Learmonth Pipeline Fabrication Facility

Marine Emergency Response Plan

APFAC017-HSE-00004

REVISION RECORD SHEET

Revision	Issue Date	Purpose	Description of Updated / Modified Sections (if any)
Draft	21.01.2019	Internal Review	-
Final	09.03.2019	Issued for Use	Draft comments incorporated.
Final	04.09.2019	Issued for Use	Regulator comments incorporated. Section 3.3 added to provide additional information if a Bundle repair is required.

Executive Summary

Subsea 7 proposes to build and operate a new pipeline Bundle fabrication site in Learmonth, Western Australia (the Proposal). Bundle pipelines would be progressively manufactured as one, up to 10 km long, segment and moved out from the manufacturing facility along the track. Once manufactured to its desired length and pressure tested, each Bundle pipeline is then towed out by boat and submerged on arrival at the offshore gas field.

The State Environmental Protection Authority (EPA) has determined that the above Proposal required formal assessment with the level of assessment set as Public Environmental Review (PER). Further, the Proposal has been referred and determined to be a controlled action under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) with assessment by "accredited assessment" under the Environmental Protection (EP) Act required.

Within this assessment process, the Environmental Scoping Document (that sets out the scope of the assessment) requires that the environmental review includes a Marine Emergency Response Plan that includes procedures to be implemented during operations which specifically address control measures to be in place in the event of an accidental spill or incident, including damage to or loss of control of the pipeline bundle during launch and towing activities.

The Marine Emergency Response Plan (MERP) to follow addresses the following key components (among others):

- Objectives of the MERP
- Key Environmental Factors that are considered in the MERP
- Operations management and business management system
- Applicable emergency response scenarios, with a focus on the environment
- Emergency response actions and guidance
- Reporting requirements
- Continuous improvement and review of the emergency response plan

Ultimately, this MERP provides the management plan to ensure that robust preventative measures are employed during project execution to reduce the likelihood of occurrence of an emergency incident to a level that is considered ALARP (as low as reasonably practicable). Further, appropriate responses are identified to minimise the associated impact of any incident.

This MERP is a management system level document that will be supplemented by additional documentation that may be generated throughout the life of the facility, or during the execution of any bundle projects that utilise the facility. In particular, project specific documentation will be developed that address the particular bundle launch and towing scenarios, accounting for the specific vessels and fleet involved, the environmental conditions at the time of the operations, and the detail of the bundle being launched (noting that all bundles are typically different in some way). This MERP sets a minimum level of expectation and requirements to be implemented, with the additional documents to follow building on this foundation to ensure a safe and sustainable operation can be executed at all times.

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1. CONTEXT, SCOPE AND RATIONALE

This Marine Emergency Response Plan (MERP) is submitted in support of the Environmental Review Document (ERD) (Assessment Number 2136 / EPBC 2017-8079) developed by Subsea 7 Australia Contracting Pty Ltd (Subsea 7) for the Learmonth Pipeline Fabrication Facility (the Proposal). This document has also been developed in support of Subsea 7's referral of the Proposal under the EPBC Act on 31 October 2017.

The MERP is designed to be adaptive and will be updated over the life of the Proposal as further information about Bundle launch and tow operations within Exmouth Gulf and the project area, and effectiveness of implemented management measures, is obtained.

1.1 PROPOSAL

Subsea 7 proposes to build and operate a new pipeline Bundle fabrication site in Learmonth, Western Australia (the Proposal) (Figure 2-1).

Bundle pipelines would be progressively manufactured as one, up to 10 km long, segment and moved out from the manufacturing facility along the track. Once manufactured to its desired length and pressure tested, each Bundle pipeline is then towed out by boat and submerged on arrival at the offshore gas field.

The proposed pipeline Bundle fabrication facility will include a Bundle track of approximately 10 km in length and an access road from Minilya-Exmouth Road approximately 3 km in length. The Proposal also includes the construction of a fabrication shed, where the Bundles will be constructed, a storage area where the Bundle materials will be stored prior to use, and two approximately 10 km long rail Bundle tracks along which each Bundle will be constructed and then launched. A Bundle launchway, crossing the beach and extending into the shallow subtidal area, will facilitate the launch of each Bundle.

To launch a Bundle, the Towhead on the nearshore end of the Bundle is connected to a tug (the 'Leading Tug') via a long tow line. The tug then slowly (≤ 2 knots) heads offshore, pulling the Bundle along the track and into the ocean. The onshore end of the Bundle is connected to another line which is slowly paid out from an onshore winch, until the Bundle reaches sufficient water depth for connection to another tug (the 'Trailing Tug').

The Bundle moves down the track, which extends across the beach and into the shallow subtidal area. As the Bundle towheads (both lead and trailing towheads) enter the water and gain depth, they will become buoyant as the structure and floatation devices enter the water, such that by the offshore end of the launchway they are floating above the seabed.

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Notes: Location of proposed Bundle Site.

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Figure 2-1: Location of Proposal

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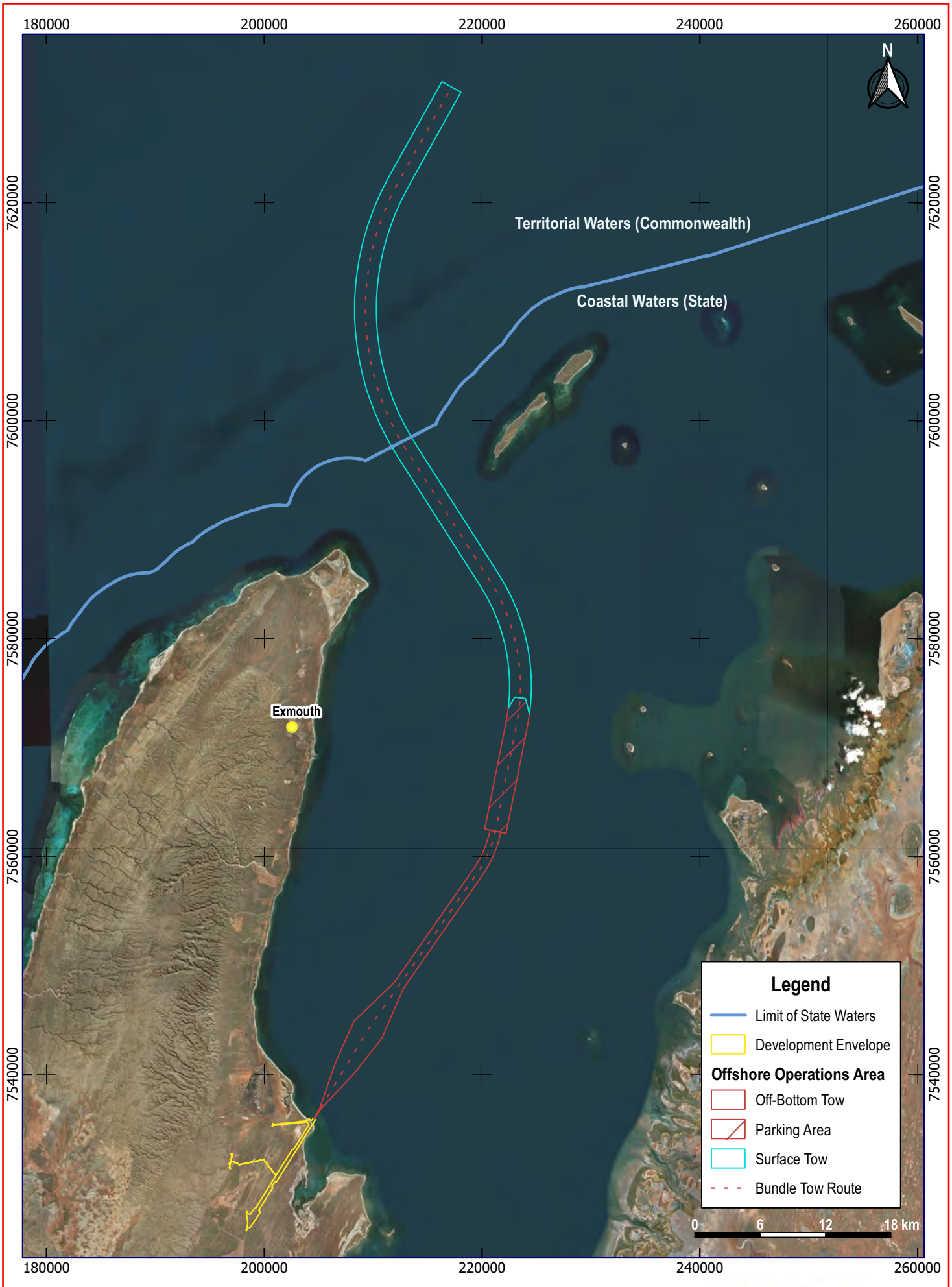
Following the launch the Bundle will be towed slowly (≤ 5 knots) offshore along the tow route (Figure 2-4). The Bundle will be in 'Off Bottom Tow', meaning that the Bundle (including towheads) will be clear of the seabed. The lower links of the long Bundle chains will be in contact with the seabed in this mode. All seabed disturbance will be within the Offshore Operations Area (Figure 2-4).

On arrival at the Parking Area (Figure 2-4) the Bundle will be stopped and various checks and reconfiguration for the subsequent 'Surface Tow' completed. The Bundle will remain within this area for nominally 24 hours to allow for all checks and reconfiguration to be completed, and to allow for the 'Surface tow' out of the Exmouth Gulf to be aligned with the optimal wind and current conditions.

On exit from the Parking Area the tow vessels will increase the tow speed to approximately 5-6 knots (≤ 8 knots through water). Hydrodynamic forces acting on the ballast chains produce a lift component and the Bundle will rise to the surface in a controlled manner. In this 'Surface Tow' configuration the Bundle lies right at the surface, ensuring the maximum clearance (~10m) from the seabed as it exits Exmouth Gulf.



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Notes: Data sourced from Subsea 7 (2018).

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Figure 2-4: Offshore Operations Area and Indicative Tow Route

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1.2 PURPOSE OF MERP

The purpose of this MERP is to document the control measures in place to prevent an unplanned event during Bundle launch and tow, and the response procedures to be implemented in an emergency scenario. The emergency response procedures have been developed to ensure that the environmental factors identified as being at risk during the launch and tow activities are not significantly impacted.

