarios will reflect:

- weather conditions, including cyclones
- seasonality.

Results will be plotted as risk contours on a spatial area incorporating relevant areas of the WA coastline.

Given the above stressors and for any given spill scenario in specific weather conditions, the likelihood of a spill reaching and impacting sensitive receptors in the marine environment will be assessed.

6.7 Assessment of Environmental Impacts

6.7.1 Assessment Method

The environmental impacts reasonably expected from the Fourth Train Proposal will be evaluated in the PER/Draft EIS.

Numerous impact assessments have been completed for the Foundation Project in its environmental approvals documentation and its subsequent Ministerial Deliverables/ Environmental Management Plans and Programs (hereafter referred to as EMPs). Therefore, the environmental assessment process for the Fourth Train Proposal will reflect the methodology and results of the most recent impact assessments completed for the Foundation Project. For most activities and environmental factors, the most recent impact assessments are those used in the various EMPs required in Statement No. 800.

The environmental assessment process for the Fourth Train Proposal will follow these steps:

1. Systematic identification of potential impacts of the Fourth Train Proposal on the identified environmental and socio-economic factors compared to those assessed and approved for the Foundation Project. Both incremental impacts of the Fourth Train Proposal in isolation, and the additional impact of the Fourth Train Proposal when added to the impacts assessed and approved for the Foundation Project will be identified. If this process reveals extra impacts or discounts any of the impacts identified in this Environmental Scoping Document, their inclusion or omission from the PER/Draft EIS will be justified.
2. Prediction of the magnitude and assessment of identified incremental and additional impacts taking into account known mitigation and management measures and any experience and lessons from the Foundation Project.
3. Determining the predicted environmental outcome for each environmental and social factor.

The environmental assessment approach will address and reflect the Environmental Principles and Objectives respectively established in the EPA's Guide to EIA Environmental Principles, Factors and Objectives (EPA 2010b). Objectives for each environmental factor expected to be relevant for the Fourth Train Proposal have been proposed by Chevron Australia in Appendix 5. Environmental Principles relevant to the Fourth Train Proposal are described in Appendix 6.

In addition, the following assumptions will be applied to the impact assessment for the Fourth Train Proposal:

- the mitigation and management measures committed to by the Foundation Project will be applied where the Fourth Train Proposal activities and designs are alike. Practicable alternative technologies or techniques to those used by the Foundation Project will also be assessed where relevant
- where available, experience gained from implementing the Foundation Project will be used. This aims to address some of the uncertainties introduced when relying on Foundation Project predictions (see Section 6.7.6).

As much of the Fourth Train Proposal will be designed to be similar to the Foundation Project, the impact assessment will, where relevant, draw upon the research undertaken for the Foundation Project, including studies completed for detailed EMPs required under State and Commonwealth Ministerial Conditions. In addition, the change in emissions and discharges will be predicted to support the assessment (see Section6.6).

The results of the impact assessment will be discussed in the PER/Draft EIS, including:

- Identification of all potential impacts on the identified environmental and socio-economic factors.
- For those residual impacts risk assessed as key, a discussion of the likely consequence, including quantification of the impact where practicable, an evaluation of mitigation and management options, and the predicted effectiveness of the proposed measures, will be provided.
- A statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible.

6.7.2 Assessment of Impacts on the Terrestrial Environment

The terrestrial environment includes the following physical and biological environment factors:

- soils and landforms
- surface and ground water
- terrestrial flora and vegetation communities, including restricted flora
- terrestrial fauna, including protected species, their habitats, and their population viability
- subterranean fauna, including protected species.

Potential impacts of the Fourth Train Proposal on these environmental factors will be discussed in the PER/Draft EIS. Potential impacts include those identified in Table A5-1 in Appendix 5. Relevant stressors include:

- atmospheric emissions
- dust
- creation of light and/or shade
- noise and vibration emissions
- creation of heat and/or cold
- generation and disposal of solid waste
- physical presence of infrastructure
- introduction or spread of non-indigenous species
- physical interaction
- site disturbance/excavation
- vegetation clearing
- spills and leaks
- accidental fires.

These potential impacts and stressors will be revisited in a risk assessment process at the start of the PER/Draft EIS preparation process and any additional risks will be included in the assessment. If this process reveals extra impacts or discounts any of the impacts identified in this Environmental Scoping Document, their inclusion or omission from the PER/Draft EIS will be justified.

Impacts on the terrestrial environment are expected to be restricted to Barrow Island, with the exception of impacts on terrestrial flora and fauna associated with atmospheric emissions. Therefore, the scope of the assessment will be mainly restricted to Barrow Island, although impacts on flora and fauna from atmospheric emissions will also be examined at a regional (Pilbara) scale.

The assessment of impacts on the terrestrial environment will be presented as both the incremental change introduced by the Fourth Train Proposal alone, and the additional impact of the Fourth Train Proposal when added to the impacts assessed and approved for the Foundation Project, in recognition that the Fourth Train Proposal's terrestrial components are being developed as a 'brownfield' project. Where the Fourth Train Proposal may use utilities or infrastructure already approved under the Foundation Project, the incremental and additional change in associated impacts will be examined.

Where relevant, the assessment of impacts will use predictions of emissions, discharges, and wastes and associated predicted changes in environmental quality, as described in Section 6.6. Furthermore, predictions made and monitoring data collected by the Foundation Project will be used to help quantify Fourth Train Proposal impacts and available. Mitigation and management strategies will be evaluated, reflecting the experience gained from the implementation of the Foundation Project and from alternative techniques or technology, where practicable. The assessment and consideration of mitigation and management strategies will also reflect the EPA's Environmental Principles where relevant (see Appendix 6).

The EPA's Checklist for Documents Submitted for EIA on Marine and Terrestrial Biodiversity (EPA [undated]) will be completed and included with the PER/Draft EIS in accordance with the EPA's requirements.

6.7.3 Assessment of Impacts on the Coastal and Nearshore Environment

For the purposes of the PER/Draft EIS, the coastal and nearshore environment is defined as the zone between the high water mark and the limit of State waters. It comprises the following physical and biological environment factors:

- marine water quality
- seabed (i.e. subtidal and intertidal benthic landforms and sediment characteristics)
- marine fauna, including protected species, their habitats, communities, and their population viability
- marine benthic primary producers and their communities.

Potential impacts of the Fourth Train Proposal on these environmental factors will be discussed in the PER/Draft EIS. Potential impacts include those identified in Table A5-1 in Appendix 5. Relevant stressors include:

- atmospheric emissions
- creation of light and/or shade
- discharges to sea
- noise and vibration emissions
- physical presence of infrastructure
- physical interaction
- physical disturbance of the seabed or foreshore
- introduction or spread of non-indigenous species
- spills and leaks.

Potential impacts and stressors will be revisited in a risk assessment process at the start of the PER/Draft EIS preparation process, and any additional risks identified will be included in the assessment If this process reveals extra impacts or discounts any of the impacts identified in this Environmental Scoping Document, their inclusion or omission from the PER/Draft EIS will be justified.

The coastal and nearshore environment reasonably expected to be affected by the Fourth Train Proposal, and therefore the scope of the impact assessment, includes the waters surrounding Barrow Island and areas of the coast potentially affected by atmospheric emissions (i.e. Pilbara region) or by a leak or spill occurring either in State or Commonwealth jurisdiction but affecting State waters.

The assessment of impacts on the coastal and nearshore environment will be presented as both the incremental change introduced by the Fourth Train Proposal alone, and the additional impact of the Fourth Train Proposal when added to the impacts assessed and approved for the Foundation Project, where relevant. This recognises that the Fourth Train Proposal's marine components in State jurisdiction are largely being developed as a 'brownfield' project (i.e. using existing facilities such as the MOF and LNG Jetty). The exception is the marine component of the Fourth Train Proposal's Feed Gas Pipeline System and shore crossing. While these are planned to be developed adjacent to or close to Foundation Project sites or infrastructure (in State jurisdiction), the area they can reasonably be expected to disturb is likely to extend beyond that of the Foundation Project. Where the Fourth Train Proposal may use utilities or infrastructure already approved under the Foundation Project, the incremental and additional change in associated impacts will be examined.

Where relevant, the assessment of impacts will use predictions of emissions, discharges, and wastes and associated predicted changes in environmental quality, as described in Section 6.6. Furthermore, predictions made and monitoring data collected by the Foundation Project will be used to help quantify Fourth Train Proposal impacts where available. Mitigation and management strategies will be evaluated reflecting the experience gained from the implementation of the Foundation Project and from alternative techniques or technology, where practicable. The assessment and consideration of mitigation and management strategies will also reflect the EPA's Environmental Principles where relevant (see Appendix 6).

The EPA's Checklist for Documents Submitted for EIA on Marine and Terrestrial Biodiversity (EPA [undated]) will be completed and included with the PER/Draft EIS in accordance with the EPA's requirements.

6.7.4 Assessment of Socio-economic Impacts

The PER/Draft EIS will examine potential impacts on these socio-economic factors:

- public health, safety, and wellbeing, and public access to health care services
- historical, cultural, Aboriginal and non-indigenous heritage and cultural associations
- environmental and heritage values of conservation areas, national and World Heritage places
- other users of the land and sea (i.e. commercial shipping, fishing, and recreation).

For information, the PER/Draft EIS will also examine potential impacts of the Fourth Train Proposal on:

- livelihoods, including employment and skills
- local communities, i.e. the structure and infrastructure of any host communities
- local and regional economies, including alignment with national, State and local socio-economic development policies and plans.

Potential impacts of the Fourth Train Proposal on these socio-economic factors will be discussed in the PER/Draft EIS. Potential impacts include those identified in Table A5-3 in Appendix 5. Relevant stressors include:

- atmospheric emissions
- dust

- physical presence of infrastructure
- physical interaction
- introduction and/or spread of non-indigenous species
- site disturbance/excavation
- vegetation clearing
- spills and leaks
- accidental fire.

Potential impacts and stressors will be revisited in a risk assessment process at the start of the PER/Draft EIS preparation process, and any additions or changes will be reflected in the assessment. If this process reveals extra impacts or discounts any of the impacts identified in this Environmental Scoping Document, their inclusion or omission from the PER/Draft EIS will be justified.

Where relevant, the assessment of impacts will use predictions of emissions, discharges, and wastes and associated predicted changes in environmental quality, as described in Section 6.6. Mitigation and management strategies will be evaluated, reflecting the experience gained from the implementation of the Foundation Project and from alternative techniques or technology, where practicable. The assessment and consideration of mitigation and management strategies will also reflect the EPA's Environmental Principles where relevant (see Appendix 6).

