



Technical Appendix A

Framework Environmental Management Plan

This page left blank intentionally.



Gorgon Development

Appendix A1: Framework Environmental Management Plan

Public

Document ID: G0-TE-H-0000-PLNX002

Revision No: 0

Revision Date: 12 August, 2005

Copy No: 0

This page left blank intentionally.



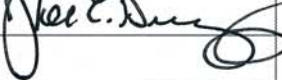
CONTROLLED DOCUMENT

TITLE

Document Information

Document Number	G0-TE-H-0000-PLNX002	DMS I.D.	G0-TE-H-0000-PLNX002	Rev 0
Document Custodian	Mark Watson	Department Owner	Gorgon HES	

Current Revision Approvals

	Name / Title	Signature	Date
Prepared by	Ken Berry/Mark Watson		12/8/05
Checked by	Ken Cheney		15/8/05
Approved by	Russell Lagdon		15 AUG 05
Document Control			

Revision History

Revision	Date	Description	Prepared by	Checked by	Approved by
0	12/08/05	For release to public	MWAZ	KCAE	RDLA

IP & Security Classification

<input type="checkbox"/> Classified	<input type="checkbox"/> Confidential
<input type="checkbox"/> Business	<input checked="" type="checkbox"/> Public

TABLE OF CONTENTS

1.0 INTRODUCTION	3
1.1 Environmental Objectives	6
1.2 Staff Resourcing, Competence, Organisation and Reporting Structure	7
1.3 Induction and Training.....	8
1.4 Continuous Improvement and Adaptive Management	8
1.5 Management of Change.....	8
2.0 DEVELOPMENT COMPONENTS AND ACTIVITIES	9
3.0 ENVIRONMENTAL PROTECTION AND MANAGEMENT MEASURES ...	10
3.1 General Conduct of Development Personnel	10
3.2 Drilling	10
3.3 Subsea Installation.....	12
3.4 Pipelaying	13
3.5 Rock Dumping/Placement.....	14
3.6 Horizontal Directional Drilling	14
3.7 Piling	15
3.8 Traffic and Access Management.....	16
3.9 Earthworks – Site Clearing and Grading	17
3.10 Blasting (Noise and Vibration).....	18
3.11 Air and Dust Emissions	19
3.12 Lighting	20
3.13 Dredging and Dredge Spoil Disposal	21
3.14 Quarantine Management	24
3.15 Waste Management.....	26
3.16 Shipping and Navigation	28
3.17 Facility Testing	29
3.18 Clean-up and Rehabilitation	30
3.19 Contingency Planning and Emergency Response	30
4.0 ENVIRONMENTAL INSPECTION AND MONITORING	35
4.1 Environmental Inspection.....	35
4.2 Environmental Monitoring	35
5.0 AUDITING	36
5.1 Compliance Auditing	36
6.0 REPORTING	36
6.1 General	36
6.2 Non-Conformance, Incident and Corrective Action Reporting.....	37

1.0 INTRODUCTION

The Gorgon Joint Venturers are committed to conducting activities associated with the proposed Gorgon Development in an environmentally responsible manner; and intend to implement best practice environmental management as part of a program of continuous improvement. This will be achieved by addressing issues systematically, consistent with internationally accepted standards and the Chevron Operational Excellence Management System. Chapter 16 of the Draft EIS/ERMP outlines the key elements of the proposed Gorgon Health, Environment and Safety Management System.

An important element of this systematic approach is the development of detailed environmental management procedures to guide construction, commissioning, operation and emergency response activities. These procedures will incorporate the proposed environmental management safeguards outlined in the Draft EIS/ERMP and will be documented via an integrated series of documents; the first step of which is this Framework Environmental Management Plan (the Framework EMP), as represented in Figure 1.



Figure 1: Phases of EMP Development

This Framework EMP compliments the material presented in the main body of the Draft EIS/ERMP as it brings together activity-specific environmental management and protection measures currently under consideration. The document has been structured to address the major Development activities associated with construction and commissioning (e.g. drilling, pipe laying and earthworks) and the major Development components (e.g. offshore wells, feed gas pipeline and gas processing facility). A matrix of activities and components is provided in Attachment 1.

The core of this Framework EMP is the set of environmental protection and management measures to avoid, reduce or mitigate impacts (refer to Section 3).

This document has a specific lifespan in its current form. Its purpose is to provide stakeholders with the opportunity to better understand the management measures proposed for construction and commissioning of the Gorgon Development. Following review of the Draft EIS/ERMP by the public and regulatory agencies, the Framework EMP will be used as a basis for, and be superseded by, the detailed EMP series. These Plans will in turn be used as the basis for the Contractors' Environmental Management Implementation Procedures (EMIPs), as outlined below.

The Joint Venturers will adopt management measures outlined in this Framework EMP to avoid or mitigate environmental impacts. The Development is currently in the early design phase with less than 10% of engineering design completed to date. As detailed design progresses it may become necessary to modify proposed management

strategies, particularly those with an engineering element. If this occurs, alternative management strategies that achieve the stated environmental objectives and outcomes will be developed. The Joint Venturers are confident that the Gorgon HES Management System and the Environmental Management Plans and procedures will provide an effective approach for protecting the conservation values of Barrow Island and the proposed Development area.

The Detailed EMP Series

The detailed EMPs will guide the activities of specific workforce groups working on particular components of the Development (i.e. dredging and spoil disposal and onshore feed gas pipeline construction). They will address normal operations, unplanned incidents and emergency situations.

The Plans will be developed and documented through a systematic and consultative process to address environmental factors and risks identified during the environmental impact assessment phase. The documents will be prepared to the satisfaction of the Commonwealth Department for the Environment and Heritage (DEH) and the Western Australian Environmental Protection Authority (EPA), upon advice from relevant regulatory agencies.

Detailed EMPs will be prepared progressively in the lead-up to the specific activity taking place. That is, some detailed EMPs, such as those for preparation of the Gas Processing Facility site, will need to be prepared in draft form prior to Ministerial approval of the Gorgon Development, as the activities will need to commence shortly after approval. Detailed EMPs for other activities, such as drilling or construction of the domestic gas pipeline, will not need to be prepared until after this time, as the activity may not occur for 12 months or more, and will be more meaningful when a greater level of engineering detail is available.

Operations EMPs will be developed during the late construction phase. Similarly, the Decommissioning EMPs will be prepared at an appropriate stage during the operation phase.

The detailed EMPs will build on the material contained in the Draft EIS/ERMP (including this Appendix) and include more detailed location-specific engineering and environmental information. In addition, the detailed EMPs will be prepared with input from government agencies and in consideration of public comment; and will incorporate conditions of approval and relevant legislative requirements and industry standards (Figure 2).

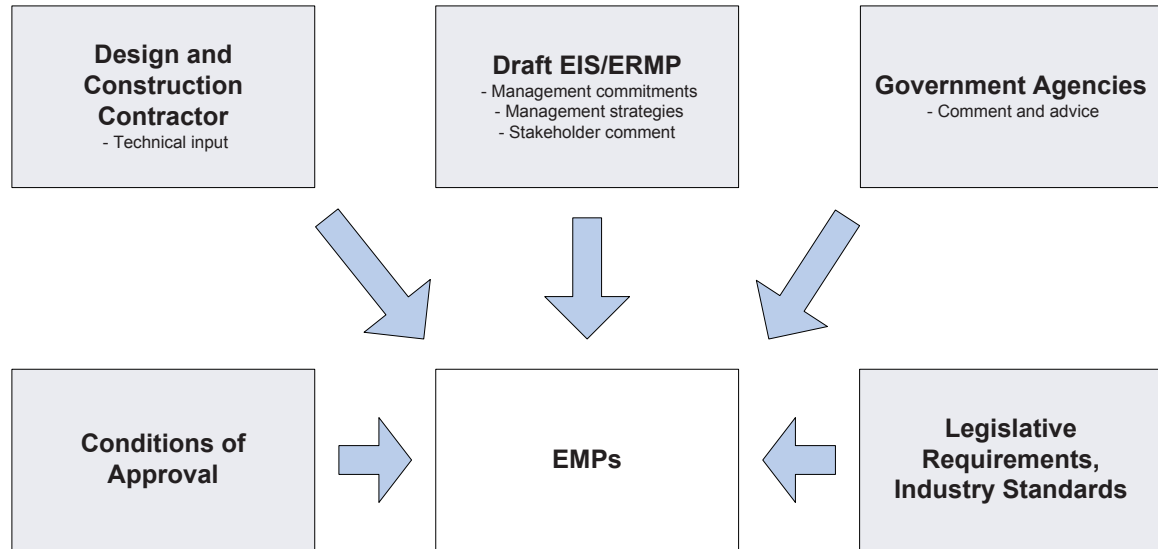


Figure 2: Inputs to Detailed EMPs

Detailed EMPs will cover all Development components. An indicative breakdown of the detailed EMPs is listed in Table 1. The final structure will be determined during the detailed design phase in conjunction with the design and construction contractor, to the satisfaction of the EPA and DEH.

Table 1: Detailed EMP Series

EMP	Title of Detailed EMP Document
1	Upstream Field Infrastructure (Manifolds and Flowlines)
2	Offshore Feed Gas Pipeline
3	Onshore Feed Gas Pipeline
4	Gas Processing Facility, Camp & Associated Infrastructure
5	Port Facilities (Materials Offloading and LNG Jetty)
6	Dredging and Dredge Spoil Disposal
7	Drilling (Offshore)
8	CO2 Injection System (Pipeline and Wells)
9	Domestic Gas Pipeline & Associated Infrastructure
10	Greenhouse Gases
11	Optical Fibre Cable
12	Mainland Supply Base
13	Quarantine Management
14	Waste Management
15	Spill Contingency and Response
16	Cultural Heritage Management

Contractor EMIPs

Environmental Management Implementation Procedures (EMIPs) will be prepared by the design and construction contractors. The EMIPs will be internal project documents that will build on the environmental protection measures contained in this Framework EMP and the detailed EMPs approved by agencies. The procedures will be finalised and approved by the Gorgon Joint Venturers prior to the construction activity being undertaken.

1.1 Environmental Objectives

This Framework EMP and the subsequent detailed EMP series and contractor EMIPs aim to achieve the environmental, social and economic objectives presented in Chapters 10 to 15 of the Draft EIS/ERMP. These objectives are collated in Boxes 1 and 2.