This document will be supplemented by project specific emergency response manuals, procedures and specific risk assessments that are developed in accordance with Subsea 7's Business Management System and standard operating procedures.

1.3 OBJECTIVES

The objectives relevant to this MERP are:

- Subsea 7 Objective: Protect the health, safety and security of everyone involved in or affected by Subsea 7 activities while minimising impact on the environment at all times.
- Subsea 7 Objective: Ensure no significant impact on marine environmental values, during construction and operation of the Proposal (inclusive of emergency events).
- Subsea 7 Objective: Ensure that any emergency event can be controlled such that environmental impacts are no greater than normal operations of Bundle launch and tow.
- EPA Objective: To protect marine fauna so that biological diversity and ecological integrity are maintained.
- EPA Objective: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.
- EPA Objective: To maintain the quality of water, sediment and biota so that environmental values are protected.

1.4 KEY ENVIRONMENTAL FACTORS

The key environmental factors addressed within the Public Environmental Review (submitted under the EP Act 1986 and EPBC Act 1999), and specifically relevant to the Bundle launch and tow operations of the Learmonth Pipeline Fabrication Facility are described in this Section 1.4. Subsea 7 have identified potential impacts to environmental values for normal operations and emergency situations. For normal operations, the Public Environmental Review (PER) document addresses the potential impacts of the Proposal on each environmental factor.

1.4.1 Marine Environmental Quality

The EPA's objective for marine environmental quality is "To maintain the quality of water, sediment and biota so that environmental values are protected".

The potential impacts to marine environmental quality as a result of an unplanned event during a Bundle launch and two are:

- Temporary impacts to water quality during Bundle launch and tow due to chains on the seabed
- Impacts to water and/or sediment quality in the event of a loss of control of the Bundle or support vessel (e.g. from a chemical spill)

1.4.2 Marine Fauna

The EPA's objective for marine fauna is "*To protect marine fauna so that biological diversity and ecological integrity are maintained*".

The potential impacts to marine fauna as a result of an unplanned event during a Bundle launch are:

- Temporary behavioural response of marine fauna due to changes in marine water quality.
- Loss or degradation of BCH representing marine fauna habitat (e.g. foraging habitat) during Bundle launch and tow.
- Direct impact (strike or entanglement) during Bundle launch and tow.
- Leak or spill of chemicals (including hydrocarbons) impacting marine fauna health.

1.4.3 Benthic Communities and Habitat

The EPA's objective for benthic communities and habitat is "*To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained".*

The potential impacts to benthic communities and habitat as a result of an unplanned event during a Bundle launch are:

- Direct loss of benthic communities and habitat (BCH) during Bundle tow in the event of a loss of control of the Bundle
- Indirect loss of BCH during Bundle tow in the event of a loss of control of the Bundle or support vessel (e.g. from a chemical spill)

2. OFFSHORE OPERATIONS & MANAGEMENT ACTIONS

2.1 SUBSEA 7 BUSINESS MANAGEMENT

2.1.1 Subsea 7 Business Management System

Subsea 7 is an industry leading offshore construction and services company. To safely, sustainably and effectively deliver Bundle technology from the Learmonth Pipeline Fabrication Facility, the Subsea 7 business management and quality assurance systems will be implemented, with site specific safety management systems developed to supplement the global Subsea 7 standards.

Subsea 7 has developed and maintains a Business Management System (BMS) that applies to all Subsea 7 operations worldwide. It is designed to assist employees and managers carry out their work as efficiently as possible and to a consistently high standard. The BMS provides access to all policies, manuals, procedures, processes, and work instruction forms that the company uses to manage the business. These documents align with global standards as well as long-term experience to develop the best practice and company standard.

The BMS complies with the requirements of the following:

- ISO 9000 - International Organisation for Standardisation quality standard;
- ISO 14001 - International standard for Environmental Management Systems;
- OHSAS 18001 - Occupational Health and Safety Management Systems;
- International Safety Management (ISM) Code - The International Management Code for the Safe Operation of Ships and Pollution Prevention;
- ISPS - The International Ship & Port facility Security system

Within the BMS, Subsea 7 has established procedures for the effective control of emergency situations at its worksites. These procedures include:

- Health, Safety, Environment and Quality Policy Statement
- Emergency Response Notification Log
- Environmental Management Procedure
- Management Of Change Procedure
- Health, Safety, Environment Incident and Observation Reporting, Classification, Investigation and Review
- Procedure for the Preparation of Project Health Safety and Environment Management Plans

These procedures identify the actions to be taken by Subsea 7 management in support of an incident at any of its locations. These procedures also explain the initial reporting steps and gives guidance to others that may become involved in support of the incident response team.

Subsea 7 along with their Clients (the Bundle end-user) will develop Emergency Response Procedures and Safety Management System Bridging Documents for the various phases of each Bundle project. These documents will contain the overall consolidated emergency response organisation specific to the Learmonth site and each project. This document will be referenced within these bridging documents to ensure the regulated emergency response is at the core of each project plan.

2.1.2 Bundle Fabrication and Terrestrial Operations Management

Site operations will be controlled by a series of operational health, safety, security and environment (HSSE) procedures, developed and maintained by Subsea 7. The Site Manager will have the overall responsibility of the implementation and maintenance of these procedures. The Site HSSE advisor will administer and update the procedures as required, and any changes will be reviewed and approved by the Site Manager prior to implementation.

All site personnel will receive a site health, safety, security and environment induction on arrival to the site, which will include a familiarisation of the site and site HSE procedures. All site personnel and third party contractors will adhere to the site HSE procedures, as well as the overarching Subsea 7 BMS documents.

A permit to work (PTW) system will be implemented for site operations. This may cover activities such as hot work (i.e. welding), working at height (inc. scaffolding) and heavy lift crane operations. Permits will be administered by a permit coordinator, and be closed after an agreed task duration has elapsed (for each working shift, the permit is re-validated). The permit to work system will ensure that all work that is carried out has been planned, risk assessed, and conforms to the safe work procedures.

Quality assurance and quality control (QA/QC) systems will be in place on site to monitor and control all Bundle fabrication activities. The QA/QC function will ensure that all work is completed as per engineering standards, to ensure the Bundle meets the required integrity. This will include auditing of material qualifications and non-destructive testing procedures. Any deviations or changes to the design specification of the Bundle will be reviewed and approved under Subsea 7's Management of Change (MOC) processes, which will include material and fabrication experts as required.

Where required or appropriate, Subsea 7 will engage independent third party verification services, to review and verify engineering and fabrication procedures have been adhered to. This will typically include the review of the final fabrication dossier of the Bundle, after final system integrity tests have been completed. Once all system checks have been completed, Subsea 7, the Client, and the independent verification body (if required), will provide formal notice that the Bundle is ready for launch.

2.1.3 Bundle Launch and Tow Management

Prior to a Bundle launch and tow commencing, all engineering documentation must be completed and approved by both the Project and Site Management team. The primary objective of the launch and tow engineering is to calculate the forces required from the Anchor Handling Tugs. This allows appropriate rigging to be selected, considering the loads at each stage of the operation. The rigging must comply with Subsea 7's and Australian standards and as such all rigging must be certified and appropriately tested by the Subsea 7 approved supplier. Any rigging that does not comply with the standards will be quarantined or disposed.

The Bundle launch and tow engineering will also define the following governing criteria for the operations:

- Limiting weather criteria
- Weather window requirements
- Relevant inspection and witness points to ensure quality control requirements have been adhered to
- Detailed step by step procedures for all operations
- Safety and risk analysis and mitigation

The project operations team will be responsible for the vessel selection and vessel assurance prior to any Bundle launch. The Subsea 7 BMS has vessel assurance audit instructions which ensure compliance with the ISM Code, ISPS Code, Maritime Labour Convention, Flag State Authority requirements, ISO 9001, ISO 14001, and IMCA M204. This audit will ensure that the safety and capability of the vessel is suitable for Subsea 7 the Bundle launch, as well as compliant will all statutory regulations. Vessels will also undergo a screening process to assess the risk of invasive marine species (IMS) and further actions will be taken as required.

The Population D humpback whales migrate annually along the coast of Western Australia to calve before migrating south to feed in the Antarctic. Calves, and their lactating mothers, rest in Exmouth Gulf for periods of up to two weeks, before migrating southwards towards their feeding grounds (Jenner and Jenner, 2005). The majority of whales have been documented to arrive between late August and late October (Irvine, 2019, Jenner et al., 2001, Jenner and Jenner, 2005).

After extensive aerial surveys of the Exmouth Gulf during the humpback whale occupancy period, the 'No-Launch' window has been defined, and Subsea 7 will not conduct any towing activities during the months of August, September and October (Irvine, 2019).

For more information refer to the Marine Fauna Management Plan, ref. APFAC017-HSE-00006.

The Proposal is within the North West coastline prone to tropical cyclones, and a Bundle will not be launched if a tropical cyclone is imminent. The cyclone season extends from the beginning of November to the end of April. Site operations will continue as normal throughout the cyclone season, with a specific Site Cyclone Management Plan in place, which details the daily monitoring of weather forecasts to identify the risk of a tropical cyclone. In the weeks leading up to a planned Bundle launch, the weather will be continually monitored and if any risk of cyclone or poor weather is expected, the launch will be delayed until an appropriate time.

2.1.4 HSE Management and Emergency Response

Subsea 7 are committed to the health, safety and security of the personnel involved in any activity, while minimising the impact on environment in which Subsea 7 operate. This is described further in the Subsea 7 HSEQ Policy (Appendix B).

As per the HSEQ Policy, all projects and sites must assess, monitor, manage and mitigate risk, by following the Subsea 7 risk assessment process. This includes analysing the risk according to a Risk Assessment Matrix, completing a Hazard Identification Risk Assessment, a Worksite review, a tool box talk before very task, a Shift Briefing at the beginning of every shift and the implementation of the Permit to Work System.

A Preliminary Hazard Assessment (PHA) has been developed for the Learmonth Pipeline Fabrication Facility (refer Appendix A). The potential hazards identified consider human, environmental, equipment, operational and supplier factors. The Subsea 7 Risk Analysis Matrix is used to grade the risks identified by the PHA for the Proposal.