6.7.5 Assessment of Cumulative Impacts

As described in Section 6.7, Chevron Australia will evaluate the environmental impacts reasonably expected with the implementation of the Fourth Train Proposal in combination with the Foundation Project, as relevant.

The following cumulative impacts will also be examined:

- impacts that are additive on one environmental factor of Barrow Island's terrestrial, nearshore, and coastal flora and fauna. For example, flora and fauna may be subject to potential environmental effects from a number of different stressors of the Fourth Train Proposal including dust emissions, air emissions, vehicular and personnel movements, vegetation clearing, and spills and leaks. Such impacts are likely to be localised to Barrow Island and its surrounding waters. For relevant sensitive receptors, the additional impact introduced by the Fourth Train Proposal when added to those assessed and approved for the Foundation Project will be examined. Additive impacts on an environmental or social factor will be assessed as part of the predicted environmental outcome for the factor.
- impacts of the Fourth Train Proposal (and Foundation Project) in addition to those of other developments on the terrestrial flora and fauna of Barrow Island and on local and regional air quality. Locally (i.e. on Barrow Island), relevant developments include the WA Oil Operations. For potential cumulative air quality impacts at a regional level (i.e. Barrow Island and the neighbouring Pilbara coast), the developments listed in Appendix 7 will be considered. Information on other developments will be sourced from publicly available data.

6.7.6 Addressing Potential Limitations

To address the potential limitations described in Section 5.3.5, Chevron Australia proposes to inform predictions by drawing on experience gained from the implementation of the Foundation Project. Available data will include:

- audit findings associated with the implementation of mitigation and management measures
- terrestrial environmental monitoring around the HDD site, Feed Gas Pipeline Systems, the Gas Treatment Plant, and Construction Village, and at other sites/areas being monitored by the Foundation Project. Available data are expected to include information on flora and

fauna and the presence of weeds and other non-indigenous species and may include construction noise measurements

- marine environmental monitoring for HDD activities including water quality, marine benthic primary producer habitats, and benthic invertebrates
- marine turtle monitoring as described in the Long-term Marine Turtle Management Plan (Chevron Australia 2010d).

It is noted that monitoring programs may not have been in place for sufficient time to detect impacts occurring over a longer timeframe.

The PER/Draft EIS will document relevant uncertainties regarding predicted impacts.

6.8 Proposed Environmental Management

Where relevant to the design of the Fourth Train Proposal, Chevron Australia intends to apply the same environmental mitigation and management measures as for the Foundation Project. This includes an overall environmental management system supported by a series of EMPs.

Where impacts identified for the Fourth Train Proposal can be managed and monitored on the same basis as the EMPs that have been approved for the Foundation Project, Chevron Australia proposes to apply these same EMPs to the Fourth Train Proposal (e.g. by way of minor amendments to expand their scope and address any incremental or additional impacts). Where relevant, Chevron Australia proposes to present the EMPs as combined Foundation Project and Fourth Train Proposal documents.

The following EMPs have been identified in this respect:

- Aboriginal Cultural Heritage Management Plan
- Air Quality Management Plan
- Best Practice Pollution Control Design
- Coastal and Marine Baseline State and Environmental Impact Report (Feed Gas Pipeline and the Shore Crossing)
- Decommissioning and Closure Plan
- Fauna Handling and Management Common User Procedure
- Fire Management Plan
- Greenhouse Gas Abatement Program
- Horizontal Directional Drilling Management and Monitoring Plan
- Long-term Marine Turtle Management Plan
- Marine Environmental Quality Management Plan
- Offshore Feed Gas Pipeline Installation Management Plan
- Post-Construction Rehabilitation Plan
- Project Site Rehabilitation Plan
- Reverse Osmosis Brine Disposal Management and Monitoring Plan
- Short Range Endemics and Subterranean Fauna Monitoring Plan
- Solid and Liquid Waste Management Plan
- Terrestrial and Quarantine Management System

- Terrestrial and Subterranean Baseline State and Environmental Impact Report
- Terrestrial and Subterranean Environment Monitoring Program
- Terrestrial and Subterranean Environment Protection Plan
- Traffic Management Common User Procedure
- Vegetation Clearing Audit Common User Procedure.

The PER/Draft EIS will describe the environmental management framework proposed for the Fourth Train Proposal including the overall management system as well as any required changes to reflect the Fourth Train Proposal in these EMPs. Hyperlinks to the Foundation Project EMPs will be provided in the PER/Draft EIS for reference.

Experience gained in implementing relevant EMPs during Foundation Project construction will be gathered and reflected in the revised EMPs to ensure that the mitigation and management measures proposed for the Fourth Train Proposal are effective.

In addition, and in accordance with EPA Guidance Statement No. 19 (EPA 2008) and the Western Australian Government's Environmental Offsets Policy 2011, the PER/Draft EIS will consider Chevron Australia's need for providing and reviewing its offsets for any residual environmental impacts associated with the Fourth Train Proposal. The Environmental Offsets Reporting Form (as provided in EPA 2008) will be included for any specific offsets proposed as part of the PER/Draft EIS.

7.0 Stakeholder Engagement

Chevron Australia will undertake transparent stakeholder and community engagement throughout the environmental approvals process and the construction and operation of the Fourth Train Proposal. A stakeholder engagement plan will be developed to guide the stakeholder consultation process for the Fourth Train Proposal.

Stakeholder engagement for the Foundation Project commenced in early 2002 and has continued since. A broad and diverse cross-section of government, industry, and community representatives are involved in this process. Stakeholder engagement for the Fourth Train Proposal will build on the framework established during the Foundation Project.

7.1 Aims of Stakeholder Engagement

The aims of the stakeholder engagement program for the Fourth Train Proposal are to:

- inform stakeholders about the Fourth Train Proposal by providing accurate and accessible information
- provide adequate opportunities and timeframes for stakeholders to consider the Fourth Train Proposal and to engage in meaningful dialogue
- identify and attempt to resolve potential issues
- consider and address issues raised by stakeholders and provide feedback.

7.2 Stakeholder Identification

The stakeholder engagement program will involve consultation with a range of stakeholders, including environmental non-government organisations (NGOs), local communities, indigenous stakeholders, industry associations, and representatives of local, State, and Commonwealth governments. Stakeholder organisations identified for the Fourth Train Proposal include, but are not limited to, those listed in Table 7-1.

7.3 Stakeholder Engagement Undertaken to Date

A number of discussions with State and Commonwealth government agencies in relation to the Fourth Train Proposal have already been undertaken prior to and during the preparation of this Environmental Scoping Document.

In addition, initial project briefings have been conducted with the Shire of Roebourne and the Shire of Ashburton, as well as with the following three key indigenous groups: Thanlanyji, Kurama Marthudunera, and Yabburara/Mardudhunera.

7.4 Planned Stakeholder Engagement

Stakeholder engagement will continue as an integral part of the Fourth Train Proposal. In particular, discussions will be held with key identified stakeholders as part of the PER/Draft EIS preparation process. During the PER/Draft EIS public review process, further engagement will take place to allow stakeholders the opportunity to raise and discuss any issues with Chevron Australia, in addition to making public submissions.

In addition to direct engagement with stakeholders, other communication methods will be used to inform the broader community of the PER/Draft EIS process. These communications will include Chevron Australia's Frontier Magazine and the Gorgon Project Update newsletter (both

available on the Chevron Australia website at: http://www.chevronaustralia.com/media/publications.aspx#z), and website postings of relevant public documents.

Table 7-1 Stakeholders Identified for the Fourth Train Proposal

Government	Non-Government
Commonwealth: • Minister for the Environment • Minister for Resources • Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) • Department of Resources, Energy and Tourism (DRET) **Western Australia:** • Minister for Mines • Minster for the Environment • Minister for State Development • Minister for Lands • Environmental Protection Authority (EPA) • Office of the Environmental Protection Authority (OEPA) • Department of Environment and Conservation (DEC) • Department of Mines and Petroleum (DMP) • Department of Planning • Department of Regional Development and Lands • Department of Fisheries • Department of Commerce • Department of Transport • Department of State Development • Department of Health **Other:** • Conservation Commission of WA • Dampier Port Authority • Fire and Emergency Services Authority • Shire of Ashburton • Shire of Roebourne	• Conservation Council of WA • Onslow Community Reference Group • Karratha Community Reference Group • Australian Conservation Foundation • Greenpeace • Marine and Coastal Communities Network • Western Australian Fishing Industry Council • Recfishwest • Wilderness Society of WA • Worldwide Fund for Nature • Waterbird Conservation Group • Wildflower Society of WA • Australian Marine Conservation Society • Western Australian Naturalists' Club • Western Australian Weeds Committee • Royal Society of WA • Pilbara Wildlife Carers Association • Western Australian Speleological Group • Environmental Weeds Action Network of WA • Birds Australia (WA Group) • Care for Hedland Environment Association • Cape Conservation Group • Nickol Bay Naturalists Club • Humane Society International • Chamber of Commerce and Industry WA • Chamber of Minerals and Energy WA • Australian Petroleum Production and Exploration Association (APPEA) • Thanlanyji • Kurama Marthudunera • Yabburara/Mardudhunera

8.0 Assessment Schedule and Team

8.1 Assessment Schedule

Chevron Australia's proposed schedule for the environmental approvals process is provided in Table 8-1. The proposed schedule aligns with the EPA's Environmental Assessment Guidelines No. 6 – Timelines for Environmental Impact Assessment of Proposals (EPA 2010e).

Table 8-1 Proposed PER/Draft EIS Development Schedule

Task/Milestone	Indicative Schedule
PER/Draft EIS submitted to OEPA and SEWPaC for review	June 2012
OEPA and SEWPaC review and provide comments on the PER/Draft EIS	5 weeks from receipt
PER/Draft EIS submitted to OEPA and SEWPaC for public release	October 2012
Public Review Period	8 weeks
OEPA prepares and forwards summary of Submissions (on PER component) to Chevron Australia	3 weeks from close of public review period
Response to the Submissions / Final EIS submitted to OEPA and SEWPaC for consideration	May 2013
OEPA assesses proposal and prepares an assessment strategy, with the response to submissions for consideration by the EPA	7 weeks from receipt of Response to Submissions[1]
OEPA consults with Chevron Australia and key government agencies on draft recommended conditions	2 weeks
EPA submits EPA Report to the Minister and publishes the EPA Report	5 weeks from EPA meeting
Appeal period to the Minister on the EPA Report	2 weeks

Note 1: The indicative schedule presented assumes that Chevron Australia's initial Response to Public Submissions document will be acceptable to the OEPA. If the Response to Public Submissions is inadequate, the OEPA will advise the proponent of this within four weeks for the first draft and within three weeks for any subsequent draft.

