Gorgon Operations

Long-term Maintenance Dredging Monitoring and Management Plan

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1.0 Introduction

1.1 Proponent

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

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

Chevron Australia is nominated as the proponent for Sea Dumping Permit No. SD2016/3382, granted under the Commonwealth *Environment Protection (Sea Dumping) Act 1981*.

1.2 Project Overview

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

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

Construction of the Marine Facilities associated with the Gorgon Gas Development (LNG Jetty and Materials Offloading Facility [MOF]) included a capital dredging program. This program began in 2010 and ran for approximately 18 months. During this time, approximately 7.5 million cubic metres (m^3) of material was removed, with approximately 6.346 million m^3 disposed of at the approved Dredge Spoil Disposal Ground (DSDG) (SD2004/0030). The balance was used in construction of the MOF. In addition, approximately 0.319 million m^3 was removed during the LNG Jetty seabed preparation works and disposed of at the approved DSDG (SD2010/1822). Following completion of the capital dredging program, three post-dredging marine habitat surveys (Post-Development Surveys) were conducted over three consecutive years, with the first survey three months after the completion of dredging and spoil disposal activities. These surveys identified no significant differences to the ecological elements listed in Condition 11.2 of EPBC Reference: 2003/1294 and EPBC Reference: 2008/4178, when compared to the baseline assessments undertaken before dredging.

To maintain navigability and ongoing safe operations of the Marine Facilities, maintenance dredging of sediment may be required. The timing and frequency of such dredging will depend on the volume of sedimentation experienced at the site.

1.3 Scope

This Long-Term Maintenance Dredging Monitoring and Management Plan (Management Plan) applies to maintenance dredging for the Gorgon Gas Development Marine Facilities.

1.4 Project Location

The Gorgon gas field is approximately 130 km and the Jansz–Io field approximately 200 km off the north-west coast of WA. Barrow Island is located off the Pilbara coast, 85 km north-north-east of Onslow and 140 km west of Karratha. Barrow Island is approximately 25 km long and 10 km wide, and covers 23 567 ha. It is the largest of a group of islands, including the Montebello and Lowendal Islands.

The locations of maintenance dredging activities that are the subject of this Management Plan are:

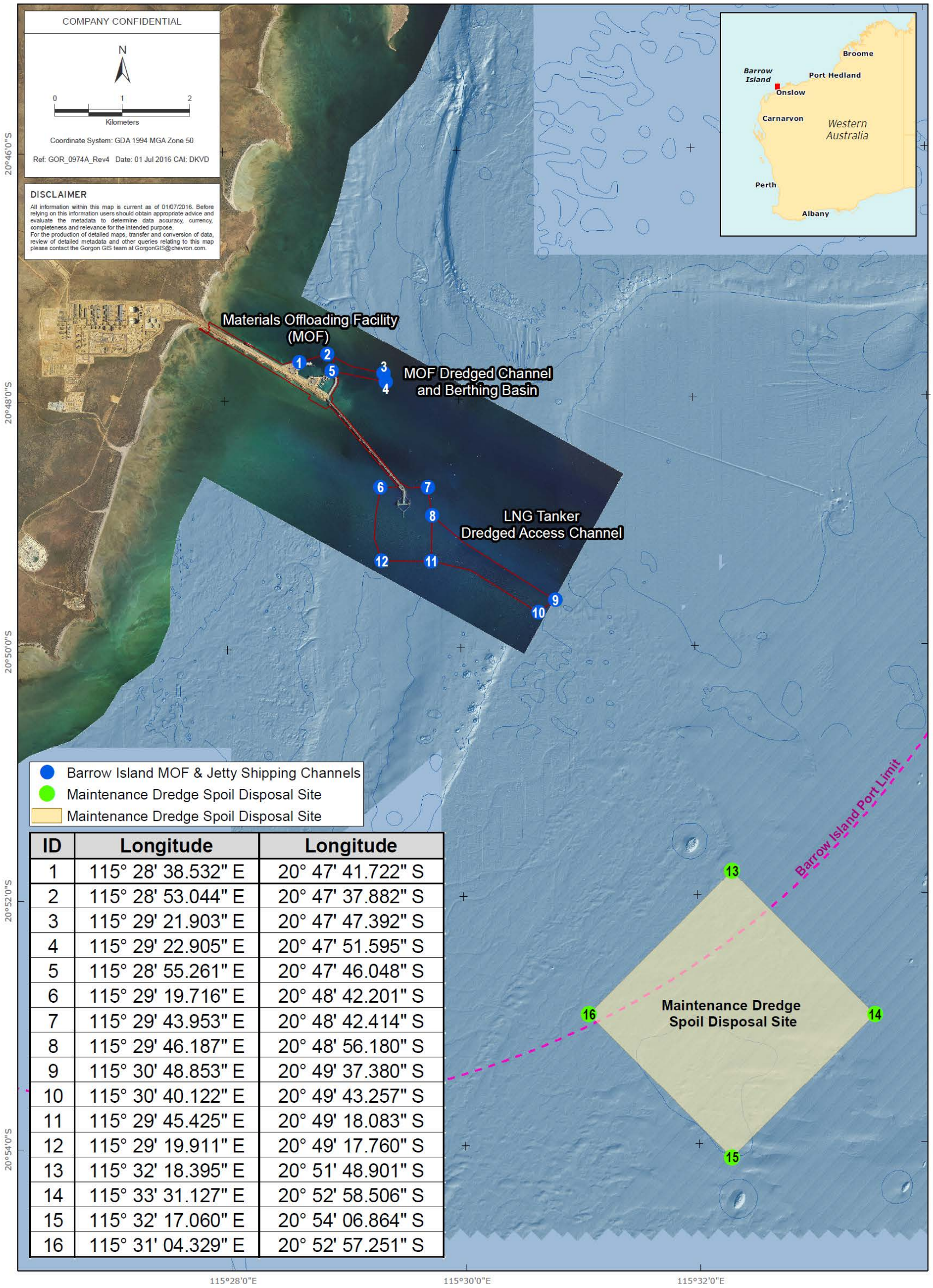
- access channel to the MOF, and berth pockets
- tanker access channel to the LNG Jetty
- turning basin for the LNG Jetty.

The proposed DSDG is the same site used during the capital dredging program and the LNG Jetty seabed preparation works. The site is defined by these WGS84 coordinates:

- 115° 32′ 18.395″ E; 20° 51′ 48.901″ S
- 115° 33′ 31.127″ E; 20° 52′ 58.506″ S
- 115° 32′ 17.060″ E; 20° 54′ 06.864″ S
- 115° 31′ 04.329″ E; 20° 52′ 57.251″ S

Figure 1-1 shows the location of the Marine Facilities, the dredging areas, and the DSDG.

LOCATION MAP IDENTIFYING MAINTENANCE DREDGE DISPOSAL SITE



ID	Longitude	Longitude
1	115° 28' 38.532" E	20° 47' 41.722" S
2	115° 28' 53.044" E	20° 47' 37.882" S
3	115° 29' 21.903" E	20° 47' 47.392" S
4	115° 29' 22.905" E	20° 47' 51.595" S
5	115° 28' 55.261" E	20° 47' 46.048" S
6	115° 29' 19.716" E	20° 48' 42.201" S
7	115° 29' 43.953" E	20° 48' 42.414" S
8	115° 29' 46.187" E	20° 48' 56.180" S
9	115° 30' 48.853" E	20° 49' 37.380" S
10	115° 30' 40.122" E	20° 49' 43.257" S
11	115° 29' 45.425" E	20° 49' 18.083" S
12	115° 29' 19.911" E	20° 49' 17.760" S
13	115° 32' 18.395" E	20° 51' 48.901" S
14	115° 33' 31.127" E	20° 52' 58.506" S
15	115° 32' 17.060" E	20° 54' 06.864" S
16	115° 31' 04.329" E	20° 52' 57.251" S

Figure 1-1: Marine Facilities, Dredging Area, and Dredge Spoil Disposal Site

2.0 Existing Management Framework

The Gorgon Gas Development, including maintenance dredging, is subject to various environmental approvals, which require Chevron Australia to have environmental management plans in place to manage associated impacts. The following subsections describe the environmental approvals and applicable environmental management plans/reports in the context of managing potential impacts from maintenance dredging.