2.1.5 Internal Reporting

Subsea 7 requires that all incidents or near misses across all of its worksites that have, or could have resulted in personal injury, illness or damage to property or the environment are reported immediately to line management, regardless of severity and whether work related or not. A brief description of the incident or near misses and any injury or loss details should be entered into the Subsea 7 internal database within 12 hours of the incident or near miss occurring.

Subsea 7 requires that all environmental incidents or near misses that have, or could have resulted in environmental impact are reported to line management and in the Subsea 7 internal database. An environmental incident or near miss is defined as an actual or potential unplanned, uncontrolled or unauthorised release to or physical disturbance of the environment causing pollution to land, air, water or the seabed.

2.2 RECEIVING MARINE ENVIRONMENT

Exmouth Gulf marks the start of the shallow Pilbara coastal waters region. The shallow protected waters of Exmouth Gulf provide a contrast to the waters of Ningaloo Reef which, outside the reef line, are exposed to the open ocean and rapidly drop off into waters approximately 1,000 m deep.

Deployment of current measurement instruments off Heron Point for two tidal cycles (spring and neaps) in May/June 2018 indicated that the predominant currents flowed to the north (ebb tide) and south (flood tide), with speeds of up to approximately 0.5 m/s (GHD 2018) (Figure 2-5). This is a key consideration of the Bundle launch and tow engineering to ensure that Bundle deviations are predicted and controlled, to maintain Bundle positional control during tow.

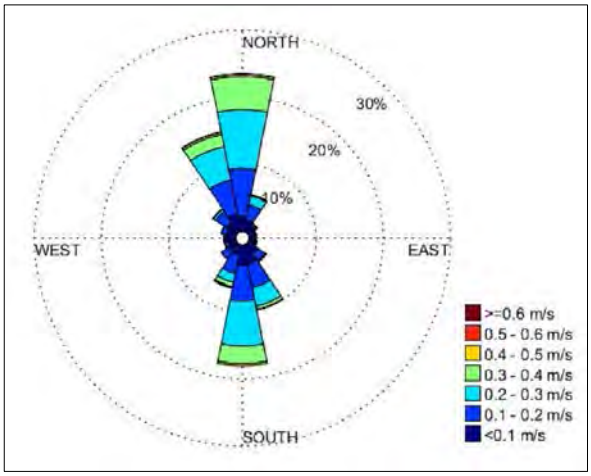
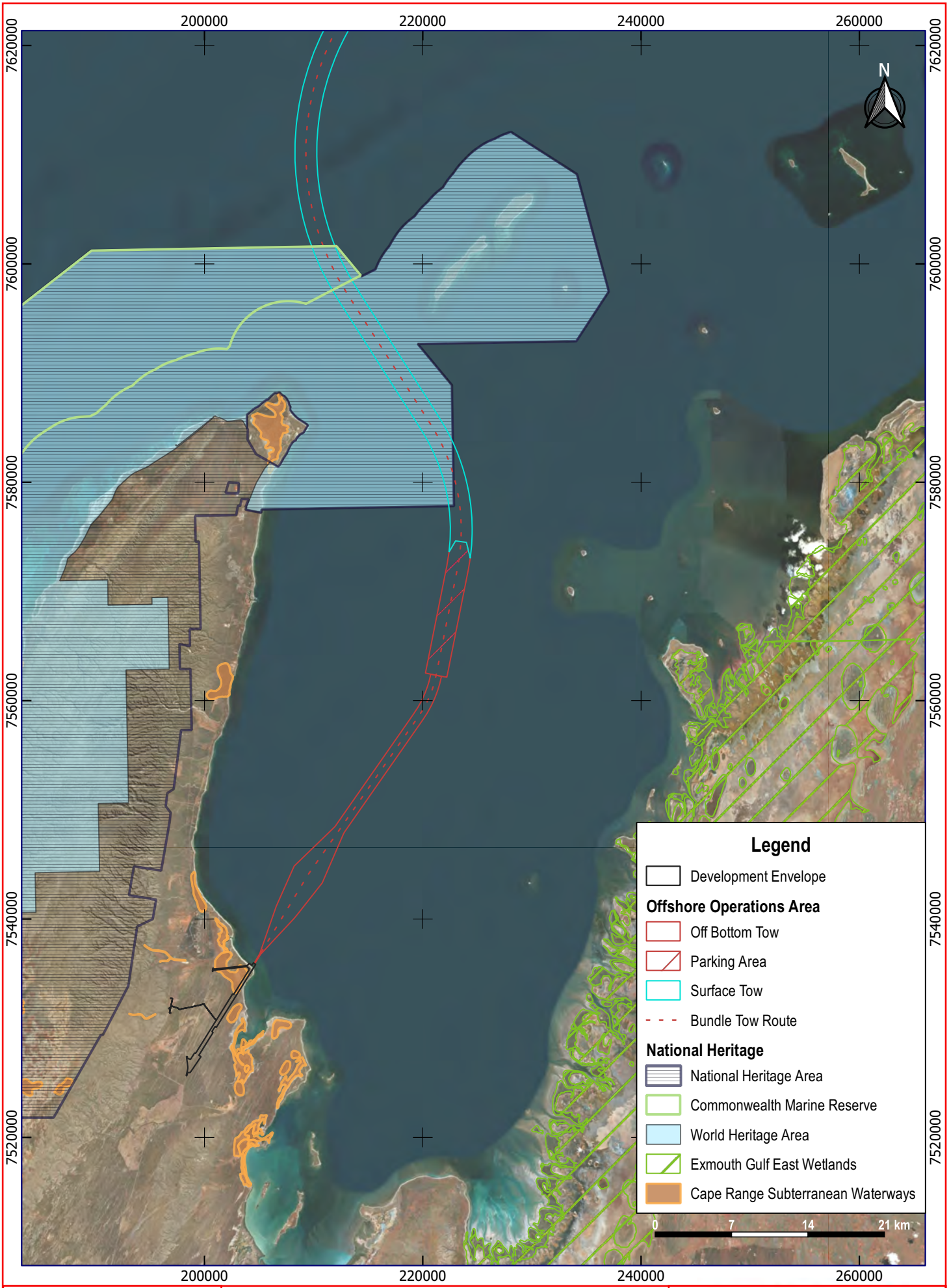


Figure 2-5: Current speed and direction recorded off Heron Point in May/ June 2018 (duration is indicated as % of time occurring throughout monitoring period) (GHD, 2018)

The areas of environmental sensitivity within Exmouth Gulf that are recognised in several State and Commonwealth government publications, policies and guidelines are shown in Figure 2-11 and Figure 2-12 respectively. Subsea 7 have completed a number of technical and environmental studies to further develop the understanding of the Exmouth Gulf and surrounding areas, and present the level of impact of Bundle launch and tow operations. These are presented to support the Public Environmental Review submitted under the EP Act 1986 and EPBC Act 1999.

The key environmental factors specifically relevant to the Bundle launch and tow operations for the Proposal are:

- Benthic Communities & Habitat;
- Marine Fauna; and
- Marine Environment Quality.



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Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from Commonwealth of Australia (2013 and 2018).

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Figure 2-10: Conservation values of Exmouth Gulf recognised at the Commonwealth level

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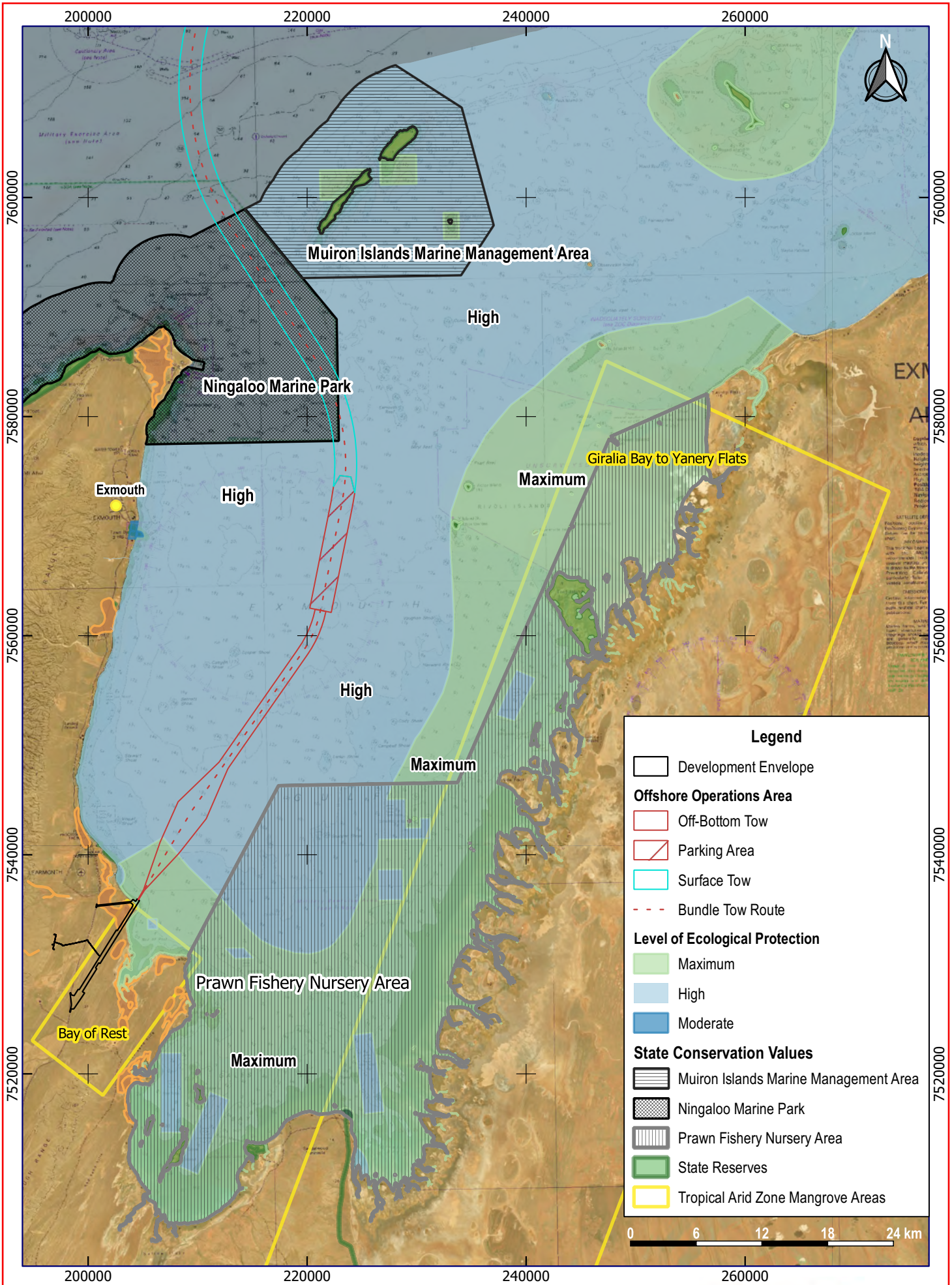

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Original Size: A4
Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from EPA (2018, 2011),Commonwealth of Australia (2018), and DBCA (2018). Maximum level of Ecological Protection areas are the same as those identified by CALM as 'Recommended for Reservation (1994).'