8.2 Assessment Team

The PER/Draft EIS will be prepared by Chevron Australia's in-house team of scientists and engineers, supported by specialist inputs from consultants and contractors, where required.

8.3 Peer Review

Chevron Australia intends to engage a number of stakeholders on various elements of the Fourth Train Proposal during the preparation of the PER/Draft EIS.

Appendix 1 References

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Appendix 2 Acronyms, Terms and Abbreviations

The following acronyms and abbreviations are commonly used in Gorgon Gas Development documentation.

ABS	Australian Bureau of Statistics
Acid Gas	A mixture of hydrogen sulfide (H_2S) and carbon dioxide (CO_2).
Additional impact	The impact of the Fourth Train Proposal when added to the impacts assessed and approved for the Foundation Project
Additive impact	Where a particular factor is affected by more than one stressor from the Fourth Train Proposal (e.g. noise and changed water quality affecting the behaviour of marine mammals)
Administrations and Operations Complex	Facilities approved under the Foundation Project comprising administration offices and maintenance workshops on Barrow Island to support the operation and maintenance of the Foundation Project and future Fourth Train Proposal infrastructure
Air Toxics	Gaseous, aerosol, or particulate pollutants that are present in the air in low concentrations with characteristics such as toxicity or persistence so as to be a hazard to human, plant or animal life.
Airshed	A volume of air confined to a distinct geographic region, and within which pollutants are contained
ALARP	As Low As Reasonably Practicable Defined as a level of risk that is not intolerable, and cannot be reduced further without the expenditure of costs that are grossly disproportionate to the benefit gained.
Ambient Air	As described in the National Environment Protection (Ambient Air Quality) Measure (National Environment Protection Council [NEPC] 2003), ambient air is considered the external air environment, and does not include the air environment inside buildings or structures.
Ancillary Systems and Facilities	This refers to the following relevant to the Fourth Train Proposal: • fuel gas and recycle gas systems • power generation • heating medium system • pressure relief/liquids disposal, flare and vent system.
APASA	Asia Pacific Applied Science Associates
APPEA	Australian Petroleum Production and Exploration Association
ARI	Assessment on Referral Information (for the proposed, now approved, Jansz Feed Gas Pipeline dated September 2007) as amended or supplemented from time to time
Atmospheric	Any emission or discharge to air, for any period of time, of solid, liquid

Emissions	or gaseous matter. Examples include, but are not limited to, dust and greenhouse gases.
Atmospheric Pollutants	As described in the National Environment Protection (Ambient Air Quality) Measure (NEPC 2003) includes carbon monoxide (CO), nitrogen dioxide (NO_2), photochemical oxidants (such as ozone – O_2 sulphur dioxide (SO_2), lead and particles (such as PM_{10}). In principle, this includes gaseous, aerosol or particulate pollutants that are present in the air in low concentrations with characteristics such as toxicity or persistence so as to be a hazard to human, plant or animal life.
AU$	Australian dollar
Avifauna	Birds of a particular region.
Barge Landing	*see* WAPET Landing
Barrow Island Act	Western Australian *Barrow Island Act 2003*
Bathymetric	Relating to measurements of the depths of oceans or lakes.
Benthic	Living upon or in the sea floor.
Benthic Habitats	Areas of the seabed that support living organisms. Examples include, limestone pavement, reefs, sand and soft sediments.
BOG	Boil-off Gas; vapours produced as a result of heat input and pressure variations that occur within various LNG storage and offloading operations stages.
BPP	Benthic Primary Producer; photosynthesising organisms (mangroves, seagrasses, algae) or organisms that harbour photosynthetic symbionts (corals, giant clams).
BTEX	Benzene, Toluene, Ethylbenzene and Xylene compounds
Calcarenite	Rock formed by the percolation of water through a mixture of calcareous shell fragments and quartz sand causing the dissolved lime to cement the mass together.
CALM	Former Western Australian Department of Conservation and Land Management (now DEC)
CALM Act	Western Australian *Conservation and Land Management Act 1984*
CAMBA	China–Australia Migratory Bird Agreement
Carbon Dioxide (CO_2) Injection System	The mechanical components being constructed on Barrow Island to enable the injection of Foundation Project reservoir carbon dioxide, including, but not limited to, compressors, pipelines and wells.
Chevron Australia	Chevron Australia Pty Ltd
CO	Carbon monoxide

CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
Commonwealth Waters	Waters stretching from three to 300 nautical miles from the Australian coast.
Construction	Offshore, includes the installation and commissioning of offshore infrastructure (Feed Gas Pipeline System, subsea wells etc.), drilling and testing of wells. Onshore, includes the preparation of terrestrial sites and the construction and commissioning of terrestrial infrastructure.
Construction Village	Dedicated village on Barrow Island to accommodate the construction workforce.
Cth	Commonwealth of Australia
Cumulative Impact	Impacts of the Fourth Train Proposal and the approved Foundation Project when combined with other past, present and reasonably foreseeable future actions (both related and unrelated) in the region.
DEC	Western Australian Department of Environment and Conservation
Demersal	Living on the seabed or just above it.
DIA	Western Australian Department of Indigenous Affairs.
Different impact	An impact predicted for the Fourth Train Proposal that was not relevant or assessed for the approved Foundation Project
Direct Impact	An impact that occurs as a direct result of the Proposal (e.g. change in air quality as a result of air emissions generated by the Proposal).
DMP	Western Australian Department of Mines and Petroleum (formerly Western Australia Department of Industry and Resources [DoIR])
DoIR	Former Western Australian Department of Industry and Resources (now DMP)
Domestic Gas	Gas destined for the domestic gas market
DomGas	Domestic Gas
Downstream	Includes the Gas Treatment Plant, MOF and LNG jetty, construction village and associated facilities and other infrastructure such as upgrades to the airport, roads and other utilities.
DRET	Commonwealth Department of Resources, Energy and Tourism
DRI	Direct Reduced Iron
Dust	A generic term used to describe solid airborne particles generated and dispersed into the air by processes such as handling, crushing and grinding of organic or inorganic materials such as rock, ore, metal, coal,

	wood or grain and stockpiling of materials.
Easement	A right held by the proponent to make use of the land of another for the installation and operation of a pipeline. Also referred to as a right-of-way.
EIS	Environmental Impact Statement
EIS/ERMP	Environmental Impact Statement/Environmental Review and Management Programme (for the Proposed Gorgon Development dated September 2005) as amended or supplemented from time to time.
EMPs	*See* 'Ministerial Deliverables/Environmental Management Plans and Programs.
Environmental Factor	Term used by the Western Australian Environmental Protection Authority (EPA 2010b) meaning receptors; i.e. characteristics of the environment such as water quality, fauna and flora etc. that may be subject to impact.
Environmental Principle	Refers to the principles of environmental management contained in section 4A of the Western Australian *Environmental Protection Act 1986* (EP Act), namely: • Precautionary Principle • Principle of intergenerational equity • Principle of the conservation of biological diversity and ecological integrity • Principles relating to improved valuation, pricing and incentive mechanisms • Principle of waste minimisation.
EP Act	Western Australian *Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
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.
ERM	Environmental Resources Management Pty Ltd
ESE	Environmental, Social and Economic
Feed Gas	Unprocessed hydrocarbons gathered from the offshore wells comprising natural gas, natural gas condensate (condensate) and produced

	formation water (produced water).
Feed Gas Pipeline System	Pipeline from the offshore gas wells to the Gas Treatment Plant including associated power umbilicals etc
Foundation Project	The combined initial Gorgon Gas Development, Revised and Expanded Gorgon Gas Development, and Jansz Feed Gas Pipeline
Foundation Project Footprint	Consists of the cleared areas and uncleared areas approved to be cleared on Barrow Island used for the construction and operation of the Gorgon Gas Development and Jansz Feed Gas Pipeline.
Fourth Train Proposal	Gorgon Gas Development Fourth Train Expansion Proposal
Fourth Train Proposal Footprint	Refers to the areas of cleared and uncleared terrestrial land that will be required for the construction and operation of the Fourth Train Proposal.
Gas Condensate	Hydrocarbon liquid dissolved in saturated natural gas that comes out of solution when the pressure drops below the dewpoint.
Gas Treatment Plant	Includes the following components: Liquefied Natural Gas (LNG) Trains, LNG Tanks, Gas Processing Drivers, Power Generators, Flares, Condensate Tanks, and Utilities Area. Reference to the Foundation Project's Gas Treatment Plant relates to the Gas Treatment Plant facilities for three LNG trains approved as part of the Foundation Project.
GHG	Greenhouse Gas
GJV	Gorgon Joint Venturers
Gorgon Gas Development	The Gorgon Gas Development as approved under Statements No. 800 and 865 and EPBC Reference: 2003/1294 and 2008/4178, as amended or replaced from time to time.
Gorgon Gas Development Foundation Project	*see* Foundation Project
Gorgon Gas Development Fourth Train Expansion Proposal	*see* Fourth Train Proposal
Gorgon Joint Venturers	The Joint Venturers from time to time as defined in the Gorgon Gas Processing and Infrastructure Project Agreement.
Greater Gorgon Area	The offshore area, situated in Commonwealth waters, encompassing a number of petroleum title blocks in the Carnarvon Basin to the west of Barrow Island. The area is illustrated in Figure 1-1. This definition should not be confused with the definition of the Greater Gorgon Area in the State Agreement.
Greenhouse Gases	Components of the atmosphere that contribute to the greenhouse effect. These include the six commonly reported GHGs under the Kyoto

	Protocol – methane (CH_4), carbon dioxide (CO_2), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).
Groundwater	Water that exists beneath the earth's surface in underground streams and aquifers.
GUFT	Gorgon Foundation Project Upstream Facilities Team
H_2S	Hydrogen sulfide
ha	Hectare
Habitat	The area or areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (e.g. substrate and topography) and the biotic factors.
HDD	Horizontal Directional Drilling
Hydrology	The movement, distribution and quality of water on earth including surface and groundwater
Incremental impact	The impact of the Fourth Train Proposal in isolation. Incremental impacts include impacts of the Fourth Train Proposal considered to be 'different' to those assessed by the approved Foundation Project (termed 'different impacts')
Indirect Impact	An impact which occurs as a consequence of a direct impact (e.g. changed plant growth as a result of reduced air quality caused by air emissions from the Proposal). Can also be referred to as a secondary or higher order impact.
Injection Lines	Used to supply chemical treatments to the wellheads.
ISO	International Organization for Standardization
JAMBA	Japan–Australia Migratory Bird Agreement
Jansz Feed Gas Pipeline	The Jansz Feed Gas Pipeline as approved in Statement No. 769 and EPBC Reference: 2005/2184, as amended or replaced from time to time.
KJVG	Kellogg Joint Venture Gorgon
km	Kilometre
km/h	Kilometres per hour
km^2	Square kilometres
Licence	A licence granted under section 91 of the *Land Administration Act 1997* (WA), in accordance with section 7 of the Ratifying Act.
Light Spill	Brightening of the environment from both direct light and light glow.