Box 1: Environmental Objectives

Environmental Factor	Management Objective
Flora and Vegetation Communities	<ul style="list-style-type: none"> To maintain the abundance, diversity, geographic distribution and productivity of flora through the avoidance or management of adverse impacts and improvement in knowledge To protect EPBC Act listed threatened and migratory species To protect Declared Rare and Priority Flora, consistent with the provisions of the <i>Wildlife Conservation Act 1950</i>
Terrestrial Fauna	<ul style="list-style-type: none"> To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystems levels through the avoidance or management of adverse impacts and improvement in knowledge To protect EPBC Act listed threatened and migratory species To protect Specially Protected (Threatened) Fauna, consistent with the provisions of the <i>Wildlife Conservation Act 1950</i>
Subterranean Fauna	<ul style="list-style-type: none"> To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge To protect EPBC Act listed threatened and migratory species To protect Specially Protected (Threatened) Fauna, consistent with the provisions of the <i>Wildlife Conservation Act 1950</i>
Soil and Landform	<ul style="list-style-type: none"> To maintain the integrity, ecological functions and environmental values of soil and landform
Foreshore	<ul style="list-style-type: none"> To maintain the integrity and stability of beaches
Water (Surface or Ground)	<ul style="list-style-type: none"> 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
Marine Fauna	<ul style="list-style-type: none"> To maintain the abundance, species diversity, geographic distribution and ecological functions of marine faunal communities To ensure that any impacts on locally significant marine communities are avoided, minimised and/or mitigated. To protect EPBC Act listed threatened and migratory species To protect Specially Protected (Threatened) Fauna consistent with the provisions of the <i>Wildlife Conservation Act 1950</i>
Marine Flora (mangroves, corals, seagrasses and algae)	<ul style="list-style-type: none"> To maintain the ecological function, abundance, species diversity and geographic distribution of mangrove, coral, seagrass and other benthic primary producer communities and their habitats
Benthic Habitats Intertidal Zone	<ul style="list-style-type: none"> To maintain the ecological functions and environmental values of marine benthic habitats and the subtidal and intertidal zones To protect EPBC Act listed threatened and migratory species
Air Quality	<ul style="list-style-type: none"> To ensure that atmospheric emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards

Environmental Factor	Management Objective
Greenhouse Gas Emissions	<ul style="list-style-type: none"> To minimise greenhouse gas emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions
Ozone Depleting Substances	<ul style="list-style-type: none"> To minimise emissions of ozone depleting substances to levels as low as practicable on an ongoing basis
Noise and Vibration	<ul style="list-style-type: none"> To avoid adverse noise and vibration impacts to fauna To ensure that noise impacts emanating from the proposed plant comply with statutory requirements specified in the <i>Environmental Protection (Noise) Regulations 1997</i>
Light	<ul style="list-style-type: none"> To avoid or manage potential impacts from light overspill and comply with acceptable standards
Liquid and Solid Waste Disposal	<ul style="list-style-type: none"> To ensure that liquid and solid wastes do not adversely affect groundwater or surface water quality or lead to soil contamination
Leaks and Spills	<ul style="list-style-type: none"> To ensure hydrocarbons and other chemicals are handled and stored in a manner that minimises the potential impact on the environment through leaks, spills and emergency situations

Box 2: Social and Economic Management Objectives

Social and Economic Factor	Social and Economic Management Objective
Local Communities	<ul style="list-style-type: none"> To maximise social enhancement opportunities dependant on the Development while minimising and mitigating adverse impacts
Cultural Heritage	<ul style="list-style-type: none"> To avoid or minimise impacts to Aboriginal and non-Indigenous cultural heritage sites To ensure that the proposal complies with the requirements of the <i>Aboriginal Heritage Act 1972</i> To ensure that the proposal complies with the requirements of the <i>Heritage of Western Australia Act 1990</i> To ensure that the proposal complies with the requirements of the <i>Historic Shipwrecks Act 1976</i>
Native Title	<ul style="list-style-type: none"> To ensure that the proposal complies with the requirements of the <i>Native Title Act 1993</i>
Workforce and Public Health and Safety	<ul style="list-style-type: none"> To ensure that the risk to the workforce and public is as low as reasonably practicable
Economic Development	<ul style="list-style-type: none"> To maximise the contribution to economic development of the region, state and nation
Community Development	<ul style="list-style-type: none"> To maximise the contribution to community development

1.2 Staff Resourcing, Competence, Organisation and Reporting Structure

Adequate staffing resources will be committed to prepare and implement the detailed EMPs and monitor and audit the effectiveness of the environmental management and protection procedures. The Gorgon Development Team and the contractors will develop and hire personnel with clearly defined responsibilities and authority levels. Personnel with responsibilities for specific environmental practices will have both the necessary education and training to ensure effective implementation of the work.

A simple and functional organisation and reporting structure will be established that reflects the hierarchy of responsibility for environmental management. This will be documented in the detailed EMPs.

1.3 Induction and Training

All Gorgon Development and contractor personnel will attend a Development orientation and induction presentation prior to commencing work on the site. All orientation and induction will contain HES requirements relevant to the specific development component or activity.

The purpose of the inductions is to ensure that all personnel understand their environmental responsibilities and are fully aware of the management and protection measures required to reduce the potential impact on the environment in the Development area prior to the commencement of construction, commissioning and operations. As part of the induction process, the environmental sensitivities of the Barrow Island and surrounding areas will be described, the environmental aims and objectives explained, and the measures in place to achieve those aims and objectives, will be outlined.

Personnel with environmental-specific responsibilities will have appropriate qualifications and experience and will be adequately trained to ensure effective implementation of the work they have been assigned.

Compliance with HES requirements will be a condition of employment and requirements will be incorporated into job specifications. For contractors, compliance with the detailed EMPs will be part of the contractor selection process and a condition of contracts.

1.4 Continuous Improvement and Adaptive Management

The Gorgon Joint Venturers have adopted an environmental management approach that is consistent with the recognised international standard AS/NZS ISO 14001:2004, Environmental Management Systems – Specification with Guidance for Use (ISO 14001).

This standard identifies the continuous improvement process as:

- identifying areas of opportunity for the improvement of the environmental management system which leads to improved environmental performance
- determining the root causes of non-conformities or deficiencies
- developing and implementing a plan or corrective and preventative action to address root causes
- verifying the effectiveness of the corrective and preventative actions
- documenting any changes in management measures resulting from process improvement
- making comparisons with objectives, goals and targets.

Through the process of staff training, site inductions, monitoring, auditing, corrective actions and the inclusion of any new environmental management procedures and initiatives, the detailed EMPs and Contractors' EMIPs will be periodically reviewed and improved to ensure stated performance objectives and standards are achieved. The flexibility of incorporating new information into this process will allow the Gorgon Development to adapt and best achieve world-class environmental performance.

1.5 Management of Change

The Gorgon Joint Venturers have an established and documented Management of Change procedure. This procedure will be applied to the Development concept and engineering design. It will also be applied to the proposed environmental management

measures and detailed procedures, to ensure due consideration of all relevant issues. Such changes may arise from modification to the design as well as from the results of additional environmental surveys and monitoring. As part of this process, alternative environmental management strategies will need to achieve the stated environmental objectives and outcomes.

Any changes to management measures which result in a change to the assessed environmental impact will be referred to DEH and the EPA. Any changes which require a change in a condition of approval will be assessed by DEH and the EPA before being considered by the relevant Ministers.

2.0 DEVELOPMENT COMPONENTS AND ACTIVITIES

Chapter 6 of the Draft EIS/ERMP details the major components that comprise the Gorgon Development and describes the construction activities required to install these components. These are listed in Table 2, and a matrix is presented in Attachment 1.

Each activity presents a range of potential environmental hazards. Section 3 of this Framework EMP outlines proposed management measures to avoid, reduce or rehabilitate potential impacts associated with each activity. The measures are structured by activity or stressor, and are presented in this format to facilitate review as part of the environmental impact assessment process. The measures will be incorporated into the detailed EMPs which, as outlined in Table 1, will generally be structured by Development component. That is, Section 3 does not explicitly provide management measures for pipeline construction (for example), but for the conduct of pipeline personnel, earthworks, waste management etc.; all of which will be included in the Onshore Feed Gas Pipeline EMP.

Table 2: Development Components and Activities

Development Components	Construction Activities
<ul style="list-style-type: none"> • Wells • Field infrastructure (manifolds, flowlines) • Feed gas pipeline • Gas processing facility • Construction Village • Port facilities (MOF, barge landing, jetty, shipping channel, turning basin) • Condensate load-out • Optical fibre cable • Domestic gas pipeline and associated infrastructure • Power and water facilities • Access roads • Airport modifications • CO₂ Injection system (pipeline, wells, monitoring) • Mainland supply base 	<ul style="list-style-type: none"> • General conduct of personnel • Drilling • Subsea installation • Pipelaying • Horizontal directional drilling • Piling • Traffic and access management • Earthworks (clearing and grading) • Blasting (noise and vibration) • Air and dust generation • Lighting • Material import (quarantine management) • Dredging and dredge spoil disposal • Waste management • Spill contingency and response • Shipping and navigation • Rock dumping/placement • Facility testing • Clean-up and rehabilitation • Incident management

3.0 ENVIRONMENTAL PROTECTION AND MANAGEMENT MEASURES

3.1 General Conduct of Development Personnel

The following measures shall apply to all construction personnel. They are primarily focussed on Barrow Island based Development components but shall be applied to all relevant workforces:

- Only authorised personnel shall be allowed on the work site.
- Development personnel shall not bring firearms or pets onto or adjacent to the site.
- Construction personnel shall confine their activities and equipment to approved and designated work site areas.
- Recreation shall be restricted to designated areas at selected times (e.g. workforce access to beaches shall be controlled).
- In accordance with CALM Act regulations, Development personnel shall not collect shells (dead or alive).
- Fishing or recreational boating shall be prohibited during the construction phase of the Development.
- Recreational facilities shall be provided within the construction village to limit requirement for recreational activity outside of the construction village.
- Wildlife (including marine fauna) shall not be fed, or harassed, and shall not be unnecessarily injured or killed.
- Vehicle speeds shall be restricted to a maximum of 60 km/hr in daylight and 40 km/hr at night.
- Personnel shall manage general rubbish in accordance with Section 3.15.
- To minimise the risk of fires due to smoking, designated work areas shall have facilities to receive cigarette butts. Matches shall be banned.
- Personnel shall be required to minimise interference with existing Barrow Island Lease operations (i.e. no parking or blocking access, marking and avoiding production flowlines, waterlines and powerlines).
- Job Hazard Analysis (JHAs) shall be prepared with appropriately trained personnel and equipment to undertake identified task(s).
- 'Tailgate meetings' shall be regularly scheduled with work crews, where current or specific environmental, health and safety issues shall be discussed.

3.2 Drilling

The following management measures will be applied to drilling offshore and onshore wells, as appropriate. Separate detailed EMPs will be prepared prior to regulatory approval for the respective drilling programs. Measures to be applied to Horizontal directional drilling (HDD) are outlined in 1.0.

- Legislative requirements (including MARPOL requirements) for ballast water, discharge criteria, garbage, harmful substances and sewage management) shall be met. Biodegradable detergents shall be used onboard.
- Offshore discharge (>12 NM from land) of treated sewage shall be conducted in accordance with Commonwealth *P(SL)A* clause 222 and *MARPOL 73/78*.
- Drilling rigs and support vessels shall meet regulatory requirements for quarantine clearance where the rig or vessels are sourced from outside Australian waters (to prevent potential introduction or translocation of undesirable species and diseases in ballast water or marine surfaces).