2.1 *Environment Protection Act 1986* (WA) and *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Long-term maintenance dredging was described in the Draft Environmental Impact Statement/ Environmental Review and Management Programme (Ref. 10) submitted for approval in accordance with the *Environment Protection Act 1986* (WA) (EP Act) and *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act). This activity was subsequently approved via Ministerial Statement (MS) 800 and EPBC Reference: 2003/1294 and 2008/4178.

Management plans approved under the conditions of environmental approval that relate to maintenance dredging in this Plan, are summarised in Table 2-1.

Where required, this Plan proposes management measures in addition to those already provided under existing approvals and environmental management plans.

The Gorgon Gas Development and Jansz Feed Gas Pipeline: Dredging and Spoil Disposal Management and Monitoring Plan (DSDMMP) (Ref. 9) was submitted, approved, and implemented throughout construction, in accordance with Condition 14 of EPBC Approvals and Condition 20 of MS 800. Correspondence in March 2016 with the Western Australian Office of the Environmental Protection Authority (OEPA) and the Commonwealth Department of the Environment (DotE) have confirmed that Condition 14 (EPBC Reference: 2008/4178) and Condition 20 (MS 800) applied to construction (capital) dredging only and are not relevant to the maintenance dredging program.

Table 2-1: Other Ministerial Plans and Requirements relating to this Management Plan

Scope	Legislative Requirement	Ministerial Plan[1]
Describe and map ecological elements within Zones of High and Moderate Impact and Reference Sites associated with the generation of turbidity and sediment deposition from dredging and dredge spoil disposal, and report on water quality and Coral Assemblages.	Condition 14 of MS 800 Condition 11 of EPBC Reference: 2003/1294 and 2008/4178	Coastal and Marine Baseline State and Environmental Impact Report (CMBSEIR) (Ref. 1)
Conduct annual surveys for at least three years to determine whether changes have occurred to marine ecological elements, including Area of Loss of Coral Assemblages, compared to baseline established by the CMBSEIR.	Condition 24 of MS 800 Condition 17 of EPBC Reference: 2003/1294 and 2008/4178	Post-Development Coastal and Marine State and Environmental Impact Survey Reports: • Year 1: 2011–2012 (PDS 1) (Ref. 2) • Year 2: 2012–2013 (PDS 2) (Ref. 3) • Year 3: 2013–2014 (PDS 3) (Ref. 4)
Management of quarantine-risk material and the discharge of ballast water from marine	Condition 10 of MS 800 Condition 8 of EPBC	Terrestrial and Marine Quarantine Management

Scope	Legislative Requirement	Ministerial Plan[1]
vessels.	Reference: 2003/1294 and 2008/4178	System (QMS) (Ref. 6)
Establishment of a Marine Turtle Expert Panel (MTEP), requiring specified membership from State and Commonwealth departments, to advise the Minister on marine turtle management and monitoring.	Condition 15 of MS 800	Long-term Marine Turtle Management Plan (LTMTMP) (Ref. 7)
Long-term management of marine turtles that use the east coast of Barrow Island, and a monitoring program to detect changes to Flatback Turtle populations.	Condition 16 of MS 800 Condition 12 of EPBC Reference: 2003/1294 and 2008/4178	
Management of solid and liquid wastes.	Condition 30 of MS 800 Condition 20 of EPBC Reference: 2003/1294 and 2008/4178	Solid and Liquid Waste Management Plan (SLWMP) (Ref. 8)
Monitoring of the marine environment for effects of waste discharges and inputs on water and sediment quality.	Condition 23A of MS 800	Marine Environmental Quality Management Plan (MEQMP) (Ref. 11)

1 Ministerial plan titles as amended or supplemented from time to time

2.2 *Environment Protection (Sea Dumping) Act 1981* (Commonwealth)

A Sea Dumping Permit is required under the Commonwealth *Environment Protection (Sea Dumping) Act 1981* to authorise the dumping, and the loading for the purposes of dumping, of any wastes or other matter into Australian waters. This Management Plan seeks to support the application for a Sea Dumping Permit (Ref. 18, GOR-COP-01955) under the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Permit No. SD2016/3382).

2.3 Proposed Dredging Activities

The objective of any maintenance dredging campaign will be to restore the following design depths:

- MOF:
  - Berth Pockets: -8.0 m CD
  - Channel and Berthing Basin: -6.5 m CD
- LNG Jetty:
  - Berth Pockets: -15.0 m CD
  - Turning Basin and Channel: -13.5 m CD.

Timing and frequency of maintenance dredging over the duration of the Sea Dumping Permit will depend on the volume of sedimentation experienced at the site, during both normal climatic conditions and as a result of cyclones. Based on sedimentation assessments, it is anticipated that the requirement for maintenance dredging will be infrequent, with each campaign estimated to take approximately two weeks.

2.4 Dredging Methods

The methodology for any maintenance dredging campaign is to be confirmed, but will be based on the volume of sedimentation, areas of infill required, and availability of dredge equipment.

A combination of a Trailer Suction Hopper Dredge (TSHD), a Back-Hoe Dredge (BHD) and a grab dredge may be used.

2.5 Proposed Dredge Spoil Disposal Ground

The DSDG is proposed to be used for the life of the Sea Dumping Permit.

3.0 Existing Environment

The existing environment of the Project location is described in detail in these publicly available documents:

- CMBSEIR (Ref. 1)
- PDS 1 (Ref. 2)
- PDS 2 (Ref. 3)
- PDS 3 (Ref. 4)
- LTMTMP (Ref. 7)
- MEQMP (Ref. 11).

The following subsections summarise the existing environment as it relates to maintenance dredging and were sourced from the documents listed above.

3.1 Physical Marine Environment

3.1.1 Water Quality

Higher turbidity levels and light attenuation coefficients indicate that the shallow waters close to Barrow Island are naturally more turbid than deeper offshore waters (Ref. 1). In the waters off the east coast of Barrow Island, turbidity and concentrations of suspended sediments are generally low (<5 mg/L) and indicative of clear water environments, although there was considerable variability amongst monitoring sites when surveyed. Very low levels of net sediment deposition were observed during the baseline surveys (generally below the limits of instrument detection) and any deposition that did occur was temporary and rapidly resuspended by waves and tidal flow (Ref. 1).

Wave activity was found to be a significant contributor to local resuspension of sediments and this was most noticeable on the east coast of Barrow Island during periods of strong easterly winds that dominate the winter weather pattern. Extreme events such as tropical cyclones also strongly influence turbidity and light attenuation (Ref. 1). Sediment vertical particle flux, as recorded by sediment traps, was strongly linked to turbidity; the highest fluxes were recorded during periods that coincided with persistent strong easterly winds or passing cyclones (Ref. 1).

3.1.2 Surficial Sediments

Geophysical data indicates that the surficial sediments at the Project location comprise carbonate sands and shelly sediments. No evidence exists of any granite/basaltic intrusions, or significant sedimentary layers containing indurated clays, organic material, or potential acid-sulfate forming soils.

Chemical data collected in 2009 indicates that the sediments sampled from the dredging areas were below NAGD guidelines for PAH. Pyrogenic contaminants are limited to a small power plant on Barrow Island, vessel exhaust emissions, and historic burn-off of onshore tar-pits; these contaminants disperse rapidly. Elevated heavy weight PAH and other pyrogenic contaminants are considered highly unlikely.

The Montebello Islands, approximately 45 km north of Barrow Island, were the site of three British nuclear tests conducted in 1952 (25 kT detonation) and 1956 (15 and 98 kT detonations). Monitoring as early as 1973 has shown little long-term contamination of marine sediments and biological tissue, including longer-life isotopes and nuclides. Sediment samples within 1 km of detonation sites were screened for radionuclides in 1979, and were below the screening level of radionuclides; therefore, sediments near Barrow Island are highly unlikely to exceed it.

Sediment sampling at Barrow Island in 2004, 2009, and 2014–2015, including the maintenance dredging area, indicated low levels of all potential metal contaminants. In the 2004 survey, sediments were below NAGD guidelines for all metals, with one exception of arsenic at one site at the DSDG. This exceedance was ascribed to natural origins; it is not uncommon for Australian marine sediments to contain naturally high concentrations of arsenic and the total value is usually dominated by organic arsenic compounds that are non-toxic and commonly accumulated by benthic algae and fauna. In the 2014–2015 survey, sediment samples were below NAGD guidelines for all metals, with exception of nickel in one sample located approximately 1400 m north-east of the LNG berthing pockets, where total nickel was 30.2 mg/kg and likely represented post-sampling contamination. This exceedance was observed outside the Gorgon maintenance dredging footprint.

