Environmental Review Document

Learmonth Pipeline Fabrication Facility

Assessment No. 2208

Issue: Sept 2019

Learmonth Pipeline Fabrication Facility
APFAC017
Environmental Review Document

Date: 10 September 2019

Author: Subsea 7

Assessment Number: 2208

REVISION RECORD SHEET

Revision	Issue Date	Purpose	Description of revision(s)	Authorisation
A	01.03.2019	Client Review	Initial Draft	S. Shute (MBS Environmental)
0	17.04.2019	EPA Review	Final Draft	S. Shute (MBS Environmental) T. Radic (Subsea 7)
1	8.07.2019	EPA Review	Final Draft	S. Shute (MBS Environmental) T. Radic (Subsea 7)
2	10.09.2019	Public Review	Final	S. Shute (MBS Environmental) D. Knox (Subsea 7)

Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on the environmental review for this proposal.

Subsea 7 proposes to construct and operate a new pipeline fabrication facility adjacent to the western shoreline of Exmouth Gulf, at Learmonth, approximately 35 km south of the Exmouth townsite. The proposed facility will allow the construction and launching of pipeline Bundles for the offshore oil and gas industry. The Environmental Review Document (ERD) has been prepared in accordance with the EPA's Procedures Manual (Part IV Divisions 1 and 2). The ERD is the report by the proponent on their environmental review that describes this proposal and its likely effects on the environment.

The ERD is available for a public review period of 8 weeks from 2 October 2019, closing on 30 November 2019.

Information on the proposal from the public may assist the EPA to prepare an assessment report in which it will make recommendations on the proposal to the Minister for Environment.

Why write a submission?

The EPA seeks information that will inform the EPA's consideration of the likely effect of the proposal, if implemented, on the environment. This may include relevant new information that is not in the ERD, such as alternative courses of action or approaches.

In preparing its assessment report for the Minister for Environment, the EPA will consider the information in submissions, the proponent's responses and other relevant information.

Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the *Freedom of Information Act 1992*.

Why not join a group?

It may be worthwhile joining a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on information in the ERD.

When making comments on specific elements in the ERD:

- Clearly state your point of view and give reasons for your conclusions.
- Reference the source of your information, where applicable.
- Suggest alternatives to improve the outcomes on the environment.

What to include in your submission
Include the following in your submission to make it easier for the EPA to consider your submission:

- Your contact details – name and address.
- Date of your submission
- Whether you want your contact details to be confidential.
- Summary of your submission, if your submission is long.
- List points so that issues raised are clear, preferably by environmental factor.
- Refer each point to the page, section and if possible, paragraph of the ERD.
- Attach any reference material, if applicable. Make sure your information is accurate.

The closing date for public submissions is: 30 November 2019

The EPA prefers submissions to be made electronically via the EPA's Consultation Hub at https://consultation.epa.wa.gov.au.

Alternatively submissions can be:

- posted to: Chairman, Environmental Protection Authority, Locked Bag 10, Joondalup, WA 6919, or
- delivered to: the Environmental Protection Authority, Prime House, 8 Davidson Terrace, Joondalup WA 6027.

If you have any questions on how to make a submission, please contact the EPA Services at the Department of Water and Environmental Regulation on 6364 7000 or learmonthpipelineconsult@epa.wa.gov.au.

Scoping Checklist

Task No.	Required Work	Section & Page No.
Regional Context and Integrating Issues		
1.	Provide information regarding the selection process for the proposal site and tow route, including an examination of the alternative options considered and the environmental constraints and values at risk for each alternative option, to demonstrate that the proposal site and tow route has been selected to avoid and minimise impacts.	Section 2.4.8, p. 38
2.	Discuss the regional and cumulative impacts of other existing or reasonably foreseeable development in the vicinity of the proposal with the potential to impact the same receptors and environmental values.	Section 2.5.8, p. 59
3.	Provide details of proposed care and maintenance, and decommissioning and closure of the proposal. Provide details of the potential risks and impacts to environmental values, and details of mitigation and management measures to ensure that the impacts are not greater than predicted.	Section 2.3.9, p. 31
EPA Factor 1 – BCH		
4.	Characterise the environment by designing and conducting a benthic communities and habitat survey to accurately map the spatial extent of benthic habitats. Based on the findings of the surveys, produce geo referenced maps showing the extent and distribution of the different benthic communities and habitats across the defined Local Assessment Unit (LAU) offshore of Heron Point, including all potential launch disturbance areas. Geo-referenced maps of benthic communities and habitats should also be provided for the bundle parking area, and those areas potentially affected by the towing activities within the Exmouth Gulf, Ningaloo Marine Park/Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place and present these at the appropriate scale. Surveys should be conducted to a standard such that the results can be used as a baseline for future quantitative monitoring. This characterisation should also identify any critical windows of environmental sensitivity for benthic communities, particularly corals.	Section 5.1.3, p. 83
5.	Assess the values and significance of benthic communities and habitats within the proposal area, and adjacent areas, and describe these values in a local and regional context. This assessment must also specifically address the values and significance of benthic communities and habitats which are: potentially affected by towing activities within the Exmouth Gulf, Ningaloo Marine Park Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place, and Muiron Islands Marine Management Area; important for significant marine fauna	Section 5.1.3.2 & 5.4.3, p. 89 & 167

Task No.	Required Work	Section & Page No.
	(in particular *Dugong dugon* and *marine turtles*); and important for supporting commercial and recreational fisheries (including aquarium fisheries).	
6.	Identify elements of the proposal that may potentially affect benthic communities and habitat, including both direct and indirect impacts, and for both construction and operation. This should include impacts in the event of an accidental spill or incident; and damage to or loss of control of the pipeline bundle during launch and towing activities.	Section 5.1.3.4, p. 92
7.	Predict the residual impacts from the proposal, both direct and indirect, on benthic communities and habitat after demonstrating how the mitigation hierarchy has been applied. Impact predictions are to: (a) Include the likely extent, severity and duration of direct and indirect impacts of the proposal on benthic communities and habitats. Predictions for both construction and operational impacts are to include the most likely worst case, and the most likely best-case loss scenarios. (b) Address any irreversible loss of, or serious damage to, benthic communities and habitat, in the context of Technical Guidance – Protection of Benthic Communities and Habitats, December 2016 including an appropriately defined local assessment unit and an assessment of the significance of any loss, including cumulative loss. (c) Include a risk assessment identifying potential impacts to benthic communities and habitat: that provides habitat for conservation significant or locally important marine fauna; that provides habitat for commercial and recreational fisheries; and that may be potentially affected by towing activities within the Exmouth Gulf, Ningaloo Marine Park Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place and Muiron Islands Marine Management Area. This risk assessment should include consideration of accidental spills or incidents, including damage to or loss of control of the pipeline bundle during launch and towing activities.	Section 5.1.6, p. 92
8.	Include details of the monitoring and management to occur during and after construction of the proposal, and during ongoing operations to demonstrate that residual impacts are not greater than predicted at the launch site, bundle parking area and along the tow path.	Section 5.1.7, p. 125
9.	Describe the likely consequences for the ecological integrity and biological diversity of the benthic communities and habitats that the identified impacts may have and include a description of the likely impact any changes may have on other dependent factors.	Section 5.1.6.11, p. 116 Section 5.4.7, p. 228
10.	Determine and quantify any significant residual impacts	Section 5.1.7, p. 125

Task No.	Required Work	Section & Page No.
	by applying the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offset Guidelines* (2014).	
11.	Where significant residual impacts remain, propose an appropriate offset package that is consistent with the *WA Environmental Offsets Policy and Guidelines and where residual impacts relate to EPBC Act-listed threatened and/or migratory species the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Spatial data defining the areas of significant residual impacts should be provided.	Section 8, p. 425
EPA Factor 2 – Coastal Processes		
12.	Characterise the environment by describing the current coastal processes in the proximity to the proposal. This is to include, but not be limited to, (a) conducting a detailed analysis of existing long-shore sediment movements and variability over at least 20 years to estimate erosional and depositional patterns including for cross-shore processes; (b) conduct an analysis of cross-shore processes and variability over at least 20 years; (c) spatially quantify the coastal morphology by presenting beach profiles and aerial imagery or a more detailed representation (e.g. unmanned aerial vehicle survey); and (d) characterise erosion and inundation provided by extreme events, particularly the potential effects of severe tropical cyclones. The characterisation is to consider all temporal scales including seasonal, inter-annual and episodic. The spatial scale must be adequate to address all coastal processes and patterns likely to be affected as a result of the proposal. Characterisation should extend beyond the limits of where impacts may potentially occur to provide a baseline for subsequent evaluation.	Section 5.2.3, p. 137
13.	Identify elements of the proposal that may potentially affect coastal processes, including both direct and indirect impacts and for both construction and operation.	Section 5.2.4, p. 141
14.	Predict the residual impacts from the proposal, both direct and indirect, after outlining any avoidance, mitigation and management options that will be applied. Impact predictions are to: (a) Be provided at a sufficient scale to address all impacts resulting from the proposal to both up and down coastal processes as well as onshore-offshore processes.	Section 5.2.7, p. 145

Task No.	Required Work	Section & Page No.
	(b) Be informed by monitoring previously undertaken in the local area. (c) Predict near-field responses to the proposed coastal facilities, including anticipated updrift and downdrift coastal change. Information should include forecast changes to beach morphology over the intended service life of the facility (e.g. predicted beach profiles). (d) Determine changes to local current and wave climate, long-shore sediment movements and erosional and deposition patterns (including cross-shore processes). (e) Consider and assess the cumulative effects from and to any other approved or reasonably foreseeable coastal developments. (f) Be for both the short and long-term (100 year planning horizon or planning horizon relevant to the service life of the facility); be provided for best, most likely and worst case scenarios; and consider the likely impacts of climate change within the service life of the facility. (g) Address the frequency, volume and potential environmental impacts of sand bypassing/backpassing adjacent to the proposal. (h) Address the requirements of State Planning Policy 2.6, particularly with regard to setback and coastal risk management.	
15.	Identify management and mitigation measures to ensure residual impacts are not greater than predicted.	Section 5.2.7, p. 145
16.	Outline the proposed ongoing governance arrangements for the management of coastal processes including the roles and responsibilities for sand bypassing/backpassing requirements where required.	Section 5.2.7, p. 145
17.	Include details of monitoring and management that will apply during construction and operation to demonstrate and ensure that residual impacts to coastal processes are not greater than predicted.	Section 5.2.7, p. 145
18.	Identify the proposed service life of the facility and anticipated service life of the facility and anticipated process of decommissioning. Include details of mitigation, monitoring, and management that will apply during and after decommissioning.	Section 2.3.9, p. 31 Attachment 3
EPA Factor 3 – Marine Environmental Quality		
19.	Conduct monitoring as necessary to characterise the existing marine environmental quality (baseline water and sediment quality) in the area potentially affected by the proposal. The characterisation needs to be informed by an assessment of threats and pressures to marine	Section 5.3.3, p. 151

Task No.	Required Work	Section & Page No.
	environmental values, both ecological and social. The characterisation is to inform the environmental quality monitoring and management plans required in 24.	
20.	Provide an Environmental Quality Plan (EQP) that spatially defines the Environmental Values (EVs), Environmental Quality Objectives (EQOs) and Levels of Ecological Protection (LEPs) that apply to the area. The EQP shall be consistent with *Technical Guidance: Protecting the quality of Western Australia's marine environment*, December 2016 and have regard for the *Pilbara Coastal Water Quality Outcomes: Environmental Values and Environmental Quality Objectives*, Map 6 (Department of Environment, 2006).	Attachment 3
21.	Identify elements, activities and potential inputs of the proposal that may potentially affect marine environmental quality, for both construction and operation.	Section 5.3.4, p. 154
22.	Describe the marine system and the cause and effect pathways of each element, activity or input from the proposal on marine environmental quality.	Section 5.3.6, p. 155
23.	Predict the extent, severity and duration of any impacts from the proposal, after outlining any avoidance and mitigation options that will be applied. Impact predictions are to be presented in the context of the EQP for: (a) Construction of coastal infrastructure Predicted impacts should also be presented spatially as an overlay to the EQP to identify where the EVs, EQOs and LEPs may not be achieved during construction. (b) Operation/maintenance of fabrication site Predicted impacts should also be presented spatially as an overlay to the EQP to identify where the EVs, EQOs and LEPs may not be achieved during operations/maintenance of the fabrication site. (c) During bundle launch, bundle parking and towing Predicted impacts should include an assessment of risk from increased turbidity during bundle launch, including from dragging of bundle ballast chains, spills, accidents and collisions during towing activities (under a range of scenarios) particularly when towing occurs in the Ningaloo Marine Park/Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place and adjacent to the Muiron Islands Marine Management Area. Predicted impacts should also be presented spatially as an overlay to the EQP to identify where the EVs, EQOs and Leap's may not be achieved during bundle launch,	Section 5.3.6, p. 155 Attachment 3

Task No.	Required Work	Section & Page No.
	bundle parking and towing.	
24.	Identify management and mitigation measures to ensure residual impacts are not greater than predicted. The PER is to include: (a) A Marine Construction Monitoring and Management Plan (MCMMP) that includes the protocols and procedures for monitoring of key environmental quality indicators (e.g. turbidity, light attenuation coefficient, visual records etc.) and management of environmental quality (e.g. silt curtains, pre-washing of material for launchway etc.) to ensure that the construction of the proposal achieves the proposed EQOs/LEPs defined in the EQP. (b) Include details of the monitoring and management to occur during and after construction of the proposal, and during ongoing operations (bundle launch, bundle parking and towing) to demonstrate that residual impacts to water quality are not greater than predicted. (c) A Marine Emergency Response Plan that includes procedures to be implemented during operations which specifically address measures to be implemented 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.	Section 5.3.7, p. 161 Attachment 3
EPA Factor 4 – Marine Fauna		
25.	Identify and assess the values and significance of marine faunal assemblages within the proposal area (including the Exmouth Gulf area and area of the Ningaloo Marine Park/Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place and Muiron Islands Marine Management Area that is potentially affected by the operation of the proposal) and describe these values in a local, regional, and State context. For listed species, this must include information on the abundance, distribution, ecology, and habitat preferences, together with baseline information and mapping of local and regional occurrences.	Section 5.4.3, p. 167
26.	Identify critical windows of environmental sensitivity for marine fauna in the proximity of the proposal area, including conservation significant or locally important marine fauna (including migratory coastal birds) and species important to commercial and recreational fisheries in the proposal area and immediate adjacent area.	Section 5.4.3, p. 167
27.	Describe the presence of marine fauna in the proximity of the proposal area, including marine mammals, other conservation significant or locally important marine fauna (including migratory coastal birds) and species important to commercial and recreational fisheries in the proximity to the proposal area, and document any known uses of	Section 5.4.3, p. 167

Task No.	Required Work	Section & Page No.
	the area by them (e.g. foraging, migrating, calving and nursing, spawning, roosting and nesting etc.). For listed species, this must include: (a) a population size and importance of the population from a local and regional perspective; and (b) information on conservation value of each habitat type (e.g. breeding, migration, feeding, resting, internesting) from a local and regional perspective, including the percentage representation of each habitat site in relation to its local and regional extent.	
28.	Identify the construction and operational elements of the proposal that may affect conservation significant or locally important marine fauna and marine fauna habitat, including from increased turbidity during bundle launch and dragging of bundle ballast chains.	Section 5.4.4, p. 208
29.	Describe and assess the potential direct and indirect impacts that may result from construction and operation of the proposal to marine mammals, other conservation significant or locally important marine fauna (including migratory coastal birds) and species important to commercial and recreational fisheries and their habitat.	Section 5.4.6, p. 208
30.	Identify any significant gaps in knowledge for conservation significant or locally important marine fauna in the proposal area and assess the importance and/or significance of those gaps with respect to identifying and managing impacts of the proposal, and where required conduct investigations to address these critical knowledge gaps.	Section 5.4.5, p. 208
31.	Identify any known marine pests or pathogens in the area that is potentially affected by the operation of the proposal, and/or adjacent waters. Conduct a risk assessment to identify whether the proposed activities are likely to introduce or extend the range of introduced marine pests or pathogens. Identify the control measures by which these may be avoided/mitigated. Based on the outcomes of the risk assessment determine in consultation with EPA Services and the Department of Primary Industries and Regional Development whether a there is a need to design and conduct a baseline survey in accordance with the guidelines provided by the Australian National System for the Prevention of Marine Pest Incursions.	Section 5.4.3.8, p. 206 Attachment 2
32.	Identify measures to mitigate adverse impacts on marine fauna in the proximity of the proposal area (including the tow area), including marine mammals, other conservation significant or locally important marine fauna (including migratory coastal birds) and species important to commercial and recreational fisheries and their habitat. This is to include management and monitoring protocols for introduced marine organisms during construction and	Section 5.4.7, p. 227

Task No.	Required Work	Section & Page No.
	operation and protocols to reduce the impacts to marine fauna during construction and operation to ensure that residual impacts to marine fauna are not greater than predicted. This should include procedures to be implemented 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.	
33.	Predict the residual impacts from the proposal, both direct and indirect, after outlining any avoidance and mitigation options that will be applied. Impact predictions, should consider both short and long-term impacts, how the proposal may change marine fauna patterns of use and cumulative impacts. This should include an assessment of the risk posed to any listed species as a result of the proposal.	Section 5.4.7, p. 227
34.	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014).	Section 8, p. 425
35.	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and Guidelines *and where residual impacts relate to EPBC Act-listed threatened and/or migratory species the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Spatial data defining the area of significant residual impacts should also be provided.	Section 8, p. 425
EPA Factor 5 – Flora and Vegetation		
36.	Identify and characterise the flora and vegetation of areas that may be directly or indirectly impacted by the proposal in accordance with Technical Guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment*, December 2016. Demonstrate how surveys are relevant, representative and demonstrate consistency with current EPA policy and guidance set out below. Include a summary of survey findings in accordance with relevant guidelines set out below.	Section 5.5.3, p. 241
37.	Identify and describe the vegetation and significant flora species present and likely to be present within the Development Envelope, and any areas that may be indirectly impacted by the proposal beyond the Development Envelope. Include an analysis of the significance of flora and vegetation in local, regional and State contexts as appropriate in accordance with the relevant guidance set out below.	Section 5.5.3, p. 241
38.	Provide a map depicting the recorded locations of the significant flora, ecological communities and significant vegetation in relation to the Development Envelope in accordance with the relevant guidelines set out below.	Section 5.5.3, p. 241
39.	Assess the potential direct and indirect impacts of the construction and operational elements of the proposal on	Section 5.5.6, p. 249

Task No.	Required Work	Section & Page No.
	identified environmental values. Include a quantitative assessment of levels of impact on significant flora, listed ecological communities and all vegetation units. Describe and assess the extent of any cumulative impacts within local, regional and State contexts as appropriate.	
40.	Describe and justify any proposed mitigation to reduce the potential impacts of construction and operation of the proposal. Include any proposed management and/or monitoring plans that will be implemented pre- and post-construction to ensure residual impacts are not greater than predicted.	Section 5.5.7, p. 259
41.	Identify, describe and quantify the potential residual impacts (direct, indirect and cumulative) that may occur following implementation of the proposed after considering and applying avoidance and minimisation measures.	Section 5.5.7, p. 259
42.	Determine the significance of any significant residual impacts on the identified environmental values by applying the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014). Provide spatial data defining the area of significant residual impacts.	Section 8, p. 425 Attachment 2
43.	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and Guidelines *and where residual impacts relate to EPBC Act-listed threatened and/or migratory species the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy.*	Section 8, p. 425
EPA Factor 6 – Subterranean Fauna		
44.	In accordance with EPA guidance: (a) conduct a desktop study, incorporating existing regional subterranean fauna surveys and databases; and (b) undertake surveys to identify and characterise subterranean fauna and subterranean fauna habitat at a local and regional scale that may be impacted directly and indirectly by the implementation of the proposal. This should include sampling inside and outside the impact areas and consider cumulative impacts.	Section 5.6.3, p. 266
45.	Provide figure(s) showing the extent of subterranean fauna habitat in relation to the proposal and species distributions.	Section 5.6.3, p. 266
46.	Describe and assess the extent of direct, indirect and cumulative impacts as a result of implementation of the proposal during both construction and operations to subterranean fauna, taking into consideration the significance of subterranean fauna and subterranean fauna habitat.	Section 5.6.6, p. 271
47.	Predict the residual impacts from the proposal on	Section 5.6.7, p. 275

Task No.	Required Work	Section & Page No.
	subterranean fauna after considering and applying avoidance and minimisation measures.	
48.	Identify management measures for the proposal to ensure residual impacts to subterranean fauna are not greater than predicted.	Section 5.6.7, p. 275
49.	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014).	Section 8, p. 425
50.	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and Guidelines *and where residual impacts relate to EPBC Act-listed threatened and/or migratory species the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Spatial data defining the area of significant residual impacts should also be provided.	Section 8, p. 425
EPA Factor 7 – Terrestrial Fauna		
51.	In accordance with the requirements of EPA Guidance: (a) conduct a desktop study, incorporating existing regional terrestrial fauna surveys and databases. (b) undertake terrestrial fauna surveys, to identify and characterise terrestrial fauna and fauna habitat, at a local and regional scale, that may be impacted directly and indirectly by the implementation of the proposal. This should include sampling inside and outside the impact areas and consider cumulative impacts. For listed species, this must include information on: • the abundance, distribution, ecology, and habitat preferences, together with baseline information and mapping of local and regional occurrences. • a population size and importance of the population from a local and regional perspective. • information on conservation value of each habitat type (e.g. breeding, migration, feeding, resting, internesting) from a local and regional perspective, including the percentage representation of each habitat site in relation to its local and regional extent.	Section 5.7.3, p. 280 Attachment 2
52.	Describe the values and significance of fauna and fauna habitat that maybe impacted directly and indirectly by implementation of the proposal during both construction and operations and describe the significance of these values in a local and regional context.	Section 5.7.3, p. 280
53.	Provide a map illustrating the known recorded locations of conservation significant species, short-range endemic invertebrate species or other significant fauna and fauna habitat in relation to the proposal.	Section 5.7.3, p. 280

Task No.	Required Work	Section & Page No.
54.	Describe and assess the extent of direct and indirect impacts as a result of implementation of the proposal during both construction and operations to terrestrial fauna taking into consideration cumulative impacts and the significance of fauna and fauna habitat. This should include an assessment of the risk posed to any listed species as a result of the proposal.	Section 5.7.6, p. 283
55.	Predict the residual impacts to terrestrial fauna after considering and applying avoidance and minimisation measures.	Section 5.7.7, p. 289
56.	Discuss proposed management, monitoring and mitigation methods to be implemented to ensure residual impacts (direct and indirect) are not greater than predicted.	Section 5.7.7, p. 289
57.	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014).	Section 8, p. 425
58.	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and Guidelines *and where residual impacts relate to EPBC Act-listed threatened and/or migratory species the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Spatial data defining the area of significant residual impacts should also be provided.	Section 8, p. 425
EPA Factor 8 – Inland Waters		
59.	Characterise the baseline hydrological and hydrogeological regimes and water quality and quantity, both in a local and regional context, including, but not limited to, water levels including the fluctuation of the aquifer system in response to tides and storm events, water chemistry, presence of acid sulphate soils, stream flows, flood patterns, spatial characteristics of the fresh/saline groundwater interface, aquifer characteristics, and recharge potential.	Section 5.8.3.4, p. 298
60.	Identify the location of abstraction bores for water requirements and identify and discuss any associated impacts of groundwater abstraction including from drawdown.	Section 5.8.3.4, p. 298
61.	Provide a detailed description of the design and location of the proposal with the potential to impact surface and ground water, including the extent of discharges and/or reinjection, and the disturbance of acid sulphate soils, if present.	Section 5.8.6, p. 303
62.	Undertake hydrological investigations to determine the effects of any proposed surface discharge, reinjection and modified drainage will have on the surface and ground water quality and quantity of the likely direct and indirect impact areas taking into account cyclonic conditions,	Section 5.8.6, p. 303 Attachment 2

Task No.	Required Work	Section & Page No.
	cumulative impacts and a range of climatic scenarios including probable maximum precipitation.	
63.	Predict the residual impacts on hydrological processes and inland waters environmental quality, for direct, indirect and cumulative impacts, after considering avoidance and minimisation measures.	Section 5.8.7, p. 310
64.	Identify management, mitigation, and monitoring methods to be implemented for the proposal to ensure residual impacts are not greater than predicted.	Section 5.8.7, p. 310
65.	Where significant residual impacts remain, and relate to MNES, propose an appropriate offsets package that is consistent with the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Spatial data defining the area of significant residual impacts should also be provided.	Section 8, p. 425
EPA Factor 9 – Social Surroundings		
66.	Characterise the heritage and cultural values of the proposal area, including for the Ningaloo Coast World Heritage Property and the Ningaloo Coast World Heritage Place, and any other areas that may be indirectly impacted to identify sites of significance and their relevance within a wider regional context.	Section 5.9.3, p. 316
67.	Conduct appropriate Aboriginal heritage surveys to identify Aboriginal sites, values, and/or cultural associations.	Section 5.9.3, p. 316 Attachment 2
68.	Conduct appropriate consultation to identify concerns in regard to environmental impacts as they affect heritage matters.	Section 5.9.3, p. 316
69.	Provide a detailed description and figure(s) of the proposed disturbance and impacts to heritage sites, values, and/or cultural associations, including for the Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place associated with the proposal.	Section 5.9.5, p. 344
70.	Assess the impacts on heritage sites, values and/or cultural associations, including for the Ningaloo Coast World Heritage Property and the Ningaloo Coast World Heritage Place, associated with the implementation of the proposal, including those resulting from changes to the environment which may impact on cultural and heritage significance or values.	Section 5.9.5, p. 344
71.	Predict the residual impacts on heritage sites, values and/or cultural associations, for direct, indirect and cumulative impacts after considering the mitigation hierarchy.	Section 5.9.7, p. 359
72.	Outline the mitigation and management measures to ensure impacts to heritage sites, values, and/or cultural associations (direct and indirect) are minimised, and not greater than predicted.	Section 5.9.7, p. 359
73.	Characterise the environment by providing a description of the visual landscape character and scenic quality values and provide maps of the visual landscape units	Section 5.9.3, p. 316

Task No.	Required Work	Section & Page No.
	that may potentially be visually affected. This should include, but not be limited to: landforms; vegetation; and waterways/bodies and can be undertaken by way of three-dimensional modelling and/or photographs.	
74.	Characterise the current, and any other reasonably foreseeable, land and recreation uses and amenity values (including for visual, noise, odour, and dust) of the proposal area.	Section 5.9.3, p. 316
75.	Identify and discuss the potential sources and impacts of noise, dust, light-spill and alteration to landscape from the proposal.	Section 5.9.5, p. 344
76.	Design and undertake a visual impact assessment (VIA) for before, during construction, after construction, during operations, and after closure and decommissioning, to assess the impacts of the proposal on visual amenity in accordance with the Western Australian Planning Commission (2007) *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design*.	Section 5.9.5, p. 344 Attachment 2
77.	The VIA will identify and describe the aspects of the proposal that may potentially affect the visual landscape character and scenic quality values both temporarily and permanently, using agreed (by the EPA) reference and vantage points of surrounding areas and use area's viewer positions and perceptions.	Attachment 2
78.	Predict the residual amenity impacts from the proposal on the landscape, land and recreation use and amenity values (including visual, noise, odour, and dust) after considering and applying avoidance and minimisation measures. Impact predictions are to include, but not be limited to: (a) The likely extent, severity, and duration of the impacts. (b) Simulations/modelling of the predicted residual impacts from the proposal, including changes to the landscape from the agreed reference and vantage points. Include the cumulative impacts on amenity (visual, noise, odour, and dust) from the proposal and other currently approved developments.	Section 5.9.7, p. 359
79.	Review the social implications of the proposal to planned activities within Ningaloo Marine Park, in the context of the stated objectives of each of the relevant social values outlined in the Management Plan for Ningaloo Marine Park and Muiron Islands Marine Management Area.	Section 5.9.5, p. 344
80.	Identify management and mitigation measures for the proposal to ensure residual impacts to land and recreation uses, and amenity (including visual, noise, odour, and dust) are not greater than predicted.	Section 5.9.7, p. 359
81.	Conduct appropriate consultation to identify the potential impacts the proposal will have on the economic	Section 5.9.5, p. 344

Task No.	Required Work	Section & Page No.
	surroundings of people affected by the proposal (related to the physical area involved in the proposal), including in relation to tourism, commercial fishing, and recreational fishing operations/business.	
82.	Identify and discuss the potential impacts to the economic surroundings of the people referred to in scope 81 above. The discussion must include consideration of the mitigation hierarchy.	Section 5.9.5, p. 344
83.	Identify management and mitigation measures for the proposal to ensure impacts to economic surroundings are not greater than predicted.	Section 5.9.7, p. 359
84.	Where significant residual impacts remain, and relate to MNES, propose an appropriate offsets package that is consistent with the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Spatial data defining the area of significant residual impacts should also be provided.	Section 8, p. 425
Other Factors or Matters – Terrestrial Environmental Quality		
	Provide details of chemical and diesel storage, and power generation and management measures, including contingencies in the event of a spill, to ensure that contamination of land does not occur.	Section 2.3 & 6.1.7, p. 17 & 369
	Provide details on the presence of acid sulphate soils within the proposal area, and if present details of proposed management measures to be implemented during construction to minimise impacts to terrestrial environmental quality.	Section 6.1.3 & 6.1.7, p. 365 & 369

Table ES 1: Work Required in Accordance with the Environmental Scoping Document (EPA 2018a)

Executive Summary

INTRODUCTION, BACKGROUND, AND CONTEXT

This Environmental Review Document (ERD) has been prepared by Subsea 7 Australia Contracting Pty Ltd (Subsea 7) for the Learmonth Pipeline Fabrication Facility (the Proposal).

The Proposal will involve the production of pipeline Bundles, used in the development of offshore gas fields, which co-locate a number of services within a single pipeline, which is constructed onshore before being launched and towed offshore to the field under development. Bundle technology represents an alternative to the conventional development of an offshore gas field. Subsea 7 currently operates the only other existing Bundle site in Wick, Scotland.

Numerous alternative sites were assessed for suitability as a Bundle construction and launch site, both within Western Australia and globally, with the environmental, planning, social and engineering constraints considered. Key physical site requirements include a 10 km long, and relatively flat, onshore area for the Bundle tracks, an adjacent medium gradient shore crossing and relatively sheltered nearshore environment. A number of sites in the North West region of Western Australia were considered, with two short-listed; Anketell Point (Karratha) and Learmonth (Exmouth). Further and more detailed environmental opportunity and constraints analysis, and studies including bathymetry surveys, were undertaken. These indicated that the Anketell site was unsuitable for Bundle fabrication and launch and thus Learmonth was determined to be the only feasible site.