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Figure 2-11: Conservation values of Exmouth Gulf recognised in State publications

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3. MARINE EMERGENCY RESPONSE PLAN

This MERP identifies the proactive and reactive management based provisions that Subsea 7 proposes to implement in the case of an unplanned event or emergency situation during a Bundle tow:

- Management measures that will be implemented to reduce the risk of an emergency situation resulting in significant impacts to personnel safety or environmental values.
- Management actions that will be used to rectify or reduce the risk of an emergency situation after an event has occurred.
- Additional services that may be utilised to help control or contain the impact of an emergency situation after an event has occurred.
- Reporting requirements relevant to implementation of this plan.

3.1 MANAGEMENT OBJECTIVES, ACTIONS AND TARGETS

The purpose of the management objectives is to define Subsea 7's aims in the context of the identified potential impacts. The marine emergency response procedures within this document are designed to reduce the risk to the environment for any unplanned event to the same level of impact as normal Bundle launch and tow operations, assessed under the Public Environmental Review submission.

To meet the management objectives, a series of fit-for-purpose contingency plans have been developed to ensure potential impacts on the marine environment and marine fauna are minimised to levels considered acceptable.

The emergency scenarios, actions and objectives, focused on achieving a safe and stable state in which any remediation actions can commence with no additional risk to personnel or the environment. These actions were specifically developed to ensure that the objectives in Section 1.3 will be met.

3.2 MANAGEMENT AND MONITORING MEASURES

The procedures to be implemented in certain unplanned or emergency scenarios are presented in Table 3-1 to Table 3-7. These procedures describe the response steps to be followed and the relevant control measures in place to avoid, minimise and control the impacts of the situation. Standard control measures in place for every launch, as identified in the site Preliminary Hazard Identification and Risk Assessment (Appendix A) include:

- Weather forecast and seasonal data reviewed to inform launch schedule to avoid tow in adverse conditions.
- Weather forecast monitored ahead of launch operations and launch window defined to avoid tow in adverse conditions.
- Defined limiting weather criteria.
- Bundle tethered to 'Leading Tug' and 'Trailing Tug' at all times, including whilst Bundle is within the Parking area.
- High specification tow vessels used for launch operations.
- Secondary system/ redundancy design in bundle monitoring system.
- Tow vessels to be equipped with 'Dynamic Positioning' (DP) systems, with a suitable level of system redundancy.

- Tow vessel position monitoring system verification within Bundle parking area.
- Secondary tow vessel position keeping system in place
- Vessel assurance and suitability surveys conducted prior to mobilisation of vessels and the commencement of operations.
- AMSA 'Notice to Mariners' and supporting information issued prior to tow to inform local vessels of operations.
- Guard vessel to monitor and enforce, if necessary, any temporary exclusion zones.
- Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs).
- Bundle 'Guard Vessel' intervention if required (as per a guard vessel procedure developed for engaging 3rd party vessels).
- Visual monitoring of bundle on surface (surface buoys and lights).
- Timing of Surface tow through Ningaloo Marine Park chosen to coincide with benign sea, tidal and weather conditions.
- Key focus group in place for community engagement and local announcements.
- Regular broadcasting of operations on VHF, as required.

Additional control measures, more specific to particular emergency scenarios, are described in Table 3-1 to Table 3-7.

3.3 REPAIR OR RECTIFICATION WORKS

Should a Bundle be damaged or lose containment of Nitrogen during the launch or tow, an engineered repair solution will be in-place to ensure the Bundle can be safely installed as intended.

In the unlikely event that an anomaly or leak is identified during the launch, which is significant and requires repair, an assessment will be carried out to determine the most suitable method of performing the rectification works. If identified during the Bundle launch, it is likely that launch would be completed, to ensure the bundle was positioned in a stable environment and in an appropriate water depth. It may be possible, in certain circumstances, to pull a partially launched bundle onshore, however, it is expected that any repair or rectification works would take place either within the Exmouth Gulf or further offshore.

If a leak has been identified during the tow, an assessment will be performed to quantify the leak and confirm if the Bundle can be installed, as intended, in the current state. Should the assessment conclude negative, the tow shall be brought to a controlled stop and the Bundle will be safely lowered towards the seabed. As Nitrogen gas is released, the Bundle may become more buoyant during this period, and this will be managed by the Tow master and offshore engineering team. Additional chain clump weights will be available on the RSV which can be used to stabilise the Bundle. Positional control of the bundle will be maintained once the Bundle is stationary.

Repair methodologies will vary depending on the nature and location of the repair. The repair may involve the use of ROV or divers to install a repair clamp or a localised repair solution. Depending on the duration of the repair, and location of the Bundle, an anchor and additional rigging may be deployed to maintain Bundle position and allow the vessels to release from the Bundle during this time.

EVENT: BREAKDOWN OF LEAD / TRAILING TUG DURING BUNDLE LAUNCH AND OFF-BOTTOM TOW

- **Key Impacts and Risks:** Direct or indirect impacts to BCH due to vessel / Bundle drift

Management Actions		Control Measures	Reporting
1.	Vessel Master of the "breakdown" vessel will communicate the breakdown to the Tow Master immediately	• Dynamic positioning vessels utilised for Bundle tows, which have equipment redundancy by design, to mitigate a single component failure mode. • Full vessel assurance audit completed prior to operations. • Clear communications maintained at all times, with the Tow Master as the dedicated single point of command. • Bundle stable in Off-Bottom Tow configuration if tow operations are suspended. • Bundle position monitoring system fully tested, and re-tested prior to tow, to provide real-time feedback of Bundle position. • Weather forecast reviewed prior to tow, current directions surveyed, and sheltered waters provide suitable environment for an equipment repair. • Full equipment failure report and standardised "Return to Work" protocol in place prior to tow resuming.	Notification to: • AMSA Incident report to: • Internal (Subsea 7) • AMSA (if the safety of the ship or the safety of navigation is affected)
2.	Tow Master will communicate a controlled "All-Stop" of the Bundle Tow. *Bundle will be suspended in the Off-Bottom Tow configuration. Bundle will be above seabed, and a number of links of chain will touch the seabed, as per normal tow operations.*		
3.	Breakdown will be contained and fully assessed by ship vessel Chief Engineer.		
4.	Should station keeping ability be compromised, or repairs considered to be extensive and time consuming, "breakdown" vessel to deploy anchors to maintain position during repairs.		
5.	Support Vessel / RSV to provide further assistance as required to provide equipment, location services, and Bundle checks during repair.		
6.	Once repair is completed, a full "Return to Work" protocol to be implemented to assess suitability of the repair prior to tow re-commencement.		

EVENT: BREAKDOWN OF LEAD / TRAILING TUG DURING BUNDLE SURFACE TOW

- **Key Impacts and Risks:** Direct or indirect impacts to BCH due to Bundle ballast chain contact in Ningaloo Marine Park

Management Actions		Control Measures	Reporting
a.	Vessel breakdown will be contained and fully assessed by ship vessel Chief Engineer, ***and if safe to do so***, the Bundle tow through the Ningaloo Marine Park will continue (duration approximately 4 hours).	• Vessels will undergo an additional systems check after Bundle submerged weight check in the 'Parking Area'. • Vessel thrust during Surface Tow is significantly less than Bundle launch, and therefore a reduced system load. • Parking Area departure timings will align with ideal tidal cycles, to reduce environmental effects on the tow operations • BCH route survey through the Ningaloo marine park – no reef / coral substrates identified along tow route.	Incident report to: • Internal (Subsea 7) • AMSA • DWER
b.	Once Bundle and tow vessels have exited the Ningaloo Marine Park, step 2. – step 6. above will be implemented.		
c.	If vessel breakdown requires an "All-Stop" and the vessel cannot continue the tow, the Bundle tow speeds will be reduced such that the Bundle enters the stable Off-Bottom Tow configuration, and step 2. – step 6. above will be implemented		

Table 3-1: Breakdown of Tug: Emergency Response and Management Actions

EVENT: MEDICAL EMERGENCY, MAN OVERBOARD, SEARCH AND RESCUE • **Key Impacts and Risks:** Risk to human life			
Management Actions		**Control Measures**	**Reporting**
1.	Should a medical emergency, man overboard, or search and rescue incident occur, the Tow Master will communicate a controlled "All-Stop" of the Bundle Tow when safe to do so.	• All vessel crews competent in man-overboard and incident first response training • Each vessel to have a designated medic on board to provide first aid response and referral to onshore medical assessment. • Appropriate provision of first aid response, personnel transfer and personnel recovery equipment across the tow fleet. • Berth nominated for emergency response within the Exmouth marine base	Notification to: • Exmouth Hospital • St John Ambulance (Exmouth) Incident report to: • Internal (Subsea 7)
2.	For man overboard or search and rescue, light vessels may mobilise to the area in which the incident occurred to assist the Injured Person (IP)		
3.	For a medical emergency, the IP will be transferred from the tow vessel to the most suitable vessel and taken to shore for medical assessment. If required, a chopper may be mobilised from Learmonth airport to assist the medical evacuation. For man overboard, the IP will be recovered to the most suitable vessel and taken to shore for medical assessment		
4.	For requests to assist in search and rescue operations, all vessels not immediately involved in the tow operations may be provided to assist if possible. All other vessels directly involved in the Bundle tow will stand-by in Off-Bottom Tow configuration, within the Operations Area, and await for the search and rescue operations to be completed.		