Sediments sampled in the maintenance dredging area in 2004, 2009, and 2014–2015 were below the NAGD guidelines for TBT, with one exception in 2014–2015. This was from a site immediately adjacent to onshore facilities (<30 m), approximately 1.5 km from the dredging footprint. This site was not sampled in earlier surveys, and it is unlikely that contamination is new—TBT has been illegal in marine paints since 2000.

The currency of sediment quality data will be maintained by implementing the Gorgon Maintenance Dredging Sampling and Analysis Plan (SAP) Manual (Ref. 12) within five years or less following the previous sampling program. Prior to sampling being undertaken, the Department of the Environment and Energy (DOTEE) will be notified, and any amendments to the SAP will be approved.

Refer to the Gorgon Maintenance Dredging Sampling and Analysis Plan Manual (Ref. 12 GOR-COP-01907) and the Maintenance Dredging Sea Disposal Permit Application (Ref. 18) for further detail.

3.2 Biological Environment

3.2.1 Marine Habitats

Hard and Soft Corals

The corals of Barrow Island and the greater Pilbara marine waters are typically dominated by Acropora (especially plate Acropora), Porites, Pavona, and Turbinaria, with a mixed assemblage of Turbinaria, Faviids, and other scleractinian corals being less dominant (Ref. 1); however, dominance of taxa can change dramatically in response to natural climatic events. At Barrow Island, baseline surveys in 2009, prior to Gorgon capital dredging, identified 48 genera (196 species) of hard coral and eight genera of soft coral (Ref. 1), with Faviidae, Poritidae, and Acroporidae families the dominant families. However, a thermal bleaching event in early 2013 resulted in a dramatic reduction in live coral cover, particularly within the Family Acropora (Ref. 4).

Barrow Island's large and continuous coral reefs are located north (Lowendal Shelf) and south (Dugong Reef, Batman Reef etc.) of the maintenance dredging areas; the nearest is Lowendal Shelf approximately 4 km from dredging locations. Smaller coral reefs, comprising primarily of small Porites bommies and mixed assemblages as described above, are located closer to maintenance dredging areas (nearest approximately 200 m from LNG dredging area, though most were approximately 1 km away).

Coral mortality associated with the capital dredging program was significantly less than that predicted and approved. Any minor declines in coral cover were predominantly observed at sites close to the dredging footprint (i.e. a site 200 m from LNG dredging area), and only partial coral colony mortality of Porites was observed, with signs of recovery after dredging ceased. Of note, the minor level of decline to corals associated with dredging was far less than that resulting from the natural thermal bleaching that occurred in 2013.

Non-coral Benthic Macroinvertebrates

Non-coral benthic macroinvertebrates (NCBMs) are a common element of the eastern intertidal and subtidal fringing environments of Barrow Island (Ref. 10). The sessile NCBM taxa of eastern Barrow Island are dominated by colonial ascidians, sea whips, sponges, and Turbinaria spp. Other fauna such as anemones, bivalves, crinoids, gastropods, gorgonians, sea cucumbers, and sea urchins have also been observed (Ref. 4). There are differences in NCBM assemblages between hard and soft substrates, with Zoanthids predominant on hard substrates and Hydroids predominant on the available hard substrates within areas dominated by soft substrates (Ref. 4). Figure 3-1 shows the location of areas that support NCBMs, which includes areas close to proposed maintenance dredging.

No changes were detected in NCBMs as a result of the capital dredging program, even at sites close (within 100 m) to the dredging area, comparing whole assemblages, or those occurring separately on soft sediment and limestone substrate (Ref. 4). Comparisons between baseline surveys and dredging surveys done after capital dredging indicate that natural temporal variation in NCBMs is greater than any change associated with dredging.

Macroalgae and Seagrass

Macroalgal communities are common on the fringing subtidal rock platform of Barrow Island. Ninety-five taxa have been reported in the region, represented equally by the red, brown, and green algae (Ref. 2).

Generally, seagrasses are sparsely distributed and commonly co-occur with macroalgae; however, natural spatial and temporal variability in seagrasses is significant in Barrow Island marine waters (Ref. 2). Seagrasses in the areas surrounding the dredging footprints are generally dominated by *Halophila ovalis* and *H. spinulosa*. Lower numbers of *Cymodocea serrulata*, *H. decipiens*, *Syringodium isoetifolium*, and Halodule species were also reported (Ref. 2). Figure 3-1 shows the areas that support macroalgae and seagrass, which includes areas close to proposed maintenance dredging.

At the cessation of capital dredging, there was no conclusive evidence that dredging had impacted macroalgae. At areas closest to capital dredging, seagrass cover increased between baseline surveys and post-dredging surveys (Ref. 4), while declines in seagrass were detected at areas distant to dredging. Given the short life-span and large spatial and temporal dynamics in tropical seagrasses, it was difficult to attribute any change in seagrass to dredging impact (Ref. 4).

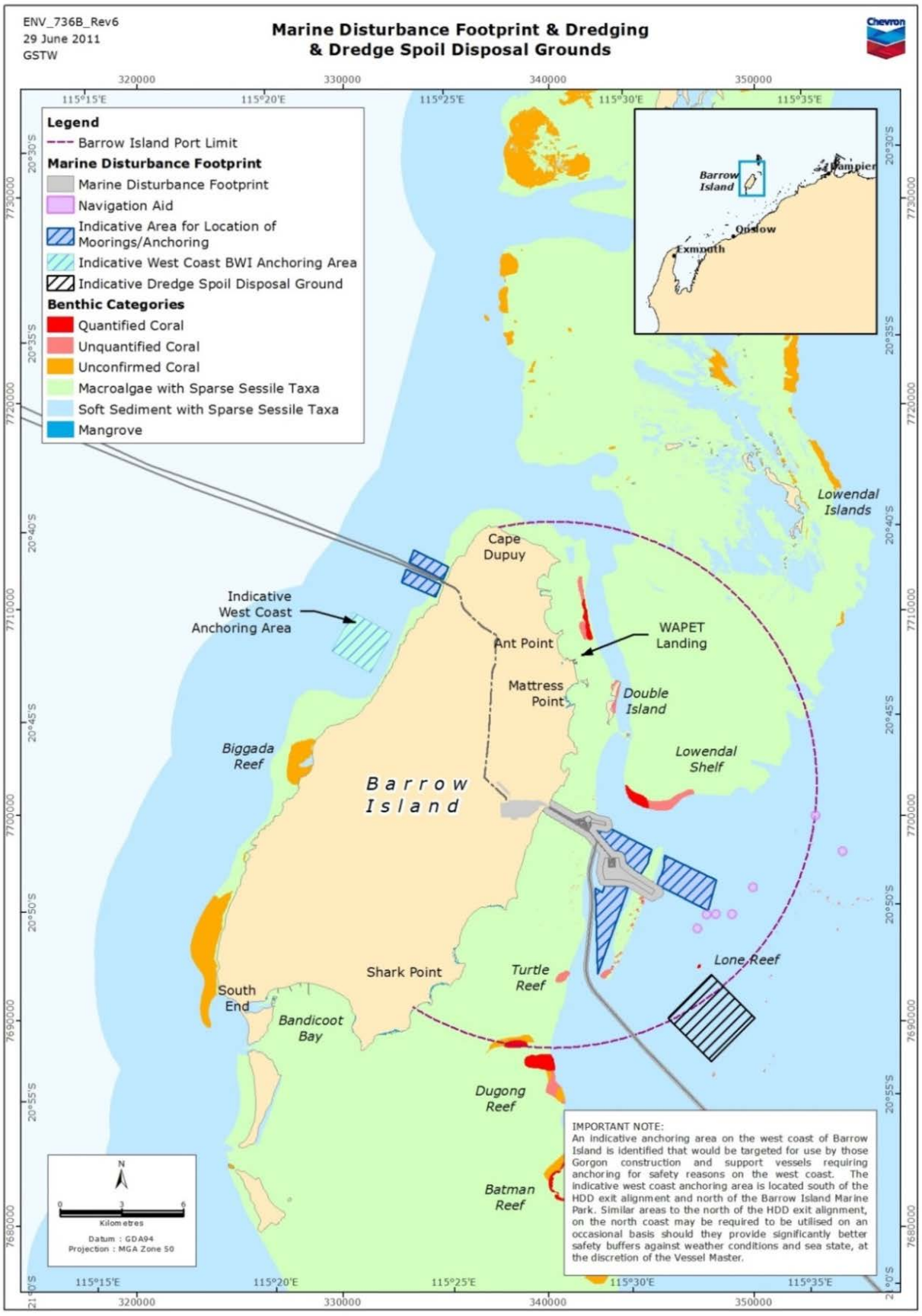


Figure 3-1: Benthic Ecological Assemblages in Barrow Island Waters

3.2.2 Marine Fauna

Marine Turtles

The Montebello/Barrow Island region contains six known species of marine turtles. Barrow Island is recognised as a regionally important nesting area for Green Turtles and Flatback Turtles, with the beaches adjacent to the Marine Facilities visited predominantly by Flatback Turtles. Hawksbill Turtles nest at low densities around Barrow Island and Loggerhead Turtles have only been recorded occasionally.