- Drilling rigs shall have adequate safety systems such as blowout preventers, alarms and automated shutdown devices in accordance with regulatory and industry standards, and for which adequate maintenance and testing programs are in place.
- Spill Contingency Plans (SCP) shall be developed for potential spill scenarios. Offshore hydrocarbon spill response shall be in accordance with the Gorgon Development SCP approved by the DoIR. The contractor's SCP shall bridge to the operator's Plan to ensure an effective, integrated response to any hydrocarbon spill.
- All rig and support vessel navigation crews shall be qualified under the Flag State and International regulations and duly certified to perform their duties.
- Prior to the start of any operations, agreement shall be reached with the Harbour Master and Pilots/Vessel Masters on procedures and communications (VHF channel, Barrow Island/Gorgon dedicated channels, etc.) to be used on the Development.
- A 'Notice to Mariners' shall be prepared and posted to provide advance notification of the rig's planned location to the local fishing industry, the public and other affected parties.
- Radio watch on shipping traffic and fishing vessel movements shall be undertaken.
- The Australian Maritime Safety Authority (AMSA) shall be notified of the rig's location (and anchor distances).
- Sensitive marine fauna activities (e.g. nesting, migration) shall be considered when planning drilling, piling and dredging plans and operations.
- A marine mammal observation program shall be developed prior to the commencement of drilling activities.
- Specific navigation routes and flight paths and operating procedures shall be developed for supply vessels and helicopters that minimise impact on wildlife.
- Onshore and Offshore rigs shall have safe operating procedures in place which meet regulatory and industry standards (including chemicals and waste management aspects, etc.).
- Drilling rigs shall have efficient solids control and mud recirculation systems which maximise recycling of drilling fluids.
- Drilling rigs shall have adequate on-board comminution, containment, drainage and monitoring systems to prevent overboard discharges of unauthorised effluents (eg. hydrocarbon or chemical contaminated effluents, whole food scraps and sewage, etc.).
- Specialised drilling methods shall be undertaken to avoid impacts to highly valued resources (eg. directional drilling, etc.).
- Special drilling methods shall be undertaken to minimise total discharges to sea (eg. Step-out wells, directional drill).
- Low toxicity, water-based drilling fluid formulations shall be used as far as practicable.
- Oil-based mud formulations shall not be used. Where required fluid properties cannot be achieved using a water-based drilling fluid, a synthetic fluid which is of low toxicity, biodegradable and non-accumulative shall be used.
- A marine safety zone shall be in place for the proposed Development (500 m radius around surface and sub-surface equipment and structures such as pipelines and jetties). This safety zone shall be gazetted under Section 119 of the Commonwealth *P(SL)A*, and will appear on Australian navigation charts.

3.3 Subsea Installation

The upstream subsea equipment (i.e. located over the Gorgon field) includes subsea trees, manifolds, flowlines and associated equipment. Management measures associated with the installation of the Gorgon pipelines are outlined Section 3.4.

The following environmental protection measures will be undertaken:

- Selection of foundation type, location and installation method will consider environmental aspects.
- Equipment will be tested onshore as much as possible to minimise offshore work activities.
- Legislative requirements (including MARPOL), for ballast water, discharge criteria, garbage, harmful substances and sewage management shall be met. Biodegradable detergents shall be used onboard.
- Offshore discharge (>12 NM from land) of treated sewage shall be conducted in accordance with Commonwealth *P(SL)A* clause 222 and *MARPOL 73/78*.
- Installation vessels and support vessels shall meet regulatory requirements for quarantine clearance where the vessels are sourced from outside (or relocated within) Australian waters (to prevent potential introduction or translocation of undesirable species and diseases in ballast water or marine surfaces).
- Installation vessels and support vessels shall have adequate safety systems such as alarms and automated shutdown devices in accordance with regulatory and industry standards, and for which adequate maintenance and testing programs are in place.
- Oil Spill Contingency Plans (OSCP) shall be developed for potential spill scenarios. Offshore hydrocarbon spill response shall be in accordance with the Gorgon Development OSCP approved by the DoIR. The contractor's OSCP shall 'bridge' to the Joint Venturers' to ensure an effective, integrated response to any spill.
- All installation vessel and support vessel navigation crews shall be qualified under the Flag State and International regulations and duly certified to perform their duties.
- Prior to the start of any operations, agreement shall be reached with the Harbour Master and Pilots/Vessel Masters on procedures and communications (VHF channel, Barrow Island/Gorgon dedicated channels, etc.) to be used on the Development.
- A 'Notice to Mariners' shall be prepared and posted to provide advance notification of the installation vessel's planned location to the local fishing industry, the public and other affected parties.
- Radio watch on shipping traffic and fishing vessel movements shall be undertaken.
- The Australian Maritime Safety Authority (AMSA) shall be notified of the installation vessel's location.
- Sensitive marine fauna activities (e.g. nesting, migration) shall be considered when planning installation activities.
- A marine mammal observation program shall be developed prior to the commencement of installation activities.
- Operating procedures shall be developed for supply vessels and helicopters to reduce impact on wildlife.
- Installation vessels and support vessels shall have safe operating procedures in place which meet regulatory and industry standards (including chemicals and waste management aspects, etc.).
- Installation vessels and support vessels shall have adequate on-board comminution, containment, drainage and monitoring systems to prevent overboard discharges of unauthorised effluents (eg. hydrocarbon or chemical contaminated effluents, whole food scraps and sewage, etc.).

- A marine safety zone shall be in place for the proposed Development (500 m radius around surface and sub-surface equipment and structures such as flowlines, manifolds, wellheads, etc). This marine safety zone shall be gazetted under Section 119 of the Commonwealth *P(SL)A*, and will appear on Australian navigation charts.

3.4 Pipelaying

Environmental protection measures to be undertaken as part of the pipelaying activities are outlined below. Measures proposed to manage rock dumping/placement associated with pipeline construction are outlined in Section 3.5; while measures to manage construction of the shore crossing are outlined in Section 3.6. Activities associated with construction of the onshore section dealt with under a number of sections: primarily general conduct (3.1); traffic and access (3.8); earthworks (3.9); blasting (3.10), dust generation (3.11), material import (3.13) and waste management (3.15). These issues will be brought together in a detailed EMP for the onshore feed gas pipeline.

- Selection of pipeline route, installation method and stabilisation technique will include environmental aspects. Stabilisation technique is mainly driven by met-ocean conditions at the site.
- Pipelines shall be separated by sufficient distance such that future pipelines can be installed safely.
- Where anchors are required, anchor management plans will be developed to ensure minimum impact on seabed features from anchors and potential anchor chain scour.
- Legislative requirements, such as MARPOL requirements, for ballast water, discharge criteria, garbage, harmful substances and sewage management shall be met. Biodegradable detergents shall be used onboard.
- Offshore discharge (>12 NM from land) of treated sewage shall be conducted in accordance with Commonwealth *P(SL)A* clause 222 and *MARPOL 73/78*.
- Pipelay barge and support vessels shall meet regulatory requirements for quarantine clearance where the vessels are sourced from outside (or relocated within) Australian waters (to prevent potential introduction or translocation of undesirable species and diseases in ballast water or marine surfaces).
- Further Marine Cultural Heritage survey work shall be conducted during the detailed engineering phase, as input to detailed EMP.
- Pipelay barge and support vessels shall have adequate safety systems such as alarms and automated shutdown devices in accordance with regulatory and industry standards, and for which adequate maintenance and testing programs are in place.
- Spill Contingency Plans shall be developed for potential spill scenarios. Offshore hydrocarbon spill response shall be in accordance with the Gorgon Development Spill Contingency Plan (SCP) approved by the DoIR. The contractor's SCP shall 'bridge' to the Joint Venturers' to ensure an effective, integrated response to any spill.
- All pipelay barge and support vessel navigation crews shall be qualified under the Flag State and International regulations and duly certified to perform their duties.
- Prior to the start of any operations, agreement shall be reached with the Harbour Master and Pilots/Vessel Masters on procedures and communications (VHF channel, Barrow Island/Gorgon dedicated channels, etc.) to be used on the Development.
- A 'Notice to Mariners' shall be prepared and posted to provide advance notification of the installation vessel's planned location to the local fishing industry, the public and other affected parties.

- Radio watch on shipping traffic and fishing vessel movements shall be undertaken.
- The Australian Maritime Safety Authority (AMSA) shall be notified of the pipelay barge's location.
- Sensitive marine fauna activities (e.g. nesting, migration) shall be considered when planning pipelaying activities.
- A marine mammal observation program shall be developed prior to the commencement of pipelaying activities.
- Operating procedures shall be developed for supply vessels and helicopters to reduce impact on wildlife.
- Pipelay barge and support vessels shall have safe operating procedures in place which meet regulatory and industry standards (including chemicals and waste management aspects, etc.).
- Pipelay barge and support vessels shall have adequate on-board comminution, containment, drainage and monitoring systems to prevent overboard discharges of unauthorised effluents (eg. hydrocarbon or chemical contaminated effluents, whole food scraps and sewage, etc.).
- Pipeline hydrotesting is addressed in Section 3.17.
- A marine safety zone shall be in place for the proposed Development (500 m either side of the pipeline corridor. This marine safety zone shall be gazetted under Section 119 of the Commonwealth *P(SL)A*, and will appear on Australian navigation charts.

3.5 Rock Dumping/Placement

The following environmental management and protection measures are proposed for rock dumping/placement activities associated with pipeline stabilisation and construction of the MOF:

- A suitably scaled map of the rock dumping/placement site (the relevant sector from an AusMap), including a clear grid reference, showing bathymetric contours, the boundaries of the site and distance from land shall be prepared. Particular reference shall be made to specific marine zoning which may have a bearing on the rock dumping/placement.
- The method(s) to be used in positioning the dumping vessel shall be identified.
- Details of the sea-bed topography, sediment characteristics, and biological characteristics (including life-cycle and timing sensitivities of cetaceans, turtles, dugongs, etc), and history of the area shall be described in the detailed EMP.
- The disposal techniques (i.e. side-cast, chute or flexible fall-pipe) and procedures shall be identified along with the size distribution and type of rock to be dumped.
- The anticipated schedule, vessel(s) and other relevant information shall be identified.

3.6 Horizontal Directional Drilling

Horizontal directional drilling (HDD) techniques may be used to install short, but critical sections of the Onshore Feed Gas Pipeline, and possibly the Optical Fibre Cable and the Domestic Gas Pipeline. The following measures shall be undertaken to minimise potential environmental impacts associated with the construction of these sites:

- The clearing or footprint of the HDD site shall be minimised to the extent practical.
- The site shall be graded and levelled and designed to allow drainage of uncontaminated areas and collection of water in those areas subject to potential contamination (see Earthworks, Section 3.9).
- Access shall be managed in accordance with Section 3.8.

- Noise, air, light and dust emissions shall be in accordance with Sections 3.10, 3.11, and 3.12, respectively.
- Waste, spills and leaks shall be handled in accordance with Sections 3.15 and 3.19.