Subsea 7 referred the original Proposal to the Western Australian Environmental Protection Authority (EPA) on 23 October 2017. On 20 November 2017, the EPA determined the original Proposal required formal assessment with the level of assessment set as Public Environmental Review (PER), with an eight-week public review period (Assessment number 2136). An Environmental Scoping Document (ESD) was prepared by the EPA to define the form, content, timing and procedure of the Environmental Review Document (ERD). A draft ESD was published for public comment by the EPA on 14 February 2018, with the final, approved, ESD published on 18 April 2018. Subsequently Subsea 7 submitted a request to make changes to the Proposal under section 43A of the *Environmental Protection Act 1986* (EP Act). The proposed amendments included:

- Amendment of the Proposal title from the 'Learmonth Bundle Site' to the 'Learmonth Pipeline Fabrication Facility'.
- Extension of the onshore Development Envelope adjacent to the Minilya-Exmouth Road to ensure a safe alignment of the site access road.
- Inclusion of the proposed production bores and associated water supply pipeline within the Development Envelope.
- Slight modification of the tow route and definition of an Offshore Operations Area to describe the maximum area (or envelope) within which launch and tow operations will occur.
- Definition of an Offshore Operations Area (Off bottom tow) within which Bundle ballast chains, which hang below the Bundle, will be in contact with the seabed. This area represents an envelope within which any and all disturbance associated with Bundle launches, over the life of the facility, may occur.

- A slight realignment of the 'Bundle laydown area' (now termed the Bundle parking area) to align with the revised tow route.
- Change to a 'Surface tow' method through Ningaloo Marine Park and the definition of an Offshore Operations Area (Surface tow) representing an envelope within which all Bundle tows, over the life of the facility, will occur.

Following initial discussions between Subsea 7 and the EPA, Subsea 7 requested that the EPA terminate its assessment of the Proposal.

Subsea 7 referred an amended Proposal to the EPA on 16 May 2019. On 29 May 2019, the EPA determined the Proposal required formal assessment with the level of assessment set as PER, with an eight-week public review period (Assessment number 2208). An Environmental Scoping Document (ESD) was prepared by the EPA to define the form, content, timing and procedure of the Environmental Review Document (ERD) (this document). A final, approved, ESD was published on 8 July 2019 (Appendix 1). The ESD outlines the preliminary key environmental factors, other environmental factors or matters and work requirements for completion of the ERD.

The ERD has been prepared to fulfil the requirements for assessment of the Proposal at a level of PER pursuant to Part IV of the Western Australian *Environmental Protection Act 1986* (EP Act). It has been prepared in accordance with the EP Act Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016 (EPA 2016a), the Guidelines for Preparing an Environmental Review Document (EPA 2018b) and to the requirements of the ESD.

The Proposal was referred to the Department of the Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 18 October 2017. On 24 February 2018, the Proposal was deemed a Controlled Action. On 1 July 2019 the DoEE accepted a variation to the Proposal to allow assessment of the amended Proposal through an accredited assessment under the EP Act, with the ERD (this document) addressing the potential impacts to the relevant controlling provisions.

OVERVIEW OF THE PROPOSAL

The Proposal is to construct and operate a new pipeline fabrication facility adjacent to the western shoreline of Exmouth Gulf, at Learmonth, approximately 35 km south of the Exmouth townsite (ES Figure 1). The proposed facility will allow the construction and launching of pipeline Bundles for the offshore oil and gas industry.

The Proposal 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 Bundle tracks along which each Bundle will be constructed and then launched (ES Figure 2). A Bundle launchway, crossing the beach and extending 380 m (measured from the dune line) into the nearshore subtidal area, will facilitate the launch of each bundle (ES Figure 3).

A Summary of the Proposal is provided in ES Table 1.

Summary of Proposal	
Proposal Title	Learmonth Pipeline Fabrication Facility
Proponent Name	Subsea 7 Australia Contracting (Subsea 7)
Short Description	The proposal is to construct and operate an onshore pipeline fabrication facility at Lots 233 and 1586 to the east of Minilya-Exmouth Road, Learmonth, approximately 35 km south of the Exmouth town site. The onshore pipeline bundle fabrication site and associated infrastructure includes two bundle tracks (approximately 10 km in length) along which the Bundles will be constructed and launched from a Bundle launchway that crosses the beach and extends into the subtidal zone at Heron Point in the Exmouth Gulf. Once launched the Bundles will be towed along a pre-determined route between two tugs at a controlled depth to the Bundle Parking area within which tow reconfiguration will occur before continuing offshore.

ES Table 1: Summary of Proposal

The Key Characteristics of the Proposal are provided in ES Table 2.

Physical Elements		
Element	Location	Proposed Extent
Bundle fabrication facility and associated infrastructure including: • Fabrication site (including site offices, staff facilities, lunchroom, storage area and car park). • Two Bundle Tracks. • Launchway facilities	Within the onshore Development Envelope as shown in ES Figure 2	Clearing and disturbance of up to 176 ha of vegetation within a 452 ha Development Envelope

Physical Elements		
Element	Location	Proposed Extent
area. • Access roads. • Spray field. • Drainage sump. • Hydro testing water pond. • Groundwater production bores and supply pipeline. • Miscellaneous (Drains, access tracks, earthworks areas).		
Bundle Launchway	Within Exmouth Gulf as shown in ES Figure 3	Direct disturbance of up to 1 ha of seabed (measured from mean high water) within a 4,164 ha Offshore Operations Area (Off bottom tow)
Offshore Operations Area (Off bottom tow)	Within Exmouth Gulf as shown in ES Figure 3	Direct disturbance of up to 1,450 ha of seabed (per Bundle launch) within a 4,164 ha Offshore Operations Area (Off bottom tow)
Offshore Operations Area (Bundle Parking area)	Within Exmouth Gulf as shown in ES Figure 3	Direct disturbance of up to 368 ha of seabed within a 2,426 ha Offshore Operations Area (Parking area)
Offshore Operations Area (Surface tow)	Within Exmouth Gulf and Ningaloo Marine Park, Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place as shown in ES Figure 3	No ground or seabed disturbance to the extent of State Waters

Operational Elements		
Element	Location	Proposed Extent
Groundwater abstraction	Learmonth (onshore)	Abstraction of up to 12 ML/annum for potable and hydrotest water

Operational Elements		
Element	Location	Proposed Extent
Bundle launch and tow	Within Exmouth Gulf and Ningaloo Marine Park, Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place as shown in ES Figure 3	Maximum of three Bundle launches per annum.

ES Table 2: Proposal Key Characteristics

To launch a Bundle, the Towhead on the offshore end of the Bundle is connected to a tug (the 'Leading Tug') via a long towline. The tug then slowly heads offshore, pulling the Bundle along the track and into the ocean. Following launch, the Bundle will be towed slowly (≤ 2 knots[1]) offshore along the tow route (ES Figure 3). 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.

On arrival at the Bundle Parking area (ES Figure 3), the Bundle will be stopped and various checks and reconfiguration of the subsequent Surface tow completed. The Bundle may remain within this area for up to 24 hours to allow for all checks and reconfiguration to be completed, and to allow for the 'Surface tow' out of Exmouth Gulf to be aligned with optimal wind and current conditions.

On exit from the Bundle Parking area the tow vessels will increase the tow speed to 5-6 knots (up to a maximum of 8 knots)[2]. 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 maximum clearance from the seabed within Ningaloo Marine Park (ES Figure 3).

Once the bundle and tow fleet exit the Exmouth Gulf and enter deeper waters, the Bundle tow speed will be reduced slightly, and the tension from the trailing tug reduced, to allow the Bundle to be lowered through the water column to sit at mid-depth through the water column. The actual depth varies pending the Bundle tow characteristics and the environmental conditions at the time, but is typically in the region of 50 m water depth. Once this depth is reached, and the Bundle is stable, the tow has entered 'Controlled Depth Tow Method' (CDTM) which will continue until the Bundle reaches the installation location.

To provide clarity regarding the tow route, and allowing for minor changes in the exact towpath (which may occur under varying environmental conditions), an Offshore Operations Area has been defined (ES Figure 3). This described the maximum area (or envelope) within which launch and tow operations will occur.

[1] Two knots is equivalent to 3.7 km/hour, well below average walking speed of 5-6 km/hour (City of Belmont 2019).
[2] Eight knots is equivalent to approximately 15 km/hour. A speed limit of 8 knots is commonly set for the safe operation of motor vessels within restricted waters (e.g. mooring areas, shallow waters or adjacent to a wharf or jetty within the Swan River) (Department of Transport 2019). In Exmouth Gulf, adjacent to the proposed tow route, no speed limits apply as these waters represent unrestricted, open waters.

Scale: 1:400000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

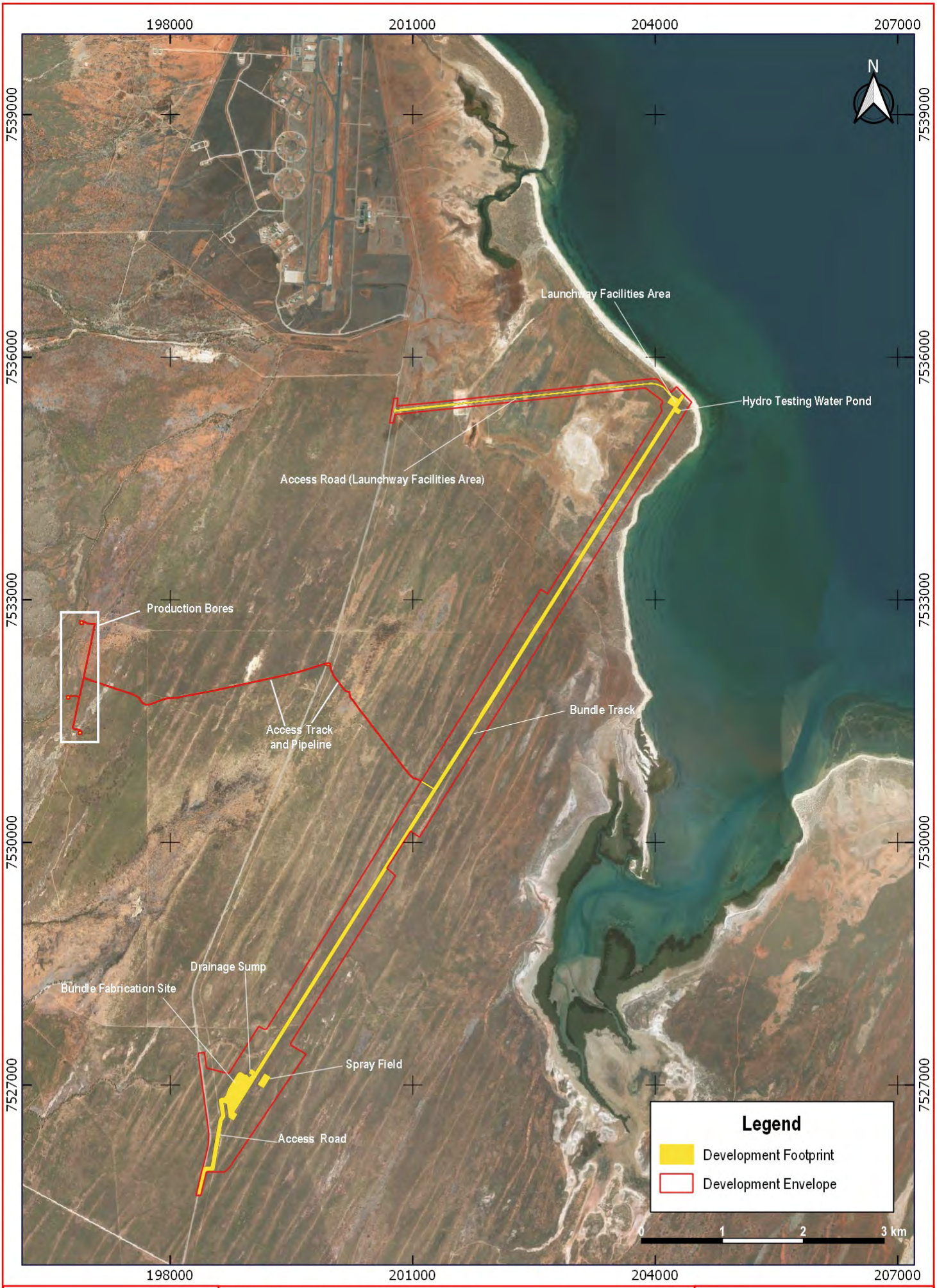
Notes: Location of proposed Bundle Site.

Subsea 7 Pipeline Fabrication Facility

subsea 7

ES Figure 1: Location of Proposal (Development Envelope)

W:\Subsea 7\GIS\Figures\PER Figures\Overview Figures.qgs 14/06/2019



Scale: 1:60000
Original Size: A4
Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

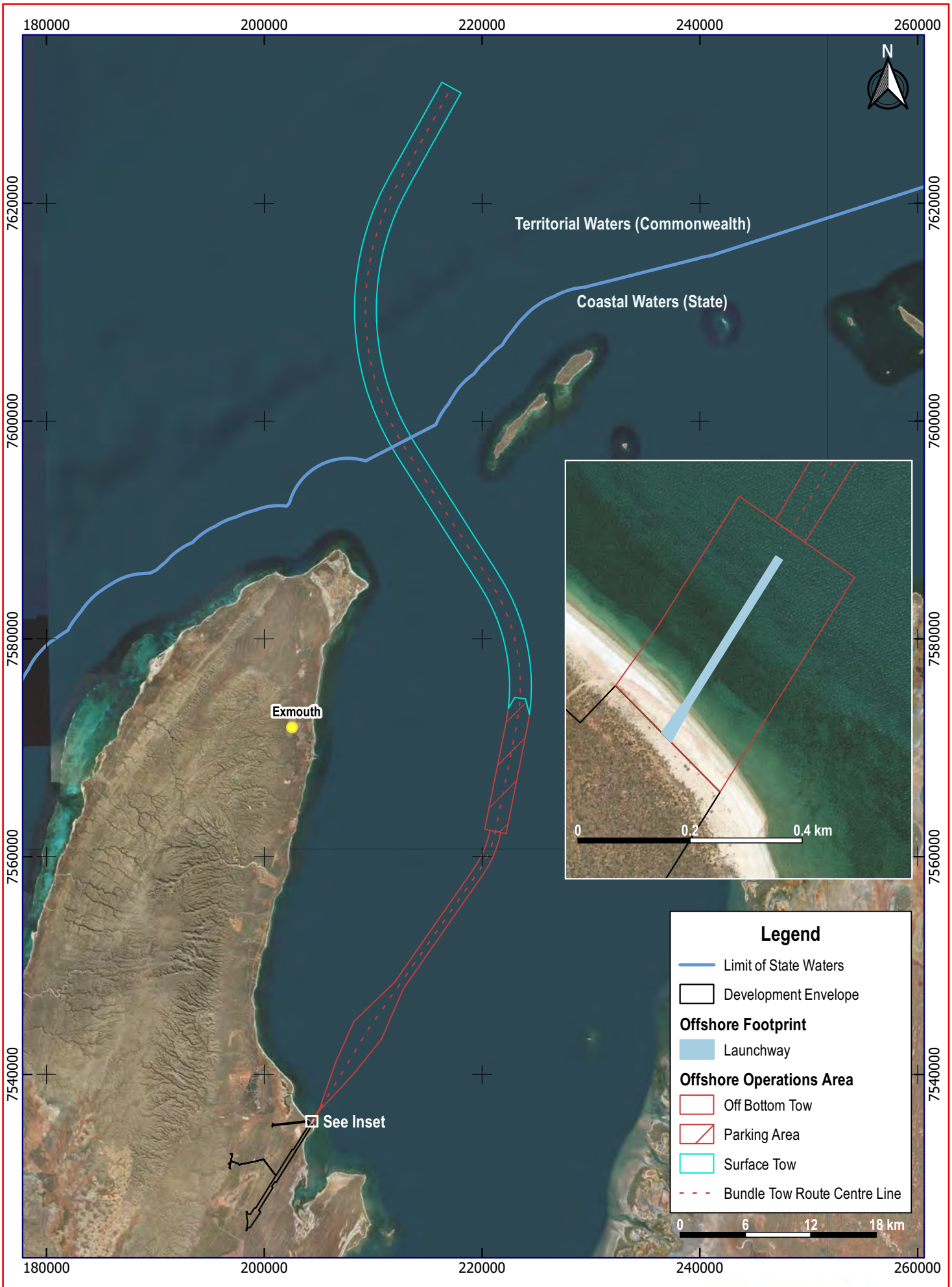
Notes: Data sourced from Subsea 7 (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

ES Figure 2: Development Envelope and indicative Development Footprint

W:\Subsea 7\GIS\Infrastructure Map.qgs 27/06/2019



Scale: 1:450000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from Subsea 7 (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

ES Figure 3: Offshore Operations Area and Indicative Tow Route

W:\Subsea 7\GIS\Figures\PER Figures\Learmonth Pipeline Fabrication Facility.qgs 01/07/2019

Bundle technology represents significant innovation compared to standard offshore field development technology, with numerous safety, performance, cost and environmental benefits. To quantify some of the environmental benefits of the use of Bundle technology, Subsea 7 completed an assessment of the offshore operations associated the most recent conventional project delivered by Subsea 7 from Exmouth Gulf (development of the Van Gogh field), and then modelled the offshore operations that would have occurred had the project used Bundle technology. The duration and magnitude of offshore and inshore (Exmouth Gulf) vessel operations were significantly reduced for the Bundle project compared to the conventional project. For the primary construction vessel, the 'Toisa Proteus', for example, offshore time was reduced by 81%, and time in Exmouth Gulf by 75% under the Bundle solution. Other advantages to a Bundle project in addition to the reduced vessel operations include a greater ability for local and domestic vessel operators to be involved as smaller and more locally available vessels can be used, and fuel consumption and greenhouse gas emissions are reduced.

SUMMARY OF POTENTIAL IMPACTS, PROPOSED MITIGATION, AND OUTCOMES

ES Table 3 provides a summary of potential impacts, proposed mitigation measures, and predicted outcomes relevant to each environmental factor.

Potential Impact	Mitigation Measures	Predicted Outcome
Key Environmental Factor: Benthic Communities and Habitats (BCH)		
EPA Objective	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	
Potential Impact	Mitigation Measures	Predicted Outcome
Direct loss of BCH during launchway construction	Measures to avoid: • NA Measures to minimise: • Launchway designed to minimise footprint (including extent of rock fill). • Use of pre-cast concrete panels will reduce seabed disturbance. Measures to rehabilitate: • NA	Habitats within the launchway footprint are well represented elsewhere and the predicted losses represent a small proportion of the habitat present within the Heron Point LAU, as follows: • Soft sediment – direct loss of 0.2 ha (0.0%) of mapped habitat. • Reef with macroalgae – direct loss of 0.3 ha (0.1%) of mapped habitat. The biological diversity and ecological integrity of BCH will be maintained. <u>Monitoring</u> Habitat mapping of BCH adjacent to launchway within one year of construction being completed (refer to the Marine Construction Monitoring and Management Plan (MCMMP) in Attachment 3).
Indirect loss or degradation of BCH due to turbidity created during launchway construction	Measures to avoid: • NA Measures to minimise: • Launchway designed to minimise footprint (including extent of rock fill) thus reducing seabed disturbance and duration of construction. • Use of pre-cast concrete panels will reduce	Construction of the Bundle launchway is estimated to take up to six months. Elevated turbidity is expected to be limited to the immediate surrounds (<50 m) of the work site. The adjacent habitats are expected to be tolerant of short-term pulses in turbidity and suspended sediment. Potential reversible impacts could occur as follows: • Soft sediment 2.0 ha (0.0%) of mapped habitat.

Potential Impact	Mitigation Measures	Predicted Outcome
	seabed disturbance and duration of construction. • Construction material to be screened and washed to remove 'fines' (particles <63 µm in diameter). • Silt curtains deployed as required to contain sediment plume. • Suspension of turbidity-generating construction activity as required. Measures to rehabilitate: • NA	• Reef with macroalgae 2.5 ha (0.7%) of mapped habitat. The biological diversity and ecological integrity of BCH will be maintained. <u>Monitoring</u> Monitoring of water quality adjacent to launchway (refer to the MCMMP in Attachment 3). Quantitative survey of BCH adjacent to launchway before construction, and within one year of construction being completed (refer to the Marine Construction Monitoring and Management Plan (MCMMP) in Attachment 3).
Direct loss of BCH during Bundle launch and tow	Measures to avoid: • Surface tow operations within Ningaloo Marine Park to avoid impacts to BCH. Measures to minimise: • All launch and tow operations will occur within the nominated Offshore Operations Area to minimise cumulative impacts to BCH. • Bundle tethered to 'Leading Tug' and 'Trailing Tug' at all times, including within Parking area, to ensure minimal lateral movement of Bundle. • Chains arranged and connected to the Bundle provide lateral stability during the initial launch and off-bottom tow to ensure operations remain within the Offshore Operations Area.	An average of two Bundle launches will occur per year with a maximum of three. Soft sediment communities are expected to rapidly recover from what will be a short-term, periodic, superficial physical disturbance of the top sediment layer. Direct impacts to Reef with microalgae and Reef with macroalgae and filter feeder habitats will be limited to a narrow corridor adjacent to the end of the launchway. These habitats are well represented to the north and south of the launchway alignment. On the basis of the 'realistic worst case' scenario, predicted BCH impacts as a result of a Bundle launch are as follows: • Soft sediment (1815.8 ha). • Reef with macroalgae and filter feeders (1.5 ha).

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • NA	• Soft sediment with filter feeders (0.4 ha). Localised loss will not result in significant impacts on biological diversity or ecological integrity of the local or regional ecosystem.
Indirect loss or degradation of BCH during Bundle launch and tow	Measures to avoid: • A maximum of three launches per year, for a nominal duration of two days per launch, is unlikely to lead to indirect impacts to BCH. Measures to minimise: • NA Measures to rehabilitate: • NA	An average of two Bundle launches will occur per year with a maximum of three. It is expected that the macroalgae and filter feeders on reefs adjacent to the inshore section of tow route will be tolerant of isolated, short-term, 'pulses' of elevated turbidity (as occur naturally) and as such will not be significantly impacted. Thus, the area of potential elevated turbidity has been deemed a Zone of Influence (ZoI), where no impacts to BCH are expected. Biological diversity and ecological integrity of BCH will be maintained. <u>Monitoring</u> Water quality monitoring adjacent to sensitive BCH outside of the Offshore Operation Area during initial Bundle launch to validate sediment fate modelling predictions (refer Marine Operational Environmental Monitoring Plan (MOEMP) in Attachment 3). Quantitative survey of BCH within and outside of the Offshore Operation Area before and following initial Bundle launch to validate impact predictions (refer Marine Operational Environmental Monitoring Plan (MOEMP) in Attachment 3).

Potential Impact	Mitigation Measures	Predicted Outcome
Direct loss of BCH during Bundle tow in the event of a loss of control of the Bundle	Measures to avoid: • Weather forecast/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 within 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. • Full tow vessel position monitoring system verification prior to leaving Bundle Parking area. • Secondary tow vessel position keeping system in place for passage through Ningaloo Marine Park. • Vessel Assurance Suitability Surveys conducted prior to commencement of operations. • Notice to mariners supporting information	Given the controls in place during each Bundle launch, the risk of a loss of control of a Bundle, leading to an impact to BCH beyond the defined Offshore Operations Area (Off bottom tow) is considered negligible (refer Marine Emergency Response Plan (Attachment 3)). Biological diversity and ecological integrity of BCH will be maintained. <u>Monitoring</u> In the event of a loss of control of the Bundle leading to seabed contact outside the Offshore Operation Area (Off bottom tow) or Offshore Operation Area (Parking area), habitat mapping of BCH adjacent to site(s) of contact within one month.

Potential Impact	Mitigation Measures	Predicted Outcome
	issued prior to tow to inform local vessels of operations. • Guard vessel to monitor/enforce exclusion zones. • Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs). • Vessel intervention if required (as described in guard vessel procedure 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. Measures to minimise: • Community engagement and announcements locally. • Broadcasting on VHF as required. Measures to rehabilitate: • NA.	
Indirect loss of BCH during Bundle tow in the event of a loss of control of the Bundle or support vessel (e.g. from	Measures to avoid: • Bundle fully pressure tested and leak tested prior to launch. • Ongoing monitoring of Bundle pressures prior to and during launch. • Weather forecast/seasonal data reviewed to	Given the controls in place during each Bundle launch, the risk of a loss of control of a Bundle, and of a resulting chemical leak or spill and an impact to BCH, is considered negligible (refer Marine Emergency Response Plan (Attachment 3)). Biological diversity and ecological integrity of BCH will

Potential Impact	Mitigation Measures	Predicted Outcome
physical contact or a chemical spill)	inform launch schedule. • Weather forecast monitored ahead of launch operations and launch window defined. • Weather conditions monitored during launch operations. • Defined limiting weather criteria. • High specification tow vessels used for launch operations. • System confirmation check completed prior to departing Parking area. • 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. • Full tow vessel position monitoring system verification prior to leaving Bundle Parking area. • Secondary tow vessel position keeping system in place for passage through Ningaloo Marine Park. • Vessel Assurance Suitability Surveys conducted prior to commencement of operations. • Notice to mariners supporting information issued prior to tow to inform local vessels of operations. • Guard vessel to monitor/enforce exclusion	be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	zones. • Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs) • Vessel intervention if required (as 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). • Timing of Surface tow through Ningaloo Marine Park chosen to coincide with benign sea, tidal and weather conditions. Measures to minimise: • 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 have: o An OCNS Hazard Quotient rating of Gold, Silver, E or D and have no substitution or product warning; or o Further assessment is to be undertaken to ensure the environmental risk is ALARP.	

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • 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. • Emergency Response Plan (Attachment 3).	
Indirect loss of BCH due to altered water flows and sediment movement as a result of the presence of the launchway	Measures to avoid: • NA Measures to minimise: • Design of launchway to minimise height of structure above surrounding beach or seabed. • Periodic bypassing of sand during launchway maintenance to limit sand accumulation to the north of the launchway and associated sand depletion to the south of the launchway. Measures to rehabilitate: • Management of onshore sediment accretion via monitoring and, when management triggers are exceeded, sand bypassing.	Due to its relatively small size and low elevation of the launchway relative to the seabed, the launchway is not expected to have any significant impact on the local wave or current conditions at or adjacent to the site. Sediment accretion is predicted to occur adjacent to the north side of the launchway, across existing beach sands and across intertidal pavement reef habitat. This pavement reef habitat does not support any macroalgae or fauna, and the biological diversity and ecological integrity of BCH will not be affected. Biological diversity and ecological integrity of BCH will be maintained. <u>Monitoring</u> The following monitoring is proposed: • Survey of beach profiles adjacent to launchway (annual). • Inspections, including photographic monitoring of shoreline adjacent to launchway (annual). • Shoreline mapping (every 3-6 years).

Potential Impact	Mitigation Measures	Predicted Outcome
Impacts to BCH as a result of removal of the launchway	Measures to avoid: • NA Measures to minimise: • Silt curtains deployed during turbidity-generating construction activities (refer MCMMP). • Suspension of turbidity-generating construction activity in the event elevated turbidity is recorded beyond the ZoMI (refer MCMMP). Measures to rehabilitate: • NA	No permanent impacts to BCH expected. Elevated turbidity is expected to be limited to the immediate surrounds (<50 m) of the work site. Potential reversible impacts to BCH could occur as follows: • Soft sediment (2.0 ha or < 0.1% of mapped habitat). Reef with macroalgae (2.5 ha or 0.7% of mapped habitat). Biological diversity and ecological integrity of BCH will be maintained.
Key Environmental Factor: Coastal Processes		
EPA Objective	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	
Potential Impact	Mitigation Measures	Predicted Outcome
Direct impact to sediment transport leading to seabed, beach or dune erosion on downdrift side of launchway	Measures to avoid: • NA Measures to minimise: • Design of launchway to minimise height of structure above surrounding beach or seabed. • Periodic bypassing of sand during launchway maintenance to limit sand accumulation to the north of the launchway and associated sand depletion to the south of the launchway.	It is predicted that sand would accumulate along the northern side of the launchway, above the low tide mark, until sediment on the beach berm starts to move across the structure. Due to the temporary reduction in sand migrating to the shoreline to the south, some narrowing or possible loss of the small perched beach formations to the south of the launchway could occur. Given the relatively slow rates of sediment transport, the proposed monitoring program, and the implementation of sand bypassing in the event that

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • Management of onshore sediment accretion (north of launchway) and depletion (south of launchway) via monitoring and sand bypassing. Note: Governance Arrangements During construction and operations, Subsea 7 will be responsible for the implementation of the nominated monitoring and mitigation measures. For three years post closure Subsea 7 will be responsible for the implementation of the nominated monitoring and mitigation measures. After this time, if the monitoring of shoreline position demonstrates a stable shoreline (in comparison to adjacent unimpacted sections of shoreline), Subsea 7's monitoring and mitigation commitments will cease.	trigger values are exceeded, the geophysical processes that shape coastal morphology will be maintained so that the environmental values of the coast are protected. <u>Monitoring</u> The following monitoring is proposed: • Survey of beach profiles adjacent to launchway (annual). • Inspections, including photographic monitoring of shoreline adjacent to launchway (annual). • Shoreline mapping (every 3-6 years).
Indirect impacts to coastal morphology by altered wave climate, water flows and sediment movement as a result of the presence of the launchway	Measures to avoid: • NA Measures to minimise: • Design of launchway to minimise height of structure above surrounding beach or seabed. • Periodic bypassing of sand during launchway maintenance to limit sand accumulation to the north of the launchway and associated sand depletion to the south of the launchway.	Due to its relatively small size and low elevation of the launchway relative to the seabed, the launchway is not expected to have any significant impact on the local wave or current conditions. Thus no significant indirect impacts to coastal morphology as a result of altered wave climate, water flows and sediment movement following launchway construction are expected. The geophysical processes that shape coastal morphology will be maintained so that the environmental values of the coast are protected.