Table 3-2: Medical Emergency, Man Overboard, Search and Rescue: Emergency Response and Management Actions

EVENT: FAILURE OF RIGGING / TOW LINE DURING BUNDLE LAUNCH AND OFF-BOTTOM TOW

- **Key Impacts and Risks:** Direct or indirect impacts to BCH due to vessel / Bundle drift

Management Actions		Control Measures	Reporting
1.	If the rigging / tow line fails, an immediate reduction in tow resistance will be experienced by the lead tow vessels. The tow fleet are to take instruction from the Tow Master, as the response is different depending on the line that has parted. Vessels may be requested to decrease or increase thrust in order to take control of the Bundle and bring the Bundle to a controlled stop.	• All rigging to be designed following current engineering, manufacturing, and testing standards, with relevant safety factors applied • All rigging and connections to be inspected and certified prior to tow operations • Expected vessel launch and tow loads calculated and verified by engineering department. • Load cells in tow line system to provide load feedback data • All vessels line of fire demarcations to highlight "Danger Zones" to which no personnel must enter • Vessels to increase loadings incremental as per launch and tow procedure • Bundle is positively buoyant (floating) with ballast chains providing stability on the seabed. Failure in rigging line will not result in the Bundle pipeline touching the seabed (i.e. the chains remain the contact point with the seabed).	Incident report to: • Internal (Subsea 7) • AMSA
2.	Dependent on the location of the failure (Lead Towhead or Trailing Towhead) the vessel that remains connected to the Bundle will commence contingency movements to maintain Bundle position on tow route. *If the Bundle is partially launched (Trailing Towhead remains onshore) the Bundle carrier pipe on the Launchway will be restrained.*		
3.	As required, the RSV will mobilise to the Towhead location, and prepare to install additional ballast weight to the disconnected Towhead, such that Towhead is stable on or above the seabed.		
4.	RSV and project support vessel will install additional anchors / rigging to the Towhead as required to ensure the Bundle does not drift.		
5.	Contingency rigging / tow line will be mobilised and reconnected to a dedicated connection point from the Towhead.		
6.	Tow will recommence as per Bundle launch and tow procedures.		

EVENT: FAILURE OF RIGGING / TOW LINE DURING BUNDLE SURFACE TOW

- **Key Impacts and Risks:** Direct or indirect impacts to BCH due to Bundle ballast chain contact in Ningaloo Marine Park

Management Actions		Control Measures	Reporting
a.	If the rigging / tow line fails during Surface Tow, an immediate reduction in tow resistance will be experienced by the lead tow vessels. The Bundle will slowly leave the surface, and enter the Off-Bottom Tow configuration whereby the ballast chains touch the seabed, and the Bundle & Towheads remain floating above the seabed.	• As above, with the addition of; • Rigging loads during Surface Tow are significantly less than loads required for Bundle launch. • BCH route survey through the Ningaloo marine park – no reef / coral substrates identified along tow route.	Incident report to: • Internal (Subsea 7) • AMSA • DWER
b.	The tow fleet are to take instruction from the Tow Master, as the response is different depending on the line that has parted. Elements of Step 2. – Step 6. above may be implemented, as required to enable the tow to continue .		

Table 3-3: Failure of Rigging: Emergency Response and Management Actions

EVENT: VESSEL COLLISION RESULTING IN A DISCHARGE OR PROBABLE DISCHARGE OF SHIP OIL

- **Key Impacts and Risks:** Direct or indirect impacts to BCH, direct or indirect impacts to marine environment quality, direct or indirect impacts to marine fauna due to spill

Management Actions		Control Measures	Reporting
1.	If a vessel collision is suspected, attempts to communicate with the vessel will be made via VHF radio (or other communications methods) to the vessel at risk to change course. *The project Emergency Notification Flowchart will detail the appropriate communication method for each worksite involved (inc. the vessels).*	• Guard vessel(s) support the tow fleet in identifying and communicating operations to third party vessels in the vicinity • All ships to have in place a Shipboard Oil Pollution Emergency Plan (SOPEP) and maintain an oil record book with details of all discharges and oil transfer operations • First strike response equipment on-board each vessel as per vessel SOPEP • All tow vessels to adhere to the maximum speed limit of 8 knots through water • Tug Management System in place to provide real-time heads up display of the positions of all tow fleet vessels • Clear communications maintained at all times, with the Tow Master as the dedicated single point of command. • All ships (over 400te gross tonnage) to operate under a Safety Management System approved by the relevant national administration. • Full description of Bundle launch and tow operations provided to AMSA prior to operations, to provide information of each vessel and the stages of the Bundle tow. • AMSA to be notified immediately should discharge or probable discharge from vessel be identified.	Incident report to: • Internal (Subsea 7) • AMSA • DWER
2.	Should communications not be acknowledged, the guard vessel(s) or nearby support vessels will approach vessel at risk to alert them of collision course and intervene where possible.		
3.	If a vessel collision is imminent, Vessel Master and Bridge Officers are to notify all crew members, and make all practical manoeuvres to change direction and may slow down if course is improved.		
4.	If a collision occurs, and an oil discharge has occurred or is likely to occur, crew to deploy first strike response equipment. Vessel Chief Engineer to isolate the leak path where possible.		
5.	Project support vessel and guard vessel(s) to support first strike response, deploying additional spill containment equipment where possible. Support vessels to also assist personnel transfers to shore if any injuries have been sustained.		
6.	Once immediate spill response has been deployed, Vessel Master and Vessel Chief Engineer to assess the damage.		
7.	AMSA to be notified of the incident, the details of any spill if a spill occurred, and all support vessels to aid AMSA in any remediation activities.		
8.	Periodic monitoring of the Bundle orientation during vessel repairs / replacement to be completed by RSV.		

Notes:

1) The Bundle will naturally enter a stable Off-Bottom Tow mode once the vessels have suspended any thrust. Therefore in this scenario the rigging will remain connected and the vessels will be free to move by winching in/out during should vessel moves be required. If required, the tow vessels will be able to disconnect from the tow to enable complete manoeuvrability.
2) Each vessel will act under the Safety Management System and SOPEP of the specific vessel. Additional control measures have been added to further reduce the risk of vessel collision to as low as reasonably practicable.
3) A major spill (e.g. due to the rupture of a fuel tank) is very unlikely to occur during a Bundle tow operation, and is no more likely to occur than in other normal tug marine operations due to the nature of the Bundle operations. In the event that a major spill incident should occur (outside of local vessel SOPEP capabilities) the Vessel Master is responsible for reporting and seeking outside assistance.

Table 3-4: Vessel Collision: Emergency Response and Management Actions

EVENT: VESSEL GROUNDING

- **Key Impacts and Risks:** Direct or indirect impacts to BCH due to vessel grounding, indirect impacts to marine environment quality due to increased turbidity

Management Actions		Control Measures	Reporting
1.	Should vessels run aground, the mandated vessel speeds will allow for safe recovery by tow support tugs.	• Route survey including obstacle identification completed prior to each Bundle tow. • Exmouth Gulf water depth is specifically selected as suitable for Bundle launch and tow, with no shoals, reefs, shallows along the defined Offshore Operations Area. • All ships to have in place a Shipboard Oil Pollution Emergency Plan (SOPEP) and maintain an oil record book with details of all discharges and oil transfer operations. • First strike response equipment on-board each vessel as per vessel SOPEP. • All tow vessels to adhere to the maximum speed limit of 8 knots • Vessels selected based on available under keel clearance (UKC) to suit the Exmouth Gulf water depths. • Vessels fully equipped with depth sounder equipment, up-to-date bathymetry data, and survey feedback of tow route. • All benthic communities and habitats within the areas of vessel operation have been characterised as sandy sediment seabed. • Clear communications maintained at all times, with the Tow Master as the dedicated single point of command. • All ships (over 400te gross tonnage) to operate under a Safety Management System approved by the relevant national administration. • Full description of Bundle launch and tow operations provided to AMSA prior to operations, to provide information of each vessel and the stages of the Bundle tow. • AMSA to be notified immediately should discharge or probable discharge from vessel be identified.	Incident report to: • Internal (Subsea 7) • AMSA • DWER
2.	The Bundle will be suspended in the Off-Bottom Tow configuration and made stable should rigging disconnection be required.		
3.	Rigging will be removed and placed on the seabed with a recovery buoy attached.		
4.	Tow vessels will reconfigure to recover the grounded vessel, and relocate to deeper waters.		
5.	Grounded vessel will drop anchor in the deeper waters, and the RSV will deploy the ROV to complete a hull inspection.		
6.	Following the outcomes of the hull inspection, the vessel will either undergo a "Back-to-Work" protocol or be replaced and seek repair.		

Table 3-5: Vessel Grounding: Emergency Response and Management Actions

EVENT: LOSS OF BUNDLE INTEGRITY DURING TOW

- **Key Impacts and Risks:** Direct or indirect impacts to marine environmental quality due to Bundle corrosion inhibitor

Management Actions		Control Measures	Reporting
1.	If a leak from the Bundle during Bundle launch or tow is identified, the Tow Master will request a controlled "All-Stop" and the Bundle will be stable in the Off-Bottom Tow configuration. *The relatively low internal pressure of the Bundle carrier pipe will be monitored during tow, and a decreasing pressure will indicate a loss of integrity. A leak will be visually identified by the RSV by a stream of gas (Nitrogen) escaping the carrier pipe.*	• Bundle fabrication is completed as per approved procedures, which conform to industry standards of qualification, control and testing. • All welds undergo a non-destructive testing regime on completion. • Once fully assembled, the Bundle undergoes a full system pressure test to confirm integrity. • Expected loads on Bundle calculated and verified by engineering department. • Bundle system pressure will be monitored during launch and tow to provide early indication of a loss of Bundle integrity. • Bundle carrier pipe does not contain any hydrocarbons (filled with inert nitrogen gas plus solid corrosion inhibitors). Any chemical to be used within flow lines must be approved as per conditions in PER.	Incident report to: • Internal (Subsea 7) • AMSA • DWER
2.	The ROV will be deployed from the RSV and inspect the Bundle line and the anomaly indicating a leak.		
3.	As the leak continues, the Bundle will progressively become more buoyant (as the gas mass is reduced), and may rise to surface.		
4.	Once the leak is identified, the leak rate will be assessed, and the Bundle carrier pipe will be recharged with Nitrogen if the leak rate is low. *If the leak is significant, the Nitrogen will eventually be lost, and seawater will begin to enter the carrier pipe. This will mix with the Bundle corrosion inhibitor. No positive pressure will promote significant release of this chemical to the environment (see Note 1).*		
5.	Once the location and extent of any damage is confirmed, a repair strategy will be developed with Bundle design engineers and operational assessments on a case-by-case basis. *Repair methodologies will vary depending on the nature and location of the repair. The repair may involve the use of ROV or divers to install a repair clamp or a localised repair solution.*		
6.	Depending on the duration of the repair, and location of the Bundle, an anchor and additional rigging may be deployed to maintain Bundle position and allow the vessels to release from the Bundle.		