3.7 Piling

3.7.1 Offshore Piling Construction and Installation

As offshore pile driving involves similar vessels, and equipment to some of the other Development's marine components (i.e. offshore drilling, subsea installation, pipelaying and dredging), many of the same environmental management and protection procedures will be undertaken, including:

- Pre-construction surveys shall be designed to investigate marine habitats and species use (particularly flatback turtles) in the area to identify and map sensitivities, important habitats, population and distribution and potentially sensitive life-cycle timing.
- Jetty pilings shall be located to reduce impact to important and sensitive marine habitats.
- Sensitive marine fauna activities (e.g. nesting, migration) shall be considered when planning drilling, piling and dredging plans and operations.
- Vessels and support equipment and anchors shall be located to avoid areas of conservation significance where practicable.
- No un-authorized pile driving shall occur.
- The construction workforce, construction and supply vessels shall be restricted to designated areas. Recreational fishing, diving, spear-fishing, fossicking, surfing, or boating shall be prohibited.
- A marine mammal observation program shall be developed prior to the commencement of activities
- Further Marine Cultural Heritage survey work shall be conducted during the detailed engineering phase, as input to detailed EMP.
- Sensitive turtle breeding, nesting and hatchling periods shall be factored into the jetty construction schedule to the extent practical.
- Sediment plumes shall be modelled to provide input to jetty piling design and detailed EMP.
- Moorings shall be established for support vessels to minimise anchoring requirements. Anchoring sites and locations shall be selected that reduce impacts on fauna.
- Light levels and turtle hatchling behaviour shall be monitored for the period November to March.
- The performance and availability of vessels, plant and equipment capable of undertaking the work proposed shall be reviewed and analysed. This includes comparison with the physical constraints of the site and/or equipment (i.e. potential restriction of certain equipment due to shallow waters or sea states).
- Drawings and plans showing sufficient detail to allow accurate field identification (i.e. appropriate scale, bathymetric and met-ocean information, GPS and Lat/Long coordinates, pile locations, etc) shall be prepared.
- All pipeline and other marine and navigational infrastructure will be located, verified and marked prior to construction activities. Survey and identification procedures (i.e. system of buoys, flagging, navigational lighting, signage, etc.) will be used. Work specifications will clearly define equipment limitations and procedures for working in the vicinity or crossing these facilities.

- A 'Notice to Mariners' shall be prepared and posted to identify the location, timing, and any new navigational aids or details related to the construction and installation of the jetty and berthing dock.
- All navigation in Barrow Island Port shall be performed under Port Regulations.
- All vessel navigation crews shall be qualified under the Flag State and International regulations and shall be duly certified to perform their duties.
- Prior to the start of any operations, agreement shall be reached with the Harbour Master, Vessel Masters and Pilots on procedures and communications (VHF channel, Barrow Island/Gorgon dedicated channels, etc.) to be used within the Development area. Specified communication channels will be established and available for all marine traffic.

3.7.2 Onshore Piling or Plinth Construction and Installation

Onshore piling or plinths will be required on Barrow Island for above ground feed gas pipelines, auxiliary lines, CO₂ injection pipeline and water lines. Activities associated with construction of the onshore plinths are dealt with under a number of sections, primarily: general conduct (3.1); traffic and access (3.8); earthworks (3.9); blasting (3.10), dust generation (3.11), material import (3.13) and waste management (3.15). These issues will be brought together in the detailed EMPs for the relevant development component.

3.8 Traffic and Access Management

Access to Development areas for equipment and workers is required for the construction and operation of the Development. For the majority of the Development, including the pipelines, access will be along existing roads and seismic lines. Because of the size and amount of construction equipment used in construction, upgrading of existing access in particular areas will be required.

The following environmental protection measures shall apply to vehicle and equipment access:

- Relevant Lessees and regulatory authorities shall be consulted regarding the use and upgrading of existing roads and seismic tracks, and the selection, location, and development of new access routes.
- Existing roads, seismic tracks, and other previously disturbed areas, shall be used in preference to creating new access.
- Where new access tracks are required, important ecological features such as bettong warrens, listed vegetation species and cultural heritage sites shall be avoided.
- Where new permanent access roads are required, topsoil shall be removed prior to new road surface preparation and either stockpiled in windrows adjacent to temporary access for re-spreading during reclamation or stockpiled for possible use at other locations where permanent access will remain.
- Vehicle speeds shall be restricted to a maximum of 60 km/hr in daylight and 40 km/hr at night, and shall be restricted to minimise potential wildlife collisions and dust.
- Dust suppression measures shall be used on road and construction sites where required.
- New access shall, where practical, avoid crossing waterways.
- Drainage channel crossings shall be designed and constructed in a manner that minimises sediment release (e.g., erosion berms, silt fences and sediment basins), does not prevent water flows and is capable of accommodating locally significant rainfall events.

- Where vehicles and equipment are required to cross existing utilities (e.g., waterlines, flowlines, power and communication cables etc.) protective measures such as ramps, signage and flagging shall be used to identify and protect these facilities.
- Vehicles shall remain on designated access roads and within the defined Development construction area and associated work/staging sites unless otherwise authorised. This shall be supported by workforce education, signs, boundary markers and fences.
- Vehicle parking shall be restricted to designated areas unless otherwise authorised.
- Following completion of construction, access not required for the operation or maintenance shall be closed and rehabilitated.
- Surface drainage patterns intercepted by access not required for the Development's operation or maintenance shall be rehabilitated as soon as practicable.

3.9 Earthworks – Site Clearing and Grading

The following environmental management measures shall apply to earthworks associated with any Development component (such as construction of the onshore pipeline, drill pads, the gas processing facility, accommodation and utilities):

- Further vegetation and cultural heritage surveys shall be conducted during detailed design phase, as input to detailed EMPs.
- An experienced and trained Site Environmental Officer with access to specialist biologist(s) will be employed to inspect construction areas prior to any site clearing.
- Un-authorized clearing shall not be permitted.
- The area of exposed soils shall be limited to that required for safe construction and operation.
- All planned land disturbance shall be clearly designated, with areas to be cleared surveyed and pegged in the field in accordance with design plans and in advance of any clearing activities.
- All pipeline and other underground and above-ground facilities including gas, water, sewer, and communication systems will be located, verified and marked prior to construction activities.
- Drainage channel crossings shall be designed and constructed in a manner that minimises sediment release (e.g. installation of erosion berms, silt fences and retention/settling basins), does not prevent water flow and is capable of accommodating locally significant rainfall events.
- Where necessary, retention/settling basins will be located in previously disturbed areas and will be constructed to intercept, settle and then redirect uncontaminated site drainage to the nearest drainage zone (within the same catchment/basin).
- Erosion and drainage control devices shall be installed where required and maintained on drainage lines to control surface run-off and minimise soil loss from the working areas.
- Storm/cyclone events could potentially breach retention/settling basins. Basins shall be engineered and constructed to allow for storm events without erosion or damage.
- Nearshore construction activities will be scheduled to minimise overlap with key breeding periods for sensitive protected fauna (e.g. turtles) where practicable.
- Sensitive vegetation communities and habitats in proximity to working areas shall be clearly marked and access to these areas will be prohibited, unless otherwise approved.

- On sites to be cleared or graded, vegetation shall be removed, mulched and either stored for later rehabilitation or directly placed on disturbed areas to reduce erosion and to encourage native seed propagation.
- Stockpiled vegetation shall be segregated from work areas.
- No burning of vegetation during site clearing shall occur unless otherwise approved.
- Topsoil, where present, shall be stripped prior to land grading. Stripping will be to a depth of colour change, dependent on local soil profiles.
- Topsoil shall be stored in a windrow or stockpile which shall be discernibly separate from any other graded or excavated materials. Topsoil shall not be contaminated with anything that might impair its plant-support capacity (e.g. aggregate, cement, concrete, fuels, litter, oils, domestic and industrial waste).
- Cleared vegetation, topsoil or subsurface material shall not be stored in drainage channels.
- Flagging or temporary fencing shall be used to clearly delineate sensitive 'no go' areas such as important vegetation, fauna habitat or areas of cultural heritage significance. Features marked in this manner shall not be disturbed. Flagging and temporary fencing shall be removed at the completion of construction.
- Construction pads and lay down areas shall be compacted to limit the potential infiltration of treated grey water to the subsurface environment.
- Hardstand runoff shall be contained within a settling/holding basin and shall only be discharged to natural drainage if it meets agreed water quality standards.
- Potential sources of ignition shall be identified through the Job Hazard Analysis process. A hot work permitting system will be used to minimise risk of fire from Development activities.
- Soil and surface stability shall be maintained at all times; cut and fill excavation will be shaped to maintain slope stability and temporary erosion control berms, drains and sediment barriers shall be installed as necessary and maintained until final construction clean-up is completed.
- Grading, drill and blast techniques will be adopted which reduce dust, noise and vibration effects (see Section 3.10).
- Mufflers and other appropriate noise suppressants will be used on heavy equipment where practicable.

3.10 Blasting (Noise and Vibration)

In rock terrain where the use of conventional excavation or ripping equipment alone is not feasible, it will be necessary to undertake controlled blasting. The following environmental management measures shall apply to all activities that involve blasting (and the generation of associated noise and vibration):

- Blasting procedures shall be conducted in compliance with Development specifications and relevant legislation.
- The handling, storage and use of explosives shall be in accordance with legislation and Industry Standards.
- Blasting activities shall be conducted in a manner that reduces the amount of clearing, grading and soil disturbance required.
- Drill and blast techniques shall be planned and adopted that reduce dust, noise and vibration effects (i.e. using smaller, more frequent blasts, as opposed to less frequent, larger blasts; using sequential, staggered, or time-delayed charges or shaped charges to minimise cumulative effects of the explosions).
- Equipment used to undertake grading and excavation work shall be appropriately sized.
- Mufflers and other appropriate noise suppressants shall be used on heavy equipment where practicable.

- Blasting mats shall be used where required.
- Blasting shall be scheduled to avoid sensitive lifecycle periods of wildlife species (e.g., breeding, nesting, migration) where practical.
- Blasting shall be scheduled for daylight hours only to avoid activity peaks for nocturnal mammals (dusk to dawn).
- Continuous soft start and repetitious warning shots (air guns) shall be used prior to blasting in the marine environment use.
- A marine mammal observation program shall be developed prior to the commencement of activities.
- Vessel speed and access shall be strictly controlled.
- Consideration of physical removal of turtles using controlled trawling methods if efforts such as warning shots are not satisfactory and turtles are not clearing the blast area.
- Blasting activities shall be suspended turtle breeding season if individuals cannot be satisfactorily removed from the area and blasting results in mortality.
- Blast rock shall be reused where suitable and practicable (for erosion control rip-rap at drainages, water discharge areas, access control or potential wildlife habitat creation etc).
- All blasting refuse, such as containers, cartridges, caps and wire shall be recovered for disposal in accordance with the approved Waste Management Plan.

3.11 Air and Dust Emissions

The following environmental management and protection measures shall apply to construction activities that have the potential to result in gaseous or dust emissions to atmosphere:

- Industry standards shall be adopted for refuelling, transfer and storage of fuels and chemicals (e.g. level indication, overflow protection, containment, bunding, appropriate drainage systems and hardstand areas) to reduce fugitive emissions.
- Any hydrocarbon or volatile chemical spill shall be cleaned up as soon as possible.
- Vehicle speeds shall be restricted to a maximum of 60 km/hr in daylight and 40 km/hr at night.
- Buses shall be used to minimise the number of vehicle movements.
- Off-road or off-site vehicle use will be prohibited without prior approval.
- Unpaved surfaces shall be stabilised to reduce dust generation. Dust suppression measures, such as use of water carts and sprinklers on exposed soils and roadways, shall be implemented. Dust suppression shall be managed to ensure that measures do not result in erosion or significant runoff. Treated grey water shall not be used for dust suppression on exposed karst formations
- Fire (and related emissions) shall be prevented and managed in accordance with Section 3.19.
- An approved dust monitoring program shall be established.
- Construction vehicles and equipment shall be regularly maintained to ensure efficient operation and appropriate emissions standards.
- Australian standard low-sulphur diesel shall be used as the vehicle and equipment fuel source.
- Modular construction techniques shall be employed to the extent practical to reduce net diesel emissions from construction machinery.
- Alternatives to ozone depleting substances shall be selected wherever practicable. Contractors shall be required to advise of the use of ozone depleting substances and develop management plans to avoid release.