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • Management of onshore sediment accretion (north of launchway) and depletion (south of launchway) via monitoring and sand bypassing.	<u>Monitoring</u> The following monitoring is proposed: • Survey of beach profiles adjacent to launchway (annual). • Inspections, including photographic monitoring of shoreline adjacent to launchway (annual). • Shoreline mapping (every 3-6 years).
Altered wave overwash and drainage due to launchway leads to dune instability during extreme flooding events	Measures to avoid: • NA Measures to minimise: • Design of launchway to minimise height of structure above surrounding beach or seabed. • Stabilisation of cut embankments. Measures to rehabilitate: • Management of onshore sediment accretion via monitoring and sand bypassing. • Reinstatement of the dune following any significant re-profiling following an extreme weather event.	The construction of the launchway will necessitate a cut through the dune system. The construction of the launchway will reduce the elevation of the coastal dune in this area from approximately 5 mAHD down to an elevation of around 2.5 mAHD at the foundation level. Such a reduction in the elevation could result in a localised increase in erosion risk and inundation vulnerability. For more severe events, or those that cause more rapid fluctuations in sea level, the ingress of seawater through the launchway cut could occur, potentially resulting in scour of the adjoining area. With the commitment to reinstate the dune structure following any significant re-profiling of the dune system, it is considered that the environmental values of the coast will be protected. <u>Monitoring</u> Inspections, including photographic monitoring, of the shoreline and dunes adjacent to the launchway will be undertaken annually.
Permanent change to water flows and sediment	Measures to avoid: • Full removal of the launchway will occur.	At the end of the service life of the facility, decommissioning will be completed including full removal of the launchway and reinstatement of the dune system will occur.

Potential Impact	Mitigation Measures	Predicted Outcome
movement as a result of the presence of the launchway post closure	Measures to rehabilitate: • Management of onshore sediment accretion via monitoring and sand bypassing.	The geophysical processes that shape coastal morphology will be maintained so that the environmental values of the coast are protected. <u>Monitoring</u> Annual monitoring of the shoreline position for a period of three years to monitor recovery of pre-development beach alignment.
Key Environmental Factor: Marine Environmental Quality		
EPA Objective	To maintain the quality of water, sediment and biota so that environmental values are protected.	
Potential Impact	Mitigation Measures	Predicted Outcome
Temporary impacts to water quality through the release of fines, nutrients or contaminants from sediments during launchway construction	Measures to avoid: • NA Measures to minimise: • Launchway designed to minimise footprint (including extent of rock fill) thus reducing seabed disturbance and duration of construction. • Use of pre-cast concrete panels will reduce seabed disturbance and duration of construction. • Construction methods to minimise the disturbance of sediments. • Silt curtains deployed to ensure environmental objectives are achieved. • Construction occurs during single shift allowing time for settling and or dissipation of fines.	Construction of the Bundle launchway is estimated to take up to six months. Elevated turbidity is expected to be limited to the immediate surrounds (<50 m) of the work site. Sediments do not contain elevated concentrations of nutrients or contaminants. Any changes in marine water quality as a result of the project are likely to affect an extremely small area. The magnitude of such changes is considered likely to be consistent with short-term increases in suspended solids associated with natural processes such as large storms. Implementation of management measures during construction will ensure that the quality of marine water, sediment and biota will be maintained and the EQOs will be met. <u>Monitoring</u> Twice daily (during works: approximately 10am and 2pm) visual monitoring during construction. In the event of persistent turbidity, assessment of

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • Suspension of turbidity-generating construction activity in the event a persistent turbidity plume is observed beyond the silt curtain(s).	water quality at the 50 m boundary (refer to Attachment 3).
Temporary impacts to water quality (turbidity) due to release of fines from construction materials (quarry rock)	Measures to avoid: • NA Measures to minimise: • Construction material to be screened and washed to remove 'fines' (particles <63 µm in diameter). • Silt curtains deployed as required to ensure environmental objectives are achieved. Measures to rehabilitate: • Suspension of turbidity-generating construction activity in the event a persistent turbidity plume is observed beyond the silt curtain(s).	Rock fill (expected to be hard rock) will be screened and washed prior to use, resulting in minimal turbidity release. Any changes in turbidity as a result of the project will be short-term and are likely to affect an extremely small area. The magnitude of such changes are considered likely to be consistent with short-term increases in turbidity associated with natural processes such as large storms or the regular strong wind events experienced in the area. Implementation of management measures during construction will ensure that the quality of water, sediment and biota will be maintained and the EQOs will be met.
Temporary impacts to water quality during Bundle launch and tow due to chains on the seabed	Measures to avoid: • No more than three launches per year will occur. Measures to minimise: • NA Measures to rehabilitate: • NA	An average of two Bundle launches may occur per year with a maximum of three. Water quality impacts will be minor, local, and of short duration. The quality of water, sediment and biota will not be significantly impacted and the environmental quality outcomes (EQOs) will be met. <u>Monitoring</u> Given the short-term nature of the predicted turbidity, no formal monitoring is proposed, although a visual

Potential Impact	Mitigation Measures	Predicted Outcome
		assessment (likely aerial) will be undertaken during the first Bundle launch).
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)	Measures to avoid: • Bundle fully pressure tested and leak tested prior to launch. • Ongoing monitoring of Bundle pressures prior to and during launch. • 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. • Defined limiting weather criteria. • High specification tow vessels for launch operations. • System confirmation check completed prior to departing Parking area. • Secondary system/redundancy design in bundle monitoring system. • Lead tow vessels 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 Bundle Parking area. • Secondary tow vessel position keeping system in place for passage through Ningaloo Marine	Given the control measures to be implemented to prevent a loss of control of the Bundle or support vessel, any such incident is extremely unlikely. Further, given the inherent strength of the carrier pipe (the outside casing of the Bundle), the lack of liquid chemicals within the carrier pipe, the release of a chemical, leading to an impact to marine environmental quality, is extremely unlikely. The quality of water, sediment and biota will not be significantly impacted and the EQOs will be met.

Potential Impact	Mitigation Measures	Predicted Outcome
	Park. • Vessel Assurance Suitability Surveys conducted prior to commencement of operations. • Notice to mariners supporting information issued prior to tow to inform local vessels of operations. • Guard vessel to monitor/enforce exclusion zones. • Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs) • Vessel intervention if required (as 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). • Timing of Surface tow through Ningaloo Marine Park chosen to coincide with benign sea, tidal and weather conditions. Measures to minimise: • Bundle carrier pipe does not contain any hydrocarbons (filled with inert nitrogen gas plus solid corrosion inhibitors).	

Potential Impact	Mitigation Measures	Predicted Outcome

	• Any chemical to be used within flow lines must have:
	  o An offshore chemical notification scheme (OCNS) Hazard Quotient rating of Gold, Silver, E or D have no substitution or product warning; or
	  o Further assessment to ensure the environmental risk is ALARP.
	Measures to rehabilitate:
	• 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.	

Key Environmental Factor: Marine Fauna		
EPA Objective	To protect marine fauna so that biological diversity and ecological integrity are maintained.	
Potential Impact	Mitigation Measures	Predicted Outcome
Loss or degradation of BCH representing marine fauna habitat (e.g. foraging habitat) due to launchway construction	Measures to avoid: • NA Measures to minimise: • Launchway designed to minimise footprint (including extent of rock fill) thus reducing seabed disturbance and duration of construction. • Use of pre-cast concrete panels will reduce seabed disturbance and duration of construction.	Habitats within the launchway footprint are well represented elsewhere and the predicted losses represent a small proportion of the habitat present within the Heron Point LAU, as follows: • Soft sediment – direct loss of 0.2 ha (0.0%) of mapped habitat, indirect impact to 2.0 ha (0.0%) of mapped habitat. • Reef with macroalgae – direct loss of 0.3 ha (0.1%) of mapped habitat, indirect impact to 2.5 ha (0.7%) of mapped habitat.

Potential Impact	Mitigation Measures	Predicted Outcome
	• Construction material to be screened and washed to remove 'fines' (particles <63 µm in diameter). • Silt curtains will be deployed during construction to minimise impacts to water quality beyond 50 m from the construction area. • Suspension of turbidity-generating construction activity (refer MCMMP in Attachment 3). Measures to rehabilitate: • NA	Construction of the Bundle launchway is estimated to take up to 6 months. Elevated turbidity is expected to be limited to the immediate surrounds (<50 m) of the work site. The adjacent habitats are expected to be tolerant of short-term pulses in turbidity and suspended sediment. Biological diversity and ecological integrity of marine fauna will be maintained. <u>Monitoring</u> Habitat mapping of BCH adjacent to launchway within one year of construction being completed.
Temporary behavioural responses of marine fauna due to noise or light spill during construction phase	Measures to avoid: • NA Measures to minimise: • Shrouded or directional lighting as well as motion-sensor or timed lighting will be used and placed such that the majority of light is focused on the working areas and not out to sea. • Deployment of silt curtains around active construction areas to assist in preventing marine fauna from entering these areas. • Use of a Marine Fauna Observer (MFO) during marine construction activities to ensure no listed marine fauna enter within a 'marine fauna exclusion zone' of 50 m surrounding active construction (e.g. placement of rock fill, placement of pre-cast slabs). Works will be	Given the management measures, no significant impacts to marine fauna are expected. Biological diversity and ecological integrity of marine fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	suspended in the event an animal enters this zone during active construction. Measures to rehabilitate: • NA	
Introduction of introduced marine pests (IMP) via construction vessels	Measures to avoid: • NA Measures to minimise: • Adoption of the Department of Agriculture and Water Resources (DAWR) 'Quick Domestic Ballast Water (DBW) Risk Assessment Tool (DAWR 2018). • Adoption of the DPIRD on-line 'Vessel Check' decision support tool and the adoption of appropriate biofouling management requirements. Measures to rehabilitate: • NA	Given the management measures no significant impacts to marine fauna are expected. Biological diversity and ecological integrity of marine fauna will be maintained.
Temporary behavioural response of marine fauna due to changes in marine water quality	Measures to avoid: • NA Measures to minimise: • Launchway designed to minimise footprint (including extent of rock fill) thus reducing seabed disturbance and duration of construction. • Use of pre-cast concrete panels will reduce seabed disturbance and duration of	Construction of the Bundle launchway is estimated to take up to six months. Elevated turbidity is expected to be limited to the immediate surrounds (<50 m) of the work site. Water quality impacts during a Bundle launch will be minor, local, and of short duration. Biological diversity and ecological integrity of marine fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	construction. • Construction methods selected to minimise disturbance of sediments. • Silt curtains will be deployed during construction to minimise impacts to water quality beyond 50 m from the construction area. • A maximum of three launches per year, for a duration of nominally two days per launch. • No launches during period of peak usage of Exmouth Gulf by Humpback whales. Measures to rehabilitate: • Suspension of turbidity-generating construction activity in the event a persistent turbidity plume is observed beyond the silt curtain(s).	
Reduction in commercial and recreational fishing species due to loss of habitat and/or changes in marine water quality (construction and operations)	Measures to avoid: • NA Measures to minimise: • Launchway designed to minimise footprint (including extent of rock fill) thus reducing seabed disturbance and duration of construction. • Use of pre-cast concrete panels will reduce seabed disturbance and duration of construction. • Construction material to be screened and washed to remove 'fines' (particles <63 µm in	The local fish and invertebrate species, and the habitats they rely on, are expected to be tolerant of occasional short-term pulses in turbidity and suspended sediment during a Bundle launch. Biological diversity and ecological integrity of marine fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	diameter). • Silt curtains will be deployed as required to ensure environmental objectives are achieved. • Suspension of turbidity-generating construction activity (refer MCMMP in Attachment 3). • Launch and tow operations will only occur within the nominated Offshore Operation Area to minimise impacts to nearshore BCH. • Bundle remains tethered to 'Leading Tug' and 'Trailing Tug' at all times, including within Parking area, to ensure minimal lateral movement of Bundle. Measures to rehabilitate: • Maximum of three launches per year to allow soft sediment habitats to recover from any superficial physical disturbance between launches.	

Potential Impact	Mitigation Measures	Predicted Outcome
Loss or degradation of BCH representing marine fauna habitat (e.g. foraging habitat) during Bundle launch and tow	Measures to avoid: • Bundle engineering completed to increase buoyancy of towheads. • A maximum of three launches per year, for a duration of up to two days per launch, is unlikely to lead to indirect impacts to BCH. Measures to minimise: • NA Measures to rehabilitate: • NA	During Bundle launch impacts to water quality will be short-term and local. The adjacent habitats are expected to be tolerant of occasional short-term pulses in turbidity and suspended sediment during a Bundle launch, such that no measurable impacts will occur. Biological diversity and ecological integrity of marine fauna will be maintained.
Temporary behavioural response of marine fauna due to noise or light spill during Bundle launch and tow	Measures to avoid: • No launches during period of peak usage of Exmouth Gulf by Humpback whales. Measures to minimise: • Lighting design during bundle launches will be a continuation of lighting management measures implemented during fabrication operations and will take account of measures proven to reduce the risk of impact on marine fauna such as shrouded or directional lighting. Measures to rehabilitate: • NA	Negligible risk of a significant impact from underwater noise given the short-term and low-level nature of underwater noise associated with a Bundle launch, and the low frequency of launches. A significant impact from light spill is unlikely given the absence of turtle nesting within Exmouth Gulf, the short duration and low frequency of launches and the measures to minimise light spill.
Direct impact (strike or entanglement) during Bundle launch and tow	Measures to avoid: • No Bundle launches during period of main Humpback whale usage of Exmouth Gulf. • Specific training on marine fauna observation	Low risk of a significant impact (i.e. direct physical interaction) to marine fauna. Biological diversity and ecological integrity of marine fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	and avoidance provided to vessel crews. • MFO on board lead support vessel and key support vessels, to identify marine fauna within 500 m ahead of tow, to allow avoidance measures to be implemented. Avoidance measures may include a change to the Off bottom tow speed, delay to the start of the Surface tow component of a tow or a slight change to the tow route (within the 2 km wide Surface tow envelope). • Adherence to Marine Fauna Management Plan (MFMP). • Ability to suspend transit if required to avoid collision. • Tow vessels and Bundle launch speeds low during launch (≤ 2 knots) and tow (≤ 8 knots). • Use of a 'spotter plane' during any Bundle launches undertaken between March and July to identify location of any Whale sharks within Ningaloo Marine Park and allow avoidance. Measures to minimise: • NA Measures to rehabilitate: • Any fauna injuries and/or deaths will be reported and a register maintained. • Injured fauna will be taken to the Exmouth office of the Department of Biodiversity, Conservation and Attractions (DBCA), or to	Monitoring Visual monitoring by MFOs during Bundle launches. Recording of any strikes or entanglement. Any vessel strikes with cetaceans will be reported in the National Ship Strike Database (https://data.marinemammals.gov.au/report/shipstrike).

Potential Impact	Mitigation Measures	Predicted Outcome
	Exmouth Wildlife Care Group, for assessment/rehabilitation.	
Introduction of introduced marine pests (IMP)	Measures to avoid: • NA Measures to minimise: • Adoption of the Department of Agriculture and Water Resources (DAWR) 'Quick Domestic Ballast Water (DBW) Risk Assessment Tool (DAWR 2018). • Adoption of the Department of Primary Industries and Regional Development (DPIRD) on-line 'Vessel Check' decision support tool and the adoption of appropriate biofouling management requirements. Measures to rehabilitate: • NA	Given the management measures no significant impacts to marine fauna are expected. Biological diversity and ecological integrity of marine fauna will be maintained.
Loss or alteration of coastal habitat as a result of changes to coastal processes or hydrodynamic/ hydrological regimes	Measures to avoid: • NA Measures to minimise: • Design of launchway to minimise height of structure above surrounding beach or seabed. Measures to rehabilitate: • Management of onshore sediment accretion via monitoring and sand bypassing.	Loss of coastal habitat, such as roosting or foraging habitat for migratory birds, could occur as a result of changes to coastal processes leading to altered erosion or accretion patterns. The shoreline at Heron Point adjacent to the launchway was not found to represent key foraging or roosting habitat. Significant changes to the beach profile adjacent to the launchway, leading to a loss of marine fauna habitat, are not expected. Monitoring and mitigation will ensure no significant changes to coastal habitat. Biological diversity and ecological integrity of marine fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
		Monitoring The following monitoring is proposed: • Survey of beach profiles adjacent to launchway (annual). • Inspections, including photographic monitoring of shoreline adjacent to launchway (annual). • Shoreline mapping (every 3-6 years).
Leak or spill of chemicals (including hydrocarbons) associated with launch and tow activities, accidental collisions and loss of control of pipeline Bundle during launch, laydown, towing, or ship groundings. Impacting marine fauna health	Measures to avoid: • Bundle fully pressure tested and leak tested prior to launch. • Ongoing monitoring of Bundle pressures prior to and during launch. • Weather forecast/seasonal data reviewed to inform launch schedule. • Weather forecast monitored ahead of launch operations and launch window defined. • Defined limiting weather criteria. • High specification tow vessels used for launch operations. • System confirmation check completed prior to departing Parking area. • 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. • Full tow vessel position monitoring system	Given the inherent strength of the carrier pipe (the outside casing of the Bundle), the lack of liquid chemicals within the annulus and the control measures to be implemented to prevent a loss of control of the Bundle or support vessel (refer Marine Emergency Response Plan (Attachment 3)), the likelihood of a chemical leak or spill leading to an impact on marine fauna health is considered negligible. Standard 'operating over water' management measures will be employed during the construction of the launchway to prevent spills of chemicals into the marine environment. Biological diversity and ecological integrity of marine fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	verification prior to leaving Bundle Parking area. • Secondary tow vessel position keeping system in place for passage through Ningaloo Marine Park. • Vessel Assurance Suitability Surveys conducted prior to commencement of operations. • Notice to mariners supporting information issued prior to tow to inform local vessels of operations. • Guard vessel to monitor/enforce exclusion zones. • Each vessel operating in adherence to International Regulations for Preventing Collisions at Sea (COLREGs) • Vessel intervention if required (as 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). • Timing of Surface tow through Ningaloo Marine Park chosen to coincide with benign sea, tidal and weather conditions. • Standard 'operating over water' management	

Potential Impact	Mitigation Measures	Predicted Outcome
	measures will be employed during the construction of the launchway. Measures to minimise: • Bundle carrier pipe does not contain any hydrocarbons). • Any chemical to be used within flow lines must have: o An OCNS Hazard Quotient rating of Gold, Silver, E or D have no substitution or product warning; or o Further assessment to ensure the environmental risk is ALARP. Measures to rehabilitate: • 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. • Thorough clean-up of environment in the event of a leak or spill.	
Key Environmental Factor: Flora and Vegetation		
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	
Potential Impact	Mitigation Measures	Predicted Outcome
Direct loss of native vegetation and significant	Measures to avoid: • Project design has considered use of existing disturbed areas and these will be used	The proposed clearing is of communities that are common and widespread with all 10 vegetation communities directly impacted by the Proposal being

Potential Impact	Mitigation Measures	Predicted Outcome
flora species during clearing for onshore infrastructure	wherever possible to minimise total ground disturbance. Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the project. • Ground disturbance procedures and a permitting system will be implemented. • Where practicable, land clearing will be undertaken progressively with the amount of active disturbance minimised. • The site induction program will provide written and verbal information on protection of vegetation, conservation significant flora and ground disturbance authorisation procedures. Measures to rehabilitate: • Compacted areas will be ripped on the contour to remove soil compaction. • Cleared vegetation and topsoil material will be retained for use in rehabilitation. • Rehabilitation will be undertaken on disturbed construction areas (e.g. directional drilling sites, adjacent to access road) as they become available.	well represented outside of the Development Envelope. Limited removal of individuals of Priority species *Corchorus congener* (P3) will occur as a result of implementation of the Proposal. *Corchorus congener* is known to occur widely in the Development Envelope and more broadly across the Learmonth area. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation and the biological diversity and ecological integrity of the present flora and vegetation will be maintained. <u>Monitoring</u> Inspections/survey to confirm no clearing beyond Development Envelope.
Indirect loss or degradation of native vegetation due to dust emissions	Measures to avoid: • Project design has considered use of existing disturbed areas and these will be used wherever possible to minimise total ground	Dust emissions during construction will be short-term in nature and the potential impact area will be localised (<50 m from source). Flora and vegetation in areas adjacent to land clearing activities is locally

Potential Impact	Mitigation Measures	Predicted Outcome
	disturbance. • Vehicles and equipment will keep to designated roads and tracks. Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the project. • Water cart used during clearing to prevent significant dust emissions. • Topsoil will be stored in designated locations and respread over rehabilitated areas to act as a seed source. • Cleared vegetation will be stored for subsequent respread over rehabilitation areas to protect the soil from erosion. Measures to rehabilitate: • Progressive rehabilitation will be undertaken on impacted areas (as required).	and regionally common. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation and the biological diversity and ecological integrity of the present flora and vegetation will be maintained.
Indirect loss or degradation of native vegetation due to the introduction or spread of weeds	Measures to avoid: • Earth moving machinery will be cleaned of soil and vegetation prior to entering or leaving the Development Envelope. • No weed affected soil, mulch or fill will be brought into the Development Envelope. • During operations, vehicles and equipment will keep to designated roads and tracks.	Increased presence of weeds, (species and abundance) may affect flora and vegetation; however these impacts will result in localised and incidental effects on the health, abundance and structure of vegetation communities, all of which are well represented locally and in the region. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation and the biological diversity and ecological integrity of the present flora and vegetation will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to minimise: • A weed hygiene system will be developed and implemented during the construction phase to avoid the establishment of new populations within the Development Envelope. Measures to rehabilitate: • Weed control to be implemented within rehabilitation areas as required.	
Fragmentation of native vegetation during clearing for onshore infrastructure	Measures to avoid: • Project design has considered use of existing disturbed areas and these will be used wherever possible to minimise total ground disturbance. Measures to minimise: • Clearing activities will be managed to ensure clearing is strictly limited to that necessary for construction. Measures to rehabilitate: • Rehabilitation will be undertaken on disturbed construction areas (e.g. directional drilling sites, adjacent to access road) as they become available.	Fragmentation may affect flora and vegetation; however these impacts will result in localised and incidental effects on the health, abundance and structure of vegetation communities, all of which are well represented in the region. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation and the biological diversity and ecological integrity of the present flora and vegetation will be maintained.
Indirect loss or degradation of native vegetation due to changes in surface water	Measures to avoid: • Where necessary, suitable floodways, drains and culverts will be installed to maintain, as much as possible, natural flow patterns.	Modification to surface water flows are considered to be minor at a local scale and as such are unlikely to affect the survival of, or reduce the condition of, vegetation within or adjacent to the Development Envelope. Vegetation communities within the Development Envelope are locally and regionally

Potential Impact	Mitigation Measures	Predicted Outcome
flows or quality	Measures to minimise: • Project design has considered the local surface water flow paths and location of drainage lines with the aim of minimising changes to natural flows. • Hazardous materials will be stored in accordance with relevant Australian Standards. Measures to rehabilitate: • Remediation and rehabilitation of any contaminated areas. • Upon closure reinstatement of the natural flow paths will occur after removal of the project infrastructure.	widespread and are resilient to both drought and short-term inundation associated with seasonal rainfall events. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation, and the biological diversity and ecological integrity of the present flora and vegetation will be maintained.
Indirect loss or degradation of native vegetation due to changes in groundwater flows or quality	Measures to avoid: • NA Measures to minimise: • Groundwater abstraction will be no more than 12 ML/annum at abstraction rates of 0.3 L/s in individual bores. • Hazardous materials will be stored in accordance with relevant Australian Standards. Measures to rehabilitate: • Remediation and rehabilitation of any contaminated areas.	It is not expected that changes in groundwater levels that may result from abstraction of groundwater will impact flora and vegetation. No GDE communities have been identified in the Development Envelope. No changes in groundwater quality are anticipated to result from development and implementation of the Proposal. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation, and the biological diversity and ecological integrity of the present flora and vegetation will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
Loss or degradation of native vegetation due to leak or spill of chemicals (including hydrocarbons)	Measures to avoid: • NA Measures to minimise: • Hazardous materials will be stored in accordance with relevant Australian Standards. • Refuelling will occur on concrete or HDPE-lined pads to contain any drips and spills. The pads will drain to a sump to allow removal of collected material. • Spill kits will be located at strategic locations throughout the project area and employees trained in their use. • Spills will be cleaned up and contaminated soils will either be treated in situ or removed from site by a licensed third party. Measures to rehabilitate: • Remediation and rehabilitation of any contaminated areas.	Leaks or spills have potential to cause adverse impacts to flora and vegetation, however these impacts will result in localised and incidental effects on the health, abundance and structure of vegetation communities, all of which are well represented in the region. Subsea 7 considers that the potential impacts to flora and vegetation can be managed such that there are no significant residual impacts to flora and vegetation and the biological diversity and ecological integrity of the present flora and vegetation will be maintained.
Indirect loss or degradation of fauna habitat due to changes in fire regimes	Measures to avoid: • NA Measures to minimise: • Development to be conducted in accordance with appropriate BAL specifications/conditions. • Vehicle traffic will be confined to defined roads and tracks (except during active clearing). • Firefighting equipment will be located on site	Mitigation measures will minimise the risk of Proposal-related fires. The Proposal-specific impacts on local fire regimes are not anticipated to adversely impact the environment given the open structure of the vegetation and locally and regionally common nature of fauna habitats within the Development Envelope. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	and in project vehicles. • Project personnel will be trained in fire response. • A Hot Work Permit system will be developed and implemented. • The project site induction will include information on the prevention and management of fires. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they become available.	
Indirect impacts to native fauna as a result of introduction or increase of feral animals	Measures to avoid: • Lidded bins. • Regular removal of waste by a licenced contractor. Measures to minimise: • Access control measures implemented to sources of water (e.g. fencing, or the use of sealed bladders, covers, etc.). Measures to rehabilitate: • A feral animal control program will be implemented if populations of feral animals noticeably increase.	It is not considered likely that development and operation of the Proposal will result in introduction of new feral animal species to the area or an increase in abundance of feral animals. It is anticipated that the proposed controls will be effective and will prevent an increase in diversity and abundance of feral animals. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
Loss or alteration of coastal habitat as a result of changes to coastal processes or hydrodynamic/ hydrological regimes	Addressed under marine fauna as related to migratory bird habitat.	
Key Environmental Factor: Subterranean Fauna		
EPA Objective	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	
Potential Impact	Mitigation Measures	Predicted Outcome
Direct loss of individuals or habitat (including Directory of Important Wetlands in Australia Cape Range Subterranean Waterways – WA006) during construction of onshore infrastructure	Measures to avoid: • NA Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the project. • Ground excavation will be kept to a minimum (expected to be limited to cuts through the tops of dunes and minor excavations during the construction of surface water drainage infrastructure). Measures to rehabilitate: • Rehabilitation will be undertaken on disturbed construction areas (e.g. directional drilling sites, adjacent to access road) as they become available.	Subterranean fauna habitat was not recorded in proximity to the fabrication shed, sprayfield or the majority of the Bundle tracks. Excavations associated with the construction of the Proposal will be shallow (up to 1 m) and are predominantly within areas not supporting stygofauna. No troglofauna habitat was recorded within the main Development Envelope but may be present at the borefield. The EPA objective for Subterranean Fauna will be met.