Marine Mammals

The Pilbara region supports migratory, transient, and resident marine mammals such as whales, dolphins, and dugongs, all of which are EPBC Act listed. Marine mammals likely to be near any maintenance dredging activities include:

- Humpback Whale
- Blue Whale
- Bryde's Whale
- Killer Whale (Orca)
- Dusky Dolphin
- Irrawaddy Dolphin
- Indo-Pacific Humpback Dolphin
- Dugong
- Whale Shark
- Great White Shark
- Grey Nurse Shark.

Demersal Fish

No fish species listed under the EPBC Act (Commonwealth) or the *Wildlife Conservation Act 1950* (WA) were observed near the proposed maintenance dredging area during the baseline surveys of 2007 and 2008. Descriptions of the fish that could be present in the proposed maintenance dredging area are described in the CMBSEIR (Ref. 1).

3.3 Sediment Plume Modelling

3.3.1 Overview

A maintenance dredging modelling study (Ref. 16) was completed; its objectives were to:

- provide best estimates of infill and the likely maintenance dredging requirements
- assess the potential impacts associated with maintenance dredging on corals and other Benthic Primary Producer Habitat (BPPH)

The models used were developed from a model complex that was extensively calibrated and validated during dredging for the Wheatstone Project and that was independently peer reviewed. The models were re-validated against data from the Gorgon Gas Development site.

Assumptions of the model were:

- A very conservative estimate of up to 860 000 m^3 of material to be dredged in a single maintenance campaign. This was based on ~0.5 m deposition throughout the dredging areas. A conservative estimate was used to ensure a worst-case scenario for potential environmental impact was assessed

- Dredging methodology: Use of a TSHD combined with BHD/grab dredge loading barges.
- Dredging duration and rates: Assumed 14-day campaign, leading to production rates of 47 000 m^3/day for the TSHD and 7400 m^3/day for the BHD/grab dredge.
- Spill rate assumptions:
  - 20% fines assumed
  - 3% spill of fines at TSHD draghead
  - 25% spill of fines at overflow
  - 15% spill of fines at disposal site from TSHD
  - 5% spill of fines from grab dredge at dredging location
  - 5% spill of fines from barges at disposal site.

3.3.2 Assessment of Impacts to Sensitive Receptors

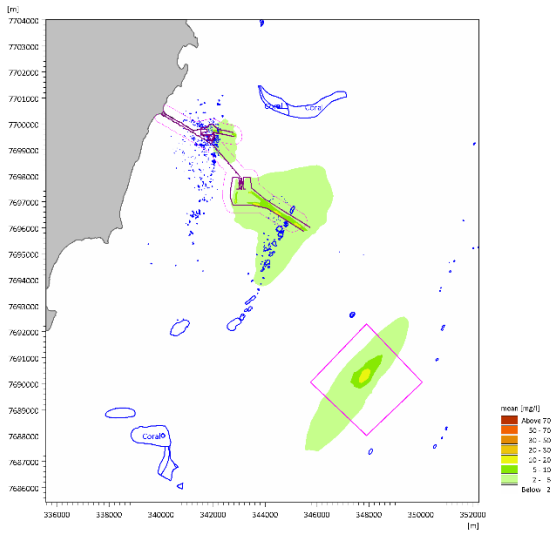
Development of Water Quality Criteria

Based on the mortality response of corals to the Gorgon capital dredging program, a set of water quality (WQ) criteria were developed to define thresholds below which no detectable impacts to corals were likely to occur. These criteria were developed from observed long-term relationships between the decline in WQ during capital dredging and associated chronic impacts on coral health. The thresholds were considered to afford protection to other benthic habitats such as seagrass, filter feeders, and macroalgae (Ref. 17). These WQ criteria were implemented to protect coral and non-coral benthic habitats during the Wheatstone capital dredging program. No impacts to these communities were detected during Wheatstone capital dredging when turbidity was maintained below these WQ criteria. Although based on WQ (turbidity), these criteria were also a proxy for sedimentation effects on vectors that were sensitive to elevated sedimentation, such as corals (Ref. 17).

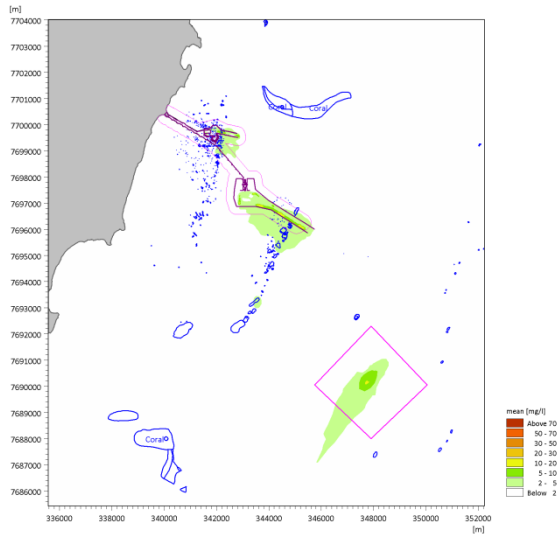
Model Interrogation

Several dredging scenarios were modelled when reviewing the potential for impacts from the maintenance dredging program. These included dredging in summer (January), winter (June), and the transitional period (September). When compared to the capital program, model outputs for the maintenance dredging program indicated turbidity and sedimentation effects were considerably less in spatial extent and concentration, as would be expected for a much smaller dredging scope. Figures showing the average suspended sediment concentrations that arrive from maintenance dredging are presented in Figure X. Given the duration of dredging is only on the order of days, chronic impacts on receptors are not possible, and therefore moderate WQ criteria could be used to interrogate impacts to receptors (below). Moderate WQ criteria are based on NTU (TSS, mg/L equivalent) of ~5.08, hence in Figure 3-2, all plumes of >5 mg/L are contained within the dredge and dredge disposal footprint.

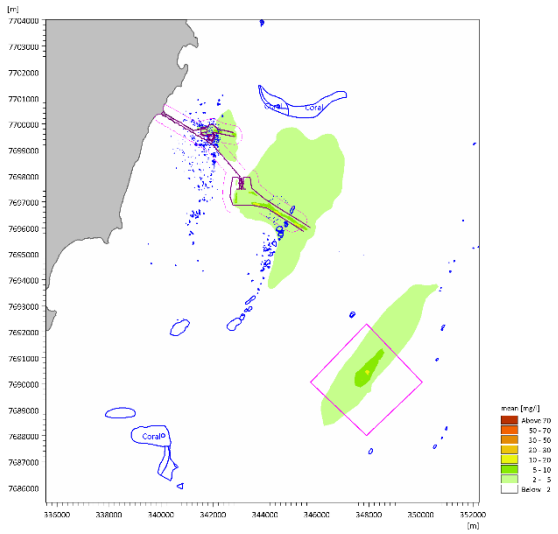
January



June



September



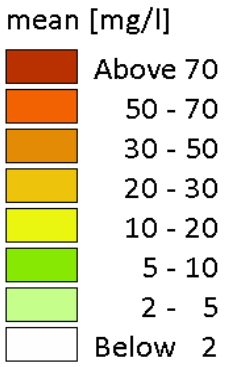


Figure 3-2: Mean Suspended Sediment Concentration (mg/L) for January, June, and September Climatic Conditions

Note: Concentrations of <5 mg/L are below moderate WQ Criteria used to interrogate impacts.