3.12 Lighting

The following management measures shall be adopted to reduce potential effects of construction lighting on sea turtles and other important marine fauna:

- Outdoor light level shall be reduced by the application of a range of strategies including: using low-pressure sodium vapour lights; reducing wattage in sensitive areas; using focused lighting units to concentrate light; shielding light sources; using artificial or natural screens; recessing sources; lowering mountings; using timers; or motion sensors.
- Night time construction activities in the near shore areas shall be minimised to the extent practical.
- Areas of construction shall be lit only when personnel are present or equipment is operating.
- Where practicable, vessel and barge loading and unloading shall be conducted during daylight hours. Where this is not practicable, lighting shall be reduced to safe levels.
- Lights shall be located such light emissions will be blocked by process vessels, equipment or structures, where practicable.
- Where colour definition or safety is not critical, light types shall be selected that are least disruptive to sea turtles (such as shielded or recessed lighting with long wavelengths).
- Construction lighting on the MOF causeway and LNG jetty shall be mounted low, shielded and focused towards the travelled pathway to reduce light spill.
- Lights shall be directed away from large plant and equipment to reduce glow effects.
- Lighting on construction vessels working at night during January to April (turtle nesting season) shall be shielded and directed onto work areas, long wavelength and switched off when not in use, to minimise attraction of hatchlings
- Matt paints and colours such as greys or shades of brown/olive shall be used to minimise the effect of reflective surfaces, paints or coatings which would contribute to glow.
- Window blinds shall be installed and used to eliminate spill from internal lighting.
- Commissioning flaring shall be reduced to the extent practical.
- A light audit shall be conducted during the turtle breeding, nesting and hatching periods (November to April) to assess illumination at the turtle beaches and light spill into marine areas.

Survey and monitoring strategies that will be adopted are to:

- monitor hatchling behaviour on nesting beaches and implement contingency responses if light levels are causing disorientation in hatchlings.
- conduct regular lighting inspections to assess compliance with lighting strategy
- conduct regular inspections of dune areas to assess whether hatchlings are becoming disorientated and moving inland
- undertake intervention (manual collection and relocation of hatchlings) under the supervision of CALM in any areas where a significant effect on hatchling orientation is resulting from lighting
- manage lighting on LNG tankers at night during January to April (turtle nesting season) to minimise attraction to hatchlings (shield and direct lights onto work areas, use long wavelength light sources and turn lights off when not in use).

The implementation detail for these strategies will be developed, in consultation with CALM and the Department of Environment (DoE), and submitted for approval as part of the detailed EMP for the Development.

3.13 Dredging and Dredge Spoil Disposal

The following management measures shall apply to dredging and spoil disposal activities:

- Routes for the feed gas pipeline, domestic gas pipeline and optical fibre cable shall be selected to avoid areas of sensitive benthic primary producers.
- Final MOF access channel alignment shall be selected to reduce the volume of dredging across the nearshore limestone reef platform. Facilities on the east coast of Barrow Island shall be designed to reduce indirect impacts to benthic primary producers.
- A solid fill causeway and open pile jetty shall be designed to reduce interruption to local hydrodynamics and sedimentation patterns.
- Jetty pylons shall be located to avoid impacts to corals.
- Dredge spoil ground location shall be selected to avoid adverse impacts to macrophytes and corals. An anchor management plan shall be developed for each operation to avoid unnecessary anchor set and anchor chain scour in areas of corals and macroalgae. Anchor chains shall be managed to reduce contact with the seabed.
- An adaptive management strategy shall be developed and implemented for dredging operations that is based on three management zones, determined on the basis of predicted environmental impact (refer to Box 1).

Box 1: Management Zones

Zone 1 – (Zone of High Impact): Area where high coral mortality may result directly from dredging or construction, burial by dredge spoil, or indirectly from smothering by sediment and/or deterioration in water quality.

Zone 2 – (Zone of Moderate Impact): Area where some coral mortality may result indirectly due to deterioration in water quality and/or an increase in sedimentation rates.

Zone 3 – (Visible plume): Area that may experience marginal increases in turbidity, but not to the extent that corals, or other components of the benthos, are likely to suffer any measurable impacts.

(Refer to Draft EIS/ERMP Chapter 11).

- Adaptive management actions shall be triggered by the results of a comprehensive monitoring program used to investigate water quality, sedimentation and coral health. Monitoring methods shall include use of satellite imagery, aerial survey, and field sampling.
- Fortnightly sedimentation and coral health monitoring shall be conducted in Zone 1 and Zone 2; and as required in Zone 3 and reference sites.
- Prior to finalisation of the monitoring program, additional geophysical, metocean, bathymetric and biological surveys shall be conducted to enhance the knowledge and understanding of the marine environment of the Development area.
- The monitoring and adaptive management plan will be refined, in consultation with the Commonwealth and Western Australian regulatory agencies.
- Monitoring results shall be assessed against alert trigger levels and a tiered management response implemented as follows:

Tier 1 Management Actions

- The initial trigger for management shall be based on water quality (total suspended solids (TSS)) and sedimentation data collected in Zone 2 and 3, respectively (refer to Table 3).
- Should monitoring show that TSS or sedimentation rates at monitoring sites in Zone 2 or Zone 3 have increased above the trigger levels, the following series of management measures shall be progressively implemented :
 - The Gorgon Dredging Site Manager shall be advised immediately.
 - Tidal, wave, and wind forecasts shall be checked and verified to predict the likely duration of the event(s) that caused the Trigger Level exceedance.
 - Management options shall be reviewed available in the event that the monitoring results progresses to the Coral Health Trigger Level.
 - Compliance with the contractor's approved work practices shall be verified.
 - The dredging contractor shall adjust work practices as required.
 - Dredge contractor shall be advised of the need to temporarily halt operations should the exceedance continue.
 - TSS and sedimentation monitoring shall intensify in the exceedance area to verify the level, duration, concentration and/or rate of these two variables and identify the likely source(s) of turbidity and sedimentation and any confounding factors.
 - Coral Health Monitoring shall be undertaken within 14 days of the exceedance.
 - Tier 1 management shall cease if within 18 days following the exceedance if:
 - TSS and sedimentation rates in Zone 2 and Zone 3 are each less than the criteria; and
 - Coral mortality in Zone 3 is below detectible limits and in Zone 2 is consistent with predicted partial mortality.

Table 3: Alert Trigger Levels

Zone	Water Quality Parameter	Trigger Level (Concentration)	Time (Consecutive Days)
Zone 2	TSS	Median TSS at moderate impact sites is greater than three times the median TSS at appropriate reference sites.	Two consecutive days of non-achievement will trigger tier 1 management.
	Sedimentation	Mean daily rates of sedimentation at moderate impact sites is greater than three times the mean daily rate of sedimentation at appropriate reference sites. Mean rates of sediment accumulation are calculated over the 14 day deployment period.	Fourteen days of non-achievement will trigger tier 1 management.
Zone 3	TSS	The five-day running median of TSS at monitoring sites within the visible plume zone is greater than the 80th percentile of the five-day running median TSS at appropriate reference sites.	Two consecutive days of non-achievement will trigger tier 1 management.
	Sedimentation	Mean daily rates of sedimentation at monitoring sites within the visible plume zone is greater than 1.5 times the mean daily rate of sedimentation at appropriate reference sites. Mean rates of sediment accumulation are calculated over the 14 day deployment period.	Fourteen days of non-achievement will trigger tier 1 management.

Tier 2 Management Actions

- Should coral health exceed threshold (trigger) values in Zones 2 or Zone 3 (refer to Table 4) the following management measures shall be implemented:
 - The influence of seasonal factors, storm activity and run-off events shall be assessed and considered prior to any response.
 - Additional monitoring (frequency and location) and testing will be conducted to verify coral health results are a consequence of dredging operations.
 - The dredging and disposal sequence shall be modified to reduce potential impact.
 - The hours of continuous dredging shall be reduced until water quality and sediment loading return to acceptable levels at the affected location(s).
 - Approval of the relevant regulatory agency shall be sought to modify the dredging and/or spoil disposal operations to allow works to continue.

Table 4: Coral Health Threshold Level

Zone	Threshold Level (Coral Mortality)
Zone 2	Partial bleaching of large, reef building corals (e.g. <i>Porites</i>) or relatively resilient species (e.g. <i>turbinaria</i>) exceeds 10%, or partial bleaching of fast growing, sensitive species (e.g. <i>Acropora</i>) exceeds 50%, compared to appropriate reference sites.
Zone 3	Low level mortality of coral species, as evidenced by a statistically detectable decrease in live coral cover compared to appropriate reference sites. A level of 10% is likely to be the minimum level of detection using current coral monitoring techniques.

Tier 3 Management Actions

- Should coral health exceed Coral Health Limit Levels (refer to Table 5), the following management measures shall be implemented:
 - The influence of seasonal factors, storm activity and run-off events shall be assessed and considered prior to any response.
 - Dredging and disposal activities shall be suspended.
 - Dredging and disposal activities shall only recommence when it can be demonstrated to the satisfaction of the Minister for the Environment, upon advice from the EPA that:
 - Any new activity would not contribute to further net mortality of corals at any site(s) at which the limit level had been exceeded.
 - The ambient environmental conditions at any site(s) at which the limit level had been exceeded are such as to not prevent recovery.

Table 5: Coral Health Limit Level

Zone	Limit Level (Coral Mortality)
Zone 2	Partial mortality of large, reef building corals (e.g. <i>Porites</i>) or relatively resilient species (e.g. <i>turbinaria</i>), as evidenced by a greater than 30% decrease in live coral cover compared to appropriate reference sites.

Zone	Limit Level (Coral Mortality)
Zone 3	Mortality of coral species, as evidenced by a statistically detectable decrease in live coral cover compared to appropriate reference sites. A level of 10% is likely to be the minimum level of detection using current coral monitoring techniques.

3.14 Quarantine Management

The following quarantine management measures shall apply to all activities that have the potential to introduce non-indigenous species to Barrow Island and the surrounding waters:

- A risk-based approach shall be adopted to quarantine management. This approach will focus on pre-border prevention of the introduction of non-indigenous species, with post-border contingencies for detection and eradication.
- A Quarantine Management System (QMS) shall be designed specifically for the Gorgon Development and will align with AS/NZS ISO 14001.
- Information developed, as necessary, for the QMS shall be integrated into existing business support systems to the extent possible; and additional tools shall be developed to capture information specifically related to quarantine barriers and risk management.
- Quarantine requirements shall be included in pre-qualification of suppliers and contractors. Only contractors and suppliers that have demonstrated a willingness to meet or exceed the Development quarantine standards shall be engaged.
- Quarantine requirements shall be included in contracts for all contractors and suppliers providing goods and services for Barrow Island.
- All relevant personnel shall be inducted regarding quarantine management requirements.
- Specific quarantine training shall be provided to personnel in the procurement and logistics supply chain.
- Quarantine responsibilities shall be included in the position description for key personnel.
- A strong culture of quarantine awareness shall be developed and promoted in the workforce.
- Any quarantine emergency shall be responded to quickly and effectively, utilising the expertise of nominated specialists and relevant government agencies.
- A monitoring program to determine the effectiveness of the implemented quarantine barriers shall be reviewed by flora and fauna specialists, and incorporated into the QMS.
- Quarantine compliance for all personnel and goods going to Barrow Island shall be recorded and tracked.
- The Gorgon Joint Venturers shall work closely with CALM to ensure that there is an ongoing examination and audit of the QMS, and regular quarantine compliance audits and checks shall be conducted throughout the supply chain.
- The quarantine management process shall include stakeholder engagement and reporting.