Potential Impact	Mitigation Measures	Predicted Outcome
Loss of individuals or habitat due to leak or spill of chemicals (including hydrocarbons) which result in groundwater contamination	Measures to avoid: • Hazardous materials will be stored, in or adjacent to the fabrication shed, in accordance with relevant Australian Standards and Dangerous Goods Storage regulations. • Chemical storage and handling procedures to prevent leaks or spills. Measures to minimise: • Refuelling to occur on concrete or HDPE-lined pads to contain any drips and spills. The pads will drain to a sump to allow removal of collected material. • Spill kits will be located at strategic locations throughout the project area and employees trained in their use. • Employees and contractors will be trained in use of spill kits. • Spills will be cleaned up and contaminated soils will be removed from site by a licensed third party. Measures to rehabilitate: • Remediation and rehabilitation of any contaminated areas.	Considering the application of standard industry practices for chemical storage and handling, and the absence of stygofauna or troglofauna habitat in proximity to the fabrication shed, the risk of impacts to subterranean fauna is considered low. The quality of groundwater will be maintained and the EPA objective for Subterranean Fauna will be met.
Indirect loss of individuals or habitat due to presence of onshore infrastructure	Measures to avoid: • Where necessary, suitable floodways, drains and culverts will be installed to maintain, as much as possible, natural flow patterns.	After installation of surface water drainage measures, surface water flow patterns are expected to remain similar to baseline flow patterns. Therefore significant impacts to surface water infiltration patterns are not expected. Subterranean fauna habitat was not recorded in proximity to the fabrication shed,

Potential Impact	Mitigation Measures	Predicted Outcome
impacting surface water infiltration	Measures to minimise: • Project design has considered the location of drainage lines with the aim of minimising changes to natural flows. Measures to rehabilitate: • Upon closure the reinstatement of the natural flow paths after removal of project infrastructure.	sprayfield or the majority of the Bundle tracks. The EPA objective for Subterranean Fauna will be met.
Indirect loss of individuals or habitat due to changes to groundwater flows or quality (including from groundwater abstraction, or discharges of treated wastewater)	Measures to avoid: • NA Measures to minimise: • Minimise water abstraction through the storage and re-use of hydrotest water. • Water storages will be lined to minimise seepage. • Low abstraction rates to reduce the likelihood of groundwater drawdown. Measures to rehabilitate: • NA.	Under the most conservative (worst-case) scenario, modelling predicts a maximum drawdown in the immediate location of the production bores of 1.15 m after 10 years of continuous abstraction, assuming no recharge occurs. Changes to localised groundwater levels are not predicted to significantly impact stygofauna habitat. The EPA objective for Subterranean Fauna will be met. <u>Monitoring</u> Regular (quarterly) monitoring of groundwater quality (including salinity) and levels, in accordance with abstraction licence conditions
Key Environmental Factor: Terrestrial Fauna		
EPA Objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	
Potential Impact	Mitigation Measures	Predicted Outcome
Direct loss of native fauna due to vehicle strike during	Measures to avoid: • NA	Fauna injury or mortality due to vehicle strikes may occur during construction and operations. Implementation of management measures will reduce the likelihood of vehicle strike. Given fauna species of

Potential Impact	Mitigation Measures	Predicted Outcome
construction and operations	Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the project. • Where practicable, land clearing will be undertaken progressively with the amount of active disturbance minimised. • A fauna relocation team will be present to assist in recovery and relocation of any native fauna displaced during land clearing. • Vehicle traffic will be confined to defined roads and tracks (except during active clearing). • Speed limits will be implemented and enforced to minimise fauna mortality due to vehicle strike. • The site induction program will provide information on fauna of conservation significance, including their appearance and habitats. Measures to rehabilitate: • Vertebrate fauna injuries and/or deaths will be reported and a register maintained. • Injured vertebrate fauna will be taken to the Exmouth office of DBCA, or to Exmouth Wildlife Care Group, for assessment/ rehabilitation.	conservation significance are all migratory or marine bird species, the likelihood of interaction with vehicles is considered low. Given the proposed management measures, a significant impact on the biological diversity and ecological integrity of terrestrial fauna is not predicted.
Direct loss of native fauna due to entrapment within water	Measures to avoid: • NA	Given the short construction period (approximately 6 weeks), the small diameter of the pipe (≤ 150 mm) and resultant small size of the trench required, and the use of existing tracks, fauna entrapment is not

Potential Impact	Mitigation Measures	Predicted Outcome
pipeline trench	Measures to minimise: • Fauna shelters (e.g. hessian bags) placed every 50 m or less in open trench. • Open sections of trench inspected in the morning, within three hours of sunrise, and immediately before pipe laying and backfilling. Any entrapped fauna retrieved and released. • Trench inspections, and fauna retrieval and release, by a suitably trained fauna handler. • Trench backfilled (to at least cover pipe) as soon as practicable after pipe laying. • Retrieved fauna released into suitable habitat near point of rescue, at appropriate distance from trench, as soon as practicable, except where they need to be held for treatment (dehydration, hypothermia, etc.), or are a nocturnal species best released in the evening. Measures to rehabilitate: • Fauna unfit for release referred to the Exmouth office of DBCA, or to Exmouth Wildlife Care Group, for assessment/ rehabilitation.	expected to be a significant risk to local fauna populations. Following the implementation of the proposed management measures, a significant impact on the biological diversity and ecological integrity of terrestrial fauna is not expected.
Direct loss of fauna habitat during clearing for onshore infrastructure	Measures to avoid: • Project design has considered use of existing disturbed areas and these will be used wherever possible to minimise total ground disturbance.	The fauna habitats identified within the Development Envelope are associated with vegetation communities that are well represented locally and regionally. The six conservation significant fauna identified in the Development Envelope are marine and migratory bird species that use coastal habitat. Similar and better

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the project. • Ground disturbance procedures and a permitting system will be implemented. • Where practicable, land clearing will be undertaken progressively with the amount of active disturbance minimised. • The site induction program will provide information of fauna of conservation significance, their appearance and habitats. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they become available. • Topsoil will be appropriately stored and respread over rehabilitated areas to act as a seed source. • Cleared vegetation will be appropriately stored and respread over rehabilitated areas to protect the soil from erosion and provide habitat for fauna.	quality coastal habitat is locally and regionally widespread and direct impacts as a result of the Proposal are small. This is discussed further in Section 5.4.5. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained. <u>Monitoring</u> Inspections/survey to confirm no clearing beyond Development Envelope.
Indirect loss or degradation of fauna habitat due to dust emissions	Measures to avoid: • Project design has considered use of existing disturbed areas and these will be used wherever possible to minimise total ground disturbance. Measures to minimise: • Water carts will be utilised for dust	Potential short-term impacts during construction are considered unlikely to significantly affect habitat condition or result in loss of habitat. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
	suppression during construction. • Land disturbance will be kept to the minimum necessary for development of the project. • Ground disturbance procedures and a permitting system will be implemented. • Measures to rehabilitate: • Disturbed or degraded areas will be rehabilitated.	
Indirect loss or degradation of fauna habitat due to introduction or spread of weeds	Measures to avoid: • Earth moving machinery will be cleaned of soil and vegetation prior to entering or leaving the Development Envelope. • No weed affected soil, mulch or fill will be brought into the Development Envelope. • During operations, vehicles and equipment will keep to designated roads and tracks. Measures to minimise: • A weed hygiene system will be developed and implemented during the construction phase to avoid the establishment of new populations within the Development Envelope. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they become available. • Conduct weed control in rehabilitation areas.	Increased presence of weeds (species and abundance) may affect fauna habitat. However, given the proposed management measures these impacts will not result in significant impacts on the health, abundance and structure of vegetation communities. Subsea 7 considers that the potential impacts to fauna habitat can be managed such that there are no significant residual impacts to terrestrial fauna habitat and the biological diversity and ecological integrity of fauna will be maintained.

Potential Impact	Mitigation Measures	Predicted Outcome
Fragmentation of fauna habitat due to presence of onshore infrastructure	Measures to avoid: • Project design has considered use of existing disturbed areas and these will be used wherever possible to minimise total ground disturbance. Measures to minimise: • Clearing activities will be managed to ensure clearing is strictly limited to that necessary for operations. • Stock fencing to be installed around site boundary that will allow native fauna to cross site. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they become available.	The potential for habitat fragmentation is most likely to occur where there is limited extent of a fauna habitat supporting a population of breeding fauna species or where a particular species is limited to that specific habitat. Fauna habitats in the Development Envelope are well represented locally and regionally and do not support species of conservation significance that are restricted. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.
Indirect loss or degradation of fauna habitat due to changes in surface water flows or changes in groundwater levels or quality	Measures to avoid: • Project infrastructure and associated surface water management infrastructure has considered existing conditions and has been designed to minimise impacts to surface drainage patterns. Measures to minimise: • Monitoring of groundwater levels and quality as required under the licence to abstract groundwater (under 5C of the *Rights in Water and Irrigation Act 1914*). Measures to rehabilitate: • Rehabilitation of areas impacted by changes to	Long-term losses of fauna habitat or changes in the biological diversity and ecological integrity of fauna habitat are not expected to result from localised changes in surface water flows. Given the absence of GDE within the Development Envelope and locally and regionally widespread nature of fauna habitats within the Development Envelope, localised changes to groundwater levels and or quality are not considered likely to have significant changes on the biological diversity and ecological integrity of fauna habitats. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be

Potential Impact	Mitigation Measures	Predicted Outcome
	surface water flows or quality.	maintained.
Indirect loss or degradation of fauna habitat due to changes in fire regimes	Measures to avoid: • NA. Measures to minimise: • Development to be conducted in accordance with appropriate BAL specifications/conditions. • Vehicle traffic will be confined to defined roads and tracks (except during active clearing). • Firefighting equipment will be located on site and in project vehicles. • Project personnel will be trained in fire response. • A Hot Work Permit system will be developed and implemented. • The project site induction will include information on the prevention and management of fires. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they become available.	Mitigation measures will minimise the risk of Proposal-related fires. The Proposal-specific impacts on local fire regimes are not anticipated to adversely impact the environment given the open structure of the vegetation and locally and regionally common nature of fauna habitats within the Development Envelope. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.
Indirect impacts to native fauna as a result of introduction or increase of feral animals	Measures to avoid: • Lidded bins. • Regular removal of waste by a licenced contractor. Measures to minimise: • Access control measures implemented to	It is not considered likely that development and operation of the Proposal will result in introduction of new feral animal species to the area or an increase in abundance of feral animals. It is anticipated that the proposed controls will be effective and will prevent an increase in diversity and abundance of feral animals. Based on the above, the biological diversity and

Potential Impact	Mitigation Measures	Predicted Outcome
	sources of water (e.g. fencing, or the use of sealed bladders, covers, etc.). Measures to rehabilitate: • A feral animal control program will be implemented if populations of feral animals noticeably increase.	ecological integrity of terrestrial fauna will be maintained.
Loss or alteration of coastal habitat as a result of changes to coastal processes or hydrodynamic/ hydrological regimes	Addressed within Section 5.4.6.11 as related to migratory bird habitat.	
Key Environmental Factor: Inland Waters		
EPA Objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	
Potential Impact	Mitigation Measures	Predicted Outcome
Changes to surface water flow patterns due to the presence of infrastructure	Measures to avoid: • Where necessary, suitable floodways, drains and culverts will be installed to maintain, as much as possible, natural flow patterns. Measures to minimise: • Project design has considered the location of drainage lines with the aim of minimising changes to natural flows. Measures to rehabilitate: • Upon closure the reinstatement of the natural	After installation of surface water drainage measures, surface water flow patterns are expected to remain similar to baseline flow patterns, and changes to flow velocities are not expected to alter the natural scour characteristics of the catchment. The hydrological regimes will be maintained after implementation of the Proposal so that environmental values are protected consistent with the EPA objective for Inland Waters.

Potential Impact	Mitigation Measures	Predicted Outcome
	flow paths after removal of the project infrastructure.	
Impact to surface water quality due to exposure of soils (risk of erosion and elevated suspended solids)	Measures to avoid: • Where necessary, suitable floodways, drains and culverts will be installed to maintain, as much as possible, natural flow patterns. • Project design has considered the location of drainage lines with the aim of minimising changes to natural flows. Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the project. • Ground disturbance procedures and a permitting system will be implemented. • Where practicable, land clearing will be undertaken progressively with the amount of active disturbance minimised. • Use of erosion control measures, such as surface treatments (compaction, hydromulch) of disturbed areas to minimise soil erosion. Measures to rehabilitate: • Rehabilitation will be undertaken on disturbed construction areas (e.g. directional drilling sites, adjacent to access road) as they become available. • Upon closure the reinstatement of the natural flow paths after removal of the project infrastructure.	Significant impacts to surface water quality from erosion during construction and operations are not expected as no significant changes to surface water flow velocities have been predicted. The quality of surface water will be maintained so that environmental values are protected and the EPA objective for Inland Waters will be achieved.

Potential Impact	Mitigation Measures	Predicted Outcome
Impact to surface water and groundwater quality due to treated wastewater discharge	Measures to avoid: • WWTP designed and located consistent with regulatory requirements relevant to the protection of water quality. • Treatment of greywater will be provided by an advanced system (such as a Wise Water system) to ensure a high recovery of nutrients. • Location of sprayfield chosen to avoid defined drainage channels. Measures to minimise: • All blackwater will be tankered offsite. • Spray field appropriately sized to promote nutrient update by vegetation and soil. Measures to rehabilitate: • NA.	No significant impact to surface or groundwater quality is expected as a result of the discharge of treated wastewater. The quality of surface and groundwater will be maintained so that environmental values are protected and the EPA objective for Inland Waters will be met.
Impact to groundwater levels due to groundwater abstraction	Measures to avoid: • NA Measures to minimise: • Minimise water abstraction through the storage and re-use of hydrotest water. • Water storages will be lined to minimise seepage. • Low abstraction rates to reduce the likelihood of groundwater drawdown.	Under the most conservative (worst-case) scenario, modelling predicts a maximum drawdown in the immediate location of the production bores of 1.15 m after 10 years of continuous abstraction, assuming no recharge occurs. Changes to localised groundwater levels are not predicted to adversely impact on beneficial uses. Local hydrological regimes will be maintained and the EPA objective for Inland Waters will be met. <u>Monitoring</u> Regular (quarterly) monitoring of groundwater quality (including salinity) and levels, in accordance with

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • NA.	abstraction licence conditions.
Impact to surface water and groundwater quality due to leak or spill of chemicals (including hydrocarbons)	Measures to avoid: • Hazardous materials will be stored in accordance with relevant Australian Standards and Dangerous Goods Storage regulations. • Chemical storage and handling procedures to prevent leaks or spills. Measures to minimise: • Refuelling to occur on concrete or HDPE-lined pads to contain any drips and spills. The pads will drain to a sump to allow removal of collected material. • Spill kits will be located at strategic locations throughout the project area and employees trained in their use. • Employees and contractors will be trained in use of spill kits. • Spills will be cleaned up and contaminated soils will be removed from site by a licensed third party. Measures to rehabilitate: • Remediation and rehabilitation of any contaminated areas.	Considering the application of standard industry practices for storage and handling, the risk of contamination of surface and groundwaters is considered low. The quality of surface and groundwater will be maintained so that environmental values are protected and the EPA objective for Inland Waters will be met.

Key Environmental Factor: Social Surroundings		
EPA Objective	To protect social surroundings from significant harm.	
Potential Impact	Mitigation Measures	Predicted Outcome
Disturbance to Aboriginal heritage places and/or cultural associations during construction	Measures to avoid: • Heritage surveys completed to allow any significant heritage sites to be mapped and avoided. Measures to minimise: • Cultural awareness training for the workforce. • Ground disturbance procedures and a permitting system will be implemented. • The site induction program will provide written and verbal information on cultural and heritage awareness. • Heritage monitors during clearing and construction activities. The quantity and extent of monitoring activities will be agreed on a case by case basis for each clearing or excavation operation. • If artefacts are located, all work will be stopped until appropriate assessment has been completed and approval to remove/disturb is obtained. • Approved Indigenous Land Use Agreement (ILUA) to be obtained and adhered to. • Cultural Heritage Management Plan to be developed and implemented. • Providing Culture Awareness training to workforce.	Given that no sites or cultural places of significance were identified during the heritage surveys, significant impacts to Aboriginal Heritage are not expected. The proposed management measures will ensure the EPA objective for Social Surroundings will be met.

Potential Impact	Mitigation Measures	Predicted Outcome
	Measures to rehabilitate: • NA	
Impacts to the social values (e.g. aesthetics and active use) of the Proposal area during construction	Measures to avoid: • Access to Heron Point and the Bay of Rest will be maintained. Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the Proposal. • Minimisation of disturbance to dunes and other elevated vantage points within the Development Envelope. • Appropriate management of noise, dust and light emissions. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they become available.	Given the maintenance of access to Heron Point and the Bay of Rest, and the management of potential aesthetic and amenity impacts associated with noise, dust and light, it is considered that the EPA objective for Social Surroundings will be met.
Changes to surface water flow patterns and/or coastal processes which may impact on Aboriginal heritage places	Measures to avoid: • Heritage survey completed to allow any significant heritage sites to be mapped and impacts avoided. • Where necessary, suitable floodways, drains and culverts will be installed to maintain, as much as possible, natural flow patterns. Measures to minimise: • Design of launchway to minimise height of structure above surrounding beach or seabed.	Given that no Aboriginal sites of places of significance were identified, and the proposed management of surface water flows and coastal processes, it is considered that the EPA objective for Social Surroundings will be met.

Potential Impact	Mitigation Measures	Predicted Outcome
	• Project design has considered the location of drainage lines with the aim of minimising changes to natural flows. • Management of onshore sediment accretion via monitoring and sand bypassing. • Cultural Heritage Management Plan to be developed and implemented. Measures to rehabilitate: • Upon closure the reinstatement of the natural flow paths after removal of the project infrastructure.	
Permanent constraint on access and traditional cultural activities	Measures to avoid: • Access to Heron Point and the Bay of Rest will be maintained. • Subsea 7 commits to ensuring that the Gnulli will be welcome visitors into the Development Envelope and that access will not be unreasonably refused. Measures to minimise: • Land disturbance will be kept to the minimum necessary for development of the Proposal. • Cultural Heritage Management Plan to be developed and implemented. • Approved Indigenous Land Use Agreement (ILUA) to be obtained and adhered to. Measures to rehabilitate: • Disturbed areas will be rehabilitated as they	Given that the site does not contain any culturally significant areas used for customary practices, and that access to Heron Point and the Bay of Rest will be maintained, impacts are considered minimal. The EPA Objective for Social Surroundings will be met.

Potential Impact	Mitigation Measures	Predicted Outcome
	become available.	
Impacts to the heritage values of the Ningaloo Coast World Heritage Property and the Ningaloo Coast World Heritage Place	Measures to avoid: • Surface tow to avoid interaction with the seabed within the Ningaloo Coast World Heritage Property (also referred to as the World Heritage Area) and the Ningaloo Coast World Heritage Place. Measures to minimise: • Limit on the number of Bundle launches (average of two, up to a maximum of three, per year). • No launches during period of peak usage of Exmouth Gulf by Humpback whales (August to October). • Local stakeholder engagement team in place to receive continuous feedback from local community groups. Measures to rehabilitate: • NA	Given the short-term nature of the tow operations through the Ningaloo Coast WHA, the Bundle tow operation is not likely to have any significant impacts on the natural beauty and aesthetic importance of the area, or on the important and significant natural habitats. There will be no contact with the seabed in this area and therefore no impacts to BCH. The likelihood of a marine fauna strike is low due to the numerous control measures that will be implemented. The heritage values of the Ningaloo Coast World Heritage Area and the Ningaloo Coast World Heritage Place are unlikely to be impacted as a result of the Proposal.
Impacts to amenity values (including visual landscape, scenic and visual aesthetic values and recreational tourism) in a	Measures to avoid: • NA Measures to minimise: • Limit on the number of Bundle launches (average of two, up to a maximum of three, per year). • Public notification prior to Bundle tow	A Bundle tow will traverse Ningaloo Marine Park for a duration of approximately four hours per launch, with no residual effect following this period. A maximum of three Bundles will be launched per year. Impacts to amenity values will not be significant and the EPA objective for Social Surroundings will be met.

Potential Impact	Mitigation Measures	Predicted Outcome
marine park	operations. • No launches during period of peak usage of Exmouth Gulf by Humpback whales (August to October). • Local stakeholder engagement team in place to receive continuous feedback from local community groups. Measures to rehabilitate: • NA	
Impacts to the social values (e.g. aesthetics or active use) of the Proposal area during operations	Measures to avoid: • Access to Heron Point and the Bay of Rest will be maintained. Measures to minimise: • Limit on the number of Bundle launches (average of two, up to a maximum of three, per year). • Public notifications prior to and during a Bundle launch. • Local stakeholder engagement team in place to receive continuous feedback from local community groups. Measures to rehabilitate: • NA	The Bundle and tow/support vessels will only be visible from Vlamingh Head Lighthouse for approximately 18 hours 21 minutes per tow. The Bundle tow will only occur within the WHA for a total of three hours 48 mins. Third party vessels will be able to navigate, and utilise, the area outside of the exclusion zone, during a Bundle launch and tow. Impacts to social values will not be significant and the EPA objective for Social Surroundings will be met.
Impacts to commercial fishing and recreational	Measures to avoid: • Public notifications prior to and during a Bundle launch.	Commercial fishing operators will have advanced notice of a Bundle launch and will be able to schedule activities to avoid the Bundle tow route (as required). The Exmouth Gulf prawn fishery occurs across

Potential Impact	Mitigation Measures	Predicted Outcome
fishing operations/ businesses and tourism activities in the Proposal area	• Local stakeholder engagement team in place to receive continuous feedback from local operators. Measures to minimise: • Limit on the number of Bundle launches (average of two, up to a maximum of three, per year). • Preferential use of local vessels to support Bundle launches. Measures to rehabilitate: • NA	approximately 300 square nautical miles, so the area affected during a Bundle launch is negligible. Recreational tour operators will be able to navigate, and utilise, the area outside of the exclusion zone during a Bundle launch and tow. Impacts to commercial fishing and recreational fishing operations/businesses and tourism activities will not be significant. Therefore, the EPA objective for Social Surroundings will be met.
Other Environmental Factors or Matters: Terrestrial Environmental Quality		
EPA Objective	To maintain the quality of land and soils so that environmental values are protected.	
Potential Impact	Mitigation Measures	Predicted Outcome
Impact to soil, surface water or groundwater quality following the exposure or disturbance of acid sulphate soils	Measures to avoid: • None (no ASS recorded). Measures to minimise: • Minimise the extent and depth of excavations. Measures to rehabilitate: • In the event of any ASS disturbance undertake treatment (e.g. lime dosing) and post-treatment testing.	Given no ASS were identified within the Development Envelope, the Proposal will not cause impacts associated with their disturbance. The EPA objective for terrestrial environmental quality will be met.
Impacts to soil, surface water or groundwater quality due to	Measures to avoid: • None (no ASS recorded)	No significant impact to terrestrial environmental quality is expected. The EPA objective for terrestrial environmental quality

Potential Impact	Mitigation Measures	Predicted Outcome
leaks or spills	Measures to minimise: • Implement appropriate chemical transport, storage and handling procedures. • Chemical and hydrocarbon storage vessels will be bunded. • Staff will be trained in refuelling procedures and the handling and management of chemicals. • Oil spill kits and equipment will be available on site. Measures to rehabilitate: • In the event of a leak or spill the contamination will be contained and contaminated material removed for offsite disposal at a licenced facility.	will be met.

ES Table 3: Summary of Potential Impacts, Proposed Mitigation, and Outcomes

TABLE OF CONTENTS

INVITATION TO MAKE A SUBMISSION I

SCOPING CHECKLIST III

EXECUTIVE SUMMARY XVII
INTRODUCTION, BACKGROUND, AND CONTEXT XVII
OVERVIEW OF THE PROPOSAL XIX
SUMMARY OF POTENTIAL IMPACTS, PROPOSED MITIGATION, AND OUTCOMES XXV

1. INTRODUCTION 1
1.1 PURPOSE AND SCOPE 1
1.2 PROPONENT 2
1.3 ENVIRONMENTAL IMPACT ASSESSMENT AND PROCESS 2
1.3.1 Overview 2
1.3.2 EPA Assessment Process 3
1.3.3 State Approval Process 5
1.3.4 Commonwealth Approval Process 6
1.4 OTHER APPROVALS AND REGULATION 6
1.5 STRUCTURE OF THE ERD (THIS DOCUMENT) 7
1.5.1 Environmental Impact Assessment 7
1.5.2 Changes in EPA Guidance Between the Original Assessment (2136) and Current Assessment (2208) 8
1.5.3 Supporting Studies 8

2. THE PROPOSAL 11
2.1 BACKGROUND 11
2.2 EXISTING FACILITY IN SCOTLAND 14
2.2.1 Site History 14
2.2.2 Environment Governance 14
2.2.3 Wick Stakeholder Feedback and Support 15
2.3 PROPOSAL DESCRIPTION 17
2.3.1 Key Characteristics 17
2.3.2 Water Source 21
2.3.3 Wastewater Treatment and Discharge 21
2.3.4 Lighting 21
2.3.5 Bundle Site Workforce 21
2.3.6 Bundles 22
2.3.7 Bundle Launch 26
2.3.8 Bundle Tow 27
2.3.9 Care and Maintenance, Decommissioning, and Closure 31
2.4 JUSTIFICATION 31
2.4.1 Value Proposition 31
2.4.2 Environmental Impact 32
2.4.3 Development Cost, Schedule Flexibility and Execution Risk 33
2.4.4 Innovation 33
2.4.5 Local Industry Content and Employment 36
2.4.6 Regional Economic Benefits 38
2.4.7 Regional Community Benefits 38
2.4.8 Alternatives Considered and Optimisation 38
2.5 LOCAL AND REGIONAL CONTEXT 49
2.5.1 Climate 49
2.5.2 Geographical and Physical 50
2.5.3 Land Tenure 51

2.5.4 Native Title 52
2.5.5 Environmental Values 53
2.5.6 Social Surroundings 58
2.5.7 Heritage 58
2.5.8 Other Nearby Projects or Proposals 59

3. STAKEHOLDER ENGAGEMENT 67
3.1 INTRODUCTION 67
3.2 KEY STAKEHOLDERS 67
3.3 STAKEHOLDER ENGAGEMENT PROCESS 68
3.4 CONSULTATION OUTCOMES 69
3.5 SECTION 43A CHANGE TO PROPOSAL (UNDER ASSESSMENT NUMBER 2136) . 76

4. KEY ENVIRONMENTAL PRINCIPLES AND FACTORS 79
4.1 PRINCIPLES OF THE EP ACT 79
4.2 PRELIMINARY KEY ENVIRONMENTAL FACTORS 81

5. PRELIMINARY KEY ENVIRONMENTAL FACTORS 82
5.1 KEY ENVIRONMENTAL FACTOR 1 – BENTHIC COMMUNITIES AND HABITAT 82
5.1.1 EPA Objective 82
5.1.2 Policy and Guidance 82
5.1.3 Receiving Environment 83
5.1.4 Potential Impacts 92
5.1.5 Potential Cumulative Impacts 92
5.1.6 Assessment of Impacts 92
5.1.7 Mitigation, Monitoring, and Predicted Outcome 125
5.1.8 Assessment of Residual Impacts to Biological Diversity and Ecological Integrity 135
5.2 KEY ENVIRONMENTAL FACTOR 2 – COASTAL PROCESSES 137
5.2.1 EPA Objective 137
5.2.2 Policy and Guidance 137
5.2.3 Receiving Environment 137
5.2.4 Potential Impacts 141
5.2.5 Potential Cumulative Impacts 141
5.2.6 Assessment of Impacts 141
5.2.7 Mitigation, Management, and Predicted Outcome 145
5.3 KEY ENVIRONMENTAL FACTOR 3 – MARINE ENVIRONMENTAL QUALITY 150
5.3.1 EPA Objective 150
5.3.2 Policy and Guidance 150
5.3.3 Receiving Environment 151
5.3.4 Potential Impacts 154
5.3.5 Potential Cumulative Impacts 155
5.3.6 Assessment of Impacts 155
5.3.7 Mitigation, Monitoring and Predicted Outcome 161
5.4 KEY ENVIRONMENTAL FACTOR 4 – MARINE FAUNA 166
5.4.1 EPA Objective 166
5.4.2 Policy and Guidance 166
5.4.3 Receiving Environment 167
5.4.4 Potential Impacts 208
5.4.5 Potential Cumulative Impacts 208
5.4.6 Assessment of Impacts 208
5.4.7 Mitigation, Monitoring, and Predicted Outcome 228
5.5 KEY ENVIRONMENTAL FACTOR 5 – FLORA AND VEGETATION 241
5.5.1 EPA Objective 241
5.5.2 Policy and Guidance 241

5.5.3 Receiving Environment 241
5.5.4 Potential Impacts 247
5.5.5 Potential Cumulative Impacts 247
5.5.6 Assessment of Impacts 249
5.5.7 Mitigation and Predicted Outcome 259
5.6 KEY ENVIRONMENTAL FACTOR 6 – SUBTERRANEAN FAUNA 266
5.6.1 EPA Objective 266
5.6.2 Policy and Guidance 266
5.6.3 Receiving Environment 266
5.6.4 Potential Impacts 271
5.6.5 Potential Cumulative Impacts 271
5.6.6 Assessment of Impacts 271
5.6.7 Mitigation and Predicted Outcome 275
5.7 KEY ENVIRONMENTAL FACTOR 7 – TERRESTRIAL FAUNA 279
5.7.1 EPA Objective 279
5.7.2 Policy and Guidance 279
5.7.3 Receiving Environment 280
5.7.4 Potential Impacts 282
5.7.5 Potential Cumulative Impacts 282
5.7.6 Assessment of Impacts 283
5.7.7 Mitigation, Monitoring, and Predicted Outcome 289
5.8 KEY ENVIRONMENTAL FACTOR 8 – INLAND WATERS 296
5.8.1 EPA Objective 296
5.8.2 Policy and Guidance 296
5.8.3 Receiving Environment 297
5.8.4 Potential Impacts 301
5.8.5 Potential Cumulative Impacts 301
5.8.6 Assessment of Impacts 303
5.8.7 Mitigation and Predicted Outcome 310
5.9 KEY ENVIRONMENTAL FACTOR 9 – SOCIAL SURROUNDINGS 315
5.9.1 EPA Objective 315
5.9.2 Policy and Guidance 315
5.9.3 Receiving Environment 316
5.9.4 Potential Impacts 344
5.9.5 Potential Cumulative Impacts 344
5.9.6 Assessment of Impacts 345
5.9.7 Mitigation and Predicted Outcome 359

6. OTHER ENVIRONMENTAL FACTORS OR MATTERS 365
6.1 TERRESTRIAL ENVIRONMENTAL QUALITY 365
6.1.1 EPA Objective 365
6.1.2 Policy and Guidance 365
6.1.3 Receiving Environment 365
6.1.4 Potential Impacts 368
6.1.5 Cumulative Impacts 369
6.1.6 Assessment of Impacts 369
6.1.7 Mitigation and Predicted Outcome 369

7. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE 371
7.1 OBJECTIVE 371
7.2 CONTROLLING PROVISIONS UNDER THE EPBC ACT 371
7.3 OTHER AGREEMENTS AND LEGISLATION 371
7.4 POLICY AND GUIDANCE 371
7.5 SUMMARY OF EXISTING ENVIRONMENTAL VALUES THAT RELATE TO MNES 373
7.5.1 World Heritage Properties 373

7.5.2 National Heritage Places 373
7.5.3 Listed Threatened Species, Communities, and Migratory Species 373
7.5.4 Commonwealth Marine Areas 390
7.6 ASSESSMENT OF POTENTIAL IMPACTS ON MNES 391
7.6.1 World Heritage Area and National Heritage Place 391
7.6.2 Listed Threatened Species, Communities and Migratory Species 398
7.6.3 Commonwealth Marine Area 422
8. OFFSETS 425
9. HOLISTIC IMPACT ASSESSMENT 426
9.1 BIODIVERSITY 426
9.1.1 Terrestrial 426
9.1.2 Marine 426
9.2 ECOLOGICAL INTEGRITY (HEALTH AND PRODUCTIVITY) 427
9.2.1 Terrestrial 427
9.2.2 Marine 427
9.3 SOCIAL ENVIRONMENT 428
9.3.1 Aesthetics 428
9.3.2 Culture 428
9.3.3 Economics 428
10. REFERENCES 430
11. GLOSSARY OF TERMS 459

TABLES – EXECUTIVE SUMMARY

ES Table 1: Summary of Proposal xix
ES Table 2: Proposal Key Characteristics xxi
ES Table 3: Summary of Potential Impacts, Proposed Mitigation, and Outcomes lxxvii

TABLES

Table 1-1: Other Approvals and Legislation Relevant to the Proposal 6
Table 1-2: Overview of Supporting Studies 9
Table 2-1: Proposal Key Characteristics 18
Table 2-2: Indicative Bundle Chemicals 24
Table 2-3: ONCS Rankings of Bundle Chemicals 26
Table 2-4: Value Proposition for Bundle Technology in Comparison to Conventional Pipeline Installation 31
Table 2-5: Vessel Operations Associated with a Conventional versus Bundle Technology Delivery of the Van Gogh Project 39
Table 2-6: Summary of Initial Desktop Assessment Outcomes 43
Table 2-7: Summary of Site Inspection and Further Assessment Outcomes 44
Table 2-8: Site Investigation and Detailed Assessment Outcomes 44
Table 2-9: Options for Bundle Launch to Minimise Seabed Disturbance 46
Table 3-1: Summary of Feedback Provided by Stakeholders Between November 2016 and December 2018 75
Table 3-2: Key Issues Raised on Section 43A Change to Proposal Application 78
Table 4-1: Principles of the EP Act 81
Table 5-1: Key Policy and Guidance Relevant to BCH 83
Table 5-2: Overview of Local and Regional BCH Studies 84
Table 5-3: Potential Impacts to BCH 92