Model outputs were further interrogated to assess the level of total suspended solids (TSS) above background that can be expected at receptor reefs used during the Gorgon Capital Dredge program, and were assessed to determine whether any elevations are expected above the moderate WQ criteria described above. TSS concentrations were predicted for all reefs close to (<1 km), further away (up to 2.5 km), and distant from dredging and spoil disposal activities.

In all scenarios, modelling indicated that turbidity arising from maintenance dredging activities will remain below moderate WQ criteria, and therefore no declines in coral health (mortality) or health of non-coral benthic habitats would be expected. Even at the closest receptor sites (approximately 200 m from dredging) under the worst-case dredging scenarios, TSS levels were less than a quarter of the intensity (NTU or TSS)

and duration (number of days) of thresholds at which effects to corals may begin to occur. Because these thresholds were also found to protect other benthic receptors (Ref. 17), the maintenance dredging campaign is not expected to result in any detectable impacts to sensitive receptors.

4.0 Environmental Monitoring and Management

4.1 Monitoring Program

A monitoring program will be implemented to examine the extent of influence of maintenance dredging on water quality, verify modelling predictions, and assess potential environmental effects. The monitoring program will comprise two elements (as described in the Sea Dumping Permit Application): Compliance Monitoring and Effects Monitoring.

4.1.1 Compliance Monitoring

Compliance monitoring assesses the actual extent of turbid plumes arising from maintenance dredging and how these compare with modelled predictions. If monitoring indicates that the extent of turbid plumes associated with dredging is consistently greater than predicted and there is plume contact with known receptor locations, the concentration and duration of elevations in turbidity associated with dredging will be compared against locally derived water quality management triggers, which, if reached, would lead to mitigation. Specifically, compliance monitoring addresses the following objectives:

- assess the actual extent of change in turbidity caused by the maintenance dredging program (e.g. concentrations and durations with distance from dredging)
- assess whether the actual changes that occurred are as predicted by the modelling.
- where monitoring indicates that the actual changes are consistently (more than three consecutive days) greater than predicted, and plumes contact known receptor locations (Section 3.2.1); compare actual changes in TSS associated with dredging against water quality management triggers for those known receptors
- where water quality management triggers are reached at receptor locations as a result of dredging, apply mitigation to minimise the likelihood of impacts to receptors.

TSS data derived from satellite imagery[1] (e.g. Moderate Resolution Imaging Spectroradiometry – MODIS – or alternative improved remote sensing products as they become available) will be collected during each maintenance dredging campaign to determine the actual extent of change associated with dredging and to verify whether actual changes that occurred are as predicted by modelling. Since accurate sedimentation data are problematic to collect in the field, TSS data is a proxy for the influence of dredging on turbidity and the amount of sediment available to fall out of suspension and settle on the substrate.

TSS data will be compiled over the duration of each maintenance dredging campaign to determine the extent of dredging influence on turbidity compared with background turbidity in areas unaffected by dredging.

The actual extent of change in turbidity caused by dredging is determined by assessing TSS concentration with distance from dredging; and by determining the distance at which background levels have been reached. The predicted impact zone for sensitive receptors is determined by assessing the concentration and duration of TSS associated with dredging against known receptor thresholds (see Effects Monitoring, Section 4.1.2).

[1] *TSS data derived from satellite imagery have been found to be reliable when compared to data collected using in-situ water quality loggers and have been used successfully to compare against management triggers and modelled predictions of the extent of influence of dredging (Ref 17). Therefore TSS data derived from satellite imagery are considered suitable for use at Barrow Island*

An assessment of whether the actual changes that occurred are as predicted by the modelling will be undertaken for the initial maintenance dredging campaign by comparing the concentration, duration, and spatial extent of TSS associated with dredging with modelled data, accounting for any model input parameters (e.g. dredge type and location, production rates, metocean conditions) that may be different between the modelled and actual dredging programs. After the first maintenance dredging campaign, if there is agreement between the modelled outputs and TSS data (or if modelling predictions were conservatively overestimated the actual extent of turbid plumes), this comparison will not be completed for future maintenance campaigns as it will be assumed that the model predictions are an accurate or conservative overestimate of actual effects.

4.1.1.1 Management Triggers

Water quality management triggers (Table 4-1) were established to guide the tiered management approach described in Figure 4-1.

These management triggers were derived from a comprehensive analysis of water quality and coral health data collected during the Gorgon capital dredging campaign. The triggers have been applied successfully to manage potential environmental impacts of the nearby Wheatstone capital dredging campaign and correspond to levels that are well below those at which impacts to receptors were observed to occur, thereby allowing for proactive management of dredging to occur well prior to any foreseeable impacts. During the Wheatstone capital dredge program, the triggers were found to afford protection to a range of benthic receptors, including corals, seagrasses, macroalgae and filter feeders, exemplified by no detectable changes being observed in these communities post-dredging, despite the movement of 31 Mm^3 of dredged material (Ref. 17).

The process described in Figure 4-1 requires TSS data associated with maintenance dredging to be compared against water quality management triggers under the following circumstances:

- Where TSS data derived from satellite imagery indicates that the actual extent of turbid plumes associated with dredging are consistently (more than three consecutive days) greater than predicted and/or are observed to extend to known sensitive receptor locations.
- Where satellite imagery is unavailable (due to cloud cover etc.) but a plume was observed to contact a known sensitive receptor location on the previous day, or is considered by Chevron to have a reasonable likelihood of contacting a known sensitive receptor location. Until such time as data is available to suggest that an elevation above trigger criteria has not occurred.

If water quality management triggers, deemed Project-attributable, are reached at sensitive receptor locations during Gorgon maintenance dredging and the conditions that led to the triggers being reached are considered likely to continue, Chevron Australia, in consultation with the TACC, will determine appropriate management actions to be implemented (Figure 4-1). Examples of management actions which may be implemented are described in Table 4-1.

The management approach described in Figure 4-1 does not preclude early management action if elevations in turbidity determined to be Project-attributable represent a significant threat to known sensitive receptor locations.

Table 4-1: Water Quality Management Triggers and Management Actions

Trigger Criteria	Potential Management Actions
Chronic trigger criteria Daily median turbidity >3.3 × background[1] turbidity and >2.62 TSS[2] for more than 20 days	The following are examples of management actions that may be implemented in order to reduce turbidity associated with dredging at

Trigger Criteria	Potential Management Actions
out of a 40 day rolling assessment period. OR **Moderate trigger criteria** Daily median turbidity >3.2 × background[2] turbidity and >5.08 TSS[3] for more than 8 days out of a 40-day rolling assessment period.	receptor locations where exceedance(s) occurred: • Shorten dredging activities from 24 hours a day (e.g. to 12 hours/day or night) • Temporarily relocate dredging operations to other areas within the dredging footprint to reduce stress on receptors • Temporarily relocate placement of spoil material to other areas of the DSDG to reduce stress to receptors

[2] Background for the assessment days derived from satellite imagery (e.g. MODIS) where available, in similarly positioned areas distant from and unaffected by dredging.

[3] While triggers were derived using NTU data, the TSS to NTU ratio for Gorgon is approximately 1:1. Therefore, triggers have been converted to TSS to enable ease of comparison with satellite-derived TSS data.