Liquid Waste	Waste that contains free liquids, which will readily separate from the solid waste under ambient temperature and pressure.
LNG	Liquefied Natural Gas
Long-term Impact	In the context of this Proposal, taken to be an impact which is expected to last for five years or more.
LPG	Liquefied Petroleum Gas
m	Metre
m/s	Metres per second
Macroalgae	Benthic marine plants that are non-flowering and lack roots, stems and vascular tissue. Can be seen without the aid of a magnification; includes large seaweeds.
Marine Disturbance Footprint (MDF)	The area of the seabed to be disturbed by construction or operation of the Fourth Train Proposal's Feed Gas Pipeline System and associated shore crossing.
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.
MDF	Marine Disturbance Footprint
MEG	Monoethylene glycol; used as a hydrate inhibitor
mg/L	Milligrams per litre
Ministerial Deliverables / Environmental Management Plans and Programs	The deliverables required as a condition of approval for the Foundation Project as defined in Ministerial Statements issued with respect to the Foundation Project (*see* 'Statement No…'). Ministerial Deliverables include various Environmental Management Plans, monitoring programs, best practice reviews, and other documents as listed in Section 6.8 of this Environmental Scoping Document. For simplicity, these various deliverables are together referred to as 'EMPs' in this Environmental Scoping Document.
Ministerial Statements	Statements, issued by the Western Australian State Minister of Environment, granting approval – with associated conditions – for the implementation of a proposal under the *Environmental Protection Act 1986* (WA). In the context of this document, this relates to the Ministerial Statements issued with respect to the Foundation Project (*see* 'Statement No…').
MOF	Materials Offloading Facility
MTPA	Million Tonnes Per Annum
MW	Megawatt

Nearshore	Close to shore; or within three nautical miles of Barrow Island.
NEPC	National Environment Protection Council
NES	[Matters of] National Environmental Significance, as defined in Part 3, Division 1 of the EPBC Act (Cth).
NGO	Non-Government Organisation
nm	Nautical miles
NO_2	Nitrogen dioxide
NOHSC	National Occupational Health and Safety Commission
Nominal	Representative value of a measurable property determined under a set of conditions, by which a product may be described. The actual value will be close to, but may not be exactly the same, as this representative value once real world factors have been taken into account in accordance with standard engineering practice.
NO_x	Nitrogen oxides (NO and NO_2)
NPI	National Pollution Inventory
NRC	National Research Council of the United States National Academies
NWS	North West Shelf
O_3	Ozone
OEPA	Office of the (Western Australian) Environmental Protection Authority
Operations Workforce Accommodation	Dedicated accommodation facility on Barrow Island to house the operations workforce for the Foundation Project and the future Fourth Train Proposal.
OSPAR	Oslo/Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
PEC	Priority Ecological Community
PER	Public Environmental Review
PGPA	Policy, Government and Public Affairs
PM	Particulate Matter
PM_{10}	A dust fraction with an aerodynamic diameter of less than 10 microns.
Pollution	Direct or indirect alteration of the environment to its detriment or degradation.
Practicable	Having regard to local conditions and circumstances including but not limited to personnel safety, weather or geographical conditions, costs, environmental benefit and the current state of scientific and technical

	knowledge.
Priority Flora	Priority Flora is a non-legislative category aimed to manage those plant taxa listed by the DEC on the basis that they are known from only a few collections, or a few sites, but which have not been adequately surveyed. Such flora may be rare or threatened, but cannot be considered for declaration as rare flora until such survey work has been undertaken.
Proposal Area	Refers to 'Fourth Train Proposal Area' illustrated in Figure 1-1, which incorporates the geographic area within which the key elements of the Fourth Train Proposal will be installed/constructed and operated. Excluded from the Proposal Area are locations that may be used to support the implementation of the Fourth Train Proposal (e.g. supply bases).
Residual impact	Impact remaining after the application of proposed mitigation and management measures
Risk	The chance of something happening that will have an impact upon objectives; measured in terms of consequence and likelihood.
Risk Assessment	In environmental assessment terms, a thorough process of evaluating impacts that combines estimates of consequences and likelihood.
RO	Reverse Osmosis
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
Seagrass	Benthic marine plants, which have roots, stems, leaves and inconspicuous flowers with fruits and seeds much like terrestrial flowering plants. Unrelated to seaweed.
Sensitive Receptor	Individuals, communities or components of the environment that could be adversely affected by a stressor and is particularly sensitive or vulnerable to a change.
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
Short-term Impact	In the context of this Proposal, an impact that occurs for less than five years.
SKM	Sinclair Knight Merz
SO_2	Sulfur dioxide
Sox	Oxides of sulfur
sp. (plural: spp.)	Species
SREs	Short Range Endemics
State Agreement	The Gorgon Gas Processing and Infrastructure Project Agreement, Schedule 1 of the *Barrow Island Act 2003* (WA).

State Government	Government of Western Australia
State Waters	The marine environment within three nautical miles of the coast of Barrow Island or the mainland of Western Australia.
Statement No. 748	Western Australian Ministerial Implementation Statement No. 748 (for the Gorgon Gas Development) as amended from time to time [superseded by Statement No. 800].
Statement No. 769	Western Australian Ministerial Implementation Statement No. 769 (for the Jansz Feed Gas Pipeline) as amended from time to time.
Statement No. 800	Western Australian Ministerial Implementation Statement No. 800 (for the Gorgon Gas Development) as amended from time to time (see also Statement 865).
Statement No. 865	Western Australian Ministerial Statement No. 865 to Amend Conditions Applying to a Proposal (under section 46 of the EP Act) for the Gorgon Gas Development. This Statement amends Conditions 18, 20 and 21 of Statement No. 800 relating to the management of dredging and dredged spoil disposal.
Stygofauna	Groundwater-dwelling aquatic fauna
Subsea Gathering System	In the context of this Proposal, this comprises subsea structures, jumpers, cluster manifolds and gas flowlines.
Substrate	The surface a plant or animal lives upon. The substrate can include biotic or abiotic materials. For example, encrusting algae that lives on a rock can be substrate for another animal that lives above the algae on the rock.
Surficial	Of or pertaining to the surface.
SWA	Safe Work Australia
TAPL	Texaco Australia Pty Ltd
Taxon (plural: taxa)	A taxon (plural taxa), or taxonomic unit, is a name designating an organism or a group of organisms.
TDF	Terrestrial Disturbance Footprint
TEC	Threatened Ecological Community
Terrestrial Disturbance Footprint (TDF)	The terrestrial area to be disturbed by construction or operation of the Fourth Train Proposal.
Troglofauna	Obligate cave- or karst-dwelling terrestrial subterranean fauna occurring above the watertable.
Uncleared Land	As defined in the Barrow Island Act.
UNCLOS	United Nations Convention on the Law of the Sea

Upstream	Gas field wells and subsea installation, marine and terrestrial components of the Feed Gas Pipeline system including HDD activities.
USEPA	United States Environmental Protection Agency
Vegetation	Any aquatic or terrestrial plant, whether it is dead or alive. Examples include, but are not limited to, grass, shrubs, trees, tree stumps, tree roots, logs, seeds and brush.
Venting	Discharge/release of gas to the atmosphere without prior combustion
VOCs	Volatile Organic Compounds
WA	Western Australia
WAPET	West Australian Petroleum Pty. Ltd.
WAPET Landing	Proper name referring to the site of the barge landing existing on the east coast of Barrow Island prior to the date of Statement No. 800.
Waters Surrounding Barrow Island	Refers to 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 is typical of the Indo–West Pacific flora and fauna.
Weeds	Plants that establish in natural ecosystems, subsequently adversely impact on natural processes and ultimately result in the decline of the native community.
WHO	World Health Organisation
Wildlife Conservation Act	Western Australian *Wildlife Conservation Act 1950*

Appendix 3 SEWPaC's Tailored Guidelines for the Preparation of a Draft Environmental Impact Statement

A copy of SEWPaC's Tailored Guidelines for the Preparation of a Draft EIS for the Fourth Train Proposal is provided here for information.

Appendix 4 Legally Protected Species Potentially Occurring in Areas Subject to the Fourth Train Proposal

Listed Species Protected under State Legislation	Common Name	Status		Presence in Proposal Area [1]
		***Wildlife Conservation Act 1950* (WA)**	**DEC**	
Avifauna				
Ardeotis australis	Australian Bustard	-	Priority 4	Possible
Malurus leucopterus edouardi	White-winged Fairy-wren (Barrow Island), Barrow Island Black and White Fairy-wren	Schedule 1	-	Likely
Mammals				
Balaenoptera musculus	Blue Whale	Schedule 1	-	Likely
Bettongia lesueur unnamed subsp.	Burrowing Bettong (Boodie)	Schedule 1	-	Likely
Dugong dugon	Dugong	Schedule 4	-	Likely
Eubalaena australis	Southern Right Whale	Schedule 1	-	Unlikely
Hydromys chrysogaster	Rakali or Water-rat	-	Priority 4	Likely
Isoodon auratus barrowensis	Golden Bandicoot (Barrow Island)	Schedule 1	-	Likely
Lagorchestes conspicillatus conspicillatus	Spectacled Hare-wallaby (Barrow Island)	Schedule 1	-	Likely
Macropus robustus isabellinus	Barrow Island Wallaroo, Barrow Island Euro	Schedule 1	-	Likely
Megaptera novaeangliae	Humpback Whale	Schedule 1	-	Likely
Petrogale lateralis lateralis	Black-flanked Rock-wallaby	Schedule 1	-	Likely
Reptiles				
Caretta caretta	Loggerhead Turtle	Schedule 1	-	Possible
Chelonia mydas	Green Turtle	Schedule 1	-	Likely
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle	Schedule 1	-	Possible
Eretmochelys imbricate	Hawksbill Turtle	Schedule 1	-	Likely
Lepidochelys olivacea	Olive Ridley Turtle	Schedule 1	-	Possible
Natator depressus	Flatback Turtle	Schedule 1	-	Likely
Subterranean Fauna				
Amphipoda *Nedsia fragilis*	-	Schedule 1	-	Likely
Amphipoda *Nedsia humphreysi*	-	Schedule 1	-	Likely
Amphipoda *Nedsia hurlberti*	-	Schedule 1	-	Likely
Amphipoda *Nedsia sculptilis/macrosculptilis*	-	Schedule 1	-	Likely
Amphipoda *Nedsia straskraba*	-	Schedule 1	-	Likely
Amphipoda *Nedsia*	-	Schedule 1	-	Likely

Listed Species Protected under State Legislation	Common Name	Status		Presence in Proposal Area [1]
		***Wildlife Conservation Act 1950* (WA)**	**DEC**	
urifimbriata				
Eleotridae *Milyeringa veritas*	Blind Gudgeon	Schedule 1	-	Likely
Ramphotyphlops longissimus	Blind Snake	-	Priority 2	Likely
Schizomida Draculoides bramstokeri	-	Schedule 1	-	Likely
Spirobolida Speleostrophus nesiotes	-	Schedule 1	-	Likely

[1] The Fourth Train 'Proposal Area' is defined in Figure 1-1. Presence in the Proposal Area is based on evidence gathered and presented to government as part of Foundation Project approvals (Chevron Australia 2009).