Management of Quarantine on Priority Pathways

Eleven pathways have been identified for the transfer of vessels, cargoes, and personnel to Barrow Island. Of these, three specific pathways (namely sand and aggregate, food and perishables and personnel and accompanying luggage) present the highest risk of transfer of non-indigenous species to Barrow Island and are therefore considered priority

pathways for assessment of quarantine risk. A pool of measures (or barriers) to prevent the introduction of non-indigenous species has been identified, and from this, via the risk assessment workshop process, the following conceptual barriers have been identified. These barriers are subject to further scrutiny and design modification prior to implementation via a Hazard Operability (HAZOP) analysis (refer to Chapter 12 of the Draft EIS/ERMP). Prior to construction quarantine barriers will be selected for all pathways via this process.

The following quarantine barriers shall be adopted for the **sand and aggregate** pathway:

- A Quarry Environmental Management Plan shall be implemented
- Quarry equipment shall be cleaned and inspected.
- Quarry material shall be covered in segregated storage.
- Quarry material shall be sampled to verify compliance.
- Material shall be covered during sea transport.
- Additional quarantine barriers will be implemented subject to the completion of the barrier selection process.

The following quarantine barriers shall be adopted for the **food and perishables** pathway:

- manage receipt, screening, consolidation, despatch from a central facility
- pre-process fresh food and vegetables prior to despatch
- select packaging to allow visual inspection; reduce organic packaging
- inspect, seal and tag shipping containers
- comply with record of food and perishables items prohibited from transport to Barrow Island
- design kitchen facility with internal quarantine zones and barriers to contain and eradicate non-indigenous species
- implement a dedicated food and packaging waste containment and removal program.
- Additional quarantine barriers will be implemented subject to the completion of the barrier selection process.

The following barriers shall be adopted for the **personnel and accompanying luggage** pathway:

- pre-employment agreements, including awareness training and inductions to appreciate quarantine risks and barriers which carry personal responsibilities
- all luggage is inspected via x-ray or visual by trained inspectors
- declaration of quarantine compliance for personal luggage
- cleaning of aircraft to meet quarantine standards
- shipment of toolboxes and work cargoes not accepted as checked luggage and processed through mainland logistics base
- transit passengers, luggage and freight contained in secure area at Barrow Island airport
- management plan for flights departing from locations other than Perth
- verification of personnel, luggage and freight on arrival.
- Additional quarantine barriers will be implemented subject to the completion of the barrier selection process.

3.15 Waste Management

The following waste management measures shall apply to all construction activities:

- Wastes shall be managed in accordance with the principles of: eliminate, reduce, reuse, recycle/recover, treat and dispose of wastes in an environmentally responsible manner.
- MSDS information on hazardous materials shall be reviewed to identify opportunities to substitute them with a less hazardous or non hazardous replacement.
- Waste management shall be included in the Job Hazard Analysis process.
- To minimise packaging wastes, supply materials shall be purchased in bulk wherever practicable.
- Wastes shall be identified, classified and segregated into specified areas to facilitate recycling.
- Unused materials shall be returned to suppliers wherever practicable.
- Chemical and other consumable suppliers shall be required to receive containers for refilling rather than for waste disposal.
- Specific waste management procedures shall be developed for each waste stream (solid, liquid and hazardous) and identified in the detailed Waste Management Plan. Emergency response and spill contingency planning measures shall be implemented in accordance with Section 3.19.
- The handling of non-destructive test media shall be in accordance with industry and regulatory requirements.

Onshore

In addition to the above general measures, the following waste management measures shall be adopted for onshore construction activities:

- Construction wastes not re-used or recycled shall be collected at designated sites, initially stored and appropriately contained on location taking into consideration fire, safety, worker health, and pest and odour control. In general, solid wastes generated during construction and operations shall either be incinerated or returned to the mainland for re-use, recycling or disposal in approved facilities.
- General rubbish such as food wrapping, garbage, and sanitary waste, shall be confined to the work site and collected daily for appropriate disposal at an approved location.
- Construction rubbish shall be collected for disposal at an approved location. Rubbish shall not be disposed of in any excavation or trench.
- Liquid wastes, redundant chemicals and batteries shall be disposed of on the mainland by a licensed waste disposal contractor.
- Liquid wastes from construction will generally be treated and then disposed into deep injection wells. Exceptions include use of treated grey water for dust suppression and disposal of chemicals and hydrocarbon at approved sites on the mainland.
- Except for emergency situations, vehicles and other equipment shall be maintained and washed at a designated maintenance yard. The maintenance facility shall accommodate a concrete or other impervious surface which shall drain to a sump. Water and potential wastes and contaminants collected in the sump shall be pumped to a separator where it shall be regularly removed by a waste contractor. Waste hydrocarbon shall be stored in labelled drums or tanks for disposal by a waste Contractor.
- Portable toilet facilities shall be located at convenient sites where workers shall have access.
- All holding basins shall be cleaned and maintained regularly.

- Segregated waste storage areas and containers shall be located away from drainages and low-lying areas. Containers shall be appropriately labelled. The area shall be graded to drain away from the storage areas to a settling basin and sump which can be emptied, as required.
- Contaminated soil shall be stored in a dedicated bin or on a designated impervious surface for removal to the mainland for bioremediation or landfill.
- Use of disposable food and drink containers shall be avoided, where practicable. The use of plastic bags shall be avoided except for containing food or putrescible wastes.
- Installation and use of a compactor/crusher for certain solid waste and recycle streams (i.e. aluminium, timber, and paper) shall be considered.
- Installation of an incinerator (possibly with heat recovery) shall be considered.
- Potentially contaminated runoff shall be contained within a holding basin and shall be discharged once cleared of any potential contaminants. Potentially contaminated hardstand water shall be captured in a holding basin, where an Oil in Water (OIW) separator system shall recover the hydrocarbon, and the water reinjected into existing or purpose constructed disposal wells.
- Potable water shall only be used where such quality is required (that is alternative water sources shall be used for drilling water, construction, dust suppression, and toilet flushing, etc.)
- Flow meters shall be installed on water sources and discharges to enable targets for reduction to be set and monitored. Sampling facilities shall be designed into on discharges.

Offshore

- Drilling rigs, pipeline lay-barges, tankers, rock dumping vessels and other supply and support vessels shall have efficient and fully operational oil/water separators in bilges.
- Ballast water shall be exchanged beyond the 12 nautical mile limit by an approved method, and shall not be discharged in port.
- The Ballast Water Decision Support System shall be used to provide vessels with a risk assessment of ballast water.
- No waste will be disposed overboard within 12 nautical miles.
- Beyond 12 nautical miles comminuted sewage and food wastes, drilling cuttings, drilling fluids and uncontaminated deck wash-down wastes shall be disposed overboard in accordance with regulatory requirements and project-specific approval conditions.
- On vessels operating less than 12 nm from land, sewage and grey water shall be stored in tanks for disposal to an approved shore-based treatment system.
- Food wastes shall be macerated so that they can pass through a 25 mm mesh before being discharged to sea, in compliance with Clauses 222 and 616 of the Schedule to the Commonwealth *Petroleum (Submerged Lands) Act 1967*, and the *International Convention for the Prevention of Pollution from Ships (MARPOL)* regulations.
- Deck drainage water shall be directed overboard if clean, or to a sump and oil/water separator if it contains traces of hydrocarbon. Contaminated drainage from decks and work areas shall be collected and processed to remove hydrocarbons.
- The discharge of surfactants, dispersants and detergents shall be minimised. Detergents or dispersants used for wash-down shall be biodegradable and phosphate free. The use of detergents shall be managed to reduce the opportunity for entry to the oily water separation system, as they adversely affect separation.
- Waste oil shall be stored in labelled drums or tanks for disposal.

- The recirculation of drilling fluids shall be optimised to minimise total discharges.
- Drilling cuttings and fluid discharges shall be monitored to ensure compliant oil concentrations.
- Discharges from essential operations such as grouting of the conductor and surface casing strings (eg. cement mixture circulation, surplus cement fluid and powder, etc.) shall be minimised.
- Discharges from drilling rigs shall be staged (eg. disposal of excess fluid at end of well) where necessary to achieve optimum dispersal.
- Where small amounts of oil additives (eg. spotting pills) are added to drilling fluid on a one-off basis, the Designated Authority shall be consulted on disposal.
- Non-incinerable domestic wastes shall be collected and compacted for onshore disposal. Detailed documentation and manifests shall be kept. Onshore receiving and disposal measures shall meet local government requirements. Waste containers will be closed to prevent loss overboard.

3.16 Shipping and Navigation

The following environmental management and protection measures shall be adopted to reduce the risk of damage to life, property and the environment that could be caused by vessel collision, grounding, equipment failure, fire, or refuelling incident:

- All relevant marine personnel shall be appropriately trained in navigation and communication procedures. All vessel navigation crews shall be qualified under the Flag State and International regulations. Crews shall be duly certified to perform their duties.
- All navigation within the Barrow Island Port boundary shall be performed under Port Regulations, current Notices to Mariners and the *International Regulations for Preventing Collisions at Sea (1972)* and amendments.
- Prior to the start of any operations, agreement shall be reached with the Harbour Master, Vessel Masters and Pilots on procedures and communications to be used within the Development area. Specified communication channels will be established and available for all marine traffic.
- All operations shall be conducted in accordance with Australian and International Conventions and regulations, particularly the *International Regulations for Preventing Collisions at Sea (1972)*, *International Convention for the Safety of Life at Sea (SOLAS) 1974*, *Marine Act 1982 (WA)*, *Shipping and Pilotage Act 1967 (WA)* and *Marine Navigation Aids Act 1973 (WA)*.
- An Oil Spill Contingency Plan (OSCP), consistent with Australian Marine Safety Association (AMSA) and MARPOL requirements, shall be prepared and approved prior to commencing marine construction or shipping activity.
- Communication shall be maintained with vessels wishing to transit the Development area, especially those areas being constructed.
- Marine and meteorologic conditions shall be forecast, monitored and communicated to construction vessels.
- Vessel and equipment location and movement shall be recorded and made available to all vessels working in the Development area.
- All pipeline and other marine and navigational infrastructure shall be located, verified and marked prior to construction activities. Survey and identification procedures (i.e. system of buoys, flagging, navigational lighting, signage, etc.) shall be used. Work specifications shall clearly define equipment limitations and procedures for working in the vicinity or crossing these facilities.
- A 'Notice to Mariners' shall be prepared and posted identifying the location, timing, and any new navigational aids or details related to the dredging and dredge spoil disposal works, drilling activity and submarine pipeline and communication infrastructure.