Table 5-4: Local Assessment Unit Areas and Short Descriptions 93
Table 5-5: Bundle Chain Footprint Modelling Scenarios 117
Table 5-6: Cumulative Impacts to BCH ('Realistic Worst Case') 122
Table 5-7: Cumulative Impacts to BCH ('Absolute Worst Case') 124
Table 5-8: Proposed Mitigation Measures and Predicted Outcome for BCH 134
Table 5-9: Policy and Guidance Relevant to Coastal Processes 137
Table 5-10: Overview of Local and Regional Coastal Processes Studies 138
Table 5-11: Potential impacts to Coastal Processes 141
Table 5-12: Proposed Mitigation Measures and Predicted Outcome for Coastal Processes 149
Table 5-13: Policy and Guidance Relevant to Marine Environmental Quality 150
Table 5-14: Environmental Values and Environmental Quality Objectives for the Marine Waters of Exmouth Gulf 151
Table 5-15: Overview of Local and Regional Marine Environmental Quality Studies 152
Table 5-16: Potential Impacts to Marine Environmental Quality 154
Table 5-17: Proposed Mitigation Measures and Predicted Outcome for Marine Environmental Quality 165
Table 5-18: Policy and Guidance Relevant to Marine Fauna 167
Table 5-19: Overview of Local and Regional Marine Fauna Studies 168
Table 5-20: Turtle Breeding Cycles 184
Table 5-21: Potential Impacts to Marine Fauna 208
Table 5-22: Proposed Mitigation Measures and Predicted Outcome for Marine Fauna 238
Table 5-23: Policy and Guidance Relevant to Flora and Vegetation 241
Table 5-24: Overview of Local and Regional Flora and Vegetation Studies 243
Table 5-25: Proposal Area Vegetation Communities 244
Table 5-26: Potential Impacts to Flora and Vegetation 247
Table 5-27: Proposed Vegetation Community Disturbance Within the Development Footprint 250
Table 5-28: Potential Impacts to Vegetation Communities from Changes in Surface Water Flows 257
Table 5-29: Proposed Mitigation Measures and Predicted Outcome for Flora and Vegetation 265
Table 5-30: Policy and Guidance Relevant to Subterranean Fauna 266
Table 5-31: Overview of Local and Regional Subterranean Fauna Studies 267
Table 5-32: Potential Impacts to Subterranean Fauna 271
Table 5-33: Proposed Mitigation Measures and Predicted Outcome for Subterranean Fauna 278
Table 5-34: Policy and Guidance Relevant to Terrestrial Fauna 280
Table 5-35: Overview of Local and Regional Terrestrial Fauna Studies 280
Table 5-36: Extent of Fauna Habitats within the Development Envelope 281
Table 5-37: Potential Impacts to Terrestrial Fauna 282
Table 5-38: Proposed Mitigation Measures and Predicted Outcome for Terrestrial Fauna 295
Table 5-39: Policy and Guidance Relevant to Inland Waters 297
Table 5-40: Overview of Local and Regional Studies Relating to Inland Waters 297
Table 5-41: Summary of Lithologies Recorded during the Drilling Program (from GHD 2018b) 298
Table 5-42: Potential Impacts to Inland Waters 301
Table 5-43: Comparison of Proposed Nutrient Loads and Concentrations to Guideline Values 306
Table 5-44: Typical Chemicals Likely to be Stored Within the Development Envelope 308
Table 5-45: Proposed Mitigation Measures and Predicted Outcome for Inland Waters 314
Table 5-46: Policy and Guidance Relevant to Social Surroundings 316
Table 5-47: Overview of Local and Regional Studies relating to Social Surroundings 317

Table 5-48: Official Values of the Ningaloo Coast (Commonwealth of Australia 2010) 324
Table 5-49: Registered Aboriginal Heritage Sites 325
Table 5-50: Visitor Summary in the Shire of Exmouth (ABS 2016a) 333
Table 5-51: Social Values of the Ningaloo Marine Park and Muiron Islands Marine Management Area (CALM 2005) and Nyinggulu Coastal Reserves Plan (DBCA 2019) 342
Table 5-52: Potential Impacts to Social Surroundings 344
Table 5-53: Proposed Mitigation Measures and Predicted Outcome for Social Surroundings 364
Table 6-1: Policy and Guidance Relevant to Terrestrial Environmental Quality 365
Table 6-2: Types of Disturbance Triggering an ASS Investigation 368
Table 6-3: Potential Impacts to Terrestrial Environmental Quality 368
Table 6-4: Proposed Mitigation Measures and Predicted Outcome for Terrestrial Environmental Quality 370
Table 7-1: Policy and Guidance Relevant to MNES 373
Table 7-2: Overview of Studies Relevant to MNES 376
Table 7-3: Listed Threatened, Migratory and Marine Species Present or Likely to be Present Within Exmouth Gulf 384
Table 7-4: Assessment of Potential Impacts on World and National Heritage 397
Table 7-5: Listed Threatened Species and Listed Migratory Species Significant Impact Criteria (DoE 2013) 399
Table 7-6: Significant Impact Assessment for Migratory Shorebirds (DEWHA 2009, DoEE 2017a) 400
Table 7-7: Assessment of Impacts to Listed Vulnerable Species against the Significant Impact Criteria 413
Table 7-8: Assessment of Impacts to Listed Critically Endangered or Endangered Species against the Significant Impact Criteria 419
Table 7-9: Assessment of Impacts to Listed Migratory Species against the Significant Impact Criteria 421
Table 7-10: Assessment of Potential Impacts to Commonwealth Marine Areas 424

FIGURES EXECUTIVE SUMMARY

ES Figure 1: Location of Proposal (Development Envelope) xxii
ES Figure 2: Disturbance Envelope and indicative Development Footprint xxiii
ES Figure 3: Offshore Operations Area and Indicative Tow Route xxiv

FIGURES

Figure 1-1: Flowchart of EPA Assessment Process (Source EPA 2016b) 5
Figure 2-1: Location of Proposal 12
Figure 2-2: Existing Bundle Site in Wick, Scotland 16
Figure 2-3: Development Envelope and Development Footprint 19
Figure 2-4: Offshore Operations Area and Indicative Tow Route 20
Figure 2-5: CHARM Hazard Quotient Ranking (source CEFAS 2018) 25
Figure 2-6: OCNS Initial Grouping for Non-CHARM Chemicals (source CEFAS 2018) .. 25
Figure 2-7: Alternative Sites Considered 42
Figure 2-8: Location of Islands and Shoals in Exmouth Gulf 48
Figure 2-9: Climate Statistics for Learmonth Airport Station 1945-2017 (BoM 2017) . 49
Figure 2-10: Current Speed and Direction Recorded off Heron Point in May/June 2018 (duration indicated as % of time occurring throughout monitoring period) (from GHD 2018) 51

Figure 2-11: Conservation Values of Exmouth Gulf Recognised in State Publications ... 55
Figure 2-12: Conservation Values of Exmouth Gulf Recognised by the Commonwealth ... 56
Figure 2-13: Biologically Important Areas for the Humpback Whale, Dugong, Marine Turtles and the Whale shark within Exmouth Gulf and Ningaloo Marine Park ... 57
Figure 2-14: Exmouth Gulf Prawn Fishery – Areas Fished (2015/2016 and 2016/2017) ... 61
Figure 2-15: Location of Existing or Reasonably Foreseeable Developments in the Vicinity of the Proposal ... 64
Figure 5-1: Regional BCH Mapping Within Exmouth Gulf (source: Bancroft 2003, SeaMap 2017) ... 88
Figure 5-2: Combined Local and Regional BCH Mapping in Exmouth Gulf ... 91
Figure 5-3: Local Assessment Units used for the Assessment of the Proposal ... 95
Figure 5-4: Direct Losses of BCH ... 97
Figure 5-5: Snap Shots of Predicted Depth Averaged TSS Following a Bundle Launch ... 103
Figure 5-6: Predicted Maximum Water Column Turbidity During a Bundle Launch and Tow (95th Percentile Values) ... 105
Figure 5-7: Predicted Depth Averaged Water Column Turbidity During a Bundle Launch and Tow (95th Percentile Values) ... 106
Figure 5-8: Area of Exceedance of the 80th Percentile of Baseline Depth Averaged Turbidity (over 24 hours) ... 110
Figure 5-9: Time-Series of Predicted Depth Averaged TSS Following Bundle Launch .. 111
Figure 5-10: Predicted Indirect Impacts to BCH Adjacent to Launchway ... 115
Figure 5-11: Potential Direct Impacts to BCH Following Multiple Bundle Launches ... 119
Figure 5-12: Zones of High and Moderate Impact and Zone of Influence (Worst Case) ... 120
Figure 5-13: Long-term Changes in Shoreline Position Adjacent to Heron Point (1949 to 2013) ... 140
Figure 5-14: Potential Changes in Sediment Transport Adjacent to the Bundle Launchway ... 144
Figure 5-15: Background Turbidity within Exmouth Gulf (May/June 2018) ... 154
Figure 5-16: Background Turbidity within Exmouth Gulf (November/December 2018) . 154
Figure 5-17: Modelled Exceedance of EQG for the Maintenance of Ecosystem Health During Bundle Launch and Tow ... 158
Figure 5-18: Biologically Important Areas for Cetaceans within the Region ... 170
Figure 5-19: Distribution of Humpback Whales in Exmouth Gulf in 2004/2005 (from CWR 2005) ... 172
Figure 5-20: Distribution of Humpback Whales in Exmouth Gulf in 2018 (from Irvine 2019) ... 173
Figure 5-21: Temporal Variation in the Abundance of Humpback Whales in Exmouth Gulf in 2018 (from Irvine 2019) ... 174
Figure 5-22: Seasonal Variation of Humpback Whale Numbers in Exmouth Gulf During the Southern Migration (2018 and 2004/2005) (from Irvine 2019 and CWR 2005) ... 175
Figure 5-23: Distribution of Dolphins in Exmouth Gulf in 2018 (from Irvine 2019) ... 178
Figure 5-24: Biologically Important Areas for Dugong within the Region ... 180
Figure 5-25: Distribution of Dugong in Exmouth Gulf (from JCU 1994 and CWR 2005) ... 181
Figure 5-26: Distribution of Dugong in Exmouth Gulf in 2018 (from Irvine 2019) ... 182
Figure 5-27: Biologically Important Areas for Marine Turtles within the Region (from DoEE 2015) ... 185
Figure 5-28: Marine Turtle Habitat (from DoEE 2015) ... 186

Figure 5-29: Distribution of Marine Turtles in Exmouth Gulf in 2018 (from Irvine 2019) 187
Figure 5-30: Biologically Important Areas for the Whale Shark Within the Region (from DoEE 2015) 191
Figure 5-31: Key Specimen Collector Fishing Areas Within Exmouth Gulf for 2014 to 2017 (from DPIRD 2018) 195
Figure 5-32: Key Charter Fishing Areas Within Exmouth Gulf for 2014 to 2017 (from DPIRD 2018) 196
Figure 5-33: Recreational Fishing Effort Within Exmouth Gulf and Along the North West Cape (from Sumner *et al*. 2002) 197
Figure 5-34: Total Shorebird Counts in Exmouth Gulf (January 2018) (from Birdlife 2018) 199
Figure 5-35: Key Shorebird Species Counts within Exmouth Gulf (January 2018) (from Birdlife 2018) 201
Figure 5-36: Nationally Significant Shorebird Counts within the Bay of Rest North Shorebird2020 Survey Area (from Western Wildlife 2019) 202
Figure 5-37: Shorebird Species Counts Within the 'Bay of Rest North' Survey Area (October 2018) (from Western Wildlife 2019) 204
Figure 5-38: Shorebird Species Counts Within the 'Bay of Rest North' Survey Area (January 2019) (from Western Wildlife 2019) 205
Figure 5-39: Local and Regional *Trikentrion flabelliforme* Records 215
Figure 5-40: Proportion of Vessel Type Involved in Collisions with Cetaceans in Australian Waters (from DoEE 2016) 220
Figure 5-41: Vegetation Communities Mapped within the Survey Area 248
Figure 5-42: Potential Loss of Vegetation Communities during Clearing for Onshore Infrastructure 252
Figure 5-43: Priority Flora Records 253
Figure 5-44: Location of Stygofauna Sampling Bores 269
Figure 5-45: Location of Proposal Infrastructure in relation to Surface Geology and Stygofauna records 273
Figure 5-46: Modelled Groundwater Drawdown at the Production Bores 274
Figure 5-47: Potential Loss of Fauna Habitat During Clearing for Onshore Infrastructure 285
Figure 5-48: Groundwater Sub-Areas (data from BoM 2016) 300
Figure 5-49: Catchment Areas 302
Figure 5-50: Modelled Changes to Surface Water Flood Levels (100-year ARI event) 305
Figure 5-51: Gascoyne Regional Area 319
Figure 5-52: Heritage 326
Figure 5-53: Land Tenure 328
Figure 5-54: Landscape Character Units 331
Figure 5-55: Recreational Values 335
Figure 5-56: Access to Heron Point (Post Development) 346
Figure 5-57: Operations Phase Photomontages 354
Figure 5-58: Modelled Exceedance of EQG for Maintenance of Recreation and Aesthetics during Bundle Launch and Tow 355
Figure 6-1: Desktop ASS Risk Mapping and ASS Investigation Sampling Locations 367

PLATES

Plate 2-1: Conceptual Site Layout for the Proposal 13
Plate 2-2: Pipeline Bundle Cross-section 22
Plate 2-3: Bundle Launch (Wick, Scotland) 27
Plate 2-4: Bundle Tow Arrangement – Off Bottom Tow 29

Plate 2-5: Bundle Tow Arrangement – Surface Tow 29
Plate 2-6: Bundle Tow Arrangement – CDTM 30

ATTACHMENTS

Attachment 1: Environmental Scoping Document (EPA 2019)
Attachment 2: Supporting Studies
Attachment 3: Environmental Management Plans
Attachment 4: Letters relating to Subsea 7's site in Wick, Scotland
Attachment 5: Subsea 7 Health Safety Environment and Quality Policy Statement

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

This Environmental Review Document (ERD) has been prepared by Subsea 7 Australia Contracting Pty Ltd (Subsea 7) for the Learmonth Pipeline Fabrication Facility (the Proposal). The Proposal is to construct and operate a new pipeline fabrication facility adjacent to the western shoreline of Exmouth Gulf, at Learmonth, approximately 35 km south of the Exmouth townsite. The proposed facility will allow construction and launching of pipeline Bundles for the offshore oil and gas industry. A pipeline Bundle, used in development of offshore gas fields, co-locates a number of services within a single pipeline, which is constructed onshore before being launched and towed offshore to the field under development.

The Proposal 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 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.

Subsea 7 referred the original Proposal to the Western Australian Environmental Protection Authority (EPA) on 23 October 2017. On 20 November 2017, the EPA determined the original Proposal required formal assessment with the level of assessment set as Public Environmental Review (PER), with an eight-week public review period (Assessment number 2136). An Environmental Scoping Document (ESD) was prepared by the EPA to define the form, content, timing and procedure of the Environmental Review Document (ERD). A draft ESD was published for public comment by the EPA on 14 February 2018, with the final, approved, ESD published on 18 April 2018. Subsequently Subsea 7 submitted a request to make changes to the Proposal under section 43A of the *Environmental Protection Act 1986* (EP Act). Following initial discussions between Subsea 7 and the EPA, Subsea 7 requested that the EPA terminate its assessment of the Proposal.

Subsea 7 referred an amended Proposal to the EPA on 16 May 2019. On 29 May 2019, the EPA determined the Proposal required formal assessment with the level of assessment set as PER, with an eight-week public review period (Assessment number 2208). An Environmental Scoping Document (ESD) was prepared by the EPA to define the form, content, timing and procedure of the Environmental Review Document (ERD). A final, approved, ESD was published on 8 July 2019 (Appendix 1). The ESD outlines the preliminary key environmental factors, other environmental factors or matters and work requirements for completion of the ERD.

The ERD (this document) has been prepared to fulfil the requirements for assessment of the Proposal at a level of PER pursuant to Part IV of the Western Australian *Environmental Protection Act 1986* (EP Act). It has been prepared in accordance with the EP Act Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016 (EPA 2016a), the Guidelines for Preparing an Environmental Review Document (EPA 2018b) and to the requirements of the ESD.

The Proposal was referred to the Department of the Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 18 October 2017. On 24 February 2018, the Proposal was deemed a Controlled Action. On 1 July 2019 the DoEE accepted a variation to the Proposal to allow assessment of the amended Proposal through an accredited assessment under the EP Act, with the ERD (this document) addressing the potential impacts to the relevant controlling provisions.

1.2 PROPONENT

Subsea 7 is a world-leading seabed-to-surface engineering, construction and services contractor to the offshore energy industry. Subsea 7 operates throughout the world, delivering high-quality services built on the core strengths of engineering, project management, supply chain and vessel management, supported by their commitment to invest in people, technology and assets worldwide.

In all their major operating locations, they aim to build local businesses founded on local leadership. Subsea 7 develops high-quality personnel to deliver responsive support to their clients, contribute to local economies and communities and support regional supply chains. Subsea 7 has operated in Australia and New Zealand for the past 40 years working with all major oil and gas operators and has an office based in Perth with about 70 permanent employees. Subsea 7 has been involved in the majority of major oil and gas developments in Australia, including the Chevron operated Gorgon Project and Woodside operated Pluto Project.

The proponent can be contacted at:

Subsea 7 Australia Contracting Pty Ltd (Subsea 7) (ABN 005 288 406)
15-17 William Street
Perth
Western Australia

The key contact for the project is:

David Knox
Project Manager
Email: Subsea7communications.australia@subsea7.com

1.3 ENVIRONMENTAL IMPACT ASSESSMENT AND PROCESS

1.3.1 Overview

As outlined in Section 1.1, the Proposal was referred to the EPA under Section 38 of the EP Act, and the EPA set the level of assessment for the project at Public Environmental Review (PER) with an eight-week public review period.

At a Commonwealth level, it was determined that the Proposal constitutes a controlled action under the EPBC Act, with assessment by 'accredited assessment' under the EP Act required, for the following controlling provisions:

- World Heritage Properties (Sections 12 & 15A).
- National Heritage Places (Sections 15B & 15C).
- Listed Threatened species and communities (Sections 18 & 18A).
- Listed Migratory Species (Sections 20 & 20A).
- Commonwealth Marine Areas (Sections 23 & 24A).

Under an 'accredited assessment', a single document (the ERD, this document) is prepared and assessed by the EPA. Following publication of an EPA Report, separate approvals are then granted under the EP Act (by the WA Minister for Environment) and under the EPBC Act (by the Federal Environment Minister).

The ERD will be made available for eight weeks, during which time the public may make submissions to the EPA regarding the Proposal.

1.3.2 EPA Assessment Process

Procedural requirements for environmental assessment prescribed under the EP Act are set out in the Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016 (EPA 2016a).

Following the EPA determination that the Proposal required formal assessment, the formal assessment process needs to be completed (refer Figure 1-1). Following preparation of the Environmental Review Document (ERD, this document) (Step 2 in Figure 1-1), and the completion of the subsequent public review period (Step 3 in Figure 1-1), the EPA will provide copies of public submissions (with the names of private individuals removed) to Subsea 7. Subsea 7 is then required to prepare a summary of the key issues and matters raised in the submissions and respond to the satisfaction of the EPA.

The EPA will then complete the assessment of the Proposal (Step 4 in Figure 1-1), taking into account the ERD document, public submissions, Subsea 7's response to submissions, and advice obtained from any other persons it considers appropriate, and then submit an assessment report (EPA Report) to the WA Minister for Environment and Federal Environment Minister.

The report to each of the ministers will address the environmental factors and MNES relevant to the Proposal, conditions and procedures to which the implementation of the Proposal should be subject, and any other recommendations the EPA considers appropriate.

Key dates associated with the State assessment thus far are as follows:

- Proposal referred to the Western Australian Environmental Protection Authority (EPA) on 23 October 2017.
- The EPA determined the original Proposal (Assessment number 2136) required formal assessment with the level of assessment set as Public Environmental Review (PER), with an eight-week public review period, on 20 November 2017.
- A draft ESD was published for public comment by the EPA on 14 February 2018.
- Final, approved, ESD published on 18 April 2018.
- A request for a Change to Proposal under Section 43A of the EP Act submitted to the EPA on 13 February 2019 and published for public review on 28 February 2019. The proposed amendments included:
    - Amendment of the Proposal title from the 'Learmonth Bundle Site' to the 'Learmonth Pipeline Fabrication Facility'.
    - Extension of the onshore Development Envelope adjacent to the Minilya-Exmouth Road to ensure a safe alignment of the site access road.
    - Inclusion of the proposed production bores and associated water supply pipeline within the Development Envelope.
    - Slight modification of the tow route and definition of an Offshore Operations Area to describe the maximum area (or envelope) within which launch and tow operations will occur.
    - Definition of an Offshore Operations Area (Off bottom tow) within which Bundle ballast chains, which hang below the Bundle, will be in contact with

the seabed. This area represents an envelope within which any and all disturbance associated with Bundle launches, over the life of the facility, may occur.

- A slight realignment of the 'Bundle laydown area' (now termed the Bundle parking area) to align with the revised tow route.
- Change to a 'Surface tow' method through Ningaloo Marine Park and the definition of an Offshore Operations Area (Surface tow) representing an envelope within which all Bundle tows, over the life of the facility, will occur.

- Subsea 7 subsequently requested a termination of the EPA's assessment. An amended Proposal was referred under the EP Act on 16 May 2019.
- The EPA determined the amended Proposal (Assessment number 2208) required formal assessment with the level of assessment set as PER, with an eight-week public review period, on 29 May 2019.
- Final, approved, ESD published on 8 July 2019.

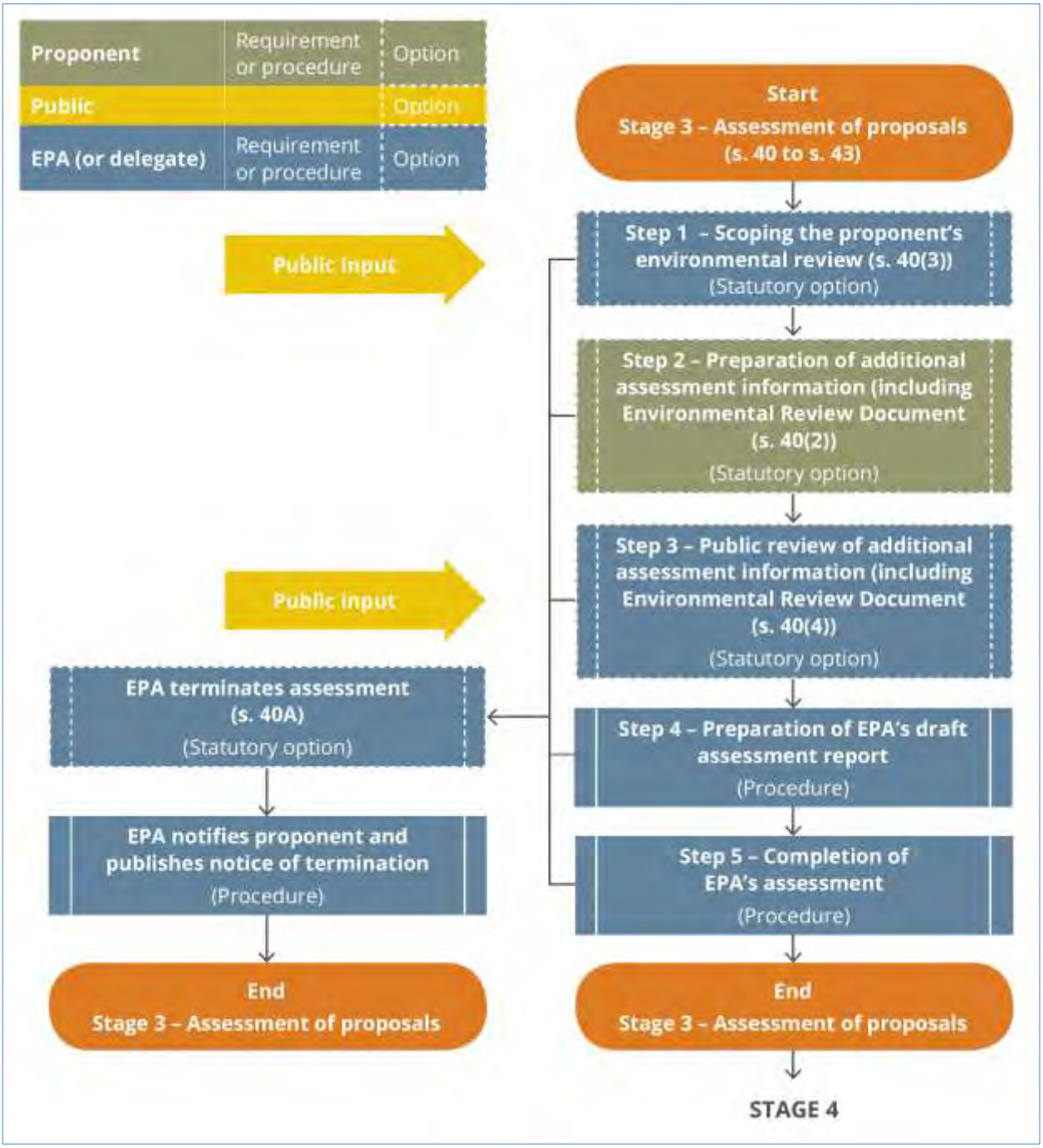


Figure 1-1: Flowchart of EPA Assessment Process (Source EPA 2016b)

1.3.3 State Approval Process

The WA Minister for Environment will publish and circulate the EPA Report as soon as reasonably able to do so. In accordance with section 100(2) of the EP Act, any person may lodge an appeal with the Minister for Environment against the contents or recommendations of the EPA Report within 14 days of the publication of the report. Once any appeals have been considered and determined by the Minister, the Minister then consults with the relevant Decision-Making Authorities (in this case the Minister for Water, Minister for

Planning, Minister for Aboriginal Affairs, and the Chief Executive Officer of the Shire of Exmouth) before deciding whether the Proposal can proceed and issuing a 'Statement that the Proposal may be implemented' (Ministerial Statement), which includes conditions of approval under the EP Act. The Minister's decision and the conditions set can be appealed by the proponent (only) within 14 days of release.

1.3.4 Commonwealth Approval Process

The Federal Environment Minister (or delegate) will review the EPA Report and decide whether the Proposal can proceed, before issuing a formal approval, including conditions of approval, under the EPBC Act.

1.4 OTHER APPROVALS AND REGULATION

In addition to assessment of the Proposal under Part IV of the EP Act and under the EPBC Act, a range of other environmental assessments and authorisations will be required for implementation of the Proposal. Additional environmental approvals likely to be required are summarised in Table 1-1.

Proposal Activities	Land tenure/ access	Approval Required	Legislation regulating the activity
Taking or disturbing flora or fauna	Pastoral Lease	Permit to Take	*Biodiversity Conservation Act 2016*
Land access and ground disturbance in areas of indigenous cultural heritage significance	Pastoral Lease	Section 18 approval(s)	*Aboriginal Heritage Act 1972* (WA)
Construction of water abstraction bores	Pastoral Lease	26D licence	*Rights in Water & Irrigation Act 1914*
Abstraction of groundwater	Pastoral Lease	5C licence	*Rights in Water & Irrigation Act 1914*
Construction of fabrication facility and associated waste treatment and management facilities	Pastoral Lease	Planning consent, building approvals (Shire of Exmouth)	• *Building Act 2011* • *Planning and Development Act 2005* • *Health Act 1911* • Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974
Storage of Dangerous Goods	Pastoral Lease	Dangerous Goods Licence for storage of amounts above manifest quantities	• *Dangerous Goods Act 2004* • *Dangerous Goods Safety Storage and Handling (Non Explosives) Regulations 2007*
An offshore petroleum or greenhouse gas activity (i.e. offshore installation/operation of a Bundle)	Commonwealth and State waters	Environment Plan	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*

Table 1-1: Other Approvals and Legislation Relevant to the Proposal

1.5 STRUCTURE OF THE ERD (THIS DOCUMENT)

1.5.1 Environmental Impact Assessment

The environmental impact assessment has been divided into sections relating to each of the preliminary key environmental factors, other environmental factors or matters, and matters of national environmental significance, as follows:

- Benthic Communities and Habitats (Section 5.1).
- Coastal Processes (Section 5.2).
- Marine Environmental Quality (Section 5.3).
- Marine Fauna (Section 5.4).
- Flora and Vegetation (Section 5.5).
- Subterranean Fauna (Section 5.6).
- Terrestrial Fauna (Section 5.7).
- Inland Waters (Section 5.8).
- Social Surroundings (Section 5.9).
- Other Environmental Factors or Matters: Terrestrial Environmental Quality (Section 6.1).
- Matters of National Environmental Significance (Section 7).
- Offsets (Section 8).
- Holistic Impact Assessment (Section 9).

For each of the impact assessment sections (Section 5.1 to 6.1), a standard structure has been used to describe the factor, its value, potential impacts, mitigation and predicted outcome, as follows:

- EPA Objective (statement of the EPA's objective for each factor).
- Policy and Guidance (provides an overview of relevant policy and guidance and how this has been taken into account in the design of the Proposal and/or the completion of technical studies and environmental impact assessment).
- Receiving Environment (provides an overview of studies undertaken and a description of the existing environment).
- Potential Impacts (provides an overview of the potential impacts to the factor as a result of the Proposal).
- Assessment of Impacts (discusses in detail the potential environmental impacts and their significance within the context of the knowledge provided by the studies undertaken).
- Mitigation and Predicted Outcome (provides a high-level discussion of Subsea 7's proposed approach to avoiding and managing its impacts and, taking into account the proposed mitigation, a summary of the predicted outcome for the environmental factor within the context of the relevant objective(s)). Monitoring to demonstrate that residual impacts are not greater than predicted will also be described.

The 'integrating issues', as presented in Table 4 of the ESD, are addressed under the most relevant section (e.g. site selection under Section 2.4, regional, and cumulative impacts under Sections 5.1.6.11, 5.3.6.5, 5.4.6.11, 5.5.6.8, 5.7.6.11, and 5.8.6.6, and proposed

care and maintenance, decommissioning and closure under Sections 2.3.9, 5.1.6.10, and 5.2.6.4).

1.5.2 Changes in EPA Guidance Between the Original Assessment (2136) and Current Assessment (2208)

The original ESD referenced the 'Statement of Environmental Principles, Factors and Objectives' (EPA 2016c). This guidance was updated to Version 2.0 in 2018 (EPA 2018c).