Notes:

1) The Bundle carrier pipe is completely filled with Nitrogen. At regular intervals, solid corrosion inhibitors are installed for offshore protection. If a leak occurs during the tow, the Nitrogen will be displaced by seawater. The seawater will dissolve the solid inhibitor packages, and this chemical will exist within the carrier pipe in a concentration up to 500ppm.

   With no positive pressure in the carrier pipe at this stage, there will be no active transmission to the marine environment. A localised discharge ('weep') will occur at the immediate area. As per the assessment in the Public Environmental Review documentation, this corrosion inhibitor will have an OCNS / CHARM Hazard Quotient corresponding to ratings of Gold, Silver, E or D on the OCNS / CHARM Ranked List of Notified Chemicals, and have no substitution or product warning, otherwise further assessment is required. This discharge is therefore deemed to be low risk to marine environment quality.

Table 3-6: Loss of Bundle Integrity: Emergency Response and Management Actions

EVENT: VESSEL COLLISION WITH BUNDLE DURING TOW

- **Key Impacts and Risks:** Direct or indirect impacts to marine environmental quality due to Bundle corrosion inhibitor

Management Actions		Control Measures	Reporting
1.	If a 3rd party vessel collision with Bundle is suspected, attempts to communicate with the vessel will be made via VHF radio (and other communications) to the vessel at risk to change course.	• Guard vessel(s) mobilised to patrol Bundle and notify nearby vessels of operations. • Guard vessel(s) and project support vessels will be local vessels to provide local knowledge and raise local awareness. • A 500m exclusion zone from the Bundle and tow vessels will be in effect during Bundle launch and tow operations. • Bundle launch and tow planning will be communicated well in advance to the local operators via a dedicated community engagement group, local noticeboards, mailing lists, and dedicated engagements. These notices will provide advice of the tow route and avoidance measures • Ongoing community engagement conducted to ensure that there is a wide knowledge of bundle launching and towing well in advance of operations • AMSA issued 'Temporary Notice to Mariners' will be provided with all information of the launch and tow operations. • Emergency VHF channels will be monitored during Bundle launch and tow, and will be used to notify nearby vessels of operations. • Visual aids ('Norwegian' buoys and surface lights) will be installed at regular intervals along the Bundle. • Bundle system pressure will be monitored during launch and tow to provide early indication of a loss of Bundle integrity.	Incident report to: • Internal (Subsea 7) • AMSA • DWER
2.	Should communications not be acknowledged, the guard vessel(s) or nearby support vessels will approach vessel at risk to alert them of collision course and intervene where possible.		
3.	Bundle tow vessels will immediately slow down (to a stop if possible) to increase the distance from the water surface to the Bundle. *The Bundle will rest approximately 5m from the seabed, majority of the tow route is >10m WD, allowing vessels to pass over the Bundle.*		
4.	If a vessel collision is made, the tow vessels will remain stationery and the RSV will locate to the collision area.		
5.	The ROV will be deployed to inspect and assess the damage.		
6.	If the damage has penetrated the carrier pipe and a leak exists, the Bundle will progressively become more buoyant (as the gas mass is reduced), and may rise to surface.		
7.	If the leak is significant, the Nitrogen will eventually be lost, and seawater will begin to enter the carrier pipe, and the Bundle will sink to the seabed. The seawater will mix with the Bundle corrosion inhibitor. No positive pressure will promote significant release of this chemical to the environment (see Note 1).		
8.	Once the location and extent of any damage is confirmed, a repair strategy will be developed with Bundle design engineers and operational assessments on a case-by-case basis. *Repair methodologies will vary depending on the nature and location of the repair. The repair may involve the use of ROV or diver to install either a repair clamp, or a localised repair solution respectively.*		

Notes:
1) See Note 1. From Table 3-6

Table 3-7: Vessel Collision with Bundle: Emergency Response and Management Actions

3.4 REPORTING PROVISIONS

3.4.1 Incident Reporting

This section details reporting provisions in addition to Subsea 7 internal reporting, detailed in Section 2.1.5.

As per the requirements of MARPOL (International Convention for the Prevention of Pollution from Ships) and AMSA (Australian Maritime Safety Authority) a detailed report to AMSA will be issued for events as follows:

- Damage, failure or breakdown of a ship of 15 metres in length or more which affects the safety of the ship or results in impairment of the safety of navigation (including collision, grounding, fire, structural or engine failure)
- Any discharge or probable discharge of oil or noxious liquids substances carried in bulk, resulting from damage to the ship or its equipment, or for the purpose of securing the safety of a ship or saving life at sea
- Any discharge during the operation of the ship of oil or noxious liquid substances in excess of MARPOL discharge limits or rates
- Any discharge or probable discharge of harmful substances in packaged form (including freight containers, shipborne barges, road and rail vehicles, and portable tanks).

Reports to AMSA will also be provided to CEO of the Department of Water and Environmental Regulation (DWER) as per Section 3.2.3.

3.4.2 Annual Reporting

Subsea 7 will prepare a Compliance Assessment Report (CAR) annually, for submission to the CEO of the Department of Water and Environmental Regulation (DWER). The format of these reports will be consistent with the approved Compliance Assessment Plan (CAP). The CAR will document compliance with the conditions of approval including assessment of compliance with management plan requirements where management plans form part of approval conditions.

Annual reports will also be provided to the DWER for Part V *Environmental Protection Act 1986* (EP Act) approvals and *Rights in Water and Irrigation Act 1914* (RIWI Act) licences.

3.4.3 Reporting on Exceedance of Management Objective

In the event that an emergency situation or unplanned event has resulted in an exceedance of, or failure to meet, the key objective specified in this MERP, Subsea 7 will:

- Report the incident in writing to the CEO of DWER within 21 days of the incident being identified.
- Investigate to determine the cause of the management objectives being exceeded or not being met and the potential impact associated with the incident.
- Provide a report to the CEO of DWER within 90 days of the exceedance being reported that shall include:
    - The cause of the management objectives being exceeded or not being met.
    - The findings of the investigations that was undertaken.
    - Details of revised and/or additional management actions to be implemented to prevent future exceedance of the management objectives.

- Relevant changes to the Proposal activities.

3.4.4 Reporting of Management Actions not Being Implemented

In the event that one or more management actions have not been implemented as specified in this management plan, Subsea 7 will:

- Report the failure to implement management actions in writing to the CEO of DWER within the annual CAR.
- Investigate to determine the cause of the management actions not being implemented. Provide a report in the CAR that shall include:
  - The cause for failure to implement management actions.
  - The findings of the investigations that was undertaken.
  - The potential impact in the case an emergency situation had occurred and the management action was not implemented.
  - Relevant changes to Proposal activities.
  - Measures to prevent control or abate the environmental harm which may have occurred.

4. ADAPTIVE MANAGEMENT AND REVIEW OF MERP

The MERP (this plan) will be reviewed prior to each Bundle launch, and supplemented by a project specific document that contains the emergency notification flowchart, reference to each of the fleet vessel's emergency response procedures, and the response procedures relevant to the specific Bundle design.

Adaptive management in relation to the MERP will include the following:

- Monitor and evaluate the effectiveness of the management actions against the management objectives, as Bundle launch and tow experience in the Exmouth Gulf develops.
- Adjust the management measures to ensure the notification processes, and emergency response services are current.
- Following any marine emergency or unplanned event that affects the Bundle tow, a root cause analysis will be completed to understand the cause of the event. The robustness of the emergency response procedures will be verified and adjusted if required.
- Review the emergency response procedures after each Bundle launch and tow data to verify procedures and incorporate any new data that becomes available.

5. REFERENCES

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Subsea 7. 2019. Learmonth Pipeline Fabrication Facility APFAC017: Public Environmental Review.

Appendix A: Preliminary Hazard Assessment

risk assessment

PHA – M-00002868 – Approved

Learmonth Pipeline Fabrication Facility - Marine Operations

This report shows the assessment as it was when printed on 20-Nov-18. It does not show any changes that have been made to the assessment since this time.