- Vessel speed restrictions shall be established and enforced in accordance with Barrow Island Port Authority. Should any pilot or vessel master request additional sea space to perform required manoeuvres because of size, draught or safety, the dredge or trailer hopper barge shall be moved to a safe location. Follow AMSA/Auscoast warnings; with navigational standards and procedures.
- Permanent moorings shall be installed where practicable, to minimise need for anchoring.
- All incidents, including near misses, shall be reported and recorded in accordance with regulatory and corporate Chevron guidelines.
- Whale, dolphin, dugong and sea turtle sightings will be recorded, collated and reported to HES Manager. This shall be forwarded to CALM, the WA Museum and Department of the Environment and Heritage Marine Species Section. Whale (and dolphin) observations shall be recorded on the standard cetacean sighting form.
- All towed equipment shall be labelled in the event of loss during the construction program.
- In the event of a cyclone, all marine vessels, dredging and spoil disposal operations shall be suspended and made safe in accordance with the Gorgon Development's emergency procedures.

3.17 Facility Testing

The following environmental management and protection measures shall be adopted:

- Prior to testing, the contractor shall prepare a hydrostatic testing plan which as a minimum shall include:
 - the location and detailed description of the water source
 - the volume of water required and the extraction rate
 - the anticipated quality of the source water (including chemistry and total suspended solids)
 - the equipment and infrastructure required for the testing
 - the location and detailed description of the receiving environment into which the effluent shall be discharged
 - a description and the concentration of any biocides, oxygen scavengers, rust inhibitors or other materials to be added to the test water
 - methods proposed to prevent erosion or any other biophysical impacts at the point of water discharge if test water is not discharged to injection wells.
- Where practicable piping, vessels and fabrication plant sections shall be pre-tested before shipping to Barrow Island.
- The potential impacts to subterranean fauna shall be reduced by locating withdrawal wells away from known; significant habitat areas; maintaining adequate withdrawal rates and water levels, and; screening uptake water.
- Where feasible, test water shall be reused for a series of test sections.
- Water quality monitoring shall include the results of sampling prior to use, and again prior to discharge.
- Generally, used test water shall be injected into existing or purpose drilled disposal wells. Offshore disposal may be considered depending on the scheduling of activities and technical requirement regarding hydrotest water quality. If marine discharge is to be considered, test water shall meet ANZECC/ARMCANZ (2002) water quality standards after dilution at discharge point and test water shall be discharged into high exchange areas offshore where practical.
- The handling of non-destructive test media shall be in accordance with industry and regulatory requirements.

3.18 Clean-up and Rehabilitation

The following environmental management measures will be adopted for the clean-up and rehabilitation of disturbed work sites (e.g. pipeline rights of way, drill pads, temporary or abandoned access roads, make-up or fabrications sites which will no longer be required, etc):

- The period of time between initial disturbance and clean-up of work areas shall be minimised to prevent degradation and loss of exposed soils.
- Clean-up operations shall keep pace with construction.
- The construction area shall be left with stable contours, following clean-up
- Surface drainage shall be re-established.
- Compacted soils shall be ripped or scarified.
- Benched surfaces immediately above potentially erodible or unstable terrain shall be contoured so as to avoid overloading slopes or concentrating surface runoff.
- Where there are steep disturbed slopes, the surface shall be crossed with adequately-spaced angled water bars (diversion terraces) to intercept and disperse runoff. Surface erosion control measures such as water diversion terraces shall be installed at appropriate intervals on all sloping ground to divert surface water quickly away from the disturbed area.
- Other drainage, erosion, and sediment control measures (e.g. geotextile matting, filter fencing, and retention/settling basins) shall be removed as required once stability is achieved.
- Unauthorised access to rehabilitated pipeline rights-of-way shall be prohibited
- Flagging used to identify sensitive environmental features (e.g. natural and cultural heritage), temporary fencing, survey stakes, etc., shall be removed and disposed of at the completion of construction.
- Access roads shall be rehabilitated where no longer required for operations.
- After the completion of re-contouring and erosion control works, any topsoil salvaged and stored earlier shall be spread evenly, over the areas from which it was removed.
- Native plant species shall be used to maintain biodiversity, reduce opportunity for weed establishment, and maintain wildlife habitat.
- Vegetation and indigenous seed salvaged during clearing operations shall be used with the objective of establishing plant communities similar to pre-construction conditions.
- Rehabilitation measures shall actively promote the regeneration of native groundcover and shrubs.
- Where appropriate, habitat structural elements such as rock groupings and vegetation shall be placed at the outer edges of the pipeline rights-of-way and other construction areas to enhance wildlife use of the area while not impeding operation and maintenance requirements.

3.19 Contingency Planning and Emergency Response

The following measures relate to all construction activities that have the potential to result in an unplanned environmental incident or emergency. Incidents of particular note are hydrocarbon or chemical spills, fire, wildlife injury, discovery of cultural heritage material and extreme weather conditions.

General

- All relevant personnel shall be trained in environmental incident response and reporting.

- Response measures shall be consistent with legislation, regulations, and conditions of the Development Approval.
- Contingency response planning shall conform to the Gorgon Development's overall Emergency Response Plan.
- A list of emergency response contact names and numbers shall be kept on-site at all times.

Hydrocarbons and Chemical Spills

- A complete inventory of chemicals shall be maintained.
- Wherever practicable non-hazardous (or less hazardous) materials shall be selected.
- Oil and chemical-use areas shall be appropriately contained.
- Fuel and chemical storage, handling and distribution systems, and areas where vehicles, plant and machinery are stored shall be regularly inspected to identify, repair and respond to leaks.
- Regular maintenance of dredges, drilling rigs, barges, supply vessels, plant and equipment shall be conducted to reduce the chance for equipment failure, spills and leaks. Maintenance logs shall be kept for all major vessels, plant and equipment.
- Fuel storage tanks, handling areas, drainage and bunding systems shall be inspected and maintained with particular emphasis on condition and performance of foundations and supports, serviceability of fittings, vents, valves and lines and condition of welds, surface corrosion and paintwork.
- A scheduled and systematic inspection for general leaks and spills shall be undertaken on all marine vessels, plant and equipment.
- Marine and shoreline sites that are potentially susceptible to contamination shall be monitored to detect potential impact from hydrocarbon or chemical leaks and spills.
- Records of liquids received, stored and dispensed shall be maintained and reconciled. Where any discrepancy in records indicates that leakage may be occurring, the facilities shall be subjected to investigation.
- All port authority and pollution prevention regulations shall be adhered to when delivering product from supply vessel to drilling rig, lay barge, dredgers and support vessels.
- Safe fuel transfer procedures shall be adopted.
- Refuelling of marine vessels shall only be conducted under suitable sea-state and visibility conditions.
- Dry break couplings and floating hoses shall be used where appropriate.
- Tanks and machinery shall be equipped with measurement and overflow protection (e.g. flow and level meters, relief valves, overflow protection valves and emergency shut off).
- Refuelling activities shall be visually monitored.
- An Oil Spill Contingency Plan (OSCP) shall be developed to address all credible spill scenarios, and must be approved by relevant regulatory agency prior to undertaking the construction activity to which it relates.
- Sufficient and appropriate equipment, materials and resources shall be available to respond to a spill incident.
- Absorbent materials shall be available on equipment to handle small hydrocarbon or liquid chemical leaks or spills. Spill kits shall be provided where spills are possible.
- Upon finding a spill or leak, the person on-site shall report the incident supervisory/management personnel.

- Any spillage shall be cleaned up immediately and the materials used in the clean up shall be disposed of safely. Affected areas shall be monitored to determine effectiveness of remediation.
- Hydrocarbon spills shall be reported to the DoIR in compliance with *P(SL)A (Management of Environment) Regulations 1999* (WA) and other relevant regulatory authorities in accordance with the approved OSCP.

Fire

The following measures shall be undertaken to minimise the likelihood of fire occurring, and quickly deal with potential effects if fire does occur:

- A list of available equipment and manpower to be employed on the Development including an organisation chart identifying personnel, contact numbers and responsibilities on the job site, shall be prepared.
- Fire control measures to be taken by each crew (i.e. welding, fuel transportation and handling, equipment servicing, etc) and for the work proposed, shall be clearly documented and communicated.
- All earthmoving equipment shall be fitted with spark arrestors or similar devices.
- Each vehicle shall be outfitted with a fire extinguisher.
- Fires associated with recreational BBQs shall be prohibited.
- Appropriate fire fighting equipment shall be stored at all suitable work sites in accordance with relevant regulations.
- Fire fighting equipment shall be inspected and well maintained.
- Flammable material shall be cleared from around potential fire ignition sources.
- When not in use machinery and vehicles shall be parked in areas free of flammable material and vegetation (e.g. not parked over shrubs, tall grass or cleared vegetation residue).

In the event that a fire is ignited the following shall be undertaken:

- On-site personnel shall immediately report the fire to the Development component Site Manager.
- Gorgon Joint Venturers and the contractor shall carry out initial fire suppression and take all reasonable steps to extinguish a fire that spreads beyond an area authorised or intended for burning.
- The Gorgon Joint Venturers and the contractor shall mobilise heavy equipment, man power, and water trucks as necessary for fire suppression.
- All fires observed shall be reported immediately to the Barrow Island Operations (Dial 9001) and to CALM.

Archaeology and Cultural Heritage Resource Discovery

The following measures shall be undertaken to ensure appropriate management of cultural heritage:

- All areas likely to be disturbed shall be assessed for cultural heritage by a qualified archaeologist with appropriate input from Indigenous community representatives.
- All personnel and contractors on site shall be advised that it is an offence under legislation to interfere with a site or collect artefacts.
- Site clearing works shall be monitored by suitably qualified personnel to ensure only designated areas are disturbed.
- Monitoring activities shall seek to identify potential for new discovered cultural heritage material uncovered during site clearing.

If an archaeological or cultural heritage site or artefacts are discovered during construction, the following site management measures shall be undertaken:

- All work shall cease at the location and an archaeologist shall be notified.
- The Development component Site Manager, contractor supervisor, and the Gorgon HES Manager shall be notified immediately.
- All reasonable efforts to protect the site or artefacts shall be made. For example, buffer zones shall be established or temporary barriers (i.e. stakes and appropriate flagging) shall be erected.
- No material shall be further disturbed or removed without appropriate authorisation.
- Construction workers and operational personnel shall comply with the instructions of the archaeologist. Construction may continue at an agreed distance away from the site.
- At the same time as other individuals and agencies are contacted, the archaeologist or cultural heritage monitor shall notify Indigenous people of the discovery, the steps which have been taken and make appropriate arrangement for nominated Indigenous people to attend the site, if not already present.
- Indigenous people shall be consulted regarding the management of the material once indigenous origin has been determined.
- No further work at the locations shall be undertaken until all parties have been consulted and agreement has been reached.

If Indigenous sites cannot be avoided then:

- An application should be made under Section 18 of the *Aboriginal Heritage Act 1972 (WA)* to disturb the required sites.
- A detailed recording of the site(s) shall be undertaken by qualified archaeologists.
- If the potential for sub-surface cultural material is identified the site will be test-excavated to determine this potential. A Section 16 permit (*Aboriginal Heritage Act 1972*) will need to be obtained from the DIA to conduct this work.
- Indigenous people will be consulted regarding the proposed site disturbance.