The change of relevance to the Proposal was the combination of two environmental factors, Inland Waters Environmental Quality and Hydrological Processes, into one environmental factor, Inland Waters. This change has been reflected in the ERD for the amended Proposal (this document).

1.5.3 Supporting Studies

A number of technical studies (both desktop and field studies) have been undertaken specifically for this Proposal to:

- Provide a comprehensive understanding of the receiving environment.
- Support the assessment of potential impacts resulting from the Proposal.
- Inform the development of mitigation measures and environmental management plans.

An overview of the technical studies undertaken for this Proposal is provided in Table 1-2.

Title	Date	Author	Refer
Proposal Development			
Site Selection	April 2019	Subsea 7	Attachment 2A
Site Selection Peer Review	April 2019	Teal Solutions	
Benthic Communities and Habitats			
Learmonth Habitat Surveys	February 2017	360 Environmental	Attachment 2B
Exmouth Gulf Benthic Communities and Habitat survey report	October 2018	MBS Environmental	Attachment 2C
Coastal Processes			
Subsea 7 Bundle Facility Shoreline Movement Assessment	October 2017	MP Rogers	Attachment 2D
Coastal Processes Assessment	February 2019	MP Rogers	Attachment 2E
Coastal Processes Peer Review	April 2019	Teal Solutions	
Marine Environmental Quality			
Learmonth Bundle Launch Site Baseline Water and Sediment Quality Assessment	February 2017	360 Environmental	Attachment 2F
Learmonth Hydrodynamic Survey Field Report	August 2018	GHD	Attachment 2G
Learmonth Sediment Dispersion Modelling Report	March 2019	RPS	Attachment 2H
Marine Fauna			
Subsea 7 Learmonth Bundle Site Invasive Marine Species and Pathogen Desktop Risk Assessment	Sept 2018	Biofouling Solutions	Attachment 2I
Exmouth Gulf aerial humpback whale	January	Lyn Irvine	Attachment 2J

Title	Date	Author	Refer
survey (southern migration)	2019		
Migratory bird surveys report	February 2019	Western Wildlife	Attachment 2K
Flora and Vegetation			
Detailed Flora, Vegetation and Targeted Survey	October 2018	360 Environmental	Attachment 2L
Subterranean Fauna			
Desktop Assessment of Subterranean Fauna for the Learmonth Bundle Project	August 2017	Invertebrate Solutions	Attachment 2M
Review of subterranean fauna at Learmonth Bundle Project	October 2017	Bennelongia	Attachment 2N
Subsea 7 Pipeline Fabrication Facility Stygofauna Survey	Sept 2019	Bennelongia	Attachment 2O
Terrestrial Fauna			
Learmonth Level 1 Fauna Survey	October 2018	360 Environmental	Attachment 2P
Desktop Assessment of Short Range Endemic Invertebrates for the Learmonth Bundle Project	September 2017	Invertebrate Solutions	Attachment 2Q
Inland Waters Environmental Quality			
Bundle Fabrication Facility Surface and Groundwater Investigation	March 2019	GHD	Attachment 2R
Social Surroundings			
Landscape and Visual Impact Assessment	June 2019	360 Environmental	Attachment 2S
Landscape and Visual Impact Assessment Peer Review	June 2019	GHD	
Social Impact Assessment	May 2019	360 Environmental	Attachment 2T
Terrestrial Environmental Quality			
Acid Sulphate Soils Survey Report	October 2018	MBS Environmental	Attachment 2U

Table 1-2: Overview of Supporting Studies

The majority of the technical studies undertaken for this Proposal were completed prior to the amendment of the Proposal. The proposed location of onshore and offshore infrastructure and activities has not changed since the completion of the technical studies. However, the Development Envelope and Development Footprint have been slightly amended, as follows:

- The Onshore Development Envelope and Development Footprint have been truncated at the mean high water mark in response to stakeholder comments regarding the clear differentiation of onshore versus offshore elements/disturbance.
- The Offshore Operations Area (Surface tow) runs offshore from the mean high water mark and therefore includes the launchway footprint.

While the majority of the technical studies reflect the original Development Envelope and Development Footprint, the changes to the Development Envelope and Development Footprint are not considered to have any material impact to the validity of the outcomes of the technical studies.

1.5.3.1 Environmental Management Plans

A number of environmental management plans (EMPs) have been prepared to guide the construction and/or operation of the Proposal to minimise the risk (likelihood and consequence) of adverse environmental impacts, as follows:

- Marine Construction Monitoring and Management Plan (Attachment 3A).
- Marine Fauna Management Plan (Attachment 3B).
- Environmental Quality Plan (Attachment 3C).
- Marine Emergency Response Plan (Attachment 3D).
- Decommissioning and Closure Plan (Attachment 3E).
- Marine Operational Environmental Monitoring Plan (Attachment 3F).

2. THE PROPOSAL

2.1 BACKGROUND

The Proposal is located adjacent to the western shoreline of Exmouth Gulf, at Learmonth, to the east of Minilya-Exmouth Road, approximately 35 km south of the Exmouth townsite and 2.5 km south east of the RAAF Learmonth base (Figure 2-1).

The Proposal is to construct and operate a new pipeline fabrication facility, in order to produce pipeline Bundles for the offshore oil and gas industry. A pipeline Bundle, used in the development of offshore gas fields, co-locates a number of services within a single pipeline, which is constructed onshore before being launched and towed offshore to the field development. Pipeline Bundles have been installed in a variety of configurations for both greenfield and brownfield developments, and are a proven technology with over 84 Bundles installed by Subsea 7, with the vast majority coming from the existing site in Scotland.

The Proposal includes 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 Bundle tracks (Plate 2-1) 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.

The launch operations involve pulling the Bundle along the launchway by way of anchor handling tugs. Once the Bundle is off the launchway, it is towed to a designated Parking area, which has sufficient water depth to confirm the submerged weight of the Bundle. Once the final trim and configuration of the Bundle is confirmed, it is towed to the offshore installation site using Subsea 7′s Controlled Depth Tow Method (CDTM).

Scale: 1:400000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

Notes: Location of proposed Bundle Site.

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-1: Location of Proposal

W:\Subsea 7\GIS\Figures\PER Figures\Overview Figures.qgs 14/06/2019

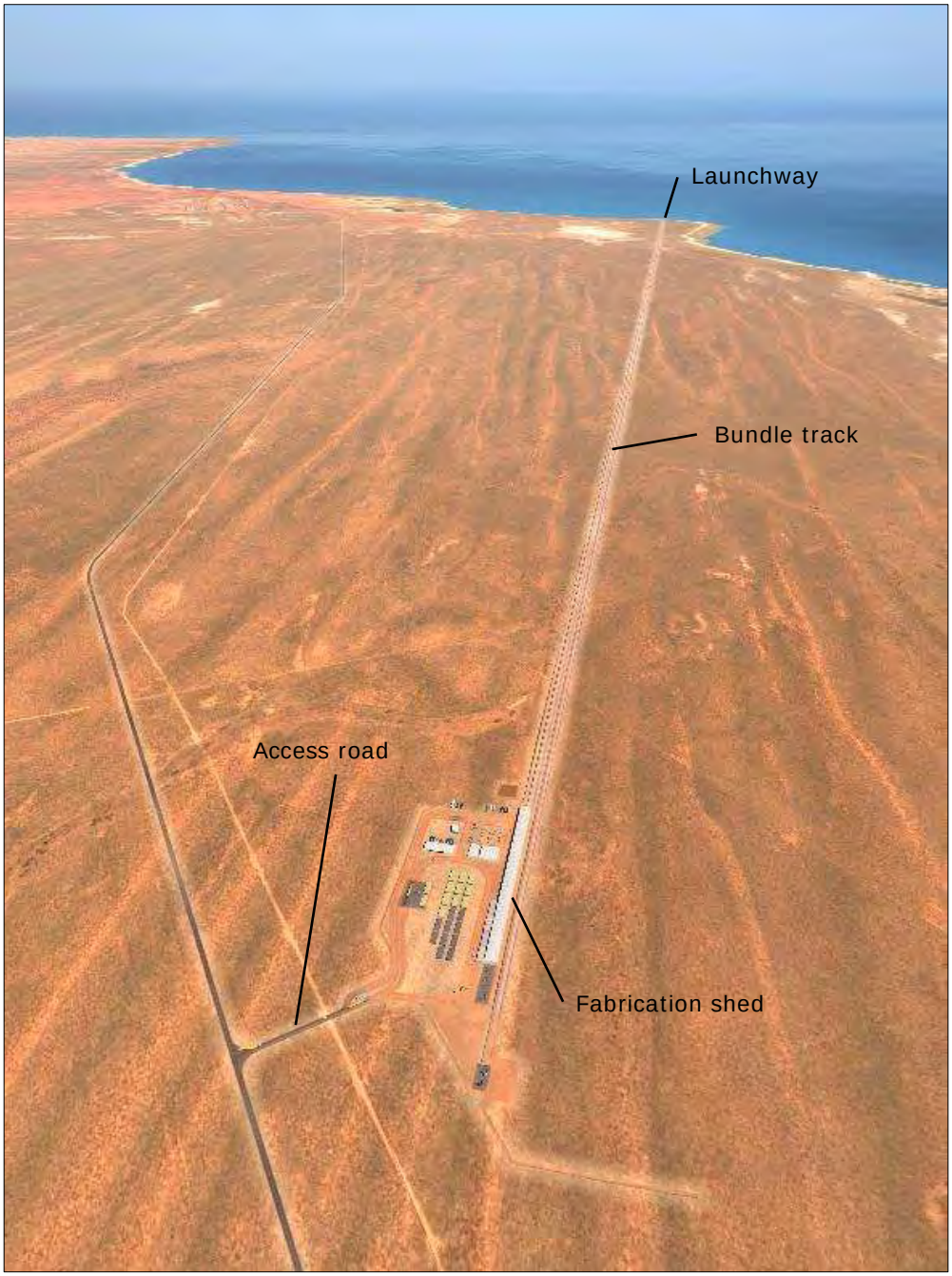


Plate 2-1: Conceptual Site Layout for the Proposal

2.2 EXISTING FACILITY IN SCOTLAND

Subsea 7 currently operates the only other existing Bundle site in Wick, Scotland (Figure 2-2). The site is located approximately six miles north of the town of Wick, Caithness, and extends from the shoreline at Sinclair's Bay landward in an east-west orientation.

2.2.1 Site History

The Wick Fabrication Site was established in 1978 and is situated to service offshore installations in the North Sea and the Norwegian Sea. The site consists of a 7.8 km Bundle track that covers an area of approximately 30 ha. This track consists of four separate railway tracks, with a combined length of 27,200 m, which is used for movement of pipes and pipeline Bundles. The site contains three fabrication sheds utilised for the welding, fabrication and testing of pipeline Bundles. The launchway used at the Wick site is 240 m long.

The longest pipeline towed from this site was 7.6 km and the heaviest structure/manifold assembly was approximately 550 tonnes. A total of 81 Bundles have been fabricated and launched at the Wick site between 1978 and 2018, with no significant environmental incidents in this time.

2.2.2 Environment Governance

Subsea 7's priority is to protect the Health, Safety and Security of everyone involved in or affected by their activities while minimising impact on the environment wherever it operates. Subsea 7's Health Safety Environment and Quality Policy Statement is provided in Attachment 5.

Subsea 7 is acutely aware of the responsibility that comes with proposing a development in Exmouth Gulf and is committed to ensuring no significant environmental impacts. The existing site in Wick is situated beside a European Site of Special Scientific Interest (SSSI), which has been established to conserve the wildlife and ecology of the area. Subsea 7 has ensured its activities do not impact the SSSI and regularly participates in activities to support this intiative (Attachment 4). This indicates Subsea 7's commitment to minimising impacts on the environment, and establishes a track record of having done so in sensitive areas.

Subsea 7 has been actively involved in environmental initiatives at the Wick site over a number of years (refer Attachment 4), including:

- Tern Relocation Program: Subsea 7 had a large involvement in the Tern Relocation Project at Wick.
- Dune Stabilisation: Subsea 7 worked collaboratively with universities and scientists, assisting in studies and projects regarding stabilisation of sand dunes.
- Beach Cleans: Personnel and equipment used at the Wick Fabrication Site regularly assist in beach clean ups along the Wick coast.
- Local Employment: At present, 95% of the workforce at the Wick site is locally based.
- Apprenticeship Program: Subsea 7 has developed a successful apprenticeship scheme at the Wick site to develop skills within the local community.

- Social Engagement: A performance recognition scheme has been in place at Wick for approximately 20 years, whereby contributions are made to charities and local organisations as a result of strong performance of the site.

2.2.3 Wick Stakeholder Feedback and Support

Subsea 7's Bundle site in Wick has become a valued and integral part of the Wick community, employment market, and economic landscape. As part of the stakeholder consultation effort for the Proposal, feedback has been sought from relevant local equivalents of the local shire / council, and various enterprise networks or development commissions in Wick, Scotland. The response that was received was overwhelmingly positive, reflecting the very positive contribution and benefit from Subsea 7's long-term presence in Wick.

In Attachment 4, three letters from Scotland are included to indicate the perception of Subsea 7 in the local community, including:

- The Highland Council.
- The Highland and Islands Enterprise.
- The Caithness Chamber of Commerce.

Common themes from the feedback include:

- Subsea 7's commitment to operating responsibility in an area of environmental significance (Wick being in a European SSSI).
- The drive to employ locally.
- The commitment to the provision of training and opportunities to youth and local community members.
- Subsea 7's engagement with the local supply chain.
- Subsea 7's willingness to continually engage with local stakeholders, including visitors and tourists, to ensure that they are considered in the operations at the site.
- The flow on benefits of Subsea 7's presence in Wick (such as the re-opening of the far north rail line, regeneration of Wick Harbour, local employment, and opportunities for other local businesses).

Scale: 1:120000
Aerial Photo: ESRI Satellite
Original Size: A4
GRID: OSGB36 / EPSG 27700

Notes: Exisitng Subsea 7 Bundle Fabrication Site.

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-2
Existing Bundle Site in Wick, Scotland

W:\Subsea 7\GIS\Figures\PER Figures\Overview Figures.qgs 10/12/2018

2.3 PROPOSAL DESCRIPTION

2.3.1 Key Characteristics

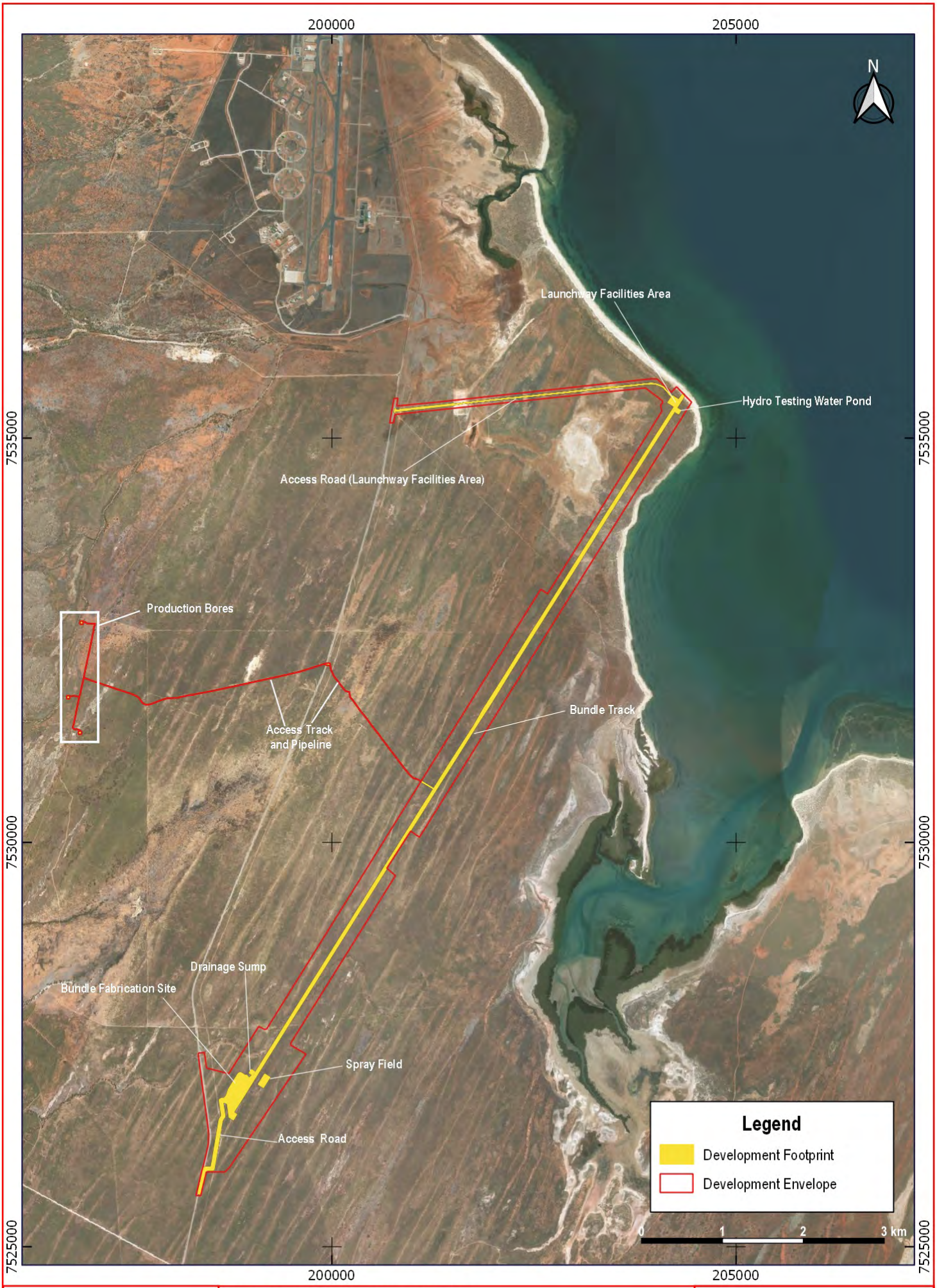
The Key Characteristics of the Proposal are provided in Table 2-1.

Summary of Proposal	
Proposal Title	Learmonth Pipeline Fabrication Facility
Proponent Name	Subsea 7 Australia Contracting (Subsea 7)
Short Description	The proposal is to construct and operate an onshore pipeline fabrication facility at Lots 233 and 1586 to the east of Minilya-Exmouth Road, Learmonth, approximately 35 km south of the Exmouth town site. The onshore pipeline bundle fabrication site and associated infrastructure includes two bundle tracks (approximately 10 km in length) along which the Bundles will be constructed and launched from a Bundle launchway that crosses the beach and extends into the subtidal zone at Heron Point in the Exmouth Gulf. Once launched the Bundles will be towed along a pre-determined route between two tugs at a controlled depth to the Bundle Parking area within which tow reconfiguration will occur before continuing offshore.

Physical Elements		
Element	Location	Proposed Extent
Bundle fabrication facility and associated infrastructure including: • Fabrication site (including site offices, staff facilities, lunch room, storage area and car park). • Two Bundle Tracks. • Launchway facilities area. • Access roads. • Spray field. • Drainage sump. • Hydro testing water pond. • Groundwater production bores and supply pipeline. • Miscellaneous (Drains, access tracks,	Within the onshore Development Envelope as shown in Figure 2-3	Clearing and disturbance of up to 176 ha of vegetation within a 452 ha Development Envelope

Physical Elements		
Element	Location	Proposed Extent
earthworks areas).		
Bundle Launchway	Within Exmouth Gulf as shown in Figure 2-4	Direct disturbance of up to 1 ha of seabed (measured from mean high water) within a 4,164 ha Offshore Operations Area (Off bottom tow)
Offshore Operations Area (Off bottom tow)	Within Exmouth Gulf as shown in Figure 2-4	Direct disturbance of up to 1,450 ha of seabed (per Bundle launch) within a 4,164 ha Offshore Operations Area (Off bottom tow)
Offshore Operations Area (Bundle Parking area)	Within Exmouth Gulf as shown in Figure 2-4	Direct disturbance of up to 368 ha of seabed within a 2,426 ha Offshore Operations Area (Parking area)
Offshore Operations Area (Surface tow)	Within Exmouth Gulf and Ningaloo Marine Park, Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place as shown in Figure 2-4	No ground or seabed disturbance to the extent of State Waters
Operational Elements		
Element	Location	Proposed Extent
Groundwater abstraction	Learmonth (onshore)	Abstraction of up to 12 ML/annum for potable and hydrotest water
Bundle launch and tow	Within Exmouth Gulf and Ningaloo Marine Park, Ningaloo Coast World Heritage Property/Ningaloo Coast World Heritage Place as shown in Figure 2-4	Maximum of three Bundle launches per annum.

Table 2-1: Proposal Key Characteristics



Scale: 1:60000
Original Size: A4
Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

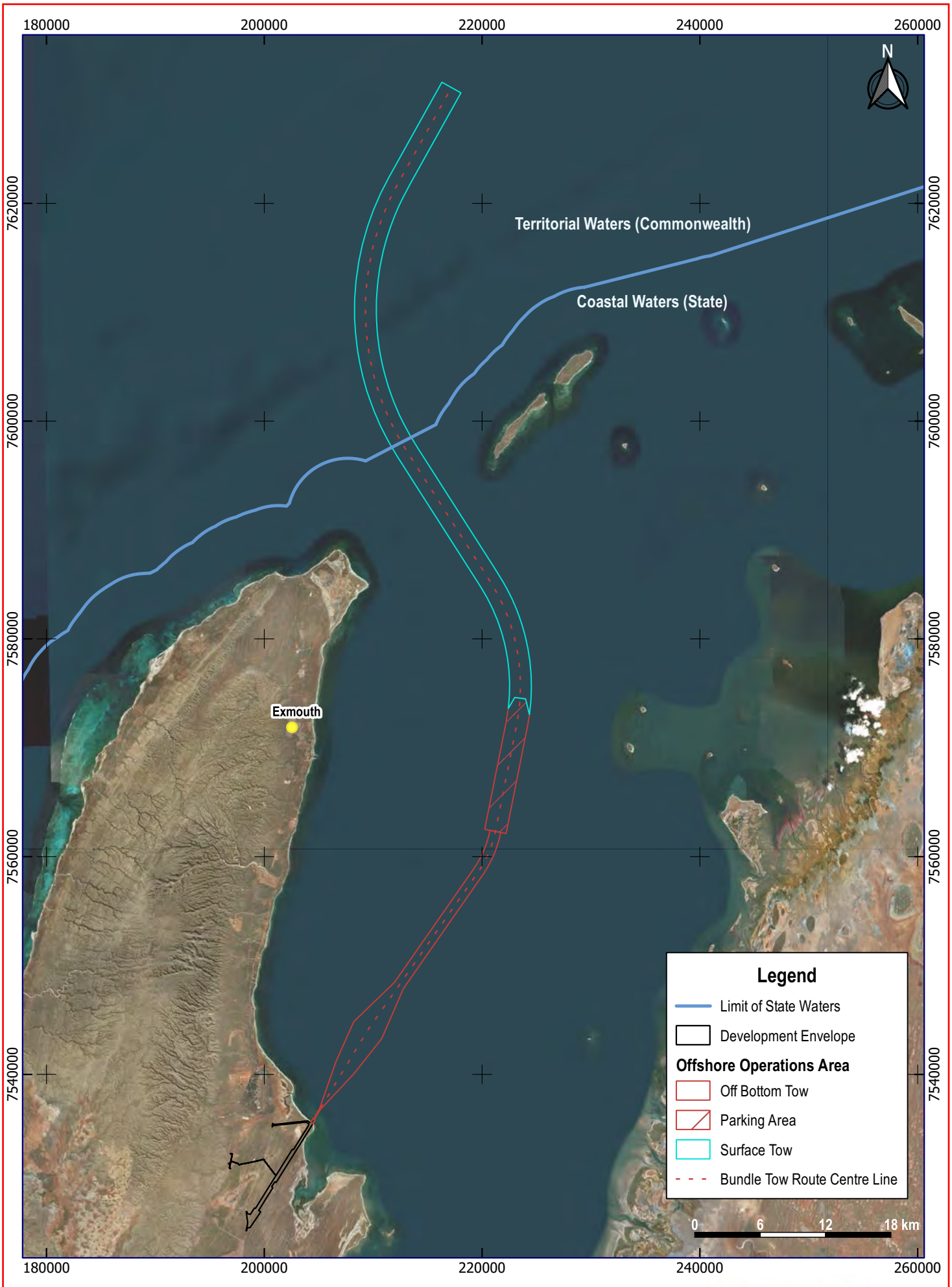
Notes: Data sourced from Subsea 7 (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-3: Development Envelope and Development Footprint

W:\Subsea 7\GIS\Infrastructure Map.qgs 14/06/2019



Scale: 1:450000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from Subsea 7 (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

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

W:\Subsea 7\GIS\Figures\PER Figures\Learmonth Pipeline Fabrication Facility.qgs 14/06/2019

2.3.2 Water Source

Subsea 7 completed a broad investigation into water supply options. From this investigation, groundwater bores were identified where the water is of sufficient quality that the initially proposed reverse osmosis (RO) water treatment plant is not required. This has a major positive impact (reduction) to the required water abstraction volumes due to the removal of any inefficiency associated with water treatment (can be 30-40%).

Groundwater abstraction of up to 12 ML/annum will occur, under a 5C licence under the *Rights in Water and Irrigation Act 1914*. Three groundwater production bores will be installed to provide the required potable water and hydro-test water (Figure 2-3). Investigation into current groundwater licences for the area indicated that only 2% of the total aquifer allocation is currently allocated.

A PVC pipeline of ≤ 150 mm diameter will be installed to transfer water from the three production bores to the main Development Envelope. The pipeline alignment will follow existing tracks, running south east, before running beneath Minilya-Exmouth Road and along another section of existing track into the Development Envelope (Figure 2-3). The pipeline will be installed either on the surface or sub-surface (up to approximately 0.3 m below the soil surface via trenching). The section running beneath the Minilya-Exmouth Road will be installed by directional drilling.

2.3.3 Wastewater Treatment and Discharge

All blackwater will be tankered to the Water Corporation's Exmouth Wastewater Treatment Plant (WWTP) for treatment. Grey water (from showers and wash basins) will be treated on site within a small WWTP. An estimated maximum grey water volume of 6,560 L/day (or 2,394 kL/year based on the site operating year-round) will require treatment prior to disposal via surface irrigation within the nominated sprayfield (Figure 2-3). Treatment of grey water will be provided by an advanced system (such as a Wise Water system) to ensure a high recovery of nutrients.

2.3.4 Lighting

The construction and operational phases of the Proposal require artificial light sources to enable tasks to be completed safely and efficiently during dark hours in accordance with occupational health and safety requirements.

It is intended that the fabrication facility will operate on a 12-hour day shift basis, with occasional 24-hour operations (during Bundle launch, or during occasional peak fabrication times where the delivery schedule requires it). Permanent (timed) lighting would be required for the following infrastructure:

- Gatehouse security.
- Car parks.
- Mechanical workshop area (sufficient for forklift use).
- General storage yard area.
- Pedestrian pathways.

2.3.5 Bundle Site Workforce

Based on two upcoming third party projects that could be executed with Subsea 7's Bundle technology, the following workforce would be required onsite:

- Up to 120 people required on site for the build phase of a Bundle (duration of 6 to 12 months for the build, test and then launch of a Bundle); and

- Over the total duration of the build, test and launch, the average number of personnel on site may be in the vicinity of 70-80 personnel.

The proposed Bundle site represents a sustainable and long-term employment opportunity for a locally based workforce. Subsea 7 notes that as each Bundle is uniquely designed to meet the specific client's requirements. Each build phase requires some differences in the number of personnel that are required, and the duration for which they are required. Being project-based work, the employment opportunities on the site ultimately depend on the uptake of the concept by operators and clients.

When there are no live projects at the Bundle site, the site would be run in a care and maintenance mode, with a small workforce on site maintaining the readiness of the site to be able to ramp up when a new project be awarded.

2.3.6 Bundles

2.3.6.1 Bundle Construction

A Bundle pipeline contains multiple pipes within a single carrier pipe (Plate 2-2). The inner pipes (flowlines) and cables will be installed for specific purposes such as hydrocarbon transfer, water, electrical or hydraulic control systems, telecommunications, or service chemicals.

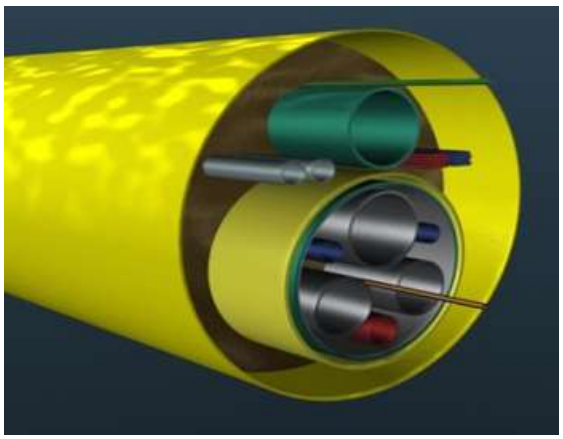


Plate 2-2: Pipeline Bundle Cross-section

The outer structural pipe (carrier pipe) can range from 60 cm to 152 cm in diameter, and each end is terminated by an end structure (towhead). These towhead structures incorporate many functions from simple valve arrangements to complex processing and control systems.

Bundles can integrate up to nine (9) fluid lines, with fluid line diameters ranging from 5 cm to 80 cm depending on the application. The lines are typically installed empty, with some small bore fluid lines installed with corrosion inhibitor or treated seawater. A large variety of material can be used for fluid lines in Bundle systems, including carbon steel, corrosion resistant alloys (e.g. Duplex, SuperDuplex, Stainless Steel), metallurgically bonded clad pipe, mechanically lined pipe, or internally plastic lined pipe.

A Bundle pipeline would be progressively manufactured until completed as one, up to 10 km long, segment and moved out from the manufacturing facility along the track towards the launch area.

For those pipes that will need to contain fluids, hydrostatic pressure testing (hydrotesting) is required to ensure pipe integrity. Hydrotesting is conducted using onsite water (sourced from groundwater). Pipeline testing will be completed as per industry standards for the type of service line, with test durations up to 24 hours. On completion of the hydrotest, the lines will be depressurised at a pre-determined rate.

The Bundle pipeline is then towed out by boat and submerged. Once at its designated location, the Bundle is installed on the sea floor to connect with other pipe segments or infrastructure. Each pipe segment would contribute to an integrated pipeline network laid on the sea floor for various uses and functions for the oil and gas industry.