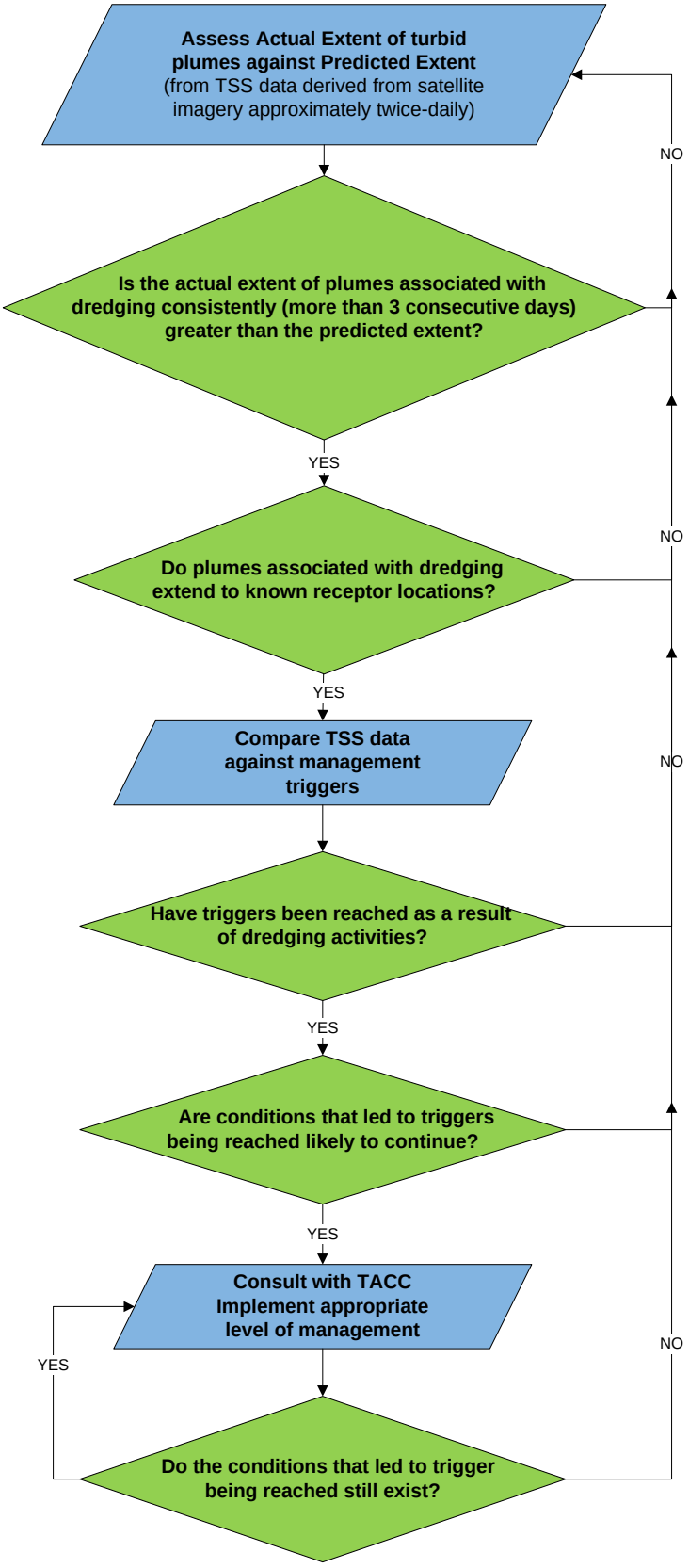


Figure 4-1: Gorgon Maintenance Dredging Turbidity Monitoring and Management Process

4.1.2 Effects Monitoring

Effects monitoring assesses whether any specific effects on the benthic communities are likely to have occurred beyond those predicted. Effects monitoring will address these specific objectives:

- determine the areas of potential effect on receptors, as defined by the concentrations, durations, and spatial extent of changes in turbidity associated with each maintenance dredging campaign
- compare areas of effect with known locations of sensitive receptors to determine likely impacts to receptors.

After each dredging campaign, the areas of potential effect on receptors will be defined by interrogating TSS maps (concentrations, durations, and spatial extent, derived from remote sending imagery) with threshold values, below which no detectable impacts to sensitive receptors are known to occur (as derived from the Gorgon marine monitoring program associated with capital dredging). Areas where thresholds are exceeded will be overlain on the mapped locations of sensitive receptors to determine potential impact zones. Because maintenance dredging programs will be infrequent (up to three to five years apart) and of short duration (approximately two weeks), it is unlikely that any cumulative effects of individual campaigns will need to be accounted for in assessing environmental effects.

The potential environmental effects of the maintenance dredging program will be based on measurements of TSS rather than in situ receptor monitoring, for these reasons:

- A strong understanding of the relationship between turbidity (also a proxy for sedimentation) and receptor health was developed during the Gorgon capital dredging campaign. This understanding was developed through a detailed analysis of turbidity and receptor health data collected during the comprehensive Gorgon capital dredging monitoring program. These thresholds have since been applied successfully to the Wheatstone capital dredging campaign (31 Mm^3). No impacts to corals, seagrass, macroalgae, or filter feeders were detected at Wheatstone when turbidity was maintained below the thresholds derived from Gorgon data.
- No declines in coral health or the health of other BPPH habitat as a result of the Gorgon maintenance dredging campaign are predicted to occur, as described by the outputs of the independently peer-reviewed sediment plume dispersal modelling. Even during the Gorgon capital dredging program when approximately 7.8 million m^3 of material was dredged over 18 months, impacts to benthic receptors were minimal, well below predicted and approved levels, and restricted to areas close to dredging activities. The proposed volume of material to be dredged and disposed over the duration of the Gorgon Maintenance Dredging Sea Dumping Permit (up to 2 million m^3 over the 10-year duration of the Permit) is significantly less than the volume dredged during the Gorgon capital dredging campaign. Additionally, the dredging periods are likely to be brief (approximately two weeks) and infrequent (approximately every three to five years).
- A conservative approach will be taken when assessing the actual environmental effects from each dredging campaign—a threshold below which no impacts to receptors are known to occur will set the criteria for defining the receptor impact zone associated with the maintenance dredging campaign.

4.2 Potential Environmental Impacts and Management Measures

The following subsections assess the potential environmental impacts associated with maintenance dredging, which were identified using the internal Chevron Australia risk management process. Control measures are proposed where impacts require mitigation. Where existing environmental management plans are in place to manage

specific impacts from the Gorgon Gas Development, these were identified as the mechanism for managing the same impacts during maintenance dredging.

Note: Any reference to a Plan, Program, Report, or Procedure approved under Part IV of the EP Act or the EPBC Act means the current version of that Plan, Program, Report, or Procedure as approved from time to time, including any amendments or replacements to that Plan, Program, Report, or Procedure made during the term of the Sea Dumping Permit. Where commitments made in any Plan, Program, Report, or Procedure change from time to time, the commitments in those Plans, Programs, Reports, or Procedures take priority over commitments made in this Management Plan.

4.2.1 Marine Turtles

Potential impacts to marine turtles from maintenance dredging include:

- altered behaviour in response to artificial lighting from vessels
- injury or mortality caused by fauna collision with vessels and dredging equipment (including entrainment)
- direct and indirect health effects from loss of containment of hazardous materials.

The LTMTMP (Ref. 7) requires the implementation of these design features and management measures relevant to maintenance dredging activities to minimise impact to marine turtles:

- If maintenance dredging is required during the turtle season, then turtle deterrent devices on the TSHD will be used.
- If maintenance dredging occurs during the turtle season, marine fauna observers will be present on dredging vessels.
- If marine turtles are sighted near the path of a vessel, vessels will gradually divert to avoid them (if safe to do so), or slow down to idling speed.
- Vessel movements, including any imposed speed restrictions within the Port of Barrow Island, will be under the control of the Barrow Island Port Captain.
- Vessels working at night within the Port of Barrow Island during turtle season will be required to reduce lighting to the minimum required for safe operations.

In addition, the following management measures will be implemented:

- Prior to each dredging run, watch will be maintained for any marine turtles within the monitoring zone (300 m radius of dredge vessel); if any are sighted, the dredge will be relocated to an area outside the monitoring zone, before dredging can begin.
- If any marine turtles are sighted within the monitoring zone (300 m) during a dredging run, dredging will halt until no marine turtles can be sighted within the monitoring zone.
- Prior to spoil disposal a check will be undertaken using binoculars from a high observation platform, for marine turtles within the monitoring zone (300 m).
- If any marine turtles are sighted in the monitoring zone, spoil disposal will not commence until either 20 minutes after the last marine species is observed in the monitoring zone, or the vessel has moved to another area of the disposal site where it can maintain a minimum distance of 300 m between the vessel and any marine species.
- Routine inspections will be conducted for any evidence of turtle entrainment.

4.2.2 Marine Fauna

Potential impacts to marine fauna from maintenance dredging include:

- injury or mortality caused by fauna collision with vessels and dredging equipment

- direct and indirect health effects from loss of containment of hazardous materials.

These impacts will be mitigated through this management measure:

- adherence to EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.04) – Interacting with cetaceans, which includes establishment of a caution zone around observed cetaceans, with a radius of 150 m for a dolphin and 300 m for a whale.