Appendix 5 Results of the Preliminary Environmental Analysis of the Fourth Train Proposal

Tables A5–1 to A5–3 present the results of the Preliminary Environmental Analysis conducted during the preparation of this Environmental Scoping Document. The tables provide a link between the potential environmental impacts of the Fourth Train Proposal and the additional investigations identified by Chevron Australia as being necessary to address the OEPA's requirements for the PER.

Table A5–1 covers environmental factors in State jurisdiction, including coastal waters, Barrow Island, and the nearby Pilbara coast. It encompasses areas affected by construction and operation of the marine component of the Feed Gas Pipeline System within nearshore waters; the HDD sites; the terrestrial component of the Feed Gas Pipeline System; the fourth LNG train at the Gas Treatment Plant and its associated utilities; supply vessel operations at the MOF and/or WAPET Landing; and the export of LNG and condensate from the LNG Jetty.

Table A5–2 considers impacts and associated proposed investigations for emissions, discharges and wastes that are reasonably expected to be generated by the Fourth Train Proposal.

Table A5–3 covers socio-economic factors potentially affected by the Fourth Train Proposal.

Notwithstanding the results of the preliminary environmental analysis presented here in Tables A5–1 to A5–3, the Fourth Train Proposal will undergo a thorough environmental risk assessment at the start of the PER/Draft EIS during which the environmental stressors, environmental factors, and potential impacts identified during this preliminary environmental analysis will be revisited, confirmed, and/or amended.

Table A5–1 Preliminary Environmental Analysis Results – Terrestrial, Nearshore and Coastal Environment (in State jurisdiction)

Environmental Factor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Potential Management
Terrestrial Environment					
Soils and landforms	Areas surrounding the Fourth Train Proposal Footprint on Barrow Island (see Section 2.3)	To maintain the integrity, ecological functions, and environmental values of soil and landforms	Exposure and erosion of topsoil, sedimentation of water courses, changes in natural drainage patterns, soil compaction, soil inversion, disturbance to geological features (i.e. caves) and changes in landform during construction. Potential contamination of soil resulting from spills and leaks.	Assess the change in impact compared to the Foundation Project. Where available and relevant, use monitoring data, audit results and observations from the Foundation Project to substantiate construction-phase predictions. Use baseline data collected for the Foundation Project.	Mitigate impacts initially through engineering design and constructability review. For residual impacts, review relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project including the various applicable EMPs (see Section 6.8).
Surface and groundwater	Groundwater and surface freshwater resources on and beneath areas that will be affected by the construction and operation of the Fourth Train Proposal infrastructure on Barrow Island	To maintain the quantity and quality of water so that existing and potential environmental values, including ecosystem function, are protected. To minimise the potential for erosion due to stormwater flow.	Reduction in the quality of surface and groundwater due to sedimentation and turbidity, discharge of hydrotest water, surface run-off, change in groundwater recharge, and HDD cuttings dewatering during construction; and the discharge of bilge and ballast water and surface run-off during operation. Potential contamination of water from hydrocarbon leaks and spills.	Assess the change in impact identified and managed for the Foundation Project. Where available and relevant, use monitoring data, audit results and observations from the Foundation Project to substantiate construction-phase predictions. Use baseline data collected for the Foundation Project.	Mitigate impacts initially through concept selection, engineering design, and constructability review. For residual impacts, review relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project including the various applicable EMPs (see Section 6.8).
Terrestrial flora and vegetation communities, including restricted flora	Areas surrounding the Fourth Train Proposal Footprint on Barrow Island (see Section 2.3), Barrow Island more generally and potentially extending to the wider West Pilbara	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystems levels through the avoidance or management of adverse impacts and improvement in knowledge.	Possible clearance of up to 10 ha of vegetation for the purposes of HDD activities and during excavation for the terrestrial component of the Feed Gas Pipeline System. Damage and loss of vegetation due to vehicle and personnel movements during construction	Assess the extent to which construction and operation of the Fourth Train Proposal changes the impacts identified for the Foundation Project. Where available and relevant, use monitoring data, audit results and observations from the Foundation Project to	Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including: • Definition of a Terrestrial Disturbance Footprint (TDF) • Terrestrial and Marine Quarantine Management

Environmental Factor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Potential Management
	airshed (for air quality impacts).	To protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act.	and operation. Risk of fire as a result of hot works and vehicle use during construction and operation. Potential for non-indigenous species to be introduced or spread during construction and operation. Indirect impacts due to dust generated during construction and due to air emissions during operations.	substantiate construction-phase predictions. Use results of operational and non-routine atmospheric emissions modelling to evaluate the potential for the Fourth Train Proposal to impact flora and vegetation communities on Barrow Island and in the wider West Pilbara airshed. Use baseline data collected by the Foundation Project.	System • Various EMPs (Section 6.8). Identify how the Fourth Train Proposal affects the scope of the TDF approved for the Foundation Project.
Terrestrial fauna including protected species	Areas surrounding the Fourth Train Proposal Footprint on Barrow Island (see Section 2.3), and Barrow Island more generally.	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement of knowledge. To protect Specially Protected (Threatened) Fauna, consistent with the provisions of the Wildlife Conservation Act 1950.	Direct and indirect disturbance of fauna and/or their habitat during HDD activities, construction of the terrestrial component of the Feed Gas Pipeline System, and as a result of vehicle and personnel movements, dust, noise, creation of heat and shade and light spill around the Gas Treatment Plant. Disturbance to fauna during operations associated with personnel and vehicle movements, noise and light emissions. Potential for non-indigenous species to be introduced or spread during construction and operation. Potential for additive impacts on the fauna of Barrow Island, including protected species, associated with multiple stressors.	Assess the change in risk to terrestrial fauna and protected species compared to the Foundation Project. Evaluate impacts on fauna of operational light, noise and air emissions from the Gas Treatment Plant on sensitive fauna using modelled predictions. Where available and relevant, use monitoring data, audit results and observations from the Foundation Project to substantiate construction-phase predictions. Use baseline data established for the Foundation Project.	Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including: • Definition of a TDF • Terrestrial and Marine Quarantine Management System • Various EMPs (Section 6.8). Identify how the Fourth Train Proposal affects the scope of the TDF approved for the Foundation Project.

Environmental Factor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Potential Management
Subterranean fauna including protected species	Areas beneath the Fourth Train Proposal Footprint on Barrow Island (see Section 2.3) and within its zone of hydrogeological influence.	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement of knowledge. To protect Specially Protected (Threatened) Fauna, consistent with the provisions of the Wildlife Conservation Act 1950.	Disturbance to subterranean fauna resulting from HDD activities and during excavation for the terrestrial component of the Feed Gas Pipeline System. Potential for non-indigenous species to be introduced or spread during construction and operation. Indirect impacts may occur due to changes to organic inputs to groundwater following vegetation clearance of up to 10 ha of uncleared land and changes to groundwater infiltration rates.	Assess how the Proposal impacts subterranean fauna drawing on the predictions made and any evidence gathered by the Foundation Project. Use baseline data established for the Foundation Project.	Mitigate impacts initially through concept selection, engineering design and constructability review. Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including: • Terrestrial and Marine Quarantine Management System • Various EMPs (Section 6.8).
Nearshore and Coastal Environment (in State Jurisdiction)					
Marine fauna including protected species and benthic faunal communities (except benthic primary producers)	Coastal and nearshore waters surrounding the Fourth Train Proposal facilities (i.e. shore approach of the Feed Gas Pipeline System, offshore HDD site, the MOF and LNG Jetty and their approaches). Pilbara coastline and coastal waters for impacts reasonably expected from accidental spills.	To maintain the abundance, diversity, geographic distribution and productivity of marine fauna at species and ecosystems levels through the avoidance or management of adverse impacts and improvement in knowledge. To avoid, reduce and/or mitigate against impacts on the ecological functions and environmental values of marine benthic habitats (except benthic primary producer habitats). To protect Specially Protected (Threatened) Fauna consistent with the provisions of the Wildlife	Disturbance to the behaviour of marine fauna, including marine turtles and other protected species, resulting from physical interaction, light spill, wastewater discharges, and noise generated during HDD activities and construction of the shore approach of the Feed Gas Pipeline System. Also potential for any changes in light spill and wastewater discharges from the operational Gas Treatment Plant and Feed Gas Pipeline System to affect marine fauna and/or because of an anticipated increased frequency of LNG and condensate export activities. Impacts could also occur as a result of a hydrocarbon spill or resulting from the introduction or	Assess the change in impacts to marine fauna generated by the construction and operation of the Fourth Train Proposal, compared to those predicted for the Foundation Project. Where available and relevant, use monitoring data, audit results and observations from the Foundation Project to substantiate construction-phase predictions. Use baseline data collected for the Foundation Project. Use modelling to predict the geographical extent and magnitude of potential impacts reasonably expected from hydrocarbon spills and from light spill from the operational Gas	Mitigate impacts initially through concept selection, engineering design and constructability review. Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including: • Definition of a Marine Disturbance Footprint (MDF) • Terrestrial and Marine Quarantine Management System • Various EMPs (Section 6.8). Identify how the Fourth Train Proposal affects the scope of the MDF approved for the Foundation Project.