Should human remains be discovered, the following legislation will apply:

- *Coroners Act 1996 (WA)* – all human remains
- *Aboriginal Heritage Act 1972 (WA)* – (Indigenous burials)
- *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984* – (Indigenous burials).

On discovery of skeletal material:

- All work shall cease at the location and the archaeologist and cultural heritage monitor shall be notified, if not already present at the location.
- The Development component Site Manager, contractor supervisor, and the Gorgon HES Manager shall be notified.
- All reasonable efforts to protect the remains shall be made. The material shall not be removed or disturbed further but buffer zones or temporary barriers may be appropriate.
- Construction workers and operational personnel shall comply with the instructions of the archaeologist. Construction may continue at an agreed distance away from the site.
- All personnel and contractors on site should be advised that it is an offence under the *Coroners Act 1996 (WA)* and the relevant heritage legislation to interfere with the remains.
- Under Section 17 of the *Coroners Act 1996 (WA)* the local Police/Coroners office will be notified. Direction in the first instance should be taken from the Police. However, given the potential significance of any burials, an archaeologist/physical anthropologist with demonstrable experience in excavating Indigenous and

- historical burials should supervise the removal of the human remains, as the skills required for this form of excavation are likely beyond that of police forensic teams.
- If human remains are suspected to be Indigenous then the Registrar of Aboriginal Sites at the Department of Indigenous Affairs (DIA) will be informed. In addition the Federal Minister for Indigenous Affairs Office needs to be informed.
 - At the same time as other individuals and agencies are contacted, the archaeologist or cultural heritage monitor shall notify Indigenous people of the discovery, the steps which have been taken and make appropriate arrangement for nominated Indigenous people to attend the site, if not already present.
 - Indigenous people shall be consulted regarding the management of the material once indigenous origin has been determined.
 - No further work at the locations shall be undertaken until all parties have been consulted and agreement has been reached.
 - The location of the burial shall be recorded in sufficient detail for its future protection.
 - In consultation with the Police/Coroner and DIA staff steps will be taken to identify the skeletal material. A physical anthropologist shall need to be engaged to complete this task on site.

Wildlife Incidents

The following environmental protection measures shall be adopted to avoid, mitigate or respond to incidents that result in impacts to wildlife:

- Development personnel shall not be permitted to intentionally harass or harm wildlife on or near the worksite, or along access routes to the worksite.
- Vehicles and equipment shall be operated in accordance with Section 3.8.
- All work-site personnel shall be inducted regarding the proper response to wildlife encounters (including unexpected encounters).
- Vehicle collisions with wildlife on the worksite or access routes shall be reported to the Site Environmental Officer.
- The appropriate care and handling of injured animals will be identified in a plan prepared in consultation with CALM.
- The Site Environmental Officer shall maintain a record of all reportable wildlife incidents and non-compliance.

Weather and Climatic Events

The following environmental protection measures shall be adopted to avoid or mitigate impacts associated with high intensity cyclonic rainstorms that have the potential to result in flooding and erosion:

- During high-risk season(s), a reserve of suitable material and equipment shall be located on-site to mitigate potential erosion and sedimentation due to heavy rainfall events.
- Drainage channel crossings shall be designed and constructed in a manner that minimises sediment release (e.g. erosion berms, silt fences and retention/settling basins), does not prevent or unnecessarily restrict water flows and is capable of accommodating locally significant rainfall events.
- Installed retention/settling basins shall be cleaned and maintained regularly.
- Construction site drainage shall be regularly reviewed for the potential to temporarily diverting storm water away from area and materials susceptible to erosion.

4.0 ENVIRONMENTAL INSPECTION AND MONITORING

The environmental inspection and monitoring program will record compliance with required environmental management procedures and shall be used to evaluate the effectiveness of the environmental protection, mitigation, contingency planning, emergency response and rehabilitation measures.

4.1 Environmental Inspection

The Gorgon Development will be subject to a comprehensive inspection program. In accordance with standard industry practice, construction activities (such as clear and grade, blasting, welding, testing, etc), will undergo quality assurance inspections by dedicated technical inspectors. As part of the inspection program, appropriately qualified, trained and experienced Site Environmental Officers, will have an inspection role. These personnel will work with specialist environmental inspectors (such as marine monitors, quarantine inspectors and archaeologists). The inspection program (covering environmental, health, safety, trade, and utility inspections) will be coordinated by Construction Manager.

4.2 Environmental Monitoring

Environmental monitoring will be undertaken at a wide variety of locations and times to qualitatively and quantitatively evaluate the success of environmental management and protection procedures, including, but not limited to: rehabilitation, waste minimisation and management procedures, the effectiveness of fauna protection, access to existing Barrow Island Lease assets, erosion control and other control measures.

The programs will aid in the early identification of potential environmental issues and will fulfil the due diligence requirements of the Joint Venturers to document effective environmental performance, as well as any shortcomings during the construction period. In particular, the monitoring programs will aim to:

- identify environmental changes and, specifically, identify those changes resulting from the Development construction
- survey topics that are specified in permits, licenses, and approvals
- determine actual versus predicted change
- review and improve upon the EMPs.
- contribute to the assessment of the effectiveness of environmental management procedures (including those related to quarantine risks)
- provide data for the assessment of adherence to EMPs and licence conditions.

Monitoring programs will be conducted by appropriately qualified personnel. These programs will be periodically reviewed and modified to assure continued appropriateness. Records of all monitoring activities will be retained to facilitate the audit program.

The programs will investigate a range of construction issues including:

- the volume and composition of waste discharges
- the volume and composition of air emissions, including greenhouse gas emissions
- dredging effects
- the rate, extent and success of rehabilitation

- the detection, control and eradication of potentially introduced animals, plants and diseases
- presence and abundance of rare fauna
- protection of sites of cultural and historical significance.

5.0 AUDITING

5.1 Compliance Auditing

Compliance auditing shall be undertaken throughout the design, construction, operations and decommissioning phases of the Gorgon Development. An audit program will be developed in consultation with the Environmental Audit Branch of the Department of Environmental Protection and the Commonwealth Department of Environment and Heritage. This program will define the scope and timing of audits. Generally, audits will assess compliance with regulatory requirements, licence conditions and matters covered in the detailed EMPs and the EMS.

The audit methodology shall be based on objective evidence that will generally comprise review of documented environmental records, direct observations of activities and interviews with relevant personnel.

6.0 REPORTING

6.1 General

Information management will be a key aspect of the successful execution of the design, construction and operations phases of the Development. Numerous environmental reports and audits shall be required to record details such as the progress of work, monitoring of key physical and environmental factors, incidents, complaints and their status and resolution, compliance and performance. Reporting procedures will be consistent with regulatory (notably those under the Barrow Island Act), and as agreed with the EPA and DEH.

The proposed major reports, as well as the individual roles and responsibilities for reporting are outlined in

Table 6: – Key Reporting Requirements and Responsibilities

Report	Prepared by	Submitted to	Content
Daily Environmental Report	Gorgon Site Environmental Officer	Development component Site Manager and Gorgon HES Manager	Daily log of activities. Daily general discussion and communication with job site inspectors and contractors. Identification of specific issues and potential incidents. Forward planning and scheduling

Report	Prepared by	Submitted to	Content
Weekly Environmental Report	Gorgon Site Environmental Officer	Development component Site Manager and Gorgon HES Manager	On-going compliance activities, priority actions, review of completed and scheduled construction activities. Summary of incidents and reporting (as required).
Environmental Incident Report (as required)	Gorgon Site Environmental Officer and other Specialist Consultants	Development component Site Manager, Gorgon HES Manager, and Barrow Island Coordination Council and DoE for waste discharges	Issues, practices or incidents which may impact the environment. Actions taken to avoid, mitigate, investigate and respond to the incident, procedures for evaluation, follow-up of the success of actions taken and closure of actions.
Monthly Environmental Monitoring Report	Gorgon HES Manager	Gorgon Development Management, Barrow Island Coordination Council	Summary of monitoring data along with assessment of progress against EMPs. Report on staffing and compliance issues. Summary of compliance auditing reports. Requirements for EMP or procedure, reporting or communications adjustments. Record of any significant incidents and follow-up.
Quarterly Environmental Monitoring Report	Barrow Island Coordination Council, Gorgon HES Manager	Gorgon Development Management, EPA, DoIR and DEH	Summary of feedback compliance monitoring, issue management, actions and activities taken to respond to environmental issues. Scheduling and environmental performance review.
Six-monthly Progress Report	Barrow Island Coordination Council, Gorgon HES Manager and Gorgon Development Stakeholder Communications Manager	Gorgon Development Manager, EPA, DoIR, DEH and public stakeholders	Summary and update of Development progress, compliance monitoring and results, complaint and environmental incident reporting and follow-up. Overall performance evaluation and compliance with EMP/EMS objectives.
Internal Development Environmental Audit	Gorgon Site Environmental Officer, Specialist Consultants	Gorgon HES Manager, Gorgon Development Management	Assessment of progress against EMP including non-compliance and corrective action reports where required.

6.2 Non-Conformance, Incident and Corrective Action Reporting

Where monitoring and/or audits indicate that performance does not conform to environmental management requirements, or further improvement in performance standards is necessary, corrective action will be required.

Investigation and corrective action procedures shall be established to:

- determine the cause of non-conformance
- identify and implement corrective action
- initiate preventative actions
- apply controls to ensure that preventative actions are effective
- record any changes in written procedure resulting from the corrective action.

Corrective actions shall include management responsibilities for addressing, tracking and close-out of incident investigations, audits, inspections and monitoring programs.

Chevron Australia has a robust and proven incident management and investigation process. The Gorgon Development shall review, revise, document and adopt this process where appropriate.

This process shall include:

- management roles and responsibilities in incident investigation
- root-cause analysis for significant events and near misses
- periodic evaluation of incident cause trends to determine where improvements in systems, processes, practices or procedures are warranted
- procedures for sharing of relevant lessons learnt
- procedures for follow-up and closure of actions.

Attachment 1

Matrix of Development Components and Activities

Development Component	Development Activities																				
	General Conduct	Drilling	Subsea Installation	Pipelaying	Rock Dumping/ Placement	Horizontal Directional Drilling	Piling	Traffic and Access	Earthworks	Blasting	Air and Dust Emissions	Lighting	Dredging and Spoil Disposal	Quarantine Management	Waste Management	Shipping and Navigation	Facility Testing	Clean-up and Rehabilitation	Contingency Planning and Emergency Response		
Wells	✓	✓	✓								✓	✓		✓	✓	✓	✓		✓	✓	
Upstream Field Infrastructure (Manifolds and Flowlines)	✓		✓	✓							✓	✓		✓	✓	✓	✓	✓		✓	✓
Feed Gas Pipeline (Offshore and Onshore)	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Port Facilities (MOF and LNG Jetty)	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
MOF and LNG Channel and Turning Basin	✓		✓		✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Condensate Load-out	✓		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Optical Fibre Cable	✓		✓		✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Domestic Gas Pipeline & Infrastructure	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Gas Processing Facility, Camp & Infrastructure	✓			✓				✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Power and Water Facilities	✓	✓		✓				✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Access Roads	✓							✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Airport	✓							✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
CO2 Injection System (Pipeline and Wells)	✓	✓		✓				✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Mainland Supply Base	✓			✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