The LTMTMP (Ref. 7) requires the implementation of these design features and management measures relevant to maintenance dredging activities, to minimise impact to marine turtles; these are relevant to marine fauna:

- If maintenance dredging occurs during turtle season, marine fauna observers will be present on dredging vessels.
- Procedures will be implemented to prevent loss of containment during the bulk transfer of hydrocarbons and chemicals to/from vessels.
- If marine turtles (including other marine megafauna) are sighted near the path of a vessel, vessels will gradually divert to avoid them (if safe to do so), or slow down to idling speed.
- Vessel movements, including any imposed speed restrictions within the Port of Barrow Island, will be under the control of the Barrow Island Port Captain.

In addition, the following management measures will be implemented for marine species listed under the EPBC Act:

- Prior to each dredging run, watch will be maintained for any marine mammals within the monitoring zone (300 m radius of dredge vessel); if any are sighted, the dredge will be relocated to an area outside the monitoring zone, before dredging can begin.
- If any marine mammals are sighted within the monitoring zone (300 m) during a dredging run, dredging will halt until no marine mammals can be sighted within the monitoring zone.
- Prior to spoil disposal, a check will be undertaken using binoculars from a high observation platform, for marine species within the monitoring zone (300 m).
- If any marine species are sighted in the monitoring zone, spoil disposal will not commence until either 20 minutes after the last marine species is observed in the monitoring zone, or the vessel has moved to another area of the disposal site where it can maintain a minimum distance of 300 m between the vessel and any marine species.

4.2.3 Marine Pest Species

Marine pest species have the potential to impact on the conservation values of Barrow Island and its surrounding waters.

All vessels must adhere to the Commonwealth *Quarantine Act 1908* and the Quarantine Regulations 2000, which includes requirements for entry into Australian waters, ballast water management, and sanitation. All marine vessels operating in State and Barrow Island waters must remain free from marine pests, in accordance with the Western Australian Prevention List for Introduced Marine Pests (Ref. 5).

The QMS (Ref. 6) requires implementation of these management measures relevant to dredging vessel activities, to minimise the potential for introduction of marine pest species:

- All vessels approaching or accessing Barrow Island must develop and comply with a Vessel Quarantine Management Plan or Pest Control Program.
- Authorisation to mobilise is granted via the issue of a Vessel Quarantine Mobilisation Certificate if it can be demonstrated that the vessel has met quarantine requirements.

- Vessel Final Quarantine Clearance is granted when the authorisation to mobilise is issued or when all subsequent remedial actions (including but not limited to advice reports, instructions) have been completed.

4.2.4 Benthic Primary Producer Habitat

Potential impacts to corals and other BPPH from maintenance dredging include:

- loss of corals and other BPPH as a result of deterioration of water quality (elevated TSS)
- loss of BPPH through anchoring and mooring of dredging and support vessels
- loss of BPPH through vessel groundings.

These impacts will be mitigated through these management measures:

- If TSS data (derived through satellite imagery) indicates that water quality at sensitive receptor sites is deteriorating to a level that may impact corals, then the dredging management responses in Table 4-1 will be considered.
- Designated anchorages will be located within the Port of Barrow Island.
- Hydrographic charts of the area of operation will be made available to the dredging contractor.
- Vessel movement and anchorages will be monitored by the Barrow Island Port Captain.

4.2.5 Marine Water and Sediment Quality

Potential impacts to water and sediment quality from maintenance dredging include:

- loss of containment of hazardous materials
- vessel discharges (effluent, treated oily water)
- dredging potentially contaminated sediments.

These impacts will be mitigated through these management measures:

- development and implementation of a Sampling and Analysis Plan
- marine vessels >400 T will carry on board a Shipboard Oil Pollution Emergency Plan.

In addition, the LTMTMP (Ref. 7) requires the following management measures during dredging activities to minimise impact to marine turtles; these are relevant to marine water and sediment quality:

- procedures will be implemented to prevent loss of containment during the bulk transfer of hydrocarbons to/from vessels
- appropriate emergency response will be implemented if there is a loss of containment.

The SLWMP (Ref. 8) requires these management measure relevant to dredging activities:

- treatment and discharge of waste from vessels to comply with the requirements of MARPOL 73/78 (Ref. 15) and the Commonwealth *Protection of the Sea (Prevention of Pollution from Ships) Act 1983.*

The MEQMP (Ref. 11) also requires these relevant management measures and design features:

- MOF, LNG Jetty, and turning basins:

    - storage vessels and higher-risk leak points (e.g. bowsers, flanges, valves) equipped with kerbed containment and sumps; LNG Jetty bunds (remote from drainage system) are fully self-contained
    - operational procedures specifying that areas are to be maintained clean, requiring immediate clean-up of spills, routine inspections for damaged or leaking equipment, pre/post rainfall inspections and cleanout, dewatering of sumps and bunds, and scheduled preventive maintenance programs
- marine vessels within the Barrow Island Port area:
    - marine vessels must be registered with the International Maritime Organization (IMO), which prohibits the use of antifoulants containing TBT
    - internal marine Operational Excellence (OE) inspections verify that vessels are IMO-registered, which confirms that the antifoulants used are TBT-free.

5.0 Auditing, Reporting, and Review

5.1 Consultation Requirements

Chevron Australia will form a Technical Advisory and Consultative Committee (TACC), composed of relevant experts in the marine environment, dredging and marine turtles. The TACC will be chaired by an external expert. Prior to the first dredging campaign, a Terms of Reference for the TACC will be established and the Committee formed. The role of the TACC is to:

- be informed of upcoming dredge campaigns
- review outcomes post-campaign
- be consulted as required during a dredge campaign.

The Sea Dumping Permit SD2016/3382 requires that any emergency dredging activities undertaken must be reported to the TACC and raised as an agenda item for discussion at the TACC meeting immediately following the dumping activities.

5.2 Reporting Requirements

Chevron Australia will comply with any reporting requirements specified within the Sea Dumping Permit SD2016/3382, which include:

- complete bathymetric surveys of the disposal site by a suitably qualified person:
  - prior to the commencement of dumping activities under this permit
  - within 90 calendar days of the disposal site being used for dumping activities
- within 2 months of the final bathymetric survey being undertaken, provide a digital copy of the bathymetric surveys to the Australian Hydrographic Office, Locked Bag 8801, Wollongong, NSW 2500
- provide a report on the bathymetry to DOTEE within 2 months of the final bathymetric survey being undertaken, including a chart showing the change in sea floor bathymetry as a result of dumping activities and written commentary on the volumes of dumped material that appear to have been retained within the disposal site
- provide completed Appendix 2 of SD2016/3382 to DOTEE by 31 January each year, including on the day of the expiry of the permit or completion of all dumping activities under this permit.

Within 90 days of the end of a dredge campaign, Chevron Australia will submit a summary report to DOTEE, which would include a summary of:

- dredging activities (volumes dredged, re-used, disposed of)
- monitoring results, where applicable.
- any incidents, exceedances, and management actions taken, where applicable.

Additionally, Chevron Australia must submit and make publicly available, annual Compliance Reports in accordance with Condition 4 of MS 800 and Condition 2.0 of EPBC Reference: 2003/1294 and 2008/4178. These reports address the status and compliance of the Gorgon Gas Development with the conditions referred to in MS 800 and EPBC Reference: 2003/1294 and 2008/4178. The reports must identify all non-compliances and describe corrective and preventive actions taken.

Chevron Australia must also submit and make publicly available, annual Environmental Performance Reports in accordance with Condition 5 of MS 800 and Condition 4 of EPBC Reference: 2003/1294 and 2008/4178.

SD2016/3382 requires that the following records are retained, comprising either weekly plotting sheets or a certified extract of the ship's log which detail:

- the dates and times of when each dumping run commenced and finished
- the position (as determined by GPS) of the dumping vessel at the beginning and end of each dumping run, including the path of each dumping run
- the volume of dredged material (in situ cubic metres) dumped and quantity in dry tonnes
- the person(s) undertaking the marine species observation required in Condition 11 and any marine species observed within the monitoring zone for each run, including the date, time and approximate distance from the vessel, and the action taken to comply with Condition 12
- the person(s) responsible for the operation of the vessel at any time during dumping activities.