Environmental Factor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Potential Management
		Conservation Act 1950.	spread of non-indigenous species	Treatment Plant.	
Marine benthic primary producers (BPP) and their habitats.	Coastal and nearshore waters surrounding the Fourth Train Proposal facilities (i.e. shore approach of the Feed Gas Pipeline System, offshore HDD site, the MOF and LNG Jetty and their approaches). Pilbara coastline and coastal waters for impacts reasonably expected from accidental spills.	To maintain the abundance, diversity, geographical distribution, ecological function and productivity of mangroves, marine macrophytes (seagrass, macroalgae) and corals through the avoidance or management of adverse impacts and improvement in knowledge.	Loss and/or disturbance to coral communities during laying of the Feed Gas Pipeline System including shore crossing activities, and loss and/or stress on BPPs and their habitats in the event of a spill, leak, or through the accidental introduction or spread of non-indigenous species.	Assess the change in impact compared to that predicted for the Foundation Project. Where available and relevant, use monitoring data (e.g. associated with Foundation Project HDD activities) to validate impact predictions. Use baseline data collected for the Foundation Project. Use modelling to predict the geographical extent and magnitude of potential impacts reasonably expected from hydrocarbon spills (for realistic construction and/or operational phase scenarios).	Mitigate impacts initially through concept selection, engineering design and constructability review. Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including: • Definition of a MDF • Terrestrial and Marine Quarantine Management System • Various EMPs (Section 6.8). Identify how the Fourth Train Proposal affects the scope of the MDF approved for the Foundation Project.
Marine water quality	Coastal and nearshore waters surrounding the Fourth Train Proposal facilities (i.e. shore approach of the Feed Gas Pipeline System, offshore HDD site, the MOF and LNG Jetty and their approaches). Pilbara coastline and coastal waters for impacts reasonably	To maintain the quality of marine water so that existing and potential environmental values, including ecosystem functions and integrity of the seabed and the coast, are maintained.	Change in water quality on the west coast of Barrow Island due to the construction of the Feed Gas Pipeline System and associated HDD activities. Potential change in water quality on the east coast of Barrow Island associated with discharges from additional shipping and in the event that the Fourth Train Proposal affects Foundation Project approved wastewater disposal infrastructure. Also potential to affect marine water quality resulting from spills	Assess the change in impact compared to that predicted for the Foundation Project. Where available use monitoring data to validate impact predictions (e.g. associated with Foundation Project HDD activities). Use baseline data collected for the Foundation Project. Use modelling to predict the geographical extent and magnitude of potential impacts reasonably expected from	Mitigate impacts initially through engineering design and constructability review. Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including the various applicable EMPs (Section 6.8).

Environmental Factor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Potential Management
	expected from accidental spills and leaks.		and leaks during the construction and operational phases.	hydrocarbon spills (for realistic construction and/or operational phase scenarios).	
Foreshore (including beach and primary dune systems)	North Whites Beach and its primary dune system	To maintain the integrity, ecological functions and environmental values of the soil and landform of the coast.	No impacts associated with planned Fourth Train Proposal activities are anticipated for the beach or primary dune system. However, impacts may occur as a result of unplanned activities including: • change in landform and deposition of drilling fluid onto the beach in the event of an accidental HDD frac-out • deposition of hydrocarbons onto the beach in the event of a spill occurring offshore • erosion/wash-out of dune system due to alteration in drainage at the HDD site and/or onshore Feed Gas Pipeline System route.	Assess the change in impact compared to that predicted for the Foundation Project. Use data and evidence collected by the Foundation Project to substantiate impact predictions where these are available. Use baseline data collected for the Foundation Project.	Impacts to the foreshore have been avoided through selection of the HDD technique to cross the shore of Barrow Island. Avoid credible residual impacts through site selection, engineering and site design, constructability reviews, and careful planning of construction activities. Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including its various EMPs (Section 6.8).
Seabed (subtidal and intertidal)	Seabed surrounding Barrow Island. Pilbara coast for impacts reasonably expected from accidental spills and leaks.	To maintain the integrity, ecological functions and environmental values of the seabed	Change in seabed profile and seabed composition due to the physical presence of the Feed Gas Pipeline System as it approaches the shore of Barrow Island. Anchor and chain scour to the seabed. Sedimentation and associated changes to sediment profile due to HDD activities and laying of the Feed Gas Pipeline System in nearshore waters.	Assess the change in impact compared to that predicted for the Foundation Project. Use monitoring data (e.g. associated with Foundation Project HDD activities) to validate impact predictions where available. Use baseline data collected for the Foundation Project.	Mitigate impacts initially through Feed Gas Pipeline System route selection, constructability reviews, and execution plans. Review the relevance and effectiveness of applying the same mitigation and management measures approved for the Foundation Project, including its various EMPs (Section 6.8).

Environmental Factor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Potential Management
			Potential contamination of seabed sediment during construction and operation of the marine component of the Feed Gas Pipeline System as a result of leaks and spills.	Use modelling to predict the geographical extent and magnitude of potential impacts reasonably expected from hydrocarbon spills (for realistic construction and/or operational phase scenarios).	

Table A5–2 Preliminary Environmental Analysis Results – Emissions, Discharges and Wastes

Environmental Stressor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Possible Management
Atmospheric emissions (including dust but excluding greenhouse gases)	Airshed surrounding Barrow Island and the adjacent Pilbara coast	To meet statutory requirements and acceptable standards, and thereby avoid or mitigate any adverse effects of atmospheric emissions on environmental values or the health, welfare, and amenity of people and land uses	Reduction in air quality during construction of terrestrial infrastructure, operation of the Gas Treatment Plant, and reasonably expected emissions from the loading and export of additional LNG and condensate.	Predict and assess the potential change in air quality reasonably expected from the implementation of the Fourth Train Proposal compared to the Foundation Project. Use atmospheric dispersion modelling to establish the baseline for atmospheric pollutants (i.e. the operational Foundation Project and existing emissions sources on Barrow Island) and to predict the change in operational air quality resulting from the Fourth Train Proposal. As the Foundation Project is not yet operational, note that no data are available to validate modelling.	Initially, mitigate impacts through the same mitigation and management mechanisms approved for the Foundation Project where relevant and effective, including concept selection, engineering design, and various relevant EMPs (Section 6.8). Review the effectiveness of Foundation Project mitigation and management and revise where necessary. Where relevant and practicable, examine the feasibility of realistic alternative technologies.
Emissions of greenhouse gases	Global atmosphere	To reduce emissions to levels as low as reasonably practicable on an ongoing basis and consider offsets to further reduce cumulative emissions	During the construction phase, emissions generated from vessel, vehicle and equipment engines and power generation. During operation, management of reservoir and process CO_2 at the Gas Treatment Plant.	Use calculations of emissions from the operational Foundation Project to establish the baseline. Estimate the key emission sources reasonably expected from the operational Fourth Train Proposal and assess alternative options for their reduction. Estimate the volume of additional CO_2 generated by the implementation of the Fourth Train Proposal and present the results of CO_2 Dupuy Simulation Modelling predicting the behaviour of injected CO_2 from the Fourth Train Proposal and	Evaluate realistic options for reducing emissions of reservoir and process greenhouse gases. Manage impacts through concept selection, engineering design, and updates to relevant Foundation Project EMPs.

Environmental Stressor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Possible Management
				Foundation Project in the Dupuy Formation. Present the level of assurance of CO_2 plume migration in the Dupuy Formation over time. As the Foundation Project is not yet operational, note that no data are available to validate the calculations.	
Light spill	Barrow Island, its coast, and surrounding nearshore waters	To avoid or manage potential impacts from light overspill	Disturbance to the behaviour and possibly breeding of marine turtles and terrestrial fauna resulting from artificial lighting at construction and operational work sites.	Assess the change in light spill introduced by the Fourth Train Proposal compared to the Foundation Project. Use light spill modelling to establish the baseline for the Fourth Train Proposal (i.e. operational Foundation Project) and to predict the change in light spill caused by the operation of the fourth LNG train at the Gas Treatment Plant. Note that no monitoring data will be available to validate modelled predictions.	Engineering design will primarily be used to manage light spill. Likely impacts of light on marine turtles will be managed through the Long-term Marine Turtle Management Plan. Use of lighting systems will also be managed through other EMPs (e.g. HDD Management and Monitoring Plan). Review the effectiveness of Foundation Project mitigation and management measures, and revise where necessary. Where relevant and practicable, examine the feasibility of realistic alternative technologies.
Discharges to sea (including run-off)	Coastal and nearshore waters surrounding the Fourth Train Proposal facilities (i.e. shore approach of the	To meet statutory requirements and acceptable standards and thereby avoid or mitigate any adverse affects of discharges on the environmental values of the	Reduction in marine water quality due to run-off with entrained sediment and contaminants, discharge of hydrotest water, RO brine, bilge and ballast water. Potential contamination of water from hydrocarbon leaks and spills.	To the extent possible, identify and estimate any change in discharges to sea compared to those anticipated for the Foundation Project. Where wastewater infrastructure could be used by the Fourth Train	Manage likely impacts through concept selection, engineering design, constructability reviews, and using the same mitigation and management measures approved for the Foundation

Environmental Stressor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Possible Management
	Feed Gas Pipeline System, offshore HDD site, the MOF and LNG Jetty and their approaches).	marine environment or the health, welfare, and amenity of people and sea users		Proposal, document the incremental change and additional volumes / durations / concentrations etc. as relevant, introduced by the Fourth Train Proposal compared to that assessed and approved for the Foundation Project. Use baseline information and technical studies conducted for Foundation Project approvals, where available and the results of the engineering studies completed for the Fourth Train Proposal for the assessment of impacts. Where available and relevant, use monitoring data, audit results and observations from the Foundation Project to substantiate construction-phase predictions. Use baseline data collected for the Foundation Project.	Project where relevant and effective, including various EMPs (Section 6.8). Review the effectiveness of mitigation and management measures, and revise where necessary. Where relevant and practicable, examine the feasibility of realistic alternative technologies.
Noise and vibration	Barrow Island, its coast, and surrounding waters	To avoid adverse noise and vibration impacts to terrestrial and marine fauna, by benchmarking noise against statutory requirements and acceptable standards	Disturbance to and potential impacts on the behaviour and breeding of terrestrial and marine fauna as a result of noise generated during construction and operation of the Fourth Train Proposal. Note there are no public premises or communities on Barrow Island that will be impacted by the Fourth Train Proposal thus the Environmental Protection (Noise) Regulations do not apply.	To the extent possible, describe any changes in construction-phase noise taking into account the relevant activities of the Foundation Project. Limited noise monitoring data are expected to be available (e.g. from the Foundation Project's HDD activities) to substantiate construction-phase terrestrial noise estimates. Use noise modelling to establish the baseline (i.e. operational Foundation Project) and to	Manage likely impacts through engineering design, construction methods and various EMPs (see Section 6.8). Review the effectiveness of mitigation and management measures, and revise where necessary. Where relevant and practicable, examine the feasibility of realistic alternative technologies.