While the manufacturing of Bundles is based on customer demand, it is estimated that two launches could occur, on average, per annum. In the event that several smaller Bundles are built in quick succession, there is potential for a maximum of three Bundle launches in a 12 month period.

2.3.6.2 Bundle Chemicals

There will be no antifoulants within the paint used on the Bundles, which is an epoxy product. The chemicals contained within epoxy are all tightly bound within the dry and hardened product such that loss into the surrounding seawater is negligible.

For small diameter flowlines within the Bundle, fluids will be present in the lines during Bundle tow and installation. All flowlines, and the surrounding carrier pipe, are sealed prior to Bundle launch.

Selection of Bundle transport and installation contents is performed in consultation with the field operator and the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) to confirm compatibility with existing infrastructure, and ensure environmental impacts and risks associated with any chemicals are managed to a level that is acceptable and ALARP. The field operator is required to submit a field development Environment Plan for approval as part of Environment Regulations administered by NOPSEMA.

The indicative Bundle pipe contents during tow and installation operations are summarised in Table 2-2.

NOPSEMA recognises several international management systems have been established to assess the environmental performance of chemical products to inform the chemical selection process (NOPSEMA 2018). The Offshore Chemical Notification Scheme (OCNS), managed by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) in the United Kingdom, is one of the predominant management systems. The OCNS provides a framework and updated register which ranks the environmental performance of chemicals used in offshore petroleum activities.

Line Function	Pipe Contents	Approximate Volume[3]	Purpose
Carrier Pipe	Inert Gas & Seawater Treatment	6,400 m^3	Inert gas reduces the submerged weight of the Bundle during transport and installation. This is typically nitrogen gas at 50 bar internal pressure. Installed as solids within a dissolvable package, seawater treatment chemicals prevent corrosion or biological growth inside the pipe[4]. Typical seawater treatment chemicals include; • Hydrosure O-3670R at 500 ppm concentration • Roemex RX-5254
Production	Inert Gas	2,500 m^3	Inert gas reduces the submerged weight of the Bundle during transport and installation. This is typically nitrogen gas at various internal pressures.
Utility	Hydrate Inhibitor	300 m^3	Hydrate inhibitors are used to prevent formation of hydrates in the pipe during production. Typical hydrate inhibitors include: • Mono Ethylene Glycol (MEG) • Methanol
Control	Hydraulic Control Fluid	10 m^3	Hydraulic control fluid is used to apply hydraulic pressure to hydraulic control systems. Typical hydraulic control fluids include; • Oceanic HW443 • Transaqua HT2

Table 2-2: Indicative Bundle Chemicals

[3] Volume is based on a Bundle length of 10 km.
[4] These chemicals take effect after the carrier pipe is flooded with seawater, after Bundle installation.

Chemicals are ranked by the Chemical Hazard Assessment and Risk Management (CHARM) mathematical model to produce a Hazard Quotient (HQ), which uses toxicity, biodegradation, and bioaccumulation data provided by suppliers. The chemicals are assigned a colour banding, as illustrated in Figure 2-5.

Minimum HQ value	Maximum HQ value	Colour banding
>0	<1	Gold
≥1	<30	Silver
≥30	<100	White
≥100	<300	Blue
≥300	<1000	Orange
≥1000		Purple

Lowest hazard

Highest hazard

Figure 2-5: CHARM Hazard Quotient Ranking (source CEFAS 2018)

Products not amenable to the CHARM model (i.e. inorganic substances, hydraulic fluids etc.) are not assigned a colour banding, but assigned a OCNS grouping, A–E based on the persistence, bioaccumulation, and toxicity (PBT) test data, refer to Figure 2-6. Group A products are considered to have the greatest hazard potential and Group E the least.

Initial grouping	A	B	C	D	E
Result for aquatic-toxicity data (ppm)	<1	>1-10	>10-100	>100-1,000	>1,000
Result for sediment-toxicity data (ppm)	<10	>10-100	>100-1,000	>1,000-10,000	>10,000

Figure 2-6: OCNS Initial Grouping for Non-CHARM Chemicals (source CEFAS 2018)

For the typical Bundle chemicals listed in Table 2-2, the published OCNS groupings are shown in Table 2-3. The low hazard rankings of these chemicals are defined by applying the CHARM/Non-CHARM assessment criteria to the chemical toxicity, biodegradation and bioaccumulation test data.

Chemical	Use	Colour Banding	OCNS Group
Hydrosure O-3670R at 500 ppm	Combined Biocide, Oxygen Scavenger, Corrosion Inhibitor	GOLD	
Roemex RX-5254	Combined Biocide, Oxygen Scavenger, Corrosion Inhibitor	GOLD	
MEG	Hydrate inhibitor		E
Methanol	Hydrate inhibitor		E
HW443	Hydraulic control fluid		D
Transaqua HT2	Hydraulic control fluid		D

Table 2-3: ONCS Rankings of Bundle Chemicals

To control chemicals selected for use within the Bundle during tow and installation operations, Subsea 7 has deemed that chemicals that have an OCNS Hazard Quotient corresponding to ratings of Gold, Silver, E or D on the OCNS Ranked List of Notified Chemicals, and have no substitution or product warning, do not require further assessment, as they do not represent a significant risk to the environment. This is in line with the chemical selection standards of most offshore field operators. Should a field operator have a more stringent chemical selection process, this will take precedence.

Chemicals not meeting the criteria above (i.e. OCNS Hazard Quotient white, blue, orange, purple, A, B, C or have product/substitution warning), or those that are not on the OCNS Ranked List of Notified Chemicals, will require further assessment to understand the potential environmental impacts of a leak or spill into the marine environment. This assessment will be documented and will include:

- Assessment of the toxicity and biodegradation of the chemical in the marine environment and any other environmental issues or potential risks.
- Investigation of potential alternatives for the chemical, with preference for options that are on the OCNS Ranked List of Notified Chemicals with OCNS Hazard Quotient of Gold, Silver, or are Group E or D with no substitution or product warning.
- Justification of the selected chemical.
- Further risk reduction measures (i.e. specific controls on the use of the chemical).
- Determination of whether the environmental risk is ALARP.

2.3.7 Bundle Launch

A Bundle launchway, crossing the beach and extending 380 m (measured from the dune line) into the nearshore subtidal area, will facilitate the launch of each Bundle.

To launch a Bundle, the towhead on the offshore end of the Bundle is connected to a tug (the 'Leading Tug') via a long towline. The tug then slowly (≤ 2 knots) heads offshore, pulling the Bundle along the track and into the ocean (Plate 2-3). The onshore end of the Bundle is connected to another line which is slowly unwound from an onshore winch, until the Bundle reaches sufficient water depth for connection to another tug (the 'Trailing Tug').

Plate 2-3: Bundle Launch (Wick, Scotland)

The Bundle rolls 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.

Ballast chains are attached at intervals along the length of the Bundle to provide stability control during the launch and lift during the offshore Controlled Depth Tow Method (CDTM) tow out to the production field. Each Bundle is custom designed and built, so chain dimensions may vary. Typically, the ballast chains that hang beneath the Bundle vary between short and long lengths, alternating in a short-long-short-long configuration. The typical chain size used is 76 mm diameter chain. Short lengths are typically 10-12 links (3-4 m) and long chain lengths are typically 18-20 links (5-6 m). The long chain lengths are typically spaced at 20 m intervals along the Bundle. The longer Bundle chain lengths will have some contact (4-5 links touching the seabed) along the length of the tow route out to the Bundle Parking area (approximately 30 km).

2.3.8 Bundle Tow

2.3.8.1 Tow Fleet

A key advantage of the Bundle technology is that smaller domestic support vessels can be used in-lieu of large international pipelay and construction vessels. A typical vessel fleet for a Bundle tow would consist of the following vessels:

- 1 x Command Vessel.
- 2 x Lead Tugs (Anchor Handling Tugs).
- 1 x Trail Tug.

- 1 x Work Vessel.
- 1 x Project Support Boat.
- 2 x Guard Vessels.

2.3.8.2 Off Bottom Tow

Following launch, the Bundle will be towed slowly (nominally at 2-3 knots, up to a maximum of 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 (Plate 2-4).

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

2.3.8.3 Surface Tow

On exit from the Bundle Parking area the tow vessels will increase the tow speed to 5-6 knots (up to a possible maximum of 8 knots[5]). 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 maximum clearance from the seabed within Ningaloo Marine Park (Plate 2-5). The trailing tug provides back-tension during tow, as required.

2.3.8.4 Controlled Depth Tow Method

Once the Bundle and tow fleet exit the Exmouth Gulf and enter deeper waters, the Bundle tow speed will be reduced slightly (to 3-4 knots), and the tension from the trailing tug reduced, to allow the Bundle to be lowered to sit at mid-depth in the water column. The actual depth varies pending the Bundle tow characteristics, and the environmental conditions at the time, but is typically in the region of 50 m water depth. Once this depth is reached, and the Bundle is stable, the tow has entered 'Controlled Depth Tow Method' (CDTM) which will continue until the Bundle reaches the installation location.

The CDTM was developed by Subsea 7 and involves transportation of a pipeline Bundle configuration suspended between two tow vessels (Plate 2-6).

On arrival at the installation location the Bundle is manoeuvred into location, lowered to the seabed, and the carrier pipe flooded with seawater in its final position.

[5] Speed through water.

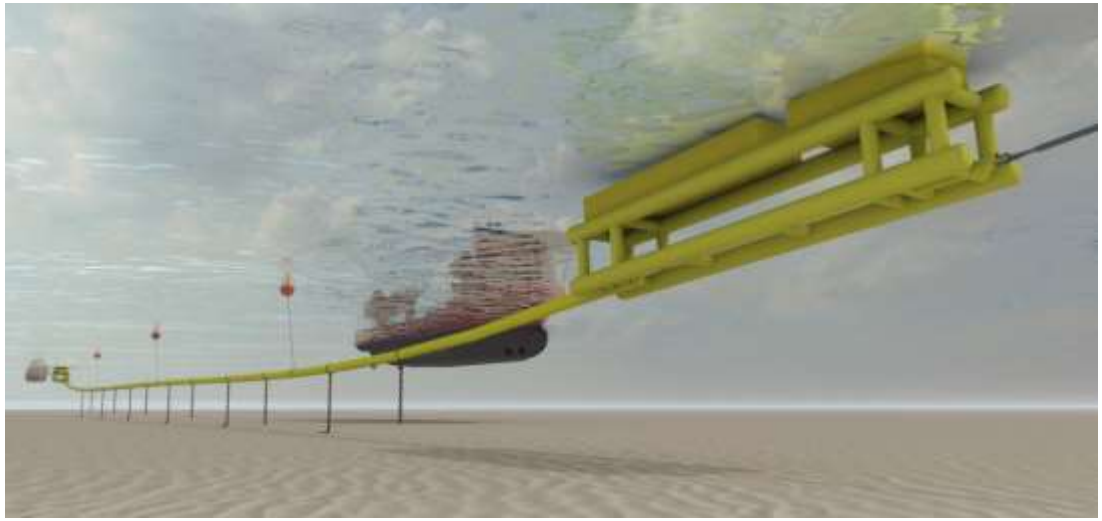


Plate 2-4: Bundle Tow Arrangement – Off Bottom Tow

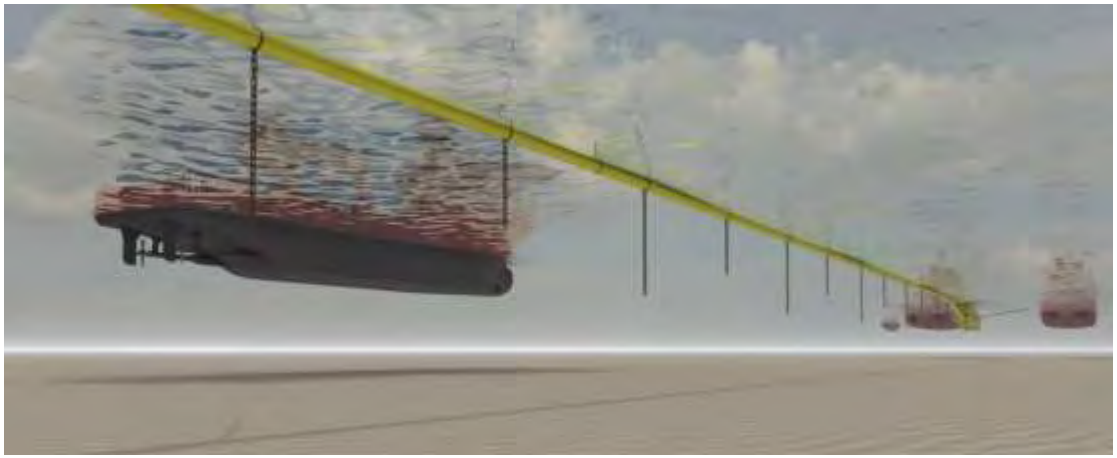


Plate 2-5: Bundle Tow Arrangement – Surface Tow

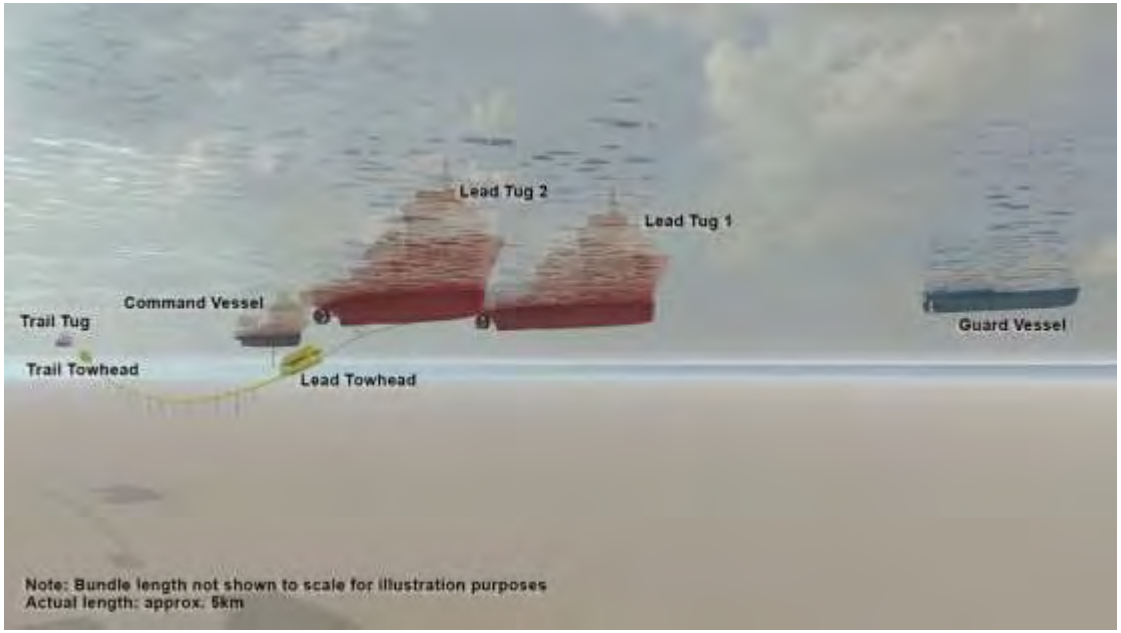


Plate 2-6: Bundle Tow Arrangement – CDTM

2.3.9 Care and Maintenance, Decommissioning, and Closure

During periods between Bundle projects a reduced onsite workforce would be retained to maintain the site in preparation for the next project and undertake required monitoring and reporting. This workforce is likely to include:

- Fabrication Manager.
- Mechanics.
- Electrician.
- Handyman.
- Administration Officer.
- Cleaner.
- Site Workers.
- Stores and Logistics Personnel.
- Water Cart Operator.

Activities to be completed during decommissioning and closure at the end of the life of the site are outlined in the Decommissioning and Closure Plan (Attachment 3).

2.4 JUSTIFICATION

The Learmonth Pipeline Fabrication Facility is proposed as a means to meet the market's needs for pipeline fabrication for the offshore oil and gas industry, but with an innovative approach that provides an overall environmental, technical, economic and local benefit in comparison to the existing pipeline delivery methods. The sections below provide further information regarding:

- The need and justification for the Proposal.
- Alternative technologies to the Proposal.
- Site selection.
- Proposal optimisation to minimise environmental impacts.

2.4.1 Value Proposition

Prior to discussing the detailed justifications for the Proposal, the overall value proposition for pipeline Bundle technology, in comparison to conventional pipeline fabrication and installation solutions, is presented in Table 2-4.

Method	Enviro. Impact	Cost	Execution Risk	Technical / Innovation	Local Content	Regional Benefit
Offshore Construction	Higher	$$$	!!!	✓✓	✓	✓
Bundles	Lower	$$	!	✓✓✓	✓✓✓	✓✓✓

Table 2-4: Value Proposition for Bundle Technology in Comparison to Conventional Pipeline Installation

Pipeline Bundles represent an alternative to conventional pipeline fabrication and installation methodologies that have been utilised extensively in Australia's offshore oil and gas industry. This alternative cannot replace conventional solutions entirely, however, for a

significant proportion of the future demand for offshore pipelines in the North West Shelf, Bundle technology represents an opportunity to realise:

- A net overall reduction in environmental impact.
- A reduction in the development cost.
- A reduction in the execution risk.
- Increased opportunities to implement technology improvements.
- Significantly increased local content and local industry participation.
- Benefits to regional WA.

2.4.2 Environmental Impact

This ERD provides an in-depth assessment specifically of the environmental impact of the Proposal. What is also relevant to consider is the potential change in environmental impact associated with the adoption of Bundle technology. Offshore pipelines have been extensively installed in Australia to support oil and gas production. Conventionally, these pipelines are installed with the use of offshore pipelay vessels that effectively fabricate the pipeline on board the vessel, and progressively lower the pipeline to the seabed. Comparing the impacts to the environment from these methods to those from Bundle technology reveals that conventional methods:

- Require a significantly greater deployment of large installation vessels. These vessels are rarely resident in Australia, and require mobilisation from other oil and gas centres around the world, which involves extensive inter-continental transits.
- Require the support of multiple support vessels throughout the installation campaign. Typically, a pipelay asset may be supported by at least one bulk carrier vessel, in addition to multiple pipe support vessels (PSVs) to ferry pipe joints between the bulk carrier and the offshore installation.
- Require significantly greater time on the water for the installation operations, as the pipeline is welded onboard the vessel.
- Require a significantly greater seabed footprint for the numerous pipelines that are required for a development.
- Present a greater environmental risk during commissioning operations as the pipelines can only be tested after installation (in water) where the environment cannot be controlled.
- Provide limited capability to re-use a facility and therefore limit cumulative impacts associated with development. Pipeline Bundles allow for the re-use of one facility to fabricate and deliver pipelines to any location on the North West Shelf.

These benefits to Bundle technology result in net improvements (reductions) in impacts to, for example:

- Benthic communities and habitat.
- Marine environmental quality.
- Marine fauna.
- Air quality.

2.4.3 Development Cost, Schedule Flexibility and Execution Risk

The use of Bundles offers a significantly greater schedule flexibility compared with conventional pipelay, as the bulk of the work is transferred to a controlled onshore environment and can be performed in advance of the offshore operations. The required in-field duration is reduced, meaning the Bundle installation can more flexibly work around drilling or other simultaneous operations. The result is a considerable reduction of risk, and the ability to predict with a greater degree of accuracy the execution of the work. This results in a higher predictability for the project, a lower risk profile, and often a lower cost base.

Bundles are able to be deployed in weather that exceeds the limiting sea states for conventional pipelay operations. Further, as production manifolds and riser bases are integrated into the Bundle system, there are significantly less installation activities.

Bundles also represent potential development cost benefits associated with pipeline installation as:

- Bundle technology removes the requirement for the mobilisation of expensive pipelaying assets from other regions of the world, and instead allows the use of more cost effective local assets. Pipeline tie-backs are characterised by relatively short pipelines. This is one reason why Bundles are particularly suitable for pipeline tie-backs.
- Technical and engineering benefits of Bundles often translate to a more cost effective approach.
- The reduced duration of offshore operations results in a reduction in logistics costs associated with supporting an extensive offshore operation (supply vessels, food and waste management, material logistics).
- The unit cost of labour for offshore operations is higher than the same labour utilised for onshore operations. Moving work onshore therefore reduces the costs.
- Bundle solutions also represent the potential for reduced social and environmental impacts associated with offshore developments. For example, removing the need to mobilise personnel for extended periods of time offshore has an associated social benefit. An associated reduction in the fuel consumption of multiple offshore vessels is also realised.

2.4.4 Innovation

Bundle technology represents significant innovation compared to standard offshore field development technology, with numerous safety, performance, cost, and environmental benefits.

Bundle technology aligns with the Government of Western Australia's announcement to establish an LNG Jobs Taskforce (in March 2018). The taskforce will focus on harnessing the job opportunities the LNG industry can provide to the WA community, including new technology, education and maintenance services. Bundle technology specifically meets the target of utilising innovative technology to generate job opportunities within the LNG industry. The technical benefits of Bundles (Section 2.4.4.2) and the innovation projects that utilise Bundle technology are particularly beneficial for gas production, delivering a true fit with the aim of the LNG taskforce.

2.4.4.1 Pipeline Bundle Technology

Fluid lines within a pipeline Bundle are often developed with thermal insulation installed. For high performance thermal insulation, fluid lines can also be developed as dry pipe-in-pipe systems, or active heating systems such as hot water or electrical heat traced flowlines (EHTF).

Control systems are regularly incorporated within pipeline Bundles, therefore removing the requirement for separate umbilical lay and burial operations. Hydraulic control tubes, electrical cables, and optical fibre cables are clamped to the fluid lines and protected by the carrier pipe. The inclusion of the complete control system allows the system to be fully tested onshore prior to installation.

The Bundle end structure, or towhead, can consist of either very simple pull-heads with isolation valves installed, to complex manifold structures. The towheads are designed specifically for each field development incorporating a number of features, which include High-Integrity Pressure Protection Systems (HIPPS), multi-slot tie-ins, riser bases, and removable modules. Typically, the leading towhead (constructed on the seaward end of the Bundle) is larger than the trailing towhead (Subsea 7 2014).

2.4.4.2 Advantages of Bundle Technology

The technical advantages of Bundle technology are as follows:

- Pipe Integrity.

  The Bundle carrier pipe sustains the majority of the installation and operational loads, reducing the risk of damage to the flowlines that would transfer the production fluid. The axial stress, bending moments and fatigue loads experienced during installation are sustained by the carrier pipe, which also prevents buckling during operations. Bundles have reduced expansion loads as thermal expansion is permitted along the full length of the bundle. The towheads are capable of moving in a longitudinal direction; as a result, buckle initiation is not required for the flowlines. This allows for a simplified connecting spool design, which benefits the spool fabrication, transportation and installation scopes.

  The onshore fabrication aspects of the Bundle system are a significant improvement to the use of conventional pipelay vessels. By providing a controlled environment for welding and non-destructive testing activities, higher quality control and production efficiencies improve the overall end product.

- On-Bottom Stability.

  Once the carrier pipe is flooded after installation, the carrier pipe and installation aids provide the necessary on-bottom stability to ensure the pipeline remains within the design corridor for the life of the installation. This removes the need for extensive trenching or rock-dumping activities that can increase the environmental impacts, or concrete mattress/culvert installation that increases the amount of subsea infrastructure.

- Protection.

  The carrier pipe provides physical protection from dropped objects (as per industry standards) as well as fishing gear protection. This also works to remove additional trenching, concrete mattress or culvert installation that is typically utilised to provide this protection.

- Thermal Performance.

  Due to the nature of most Australian offshore field developments, thermal performance is a key design factor in pipeline design, to ensure flow assurance requirements can be maintained, and the fields can be operated safely. A Bundle can be constructed with low cost dry insulation materials or pipe-in-pipe designs, for passive thermal insulation of flowlines. Active heating systems can also be developed within the Bundle that include systems such as hot water or electrical heat traced flowlines (EHTF). Thermal performance reduces the required pipeline diameters and field service lines in order to develop high temperature and high-pressure fields without risk of hydrate development and other production irregularities.

- System Testing & Commissioning.

  Unlike offshore pipelay installations, a Bundle is tested and the integrity is verified onshore, in advance of any offshore operations. This removes the need to test the pipeline offshore, where the operation is more challenging, and typically requires venting the test fluid to the marine environment. The test medium (groundwater) used for Bundle hydrotesting will be recycled where possible and used for subsequent hydrotests.

2.4.4.3 Developments in Bundle Technology

Bundles are the optimal platform for developing and introducing new technologies into the subsea industry. Numerous technology firsts have been achieved in Bundles leading to significant cost savings and reduction in environmental risk. Examples of new technologies that were developed using Bundles as a platform are outlined below.

Bubi® mechanically lined pipe was first introduced to the Subsea industry on the BP Cyrus field in 1995 within a pipeline Bundle. Following this introduction the technology is now widespread in the industry and is used extensively in individual pipelay and riser projects. The corrosion resistant liner material reduces the corrosion risk, and therefore environmental risk, and ultimately provides cost savings to projects.

Swagelining polymer lining technology was first used in the BP Machar bundle project in 2008. This technology provides an HDPE liner inside water injection pipelines that historically corrode quickly. The polymer liner prevents corrosion and reduces overall cost, whilst increasing integrity. The technology is now commonplace and polymer lined water injection pipelines are now the base case technical solution in most field developments. Directly related to the polymer lined pipe is a new joining system Linerbridge® that will have its first subsea use in a Bundle system in 2019. Following successful implementation within the Bundle, Linerbridge® will expand the installation methods that can be used for polymer-lined pipe, particularly by reducing cost and enabling installation by S-Lay.

Pipeline Bundles are a fantastic platform for first use of technology due to the ability to fully commission and strength test the system onshore. Future developments that will be introduced over the coming years are:

- Expanded use of composites.

  Still largely new to the subsea industry, composites are a focus area, with a number of key components presently being tested (including long-term submersed ageing trials). Ultimately, this will reduce the weight of the subsea system, reduce cost and reduce the overall quantity of materials used on projects, therefore enhancing sustainability and opening up the opportunities for re-use of systems. The development and acceptance of composites in the industry is key as weight drives

savings in all areas from reduced buoyancy requirements to smaller vessels with smaller cranes that have a lower environmental footprint.

- Fibre optic condition monitoring systems.

  Utilising the Bundle platform for development, fibre optic condition monitoring systems enable accurate measurement of installation stresses and operating conditions. The technology enables the reduction of risk through live condition monitoring and actual installation stress measurement that could allow increased installation weather windows, or extensions to service life. Ultimately this could lead to a reduction in design conservatism and therefore a reduction in material use and project cost.

Pipeline Bundles continue to enable new technologies to be implemented and trialled in a reduced risk environment. The inner flowlines within the cross section are protected during the installation operation and are not subjected to high installation services or plastic bending that occur with conventional installation techniques.

Overall, Bundle technology represents a significant opportunity for local industry and engineering in Western Australia to be positioned at the forefront of innovative subsea technology development, and provides a means for innovation to drive long-term sustainable opportunities.

2.4.5 Local Industry Content and Employment

In April 2001, Commonwealth, State and Territory Ministers signed an Australian Industry Participation Framework that is aimed at maximising and encouraging local industry participation in major Australian projects. A Bundle site in Australia would represent a step change in local industry participation for the offshore oil and gas industry, and is completely aligned with the intent of the framework.

At present, the greater majority of offshore pipelines are installed by highly specialised, temporarily mobilised, construction vessels. Very little of the installed infrastructure is built locally. A Bundle site would transfer much of the work that is performed to a local footprint, achieving a significant change in the local contribution to these projects.

Subsea 7 has a large number of new technologies currently under development that are based on Bundle solutions. Having a site based in Australia enables these technologies to be deployed here, assisting to future proof the industry and extend Australia's technology capability.

Subsea 7's goal is to establish a local workforce to work on the Bundle site. This is what Subsea 7 has achieved at its Wick site in Scotland, and the commitment is to repeat this concept in Western Australia. At present in Wick, approximately 95% of the workforce is locally based. Where it is not possible to obtain local employees for particular roles, the workforce may be sourced from elsewhere. Over time, as the necessary skill set is developed, it is envisaged that the large majority of roles will be performed by local employees.

To give an indication of the workforce for a Proposal, Subsea 7 has modelled the workforce requirements for two potential projects for the Learmonth site. The results of this modelling indicated that:

- Up to 120 people may be required on site for the build phase of a Bundle.
- The total duration required for the build, test and then launch for a Bundle may be between 8 to 12 months.

- The average number of personnel on site may be in the vicinity of 70-80.
- A number of roles are required for the operation of a Bundle site including:
    - Pipe welders.
    - Trades apprentices.
    - Equipment operators (e.g. forklifts, cranes, trucks).
    - Riggers.
    - Mechanics.
    - Electricians.
    - Site supervision and foremen.
    - Site management, engineering, administration, cleaning, and support staff, etc.

This list of roles is not exhaustive, and there is a very wide range of roles required during the Bundle build and launch operations.

2.4.6 Regional Economic Benefits

The Bundle site provides an opportunity for many local businesses to work directly with Subsea 7. Many indirect benefits would also flow on to the community.

An Economic Impact Assessment produced for the Project estimates that the Project will directly contribute $162.6 million to State income over the study period, averaging $4.5 million per annum, under a baseline level of activity at the site. This level of activity is in turn expected to generate a further $453 million indirectly to WA income (an average of $12.6 million per annum), resulting in a total contribution of $615.6 million over the project period at an average of $17.1 million per annum. Over half ($9.3 million per annum) is estimated to flow through to the Gascoyne Region (ACIL Allen 2018).

2.4.7 Regional Community Benefits

Subsea 7's aim is to become a contributing member of the Exmouth community. This has been achieved in Wick, and the same level of commitment to achieving this goal is proposed for Exmouth. As an example, a performance recognition scheme has been in place at Wick for 20 years, whereby donations are made to charities and local organisations as a result of strong performance of the Bundle site. To date, £220,000 (GBP) has been donated in total.

This development is not aimed at a single project but rather an ongoing operation that is able to meet the needs of the market in the long-term. The site in Wick, Scotland, is entering its 41st year of operation, with multiple generations of local families now having both direct and indirect involvement in the site. If successful, the Learmonth facility would represent one of the largest employers of local labour in Exmouth, with the prospect to offer sustainable opportunities to regional businesses and community members.