5.3 Incidents

The process for reporting and investigating incidents is addressed by implementing Chevron Australia's Incident Investigation and Reporting (IIR) Process (Ref. 14). The scope of the IIR Process covers both internal (Chevron) and external (regulator) reporting requirements, including personnel roles and responsibilities in reporting incidents.

The IIR Process includes details for reporting, recording, and investigating incidents and near misses, and correcting any deficiencies found.

Chevron Australia uses a database for recording incident reports and tracking action items resulting from incident investigations.

Table 5-1 lists the environmental incident reporting requirements, including timing, required by SD2016/3382.

Table 5-1: Incident Reporting Requirements

Incident	Required content of report	Report to	Timing
Harm or mortality to all whales, dolphins, dugongs and marine turtles listed under the EPBC Act attributable to dredging activities under SD2016/3382	Date, time and nature of each incident and the species involved, if known	DOTEE	Within 72 hours of detection
Any environmental incident or environmental risk identified during the dredging activities under SD2016/3382	The incident or risk, the measures taken, the success of those measures in addressing the incident or risk, and any additional measures proposed to be taken.	DOTEE	Within 72 hours of detection

5.4 Audits

Routine compliance audits are undertaken in accordance with Chevron Australia's Compliance Assurance Process (CA Process) (Ref. 13).

This process addresses the establishment of audit programs to verify the effectiveness of controls and the extent to which requirements are met by Chevron Australia. Audits may focus on in-field activities or administrative processes, depending on the activities being undertaken around the time of audit.

A compliance audit will be completed to verify the management measures identified in Section 4.2 are implemented during each maintenance dredging campaign.

Corrective actions identified during the audits will be managed in accordance with the CA Process. Chevron Australia uses a database for recording actions and tracking them until the they are closed out.

5.5 Corrective Actions and Contingency Plans

If undesired or unforeseen impacts are identified during reporting, audits, or incidents (see Sections 5.1, 5.3, and 5.4), corrective actions and/or contingency plans will be considered and implemented as required.

Contingency plans may be developed if reporting, audits, or incidents identify impacts that cannot be resolved and closed out via the corrective action process, and longer-term management strategies are required to mitigate the impacts.

Refer to Section 4.1 for a description of management triggers and management actions.

5.6 Review of Management Plan

Chevron Australia is committed to conducting activities in an environmentally responsible manner and aims to implement fit-for-purpose environmental management as part of a program of continuous improvement. This commitment to continuous improvement means Chevron Australia will review this Plan every five years or more often as required (e.g. in response to new information).

Reviews will address matters such as the overall design and effectiveness of the Plan, progress in environmental performance, changes in environmental risks, changes in business conditions, and any relevant emerging environmental issues.

6.0 Terminology

Table 6-1 defines the terminology and abbreviations used in this document.

Table 6-1: Terminology

Acronym / Abbreviation	Definition
BHD	Back-Hoe Dredge
BPPH	Benthic Primary Producer Habitat
CA	Compliance Assurance
CD	Chart Datum
Chevron Australia	Chevron Australia Pty Ltd
CMBSEIR	Coastal Marine Baseline State Environment Impact Report
DOTEE	Commonwealth Department of the Environment and Energy
DSDG	Dredge Spoil Disposal Ground
DSDMMP	Dredging and Spoil Disposal Monitoring and Management Plan
EP Act	Western Australian *Environment Protection Act 1986*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPBC Reference: 2003/1294	Commonwealth Ministerial Approval (for the Gorgon Gas Development) as amended or replaced from time to time
EPBC Reference: 2008/4178	Commonwealth Ministerial Approval (for the Revised Gorgon Gas Development) as amended or replaced from time to time
GTP	Gas Treatment Plant
ha	Hectare
IIR	Incident Investigation and Reporting
IMO	International Maritime Organization
JERA	Japanese New Energy Company Gorgon Pty Ltd
km	Kilometre
LNG	Liquefied Natural Gas
LTMTMP	Long-term Marine Turtle Management Plan
m	Metre
m^3	Cubic metre
Management Plan	Gorgon Operations Maintenance Dredging Management Plan
Marine Facilities	In relation to MS 800 and EPBC Reference: 2003/1294 and 2008/4178, the Marine Facilities are the: • Materials Offloading Facility (MOF) • LNG Jetty • Dredge Spoil Disposal Ground • Offshore Feed Gas Pipeline System and the marine component of the shore crossing • Domestic Gas Pipeline. For the purposes of MS 800, Marine Facilities also include: • Marine upgrade of the existing WAPET landing.

Acronym / Abbreviation	Definition
Marine species	Defined by the Sea Dumping Permit SD2016/3382 as 'all whales dolphins, dugongs and marine turtles listed under the *Environment Protection and Biodiversity Conservation Act 1999*'
MARPOL	The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. Also known as MARPOL 73/78.
MEQMP	Marine Environmental Quality Management Plan
mg/L	Milligrams per litre
MOF	Materials Offloading Facility
MS	Ministerial Statement
MS 800	Western Australian Ministerial Statement 800 (for the Gorgon Gas Development) as amended from time to time
NCBM	Non-coral Benthic Macroinvertebrates
OE	Operational Excellence
OEPA	Office of the [Western Australian] Environmental Protection Authority
PAH	Polycyclic Aromatic Hydrocarbons
PDS	Post-Development Survey; Gorgon Gas Development and Jansz Feed Gas Pipeline: Post-Development Coastal and Marine State and Environmental Impact Survey Report
QMS	Terrestrial and Marine Quarantine Management System
SLWMP	Solid and Liquid Waste Management Plan
T	Tonne
TAPL	Texaco Australia Pty Ltd
TBT	Tributyl Tin
TSHD	Trailer Suction Hopper Dredge
TSS	Total Suspended Solids
Turtle season	Period of high marine turtle activity, typically from September to March. This encompasses peak periods of marine turtle mating, nesting, and hatching at Barrow Island.
WA	Western Australia
WGS84	World Geodetic System 84; the reference coordinate system used by the Global Positioning System
WQ	Water Quality

7.0 References

The following documentation is either directly referenced in this document or is a recommended source of background information.

Table 7-1: References

Ref. No.	Description	Document ID
1.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Coastal and Marine Baseline State Environmental Impact Report*	G1-NT-REPX0001838
2.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Post-Development Coastal and Marine State and Environmental Impact Survey Report, Year 1 2011–2012*	G1-NT-REPX0004461
3.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Post-Development Coastal and Marine State and Environmental Impact Survey Report, Year 2 2012–2013*	G1-NT-REPX0005152
4.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Post-Development Coastal and Marine State and Environmental Impact Survey Report, Year 3 2013–2014*	G1-NT-REPX0006373
5.	Department of Fisheries. *Western Australian Prevention List for Introduced Marine Pests*, October 2014.	
6.	*Barrow Island Quarantine: Terrestrial and Marine Quarantine Management System*	G1-PP-QRT-GDL-0001
7.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Long-term Marine Turtle Management Plan*	G1-NT-PLNX0000296
8.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Solid and Liquid Waste Management Plan*	G1-NT-PLNX0000302
9.	*Gorgon Gas Development and Jansz Feed Gas Pipeline: Dredging and Spoil Disposal management and Monitoring Plan*	G1-NT-PLNX0000373
10.	*Draft Environmental Impact Statement/Environmental Review and Management Programme for the Proposed Gorgon Development*	NA
11.	*Gorgon Gas Development Marine Environmental Quality Management Plan*	GOR-COP-01110
12.	*Gorgon Operations: Maintenance Dredging Sampling and Analysis Plan Manual*	GOR-COP-01907
13.	*ABU OE Compliance Assurance Process – ABU Standardised OE Process*	OE-12.01.01
14.	*Incident Investigation and Reporting – ABU Standardised OE Process*	OE-09.00.01
15.	International Maritime Organization. 1997. *International Convention for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 relating thereto (MARPOL)*. International Maritime Organization, London.	
16.	DHI Water and Environment. 2016. *Gorgon Channel Sedimentation Assessment*.	43802184-RPT
17.	*Wheatstone Project Dredging and Dredge Spoil Placement Environmental Monitoring and Management Plan*	WS0-0000-HES-RPT-CVX-000-00086-000
18.	Gorgon Gas Development: Maintenance Dredging Sea Disposal Permit Application	GOR-COP-01955