Environmental Stressor	Relevant Area	Environmental Objective	Potential Impacts	Additional Investigations	Possible Management
				predict changes introduced by addition of an operational Fourth Train Proposal at the Gas Treatment Plant.	
Leaks and spills	Coastline and waters surrounding Barrow Island and along the nearby Pilbara coast.	To handle and store hydrocarbons and other chemicals in a manner that reduces the potential for leaks, spills, and emergency situations to impact on the environment to as low as reasonably practicable	Potential to impact terrestrial and coastal and nearshore environmental factors as described in Table A5–1.	Use modelling to predict the geographical extent and magnitude of potential impacts reasonably expected from hydrocarbon spills (for realistic construction and/or operational phase scenarios).	Manage likely impacts through concept selection, engineering design, constructability reviews, and the various EMPs (see Section 6.8) developed for the Foundation Project where relevant and effective. Review the effectiveness of mitigation and management measures, and revise where necessary.

Table A5–3 Preliminary Environmental Analysis Results – Society and Economy

Socio-economic Factor	Relevant Area	Socio-economic Objective	Potential Impacts	Additional Investigations	Potential Management
Public health and safety	Onslow and the Pilbara region	To avoid adverse impacts on the health and/or wellbeing of the public or their access to health care services	Pressure on public health infrastructure in the event of a major industrial accident occurring during the construction and operation of the Fourth Train Proposal. Increased health and safety risk to the public due to vessel interactions. Reduction in environmental health (specifically air quality) reasonably expected from operational air emissions from the Fourth Train Proposal.	Assess impacts on public health reasonably expected from implementation of the Fourth Train Proposal compared to the Foundation Project. Review and incorporate any experience gained from the construction of the Foundation Project. Supplement baseline data available for the Foundation Project with more up-to-date statistics gathered from secondary sources.	Mitigate likely impacts through project execution planning, Chevron Australia's policies and procedures, and compliance with overarching safety legislation. A number of EMPs referenced in Section 6.8 will also contribute towards managing impacts on public health and safety (e.g. Air Quality Management Plan).

Socio-economic Factor	Relevant Area	Socio-economic Objective	Potential Impacts	Additional Investigations	Potential Management
Cultural heritage	Barrow Island and its surrounding waters	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation	Construction may impact sites of cultural and/or archaeological heritage at sea and on Barrow Island. However, no known sites are expected to be directly affected.	Assess the potential impacts to cultural heritage using baseline information obtained by the Foundation Project and additional secondary data where relevant.	Avoid likely impacts through concept selection. Manage any key residual impacts by applying the same mitigation and management measures as implemented for the Foundation Project where relevant and effective, including the provisions in the Aboriginal Cultural Heritage Management Plan. Review the need to update the spatial coverage of this Plan and draw on any lessons and experience gained from implementation of the Foundation Project.
Conservation areas	Barrow Island, Montebello-Barrow Island Marine Conservation Reserve, the Barrow Island Marine Park, Bandicoot Bay Conservation Area, Muiron Islands Marine Management Area, and Ningaloo Marine Park (and World Heritage Area)	To protect the environmental and heritage values of areas identified as having significant environmental and/or national and World Heritage attributes	Reduction in environmental value in the event of a substantial accidental release of hydrocarbon and/or as a result of operational air emissions.	Assess the change in impact introduced by implementation of the Fourth Train Proposal. Review performance to date of the Foundation Project against the objective for this factor and apply any lessons learnt to the Fourth Train Proposal. Use modelling to predict the dispersion of operational air emissions and the spread of accidental hydrocarbon spills occurring in the marine environment.	Likely impacts will be managed through engineering design to reduce the likelihood of accidents occurring, EMPs (see Section 6.8) emergency response planning, oil spill contingency planning, and implementation of the Terrestrial and Marine Quarantine Management System. Review the effectiveness of mitigation and management measures, and revise where necessary.
Land and sea use	Barrow Island, its coast, and surrounding waters	To avoid adversely interfering with, or compromising, other economic users of the land or marine	Temporary restriction on public use of marine areas due to the establishment of exclusion zones, use of cyclone moorings and vessel movements during the laying of the	Assess the extent to which impacts to other land and sea users may change with the addition of the Fourth Train Proposal. Take into account more	Manage likely impacts through constructability reviews and applying the same mitigation and management measures as approved for the Foundation

Socio-economic Factor	Relevant Area	Socio-economic Objective	Potential Impacts	Additional Investigations	Potential Management
		environment	Feed Gas Pipeline System and its associated HDD activities in nearshore waters, and the approach of LNG and condensate export vessels during operation.	up-to-date baseline information on shipping, fishing, and recreational use of surrounding waters (to the extent it is available from public sources) and any experience gained from the Foundation Project.	Project. This includes application of various EMPs associated with construction (see Section 6.8), where relevant and effective. Review and draw on any lessons and experience gained from implementation of the Foundation Project.
Livelihoods	Onslow and the Pilbara, and Western Australia, as a whole	To deliver employment and skill development opportunities that benefit the local and regional population	Potential benefits associated with labour and service demand during construction and operation.	Assess impacts and benefits of implementing the Fourth Train Proposal. Take into account more up-to-date information on the baseline (using publicly available information) and any experience gained from implementation of the Foundation Project.	Manage likely impacts through project execution planning, contracting, and employment strategies (including, as relevant, the Gorgon Project's Australian Industry Participation Policy and Plan and the Gorgon Project Social Impact Management Plan [Environmental Resources Management (ERM) 2009; under revision]). Review and draw on any lessons learnt and experience gained from implementation of the Foundation Project.
Local communities	Onslow and the Pilbara area	To avoid compromising the social infrastructure, cultural and community structures of the local host community and, where relevant, to share benefits with the community	Change in community structures and culture and competition with the local community for the use of social infrastructure as a result of construction activities being extended on Barrow Island (beyond that of the Foundation Project).	Determine how implementation of the Fourth Train Proposal changes the risk to local communities, compared to that predicted for the Foundation Project. Draw on more up-to-date baseline information and experience gained from the Foundation Project.	Manage likely impacts through project execution planning, stakeholder engagement, and through the Gorgon Project Social Impact Management Plan (ERM 2009; under revision). Review and draw on any lessons learnt and experience gained from implementation of the Foundation Project.
Local and regional economy	Onslow and the Pilbara and Western Australia,	To contribute to the achievement of State and local development	Positive benefits on the local and regional economy due to an extended demand for labour,	Assess how the Fourth Train Proposal changes the impacts and benefits anticipated for the	Manage likely impacts through project execution planning, contracting and employment

Socio-economic Factor	Relevant Area	Socio-economic Objective	Potential Impacts	Additional Investigations	Potential Management
	as a whole	policies and plans with respect to socio-economy so that benefits are brought to the regional and local economy and negative impacts on the economy are avoided or managed	equipment, supplies, and services during construction of the Fourth Train Proposal (i.e. beyond that for the Foundation Project).	Foundation Project. Update baseline data available from the Foundation Project using secondary sources. Where available, use data collected for the Foundation Project to substantiate predictions.	strategies (including as relevant the Gorgon Project's Australian Industry Participation Policy and Plan and the Gorgon Project Social Impact Management Plan [ERM 2009; under revision]). Review and draw on any lessons learnt and experience gained from implementation of the Foundation Project.

Appendix 6 Consideration of Relevant Environmental Principles for the Fourth Train Proposal

Table A6–1 describes how the PER/Draft EIS for the Fourth Train Proposal will consider relevant Environmental Principles as stated in section 4A of the EP Act.

Chevron Australia's commitment to the environmental principles contained in the EP Act are enshrined within the Gorgon Development Sustainability Principles that were developed for the Gorgon Development in the ESE Review (ChevronTexaco Australia 2003). These Sustainability Principles have subsequently been integrated as overarching principles into the Environmental Management System for the Foundation Project, a system which will also be used to manage environmental performance of the Fourth Train Proposal. The Gorgon Gas Development Sustainability Principles are reproduced here in Table A6–2.

At a higher level, Chevron Australia's commitment to sound environmental management in all aspects of its operations is reflected in Chevron Policy 530 – Protecting People and the Environment (see Figure A6–1). Further details on Chevron Australia's environmental management framework was presented in the supporting information to the referral of the Fourth Train Proposal (Chevron Australia 2011c).

Table A6–1 Environmental Principles of Relevance to the Fourth Train Proposal

Principle	Relevant (Yes/No)	If yes, consideration
1. The precautionary principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by: • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment • An assessment of the risk – weighted consequences of various options.	Yes	Chevron Australia has committed to this principle through the Gorgon Development Sustainability Principles (see Table A6–2). This principle will be used as the basis of the environmental risk assessment and mitigation, management and monitoring approach in the PER/Draft EIS. Where uncertainty remains over the consequence or likelihood of an environmental impact occurring as a result of studies undertaken in the PER/Draft EIS, a precautionary approach will be adopted. An example of this is the implementation of the Long-term Marine Turtle Management Plan to address uncertainty over impacts of the Foundation Project to marine turtles nesting on Barrow Island.
2. The principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	Yes	This principle is included within the Gorgon Development Sustainability Principles (see Table A6–2) and is reflected in the decisions Chevron Australia will make about the Fourth Train Proposal. Alongside the Precautionary Principle, this principle forms a basis upon which the PER/Draft EIS will be grounded.
3. The principle of conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Yes	This principle is reflected in the Gorgon Development Sustainability Principles (see Table A6–2). The Environmental Objectives established for the assessment of impacts in the PER/Draft EIS (see Appendix 5) also reflect this principle.