Originator	Ewan Austin	Reference Procedures / Task Plans	
Local Reference			
Project	*Not Client Related	Additional Notes	This Preliminary Hazard Analysis (PHA) addresses the hazards and control measures of the marine aspects associated with launching and towing a Bundle from the Learmonth Pipeline Fabrication Facility, in the Exmouth Gulf. The Bundle should be assumed to be fully assembled and tested, ready on the Bundle track / launchway for the launch operations.
Operation	Marine/Vessel		
Worksite	-- not selected --		
Area on Site	Offshore		

APPROVAL

Approver	Tom Radic	Approvers Comments	[2018-11-20 - Tom Radic - Approved] -- no comment --
Approval Date	20-Nov-18		

ATTENDEES

Meeting Date	23-Oct-18	Meeting Location	Subsea 7 Perth Office

Subsea 7 Attendees

Attendee Name	Position
Ewan Austin	Project Engineer
Tom Radic	Project Manager
Harry Johnson	Project Manager
Guy Hill	Engineering Manager
Catherine Gourlay	Bundle Field Development Engineer
Arnbjorn Joensen	Bundle Tow Master
Saul Oswald	HSE Advisor

External Attendees

Attendee Name	Company Name	Position
Spencer Shute	MBS Environmental	Snr. Environmental Consultant

	Description	Consequences / Impacts	Initial			Control Measures	Technical Risk		Actions
			S	L	R		Rank	Comments	
1	Shallow Water - Vessel Grounding	• Damage to vessel • Disturbance / impact to benthic habitat	II	C	2	• Bathymetric and benthic community & habitat survey completed prior to operations • Knowledge of tidal and current conditions • Target setup positions shown on navigational display, setup positions to consider water depth and sensitive benthic habitats • Tow vessels to be equipped with 'Dynamic Positioning' (DP) systems, with a suitable level of system redundancy • Vessel draft checks in advance of vessel selection	D		
2	Vessel Collision - Operational Vessel	• Damage to vessel(s) • Fuel spill	II	D	2	• Tow management survey system in place to provide clear navigational display of relative vessel positions • Target setup positions shown on display, setup positions to consider safe working distances between vessels • Tow vessels to be equipped with 'Dynamic Positioning' (DP) systems, with a suitable level of system redundancy • Clear communications plan with a single point of command for all operations • Overarching Emergency Notification Flow chart (ENF) developed for each launch and available on all worksites / vessels • Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs) • Each vessel equipped with a vessel specific Shipboard Oil Pollution Emergency Plan (SOPEP) or equivalent, and will follow response actions to incidental pollution in accordance with the vessel's emergency plan	C	Whilst vessels may not operate using Dynamic Positioning (DP), having an operational DP system means a vessel is able to reliably keep in position when working despite changes due to weather, equipment malfunction or operator action	
3	Vessel Collision - 3rd Party Vessel (fishing, recreational)	• Damage to vessel(s) • Fuel spill	II	D	2	• Notice to mariners issued prior to launch to inform local vessels of operations • Guard vessel to monitor / enforce exclusion zones • Community engagement and announcements locally • Broadcasting on VHF as required • Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs) • Each vessel equipped with a vessel specific Shipboard Oil Pollution Emergency Plan (SOPEP) or equivalent,	C		

						and will follow response actions to incidental pollution in accordance with the vessel's emergency plan			
4	Marine Fauna Strike	• Injury to marine fauna	II	D	2	• No bundle launches during period of main Humpback whale usage of Exmouth Gulf (supported by survey data) • Specific vessel crew trained on marine fauna observation and avoidance training • Adherence to site marine fauna management plan (MFMP to be included in environmental referral documentation)	C		
5	Public Access	• Injury to member of public	II	E	3	• Maintain public access track / launchway crossing until launch preparations commence • Provide public notice of launch timings • Remove crossing and erect signage / additional fencing • Provide alternative vehicle access into the Bay of Rest	D		

TASK 2: Bundle Launch

	Description	Consequences / Impacts	Initial			Control Measures	Technical Risk		Actions
			S	L	R		Rank	Comments	
1	Tow vessel / ROV Support Vessel Breakdown	• Damage to bundle • Damage to benthic habitat	II	D	2	• Vessel operatiional and safety audits completed prior to launch • Tow vessels to be equipped with 'Dynamic Positioning' (DP) systems, with a suitable level of system redundancy • Contingency tow vessel arrangement developed, available on stand-by, and detailed in engineering procedure • Guard vessel / project support vessel readily available to provide vessel with additional equipment & personnel as required • Chain clump weight used to provide stability • Lack of high valve benthic habitat in launch and tow route, confirmed by surveys	C	Whilst vessels may not operate using Dynamic Positioning (DP), having an operational DP system means a vessel is able to reliably keep in position when working despite changes due to weather, equipment malfunction or operator action	
2	Inclement / severe weather during launch	• Uncontrolled movement of vessels and bundle • Damage to vessel • Impact to	II	D	2	• Weather forecast / seasonal data reviewed to inform launch schedule • Weather forecast monitored ahead of launch operations and launch window defined • Weather conditions monitored during launch operations	D		

		Benthic habitat				• Defined limiting weather criteria • High spec vessel for launch operations			
3	Unexpected current conditions	• Uncontrolled movement of bundle • Disturbance / impact to benthic habitat beyond disturbance envelope	II	D	2	• Onshore winch connected to trailing towhead, providing back-tension • Strict weight control during Bundle fabrication, and tailored buoyancy design • Local current data used to model bundle response throughout tide cycle / current swings • Launch timing window to coincide with optimum tide / current cycle • Launch way monitoring in place to confirm bundle alignment • Tow management survey system in place to provide clear navigational display of relative Bundle & vessel positions • Clear communications to be maintained at all times, with the launch master the single point of command • Clear handover point from launch master (onshore) to tow master (offshore) • Chain provides lateral stability when required	D		
4	Failure of tow-line (rigging)	• Damage to vessel • Injury to personnel • Disturbance / impact to benthic habitat beyond disturbance envelope	I	D	2	• Certified and tested tow line & hold-back rigging • Engineering design of tow configuration, with expected loads and safety factors agreed with tow vessels and engineering prior to operation • Marine Warranty Survey provides independent verification and approval of launch and tow operations • Vessel wire assurance management system in place • Load cells in tow line for load feedback • Connection points designed as per relevant engineering standards, tested and inspected • Lack of high valve habitat in launch and tow route	C		
5	Unidentified defect in pipe / towhead leading to loss of containment	• Damage to Bundle • Impact to marine environmental quality	II	E	3	• Bundle fully pressure tested and leak tested prior to launch • Ongoing monitoring of Bundle pressures prior to and during launch • Leak checks of buoyancy modules prior to launch • Designed in accordance to fabrication standards • No hydrocarbons used as a medium or	D		

						present within the bundle			
6	Debris / Obstacle on Launchway	• Damage to Bundle	III	C	2	• Full inspection of launchway prior to launch activities • Shallow water intervention to clean / clear launchway prior to launch	D		
7	Marine Fauna Strike	• Injury to marine fauna	II	D	2	• Marine operations "Block-Out" period during whale Southern migration resting period in Exmouth Gulf • Specific vessel crew trained on marine fauna observation and avoidance training • Ability to suspend transit if required to avoid collision • Guard / chase vessel to identify potential marine fauna in launch path • Tow vessels and bundle launch speeds low during launch (approx. 10m/min) - with a 8knot max speed limit throughout tow • Adherence to site marine fauna management plan (MFMP to be included in environmental referral documentation)	C		

TASK 3: Bundle Tow in "Off-Bottom" Mode

	Description	Consequences / Impacts	Initial			Control Measures	Technical Risk		Actions
			S	L	R		Rank	Comments	
1	Tow vessel / ROV Support Vessel Breakdown	• Damage to Bundle • Disturbance / impact to benthic habitat	II	D	2	• Vessel operational and safety audits completed prior to launch • Tow vessels to be equipped with 'Dynamic Positioning' (DP) systems, with a suitable level of system redundancy • Contingency tow vessel arrangement developed, available on stand-by, and detailed in engineering procedure • Guard vessel / project support vessel readily available to provide vessel with additional equipment & personnel as required • Lack of high valve benthic habitat in launch and tow route, confirmed by surveys	C	Whilst vessels may not operate using Dynamic Positioning (DP), having an operational DP system means a vessel is able to reliably keep in position when working despite changes due to weather, equipment malfunction or operator action	
2	Uncontrolled movement of Bundle	• Damage to Bundle • Disturbance / impact to benthic habitat	III	C	2	• Trailing tow vessel connected to trailing towhead, providing back-tension • Lead and trailing vessel loads and speeds calculated for bundle, and loads described in dedicated tow procedure for particular water depth	C		

						• ROV able to operate in shallow water to inspect Bundle • Local current data used to model bundle response throughout tide cycle / current swings • Tow management survey system in place to provide clear navigational display of relative Bundle & vessel positions • Clear communications to be maintained at all times, with the tow master the single point of command • Chains on seabed to provide resistance to lateral Bundle movement • Operational envelope defined and surveyed to allow minor adjustments to vessel and Bundle position to accommodate sway			
3	Vessel Collision with bundle - 3rd Party Vessel	• Damage to bundle • Impact to marine environmental quality	II	D	2	• Notice to mariners issued prior to launch to inform local vessels of operations • Guard vessel to monitor / enforce exclusion zones • Community engagement and announcements locally • Broadcasting on VHF as required • Surface buoys along bundle	C		
4	Loss of Pressure / Buoyancy during Tow	• Damage to Bundle • Disturbance / impact to benthic habitat	II	C	2	• Bundle fully pressure tested and leak tested prior to launch • Ongoing monitoring of Bundle pressures during tow	D		
5	Marine Fauna Strike	• Injury to marine fauna	II	D	2	• Marine operations "Block-Out" period during whale Southern migration resting period in Exmouth Gulf • Specific vessel crew trained on marine fauna observation and avoidance training • Ability to suspend transit if required to avoid collision • Guard / chaser vessel to identify potential marine fauna in launch path • Fully documented report to DBCA, AMSA and relevant authorities if marine fauna strike occurs • Tow vessels and bundle tow speeds low during off-bottom tow (approx. 2-3 knots) - with a 8knot max speed throughout tow • Adherence to site marine fauna management plan (MFMP to be included in environmental referral documentation)	C		

TASK 4: Bundle Parking & Submerged Weight Check

	Description	Consequences / Impacts	Initial			Control Measures	Technical Risk		Actions
			S	L	R		Rank	Comments	
1	External / environmental conditions leading to uncontrolled movement of Bundle	• Damage to Bundle • Disturbance / impact to benthic habitat	II	D	2	• Bundle mid-water position calculated by engineering and confirmed during Submerged weight check, (typically buoyant 5m off seabed) • Strict weight control during Bundle fabrication, and tailored buoyancy design • Local current data used to model bundle response throughout tide cycle / current swings • Parking area aligned to current directions to avoid lateral movement • Bundle position monitoring system fully tested, and re-tested prior to tow • Tow vessels to remain connected during Submerged weight check • Clear communications to be maintained at all times, with the tow master the single point of command	C		
2	Operational Vessel Collision with Bundle, leading to loss of Pressure / Buoyancy	• Damage to Bundle • Impact to marine environmental quality	II	C	2	• Bundle fully pressure tested and leak tested prior to launch • Ongoing monitoring of Bundle pressures during Submerged weight check • Leak checks of buoyancy modules Submerged weight check • ROV sonar systems utilized to confirm bundle position prior to approach • Positive clearance between support vessel keel and bundle (Minimum bundle depth 10m) • Work vessels / RSV to remain safe distance from bundle unless instructed	C		
3	Vessel Collision - 3rd Party Vessel	• Damage to vessel(s) • Loss of bundle containment • Impact to Marine Environmental Quality	II	D	2	• Notice to mariners supporting information issued prior to tow to inform local vessels of operations • Guard vessel to monitor / enforce exclusion zones • Vessel intervention described in guard vessel procedure for engaging 3rd party vessels • Community engagement and announcements locally • Broadcasting on VHF as required • Visual monitoring of bundle on surface (surface buoys and lights)	C		