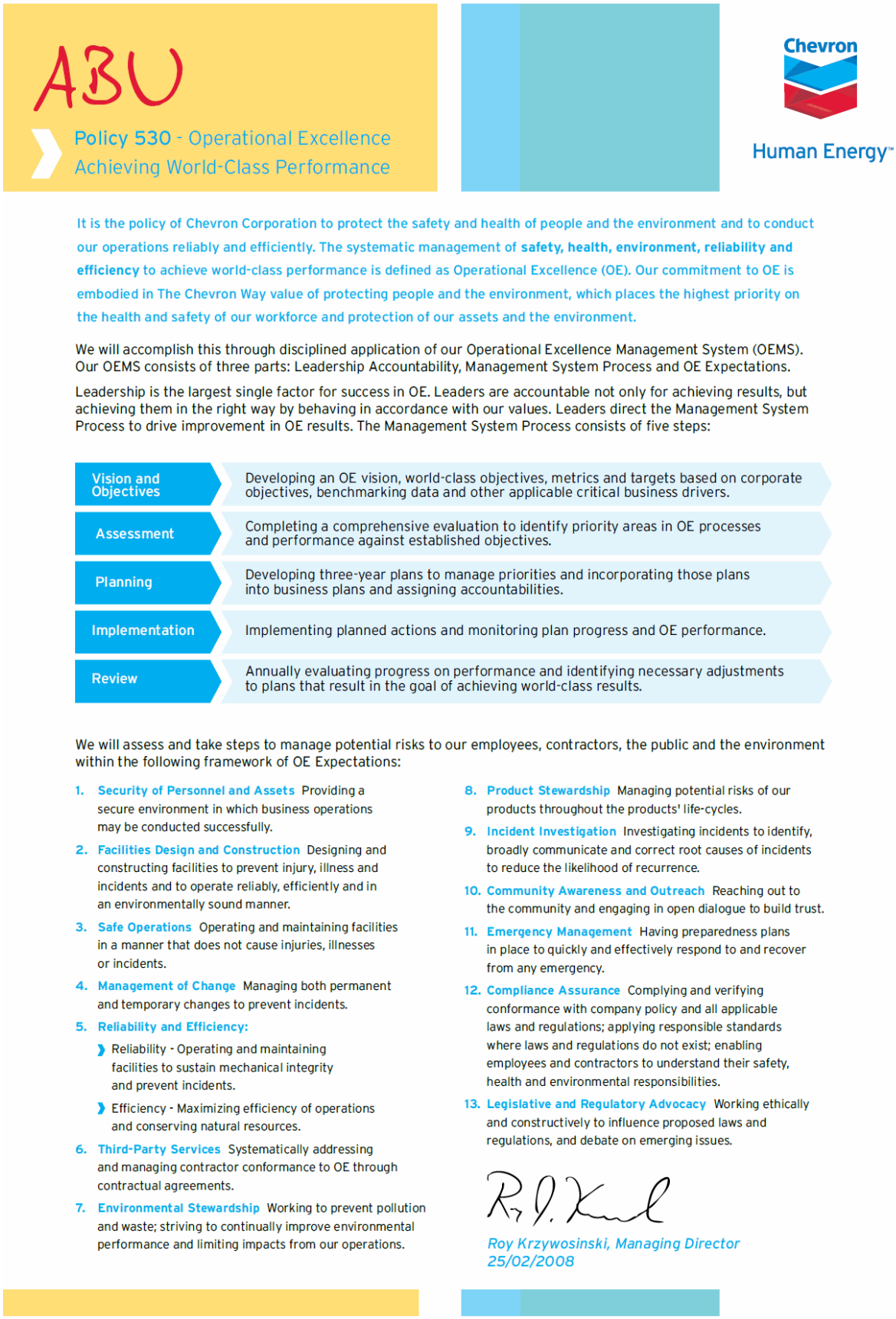
Principle	Relevant (Yes/No)	If yes, consideration
4. Principles relating to improved valuation, pricing and incentive mechanisms Environmental factors should be included in the valuation of assets and services. The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance, and abatement. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of waste. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.	Yes	The environmental implications, (including their associated costs, where relevant), of Chevron Australia's actions are incorporated into a systematic decision-making process that aims to deliver world-class performance in safety, health, environment, reliability, and efficiency. For example, market prices for environmental implications are taken into account alongside technical, economic, health and safety, operability and reliability criteria when selecting design options and alternatives. Where relevant, the PER/Draft EIS will reference market instruments (e.g. the carbon tax) to support the assessment of impacts.
5. The principle of waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Yes	Chevron Australia's commitment to Environmental Stewardship, embodied in its Policy 530, includes specific reference towards efforts to prevent and reduce waste (see Figure A6–1). The generation and disposal of waste will be included as a stressor and considered in the PER/Draft EIS. This principle will also be reflected in the various EMPs that have been prepared and implemented for the Foundation Project and that will be updated to reflect the Fourth Train Proposal. These include the Solid and Liquid Waste Management Plan and activity-specific EMPs (e.g. the HDD Management and Monitoring Plan etc).

Table A6-2 Gorgon Gas Development Sustainability Principles

Principle	Definition
Clean Energy Supply	The Gorgon Gas Development will meet Western Australian, Australian, and international demands for competitive, clean energy sources. It will also enhance energy competition and security of supply in Australia.
Economic Benefit Delivery	Current and future economic growth in Australia will benefit from the Gorgon Gas Development . It will foster economic growth and business development, generate government revenue, provide commercial returns to the Joint Venturers, and contribute to the wealth generated by Australia's natural resource base.
Biological and Ecological Integrity Protection	The Gorgon Gas Development will not disrupt ecological structure and function, nor will it result in a loss of biological diversity on Barrow Island.
Social Equity and	Communities will benefit from improved quality of life and wellbeing resulting

Principle	Definition
Community Wellbeing Enhancement	from contributions of the Gorgon Gas Development, such as creation of jobs.
Future Generations Commitment	The Gorgon Gas Development will meet the needs of the present generation and assist future generations to meet their needs.
Efficient Resource Use	International best practice and continual improvement principles will be applied to efficiently manage resources and wastes.
Precautionary Principle Application	Where there are threats of serious or irreversible damage, lack of full scientific certainty will not be used as a reason for postponing cost-effective measures to prevent environmental damage.
Community Respect and Safeguards	The Joint Venturers will respect community values, community diversity and safeguard the wellbeing of the public and workforce throughout the life of the Gorgon Gas Development.
Stakeholder Engagement	The Joint Venturers will seek the views of stakeholders and take their interests into account throughout development of the Gorgon gas field.
Accountability	The Joint Venturers are committed to the highest standards of governance and accountability. They will report regularly to the community on the sustainability performance of the Gorgon Gas Development.

Source: Chevron Australia 2005.



ABU

Policy 530 - Operational Excellence
Achieving World-Class Performance

Chevron
Human Energy™

It is the policy of Chevron Corporation to protect the safety and health of people and the environment and to conduct our operations reliably and efficiently. The systematic management of **safety, health, environment, reliability and efficiency** to achieve world-class performance is defined as Operational Excellence (OE). Our commitment to OE is embodied in The Chevron Way value of protecting people and the environment, which places the highest priority on the health and safety of our workforce and protection of our assets and the environment.

We will accomplish this through disciplined application of our Operational Excellence Management System (OEMS). Our OEMS consists of three parts: Leadership Accountability, Management System Process and OE Expectations.

Leadership is the largest single factor for success in OE. Leaders are accountable not only for achieving results, but achieving them in the right way by behaving in accordance with our values. Leaders direct the Management System Process to drive improvement in OE results. The Management System Process consists of five steps:

Vision and Objectives	Developing an OE vision, world-class objectives, metrics and targets based on corporate objectives, benchmarking data and other applicable critical business drivers.
Assessment	Completing a comprehensive evaluation to identify priority areas in OE processes and performance against established objectives.
Planning	Developing three-year plans to manage priorities and incorporating those plans into business plans and assigning accountabilities.
Implementation	Implementing planned actions and monitoring plan progress and OE performance.
Review	Annually evaluating progress on performance and identifying necessary adjustments to plans that result in the goal of achieving world-class results.

We will assess and take steps to manage potential risks to our employees, contractors, the public and the environment within the following framework of OE Expectations:

1. **Security of Personnel and Assets** Providing a secure environment in which business operations may be conducted successfully.
2. **Facilities Design and Construction** Designing and constructing facilities to prevent injury, illness and incidents and to operate reliably, efficiently and in an environmentally sound manner.
3. **Safe Operations** Operating and maintaining facilities in a manner that does not cause injuries, illnesses or incidents.
4. **Management of Change** Managing both permanent and temporary changes to prevent incidents.
5. **Reliability and Efficiency:**
   - Reliability - Operating and maintaining facilities to sustain mechanical integrity and prevent incidents.
   - Efficiency - Maximizing efficiency of operations and conserving natural resources.
6. **Third-Party Services** Systematically addressing and managing contractor conformance to OE through contractual agreements.
7. **Environmental Stewardship** Working to prevent pollution and waste; striving to continually improve environmental performance and limiting impacts from our operations.
8. **Product Stewardship** Managing potential risks of our products throughout the products' life-cycles.
9. **Incident Investigation** Investigating incidents to identify, broadly communicate and correct root causes of incidents to reduce the likelihood of recurrence.
10. **Community Awareness and Outreach** Reaching out to the community and engaging in open dialogue to build trust.
11. **Emergency Management** Having preparedness plans in place to quickly and effectively respond to and recover from any emergency.
12. **Compliance Assurance** Complying and verifying conformance with company policy and all applicable laws and regulations; applying responsible standards where laws and regulations do not exist; enabling employees and contractors to understand their safety, health and environmental responsibilities.
13. **Legislative and Regulatory Advocacy** Working ethically and constructively to influence proposed laws and regulations, and debate on emerging issues.

Roy Krzywosinski, Managing Director
25/02/2008

Figure A6–1 ABU Policy 530 – Operational Excellence

Appendix 7 Pilbara Developments for Pilbara Airshed Modelling

Based on correspondence with the DEC during preparation of this Environmental Scoping Document, atmospheric emissions from the following major industrial sources in the West Pilbara are anticipated to be included in cumulative atmospheric emissions modelling for the Fourth Train Proposal:

Operating Facilities

- Karratha Gas Plant (5 trains)
- Pilbara Iron – Dampier Power Station (120 megawatts [MW])
- Pilbara Iron – Cape Lambert Power Station (105 MW)
- West Pilbara Power Station – Karratha (86 MW)
- Yurralyi Maya Power Station – Karratha (184 MW constructed, with a total of 276 MW approved)

Under Construction

- Gorgon LNG Plant (3 trains)
- Pluto LNG Plant (2 trains)
- Sino Iron (mine and power station of approx 450 MW)
- Devils Creek Domestic Gas Project

Approved

- Sino Iron 14 MTPA Pellet Plant and Direct Reduced Iron (DRI) Plant (approved with mine and power station being constructed but unlikely to be built)
- Balmoral South (up to 600 MW power station, 80 MTPA mine and 14 MTPA Pellet and DRI Plant)
- Burrup Nitrates Pty Ltd – Ammonium Nitrate
- Macedon Domestic Gas plant
- Wheatstone LNG Plant – Onslow (5 trains)

Being Assessed

- Dampier Nitrogen – Ammonium Nitrate
- Mineralogy Pty Ltd's Mineralogy Expansion Project at Cape Preston (power stations and pellet plants)
- Anketell Port (power station and operations)
- Cape Lambert Magnetite project (not submitted as yet)

Not Progressing

- Dampier Urea (no change since 2005)
- Dampier Ammonia.