	Description	Consequences / Impacts	Initial			Control Measures	Technical Risk		Actions
			S	L	R		Rank	Comments	
1	Movement of Bundle outside tow corridor	• Disturbance / impact to benthic habitat	II	D	2	• Bundle surface position calculated by engineering which details required tension and speed, and loads described in dedicated tow procedure for Surface tow • Strict weight control during Bundle fabrication, and tailored buoyancy design, verification by submerged weight check • Local current data used to model bundle response throughout tide cycle / current swings • Optimum weather / tide for Surface tow identified and Bundle tow to re-commence to suit this window (operation expected to take 4 - 6 hours) • Regular confirmation of bundle monitoring system • Clear communications to be maintained at all times, with the tow master the single point of command • Tow route surveyed to confirm minimum water depth throughout corridor and benthic habitat types • Selection of tow route to maximize distance from shallow water habitat	C		
2	Tow vessel / ROV Support Vessel Breakdown	• Damage to Bundle • Disturbance / impact to benthic habitat	I	D	2	• Tow vessels / RSV to be equipped with 'Dynamic Positioning' (DP) systems, with a suitable level of system redundancy • Full tow vessel position monitoring system verification prior to leaving parking area • Short duration of tow within the Ningaloo Marine Park (operation expected to take 4 - 6 hours) • Procedural instructions from tow master to avoid Bundle laydown in Ningaloo Marine Park • Secondary tow vessel position keeping system in place for passage through Ningaloo Marine Park • Vessel Assurance Suitability Surveys conducted prior to commencement of operations	C	Whilst vessels may not operate using Dynamic Positioning (DP), having an operational DP system means a vessel is able to reliably keep in position when working despite changes due to weather, equipment malfunction or operator action	
3	Vessel Collision - 3rd Party Vessel	• Damage to vessel(s) • Loss of bundle containment	II	D	2	• Notice to mariners supporting information issued prior to tow to inform local vessels of operations • Guard vessel to monitor / enforce	B		

		• Impact to Marine Environmental Quality				exclusion zones • Vessel intervention described in guard vessel procedure for engaging 3rd party vessels • Community engagement and announcements locally • Broadcasting on VHF as required • Visual monitoring of bundle on surface (surface buoys and lights)			
4	Failure of bundle monitoring system	• Negligible	IV	C	3	• System confirmation check completed prior to departing parking area • Secondary system / redundancy design in bundle monitoring system • Approved transponder frequency range to ensure no impact to marine fauna or nearby radio communications • Visual monitoring of bundle on surface (surface buoys and lights)	D		
5	Marine Fauna Strike	• Injury to marine fauna	II	D	2	• Tow vessel speeds during surface tow designed as 5-6 knots • Tow vessel speeds within Exmouth Gulf limited to 8 knots • Marine operations "Block-Out" period during whale Southern migration resting period in Exmouth Gulf • Vessel crew training on marine fauna observation and avoidance training • Guard / chaser vessel to identify potential marine fauna in launch path • Fully documented report to DBCA, AMSA and relevant authorities if marine fauna strike occurs	C		
6	Loss of Pressure / Buoyancy during Tow	• Damage to Bundle • Disturbance / impact to benthic habitat	II	C	2	• Bundle fully pressure tested and leak tested prior to launch • Ongoing monitoring of Bundle pressures during tow	D		
7	Failure of tow-line (rigging)	• Damage to vessel • Injury to personnel • Disturbance / impact to benthic habitat beyond disturbance envelope	I	D	2	• Certified and tested tow line & hold-back rigging • Engineering design of tow configuration, with expected loads and safety factors agreed with tow vessels and engineering prior to operation • Vessel wire assurance management system in place • Load cells in tow line for load feedback • Connection points designed as per relevant engineering standards, tested and inspected • Tow forces during surface tow are well below peak load experienced during	C		

						launch • In the event of lead tow tug rigging failure, trailing tow tug remains connected to provide bundle position control • Snapback zones on the vessel clearly identified and clear of all personnel			

ACTIONS

	Action Required	Owner	Other Owner	Action Taken	Deadline	Completed	Status

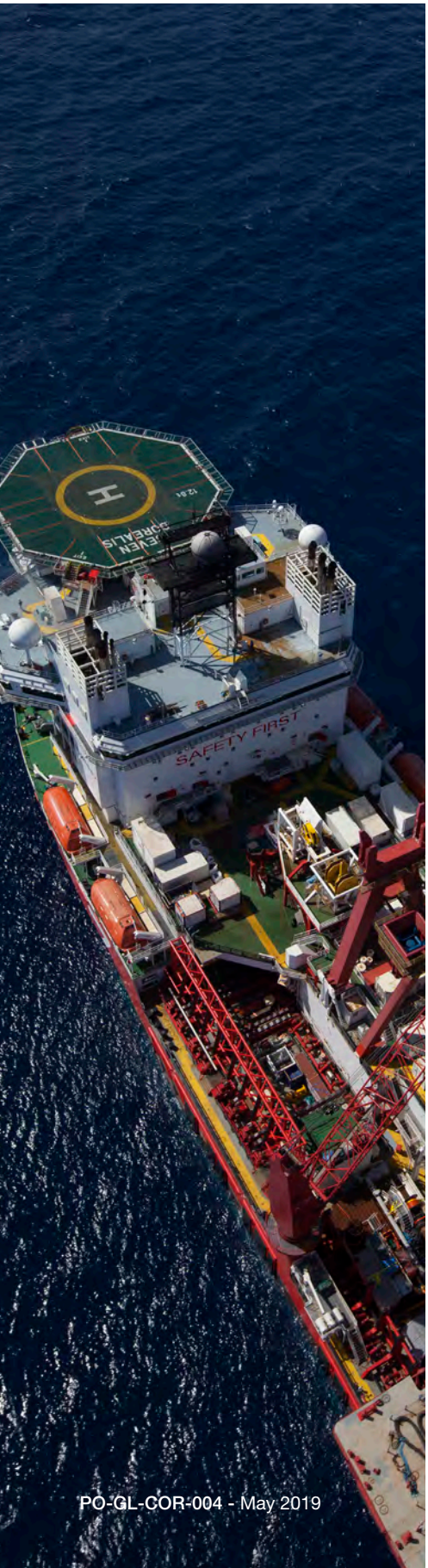
TECHNICAL RISK RATING

Ranking	Assets	Products	Environment	Method/Activity	Priority
A	New asset (Vessel / Equipment / Installation aids) New Technology	New product for Subsea 7 to manufacture or install with no industry feedback	Project is pushing environmental boundaries (pressure / temperature / severe meteorological conditions)	New type of method for the company and no industry feedback	Undesired High Technical Risk (very serious consequences) Required mitigation actions including specific risk assessments / studies
B	Known asset with either bad experiences or recent major modifications	New product for Subsea 7 with industry feedback or known product with bad experience in previous project	Significant environmental changes	New type of method for the company but similar projects performed in the industry	Special Focus Required Medium Technical Risk (serious consequences) Required mitigation actions including specific risk assessments / studies
C	Known asset with minor modifications	Known product with previous bad experience but lessons learned incorporated	Similar environmental conditions	Known type of method with minor modifications	Acceptable Medium Technical Risk (moderate consequences) Work can proceed with HSE Risk Assessment L1 (HIRA)
D	Similar assets to past projects	Known product with good feedback on recent project	Same environmental conditions	Standard method	Negligible Low Technical Risk (slight or negligible consequences) Work can proceed with HSE Risk Assessment L1 (HIRA)

Appendix B: Subsea 7 HSEQ Policy

HSEQ

Health, Safety, Environment and Quality



PO-GL-COR-004 - May 2019

Policy Statement

Subsea 7's Commitment

Subsea 7 is committed to having an incident-free workplace, delivering projects and services on time, within budget and to the required standards to create sustainable value for our shareholders, partners and the communities where we operate. This policy applies to all of the Subsea 7 Group.

Principles

Subsea 7 delivers on its Health, Safety, Security, Environment and Quality commitment by:

- Providing every day, everywhere, an environment where all those involved in or affected by our activities are safe, where everyone participates and is empowered to stop the job if they feel it is unsafe.
- Taking a proactive approach towards our social responsibilities, mitigating our impact on our planet's environment and responding to climate change.
- Engaging and collaborating with our stakeholders to identify, assess, monitor, manage and prevent foreseeable Health, Safety, Security, Environmental and Quality risks in connection with our activities.
- Using a management system with controlled procedures for our activities. We continually monitor, review, audit for compliance, improve our systems and encourage innovation.
- Deliver appropriate training to increase awareness and maintain competence.
- Maintaining effective response capabilities for incidents and emergencies.
- Investigating incidents to identify the root cause, learn and to take appropriate action to prevent reoccurrence.
- Collaborating closely with employees, contractors, clients, partners and suppliers on Health, Safety, Security, Environment and Quality to encourage improvement opportunities and provide efficient solutions to the energy sector.
- Ensuring our employees, contractors and suppliers comply with applicable international and national laws and regulations in the countries where we operate and our Code of Conduct.

Governance

Subsea 7 has a Global Management Team (GMT) led by the Chief Executive Officer, which oversees all Health, Safety, Security, Environmental and Quality matters. The GMT set objectives and ensure that adequate resources are provided to implement, maintain and review this policy.

Subsea 7 line managers are responsible for implementation and compliance with the Subsea 7 business management systems and that all employees and contractors are aware of their responsibilities.

Jean Cahuzac
Chief Executive Officer

John Evans
Chief Operating Officer