2.4.8 Alternatives Considered and Optimisation

2.4.8.1 No Development Case

Bundle technology represents an alternative to the conventional development of an offshore gas field. To quantify the benefits of the use of Bundle technology, Subsea 7 completed an assessment of the offshore operations associated the most recent conventional project delivered by Subsea 7 from Exmouth Gulf, and then modelled the offshore operations that would have occurred had the project used Bundle technology.

The chosen project, the development of the Van Gogh field, was located in the Exmouth sub-basin, approximately 50 km north of Exmouth, with field infrastructure consisting of subsea wells, flowlines, umbilicals, structures, risers and moorings, all connecting into the Floating Production Storage and Offloading (FPSO) vessel the 'Ningaloo Vision'. The project consisted of seven production, gas injection, and water injection flexible flowlines, connecting production manifolds to riser pipeline bases beneath the FPSO. Had this project been completed using Bundle technology, two Bundles would have been needed to replace the seven flowlines and associated manifolds.

The primary construction vessel for the project was the 132 m 'Toisa Proteus'. All subsea infrastructure was deployed from this vessel over an 8 month period. Due to the lack of large port infrastructure in Exmouth, the subsea products were stored on heavy lift cargo vessels (the largest being 153 m in length) that were anchored in Exmouth Gulf for the duration of the project. Other vessels included tugs, cargo barges, and light supply vessels.

The results of the assessment and modelling are presented in Table 2-5. The duration and magnitude of offshore and inshore (Exmouth Gulf) vessel operations are significantly reduced for the Bundle project compared to the conventional project.

Vessel Type	Operation Requirement (days)	
	Conventional Project	Bundle Project (2 Bundles)
Exmouth Gulf		
Toisa Proteus	15.6	3.9
Heavy Lift Vessel1	68.0	0
Heavy Lift Vessel2	7.3	0
Bundle Lead Tug	0	3.9
Bundle Trail Tug	0	3.9
Work Vessel	0	6.7
Personnel Transfer	0	6.7
Guard Vessel	0	4.0
Total	90.9	28.9
Offshore		
Toisa Proteus	50.1	9.6
HLV1	0	0
HLV2	0	0
Bundle Lead Tug	0	5.3
Bundle Trail Tug	0	4.5
Work Vessel	0	0
Personnel Transfer	0	0
Guard Vessel	0	3.6
Total	50.1	23.0

Table 2-5: Vessel Operations Associated with a Conventional versus Bundle Technology Delivery of the Van Gogh Project

For the primary construction vessel the 'Toisa Proteus', offshore time is reduced by 81%, and time in the Exmouth Gulf by 75%. Also, as there is no requirement for the heavy lift cargo vessels during manifold and flowline installation, 83 days of heavy vessel time in the Exmouth Gulf is avoided with a Bundle solution.

This case study demonstrates that offshore vessel operations associated with offshore gas field development can be considerably reduced by the use of Bundle technology. Other advantages to a Bundle project, in addition to the reduced vessel operations, include a greater ability for local and domestic vessel operators to be involved as smaller and more widespread vessels can be used, and a reduction in fuel consumption and greenhouse gas emissions. The continued adoption of the 'no development' case is to forgo the efficiency gains and commensurate reductions in environmental risk offered by Bundle technology.

2.4.8.2 Site Selection

Numerous alternative sites were assessed for suitability as a Bundle construction and launch site, with the environmental, planning, social and engineering constraints considered.

The project requires a 10 km long Bundle track, with adjacent medium gradient shore crossing. The site profile needs to be gentle enough to ensure uniform load distribution from the ground to the Bundle via Bundle support systems during assembly, testing and launch.

This is not the first time that Australia would have used Bundle technology, with previous Bundle fabrication and deployments occurring from two temporary facilities:

- Gnoorea Point, approximately 60 km from Karratha (Western Australia), was previously used as a temporary facility to build and deploy Bundles for two projects during the 1990s.
- McGauran's Beach, approximately 21 km from Woodside (Victoria) and within the McLoughlin's Beach – Seaspray Coastal Reserve, was previously used for a single Bundle deployment in 1996.

Bundle technology and design has developed and progressed significantly since this time, and these improvements have changed the site requirements to support the technology.

Subsea 7 undertook an initial screening to identify potential sites within the North West region of Western Australia that may be suitable for a fabrication facility. This initial screening was based on three elements (Attachment 2A):

- Maximum towing distance of a Bundle.
- Open water tow operations.
- Proximity to existing towns and infrastructure.

Ten potential sites for the proposed Bundle fabrication facility were identified (Figure 2-7):

- Browse SIA (Browse LNG Precinct).
- Boodarie SIA.
- Anketell Point.
- Burrup SIA.
- Maitland SIA.
- Gnoorea Point (Mardie Station).
- Cape Preston East.
- Ashburton North SIA.
- Learmonth.
- Exmouth.

Risk assessments and environmental opportunity and constraints tools were then used to assess the suitability of each site. The assessment for each site consisted of a consideration of the following six factors (refer Table 2-6 and Attachment 2A):

- Marine conditions and suitability.
- Terrestrial conditions and suitability.
- Land tenure.
- Local infrastructure.
- Heritage values.
- Environmental values.

Each factor was assessed using a 'traffic light' system of Green (Suitable), Amber (More information required) or Red (Unsuitable) (refer Attachment 2A).

Following this analysis, three potential sites were identified as appropriate for further assessment (Table 2-6):

- Anketell Point.
- Gnoorea Point (Mardie Station).
- Learmonth.

Following a site inspection of these sites, preliminary stakeholder engagement and further desktop assessment, Gnoorea Point was ruled out due to unsuitable land tenure, unfavourable marine and terrestrial conditions and the risk to environmental values (Table 2-7, Attachment 2A).

Further and more detailed environmental opportunity and constraints analysis, and studies including bathymetry surveys, were undertaken for the remaining sites; Anketell Point and Learmonth. These indicated that Anketell Point was unsuitable for Bundle fabrication and launch and thus Learmonth was determined to be the only feasible site (Table 2-8, Attachment 2A).

Scale: 1:3700000
Original Size: A4
Grid: GDA 94 MGA Zone 50

0 50 100 150 km

Notes: Data sourced from Subsea 7 (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-7: Alternative Sites Considered

W:\Subsea 7\GIS\Infrastructure Map.qgs 28/06/2019

Site	Marine Conditions	Terrestrial Conditions	Land Tenure	Local Infrastructure	Heritage Values	Environmental Values	Progress to Next Stage of Assessment
Browse SIA							No
Boodarie SIA							No
Anketell Point							Yes
Burrup SIA							No
Maitland SIA							No
Gnoorea Point							Yes
Cape Preston East							No
Ashburton North SIA							No
Learmonth							Yes
Exmouth							No

Table 2-6: Summary of Initial Desktop Assessment Outcomes

Site	Marine Conditions	Terrestrial Conditions	Land Tenure	Local Infrastructure	Heritage Values	Environmental Values	Progress to Next Stage of Assessment
Anketell Point							Yes
Gnoorea Point							No
Learmonth							Yes

Table 2-7: Summary of Site Inspection and Further Assessment Outcomes

Site	Marine Conditions	Terrestrial Conditions	Land Tenure	Local Infrastructure	Heritage Values	Environmental Values	Site Selected for Development
Anketell Point							No
Learmonth							Yes

Table 2-8: Site Investigation and Detailed Assessment Outcomes

2.4.8.3 Facility Design

The Development footprint was designed to minimise development at the seaward end of the site and to minimise adverse aesthetic impacts to users of the beaches and inshore waters of Exmouth Gulf. This included location of the proposed fabrication shed at the south western extent of the site, furthest from the shoreline.

The original Proposal included an approximately 750 m long interface with the Minilya-Exmouth Road to allow for flexibility in the final alignment of the site access road. Advice was received from Main Roads WA (MRWA) in July 2018 that, for safety reasons, the site access road should join the Minilya-Exmouth Road at a slightly different location (either slightly to the north or slightly to the south) due to the bend in the road. In liaison with MRWA, the Development Envelope was slightly extended to the north (further from the bend and beyond the slight dip in the road associated with the creekline) and to the south (further from the bend) to ensure that the Development Envelope allows for a safe alignment of the site access road (Figure 2-3). The final alignment of the site access road will be determined following completion of detailed road engineering.

2.4.8.4 Water Source

The installation and operation of a Reverse Osmosis (RO) plant was initially proposed to treat groundwater to the quality required to provide the required potable water and hydro-test water. It was estimated that the RO plant would produce 17 kL/day of wastewater during active operations on site, with a total dissolved solids (TDS) content of up to 1300 mg/L (for reference seawater has a TDS of approximately 35,000 mg/L).

Since the original referral of the Proposal under the EP Act (in 2017), substantial additional studies have been completed to investigate potential water source options. These studies have resulted in the identification of a 'fresh' (salinity (as TDS) of less than 1120 mg/L) groundwater source, to be abstracted from three bores (refer Figure 2-3). Water quality is expected to be such that water treatment will not be required prior to use, and as such no RO plant or associated wastewater stream will be required. An associated reduction in the required groundwater abstraction volume from 16 ML/annum to 12 ML/annum has been achieved.

2.4.8.5 Bundle Launch and Tow Method

Since the original referral (in 2017), Subsea 7 has performed extensive launch and tow engineering studies to define a locally appropriate Bundle launch methodology that is sensitive to the characteristics of the Learmonth site, to address the feedback received through stakeholder engagement and to continue the research required ahead of site development. Some key aims of the engineering included:

- Investigation of opportunities to increase buoyancy of the Bundle towheads and therefore reduce/eliminate seabed interaction.
- Modelling of vessel operations within Exmouth Gulf during a Bundle launch and tow.
- Use of site-specific current data obtained since the referral to model in detail the towpath of Bundles, under different oceanographic conditions, during launch and tow.

The fundamental objective was to develop a robust Bundle launch and tow methodology, building on the knowledge obtained from 40 years of operations in the North Sea, but adapted to suit the very specific conditions in Exmouth Gulf. As a result of this engineering, the width of the Offshore Operations Area at the end of the launchway has been reduced since the original referral of the Proposal.

A launch methodology has been developed for the Learmonth site that minimises the potential for 'indirect' impacts such as seabed erosion from tug thrusters. The site-specific methodology provides for two options depending upon the size (and weight) of the Bundle and the forces required for launch (Table 2-9).

Scenario	Pull Force Delivery Method	Rationale
Lighter Bundles	Vessel propulsion, approx. 50-100 Te[6] range	Adequate under keel clearance for vessel to apply low pull force with minor/negligible impact to seabed.
Heavier Bundles	Combination of vessel propulsion (50-100 Te range) + Vessel Winching	Vessel propulsion to be limited to a level such that there is no significant impact to seabed. Remaining required force delivered by vessel winch, with vessel position maintained by a combination of propulsion and anchor spread (consisting of length of ballast chain laid on seabed within Off bottom tow area).

Table 2-9: Options for Bundle Launch to Minimise Seabed Disturbance

The proposed options mitigate the risk of impact to the seabed, as follows:

- Avoidance of large vessel propulsion forces mitigates the risk of seabed erosion.
- Avoiding the use of drag anchors that require embedment and proof loading to be effective and can cause the disturbance of soft sediment to a significant depth. The use of ballast chain as an alternative leads to surface disturbance only.
- Ballast chain footprint will be minimal and will be contained within the Off bottom tow area.

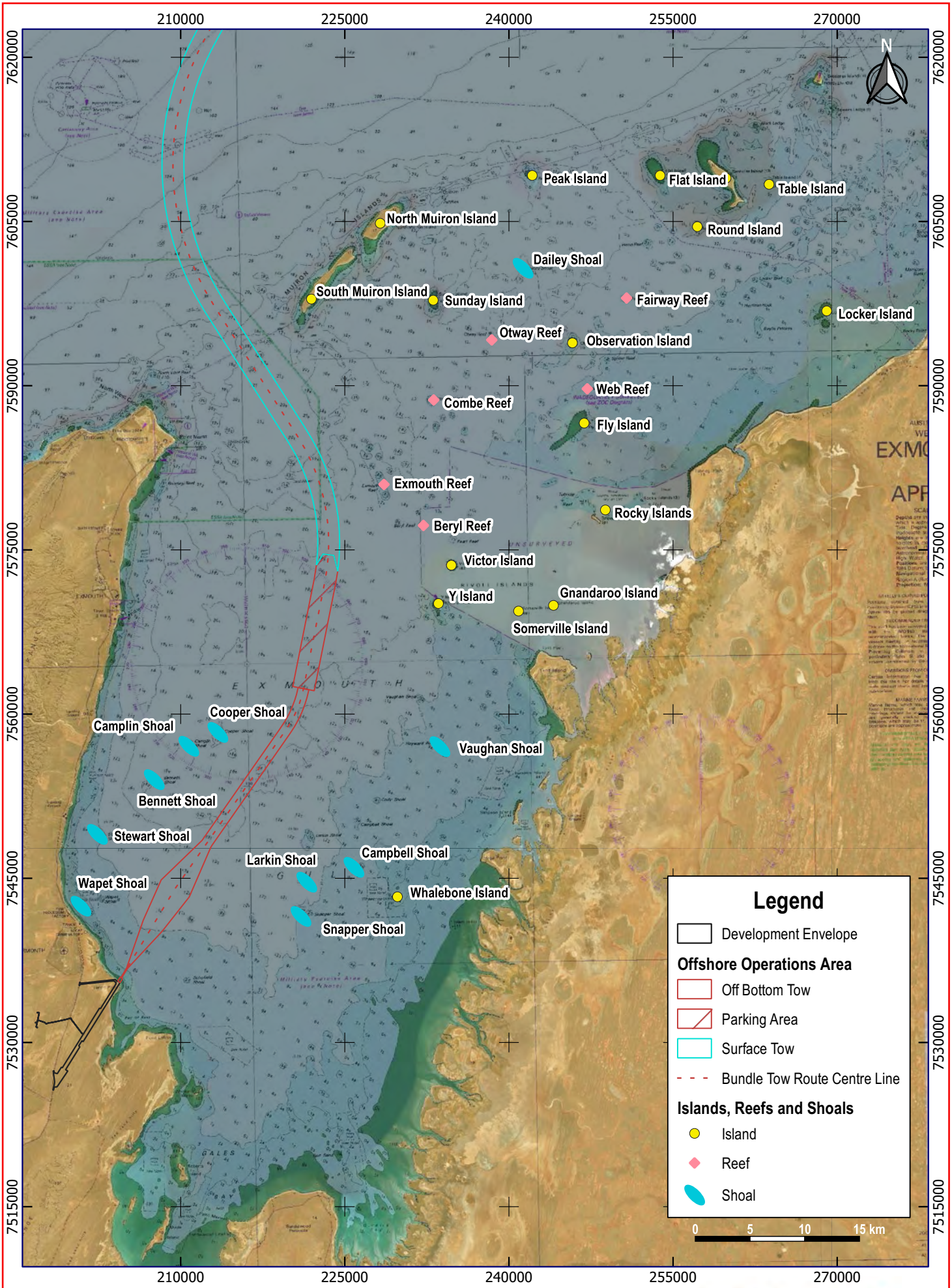
2.4.8.6 Bundle Tow Route

A tow route passing to the east of the Muiron Islands, and avoiding Ningaloo Marine Park, was considered. It was determined that this option was not feasible, and presented a greater risk of a significant environmental impact, given:

- The reefs and shoals south and east of the Muiron Islands (refer Figure 2-8) are distributed such that there is no route which would be navigable by a Bundle tow fleet.
- The tidal movement around these reef and shoal features is more erratic and faster moving and would cause challenging and unpredictable deflections in the Bundle under tow.

[6] The vessel propulsion force is an indicative range. The actual force that is required is specific to the Bundle being launched. As every Bundle is different in some way, the force required will also be different. The limiting propulsion is heavily dependent on the vessel being utilised for the launching operation, and the particular draft condition, trim, and loading of the vessel at the time. Project-specific analysis and risk assessment are conducted for every Bundle launch to determine these requirements and limits, and then select the appropriate pull force delivery method.

- Given the shallow water depths to the east of the Muiron Islands a surface tow could not be conducted, so additional direct impacts to BCH would occur.
- The area currently designated for surface tow between the tip of the North west cape and the Muiron Islands is widely used as a transit area by commercial vessels and recreational fishing vessels alike, so Subsea 7's proposed operation does not represent a change to the type of activity currently undertaken.



Scale: 1:450000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

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

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-8: Location of Islands and Shoals in Exmouth Gulf

W:\Subsea 7\GIS\Figures\PER Figures\Learmonth Pipeline Fabrication Facility_Islands and shoals.qgs 10/09/2019

2.5 LOCAL AND REGIONAL CONTEXT

2.5.1 Climate

The climate of the region is hot semi-arid with hot summers and mild winters. Climate data from 1945 to 2017 was obtained from the Learmonth Airport Station located approximately 1.5 km north west of the Development Envelope (Figure 2-9). The annual mean maximum temperature is 31.9°C and the annual mean minimum temperature is 17.7°C. The mean annual rainfall was recorded at 260.7 mm (BoM 2017).

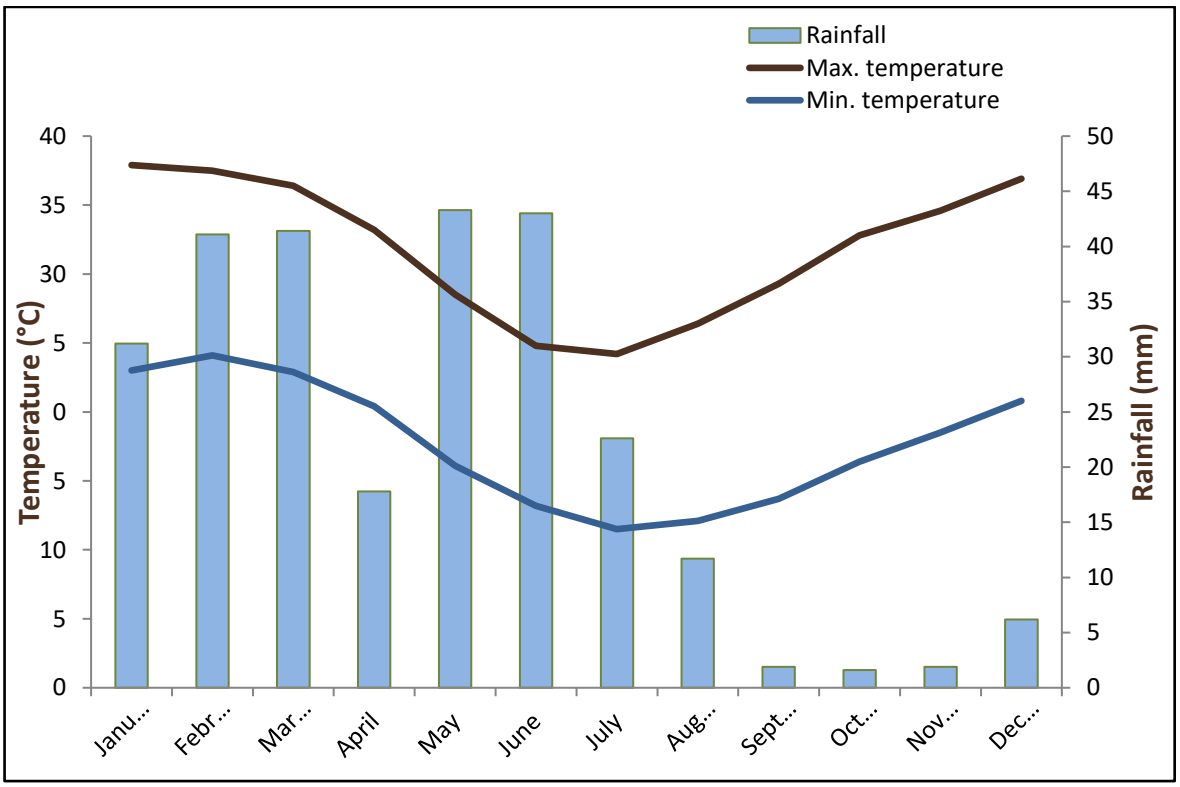


Figure 2-9: Climate Statistics for Learmonth Airport Station 1945-2017 (BoM 2017)

A general south or south westerly wind regime predominates for much of the year. Winds from the north easterly quadrant are common during afternoons in both summer and winter. However, winds may vary considerably due to the influence of afternoon sea breezes in the warmer months. These sea breezes are generally south to south westerly on the western side of North West Cape and typically either south westerly or north easterly on the Exmouth Gulf side.

The annual rainfall for the Exmouth Gulf region is highly variable with an annual average of 260 mm. Peak rainfall occurs from January to March (associated with the passage of tropical cyclones) and between May and June (associated with tropical cloud bands originating to the north west). The heaviest rainfall is generally associated with tropical cyclones and can cause extensive flooding in the area – tropical cyclones are responsible for 20–40% of the annual input of freshwater into Exmouth Gulf (Wyrwoll 1993). Tropical cyclones affect the North West Cape area about once every two years on average. A severe cyclone will impact the area approximately once every 25 years, with severe tropical cyclones having occurred in 1945, 1953, 1964 (Tropical Cyclone Katie) and 1999 (Tropical Cyclone Vance). Tropical Cyclone Vance was registered as a Category 5 cyclone and was the most intense tropical cyclone ever recorded to cross the Australian coast (Bureau of

Meteorology 2000). The eye of this cyclone passed down Exmouth Gulf, about 25 km to the east of Exmouth and 80 km to the west of Onslow. During this cyclone, the highest ever wind gust recorded on the Australian mainland of 267 km/h was recorded at Learmonth Airport on 22 March 1999. Tropical Cyclone Vance also resulted in approximately 200-300 mm of rainfall to the east and south of Exmouth with consequent flooding of these areas (Blandford & Associates and Oceanica 2005).

2.5.2 Geographical and Physical

2.5.2.1 Surface Geology and Soils

Surface geology was mapped at a scale of 1:100 000 and identified three surface geology profiles within the Heron Point area (GSWA 2008):

- Dunes 38496: Dunes, sandplain with dunes and swales; may include numerous interdune claypans; residual and Aeolian sand with minor silt and clay; Aeolian red quartz sand, clay and silt in places gypsiferous; yellow hummocky sand.
- Estuarine and delta deposits 38489: Coastal silt and evaporate deposits; estuarine, lagoonal, and lacustrine deposits.
- Colluvium 38491: Colluvium, sheetwash, talus: gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and Aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite.

Department of Agriculture and Food WA (DAFWA) Soil Subsystems mapping indicates that the Littoral System and the Cardabia System occur in the Heron Point area (DAFWA 2012):

- Littoral System: Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse *Acacia* shrublands and mangrove forests.
- Carbadia System: Undulating sandy plains with linear dunes, minor limestone plains and low rises, supporting mainly soft spinifex hummock grasslands with scattered acacia shrublands and mangrove forests.

Review of the 'Yanrey-Ningaloo' (Learmonth) 1:250, 000 geological maps indicates the geology of the Development Envelope mainly comprises of longitudinal network dunes and residual sandplains comprised of red brown to yellow quartz sand (GHD 2017).

2.5.2.2 Surface Water

A defined watercourse intersects the Development Envelope approximately 2 km from the proposed fabrication shed. The watercourse has an upper catchment extending approximately 10 km to the west of the site, with a catchment area of 1,689 ha (refer Section 5.8.3).

A smaller catchment (approximately 155 ha) lies to the south of the Development Envelope (refer Section 5.8.3).

Areas along the Bundle track/road corridor (approximately 2 km on the approach to the launchway), and the majority of the access track, are located in the supratidal flats and do not appear to have any external drainage (refer Section 5.8.3).

2.5.2.3 Marine

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 that,

outside the reef line, are exposed to the open ocean and rapidly drop off into waters approximately 1,000 m deep.

The deeper waters outside the Gulf are stratified in temperature while the waters inside the Gulf are vertically well mixed, more turbid and higher in chlorophyll-a (Verspecht 2002).

The tidal circulation in the Exmouth Gulf has been predicted by Massel *et al*. (1997) and APASA (2005). Tidal circulation along the deeper waters of the western margin are primarily orientated north-south, while tidal migrations along the eastern margin are more complex, being steered by local topography (Oceanica 2006).

During the flood tide, transport occurs in one direction over a distance of approximately 4 km before the flow stops and starts to reverse as the ebb tide commences. Thus there is little possibility of direct (i.e. in a single cycle) transfer by the tides of any material or nutrient from the south or east coasts to the North West Cape area and Ningaloo Reef. This has implications for the connection between the Gulf and Ningaloo, in that at best the Gulf could provide organic and suspended sediments to waters offshore; however, the dominant south and south westerly wind direction will tend to move waters north east out of the Gulf (Oceanica 2006).

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 2018a) (Figure 2-10).

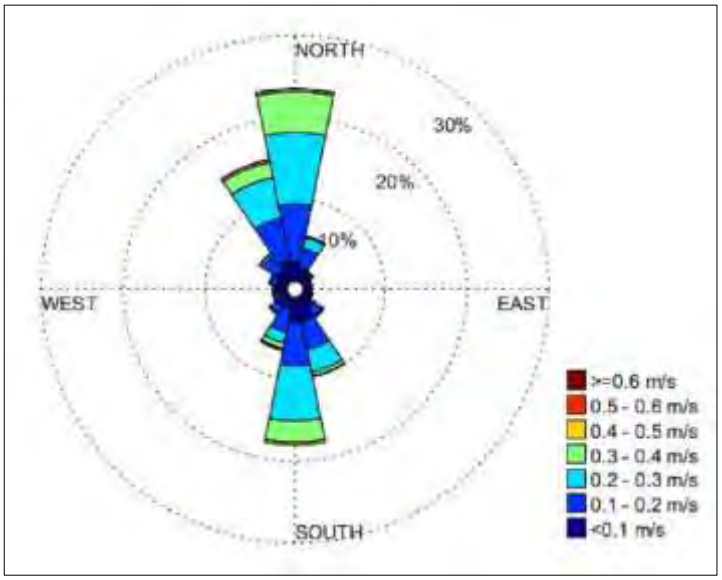


Figure 2-10: Current Speed and Direction Recorded off Heron Point in May/June 2018 (duration indicated as % of time occurring throughout monitoring period) (from GHD 2018)

2.5.3 Land Tenure

The Development Envelope is located partially on Lot 233 (P219618) and Lot 1586 (P72986), which are subject to the Exmouth Gulf Pastoral Lease accessed from Minilya-Exmouth Road. The Development Envelope is approximately 35 km south of the Exmouth townsite. The land is zoned as 'Rural' under the Shire of Exmouth Local Planning

Scheme No. 4. The Site is subject to the 'Exmouth Gulf' Pastoral Lease, which has a term of 39 years, 3 months, 1 day, as of 1 July 2015.

On 10 October 2017, the (then) Commissioner of the Shire of Exmouth adopted Scheme Amendment 32 to the (now revoked) Town Planning Scheme No. 3 (TPS 3) for the purposes of rezoning part of Lot 233 Minilya-Exmouth Road and part of Lot 1586 Minilya-Exmouth Road, Learmonth, from 'Pastoral' to 'Special Use No. 9' zone, and amending the scheme map accordingly. The amendment was referred to the Western Australian Planning Commission (WAPC) and on 30 January 2018, WAPC advised that Amendment 32 was suitable for advertising. The amendment was referred to the EPA, which requested further information that would be contained within an ERD.

During 2018 the Shire of Exmouth finalised its draft Local Planning Strategy and draft Local Planning Scheme No. 4 (LPS 4) with modifications required by the WAPC. The Local Planning Strategy (final, as modified) has been approved by the WAPC and the Minister for Planning has approved the LPS 4. The previous Scheme Amendment 32 has fallen away as the TPS 3 has been revoked.

Under the LPS 4, the Development Envelope is zoned as 'Rural'. Subsea 7 has resubmitted a Scheme Amendment Request to rezone the area from 'Rural' to 'Special Use' under LPS 4. As a result, the intended amendment to TPS 3 via Scheme Amendment 32, has been reconfigured to relate to LPS 4. A Special Use zone is still proposed for the purposes of rezoning the Development Envelope. The EPA determined that the proposed amendment to LPS 4 required formal assessment under Part IV of the EP Act. An Environmental Review process is underway and a separate impact assessment document has been prepared to fulfil the assessment requirements (under Assessment number 2209) under Section 48A of the EP Act.

2.5.4 Native Title

One registered Native Title claim exists across the Proposal area; Gnulli WC1997/028 (DAA 2017). The Gnulli Native Title claim covers approximately 82,708 km^2 of land and sea in the Yamatji Region. It lies in the Shires of Ashburton, Carnarvon, Exmouth and Upper Gascoyne. The claim is currently in the process of determination.

As part of stakeholder engagement for the Proposal, Subsea 7 has engaged regularly with Gnulli, through their representatives the Yamatji Marlpa Aboriginal Corporation (YMAC), since mid-2017. Subsea 7's first attendance at the Gnulli Working Group meeting occurred in August of 2017, and Subsea 7 has remained a regular attendee at the Working Group's meetings since this first engagement.

Subsea 7 remains committed to recognising the rights, history and heritage of the Traditional Owners, with the aim of forming long-term and mutually beneficial relationships. Together, the Gnulli and Subsea 7 have achieved a number of milestones over the period of engagement:

- The parties have performed heritage surveys on the site with input and leadership from the Traditional Owners.
- The Traditional Owners have provided education, assistance and monitoring during environmental investigations associated with the subterranean fauna drilling program, maintaining an onsite presence throughout the work.
- The Gnulli Working Group and Subsea 7 have performed site visits together on the land, to enable all parties to better understand one another.

These activities have contributed to increasing Subsea 7's cultural awareness of the Gnulli people's relationship with the land. This engagement has fostered a positive working relationship, whereby the Proposal can be discussed and understood at all levels, together with the potential for impact, to ensure an appropriate final Proposal design. Subsea 7 is committed to entering into a mutually beneficial agreement with the Gnulli people, and continues to progress this in consultation with the Gnulli and YMAC.

2.5.5 Environmental Values

The conservation values of Exmouth Gulf are recognised in several State government publications, policies and guidelines:

- In 1975, the Conservation Through Reserves Committee recognised its conservation significance and recommended that a series of studies on biophysical characteristics of the tidal and supra-tidal flats of Exmouth Gulf be conducted.
- The fringe of arid zone mangroves along the east coast of Exmouth Gulf is recognised as being of 'regional significance' in EPA Guidance Statement No. 1 (EPA 2001) (Figure 2-11).
- The mangroves along the south western end of Exmouth Gulf are described in EPA Guidance Statement 1 (EPA 2001) as 'Area 1: Bay of Rest' and are classified as being of 'Very High' importance (Figure 2-11). For Guideline 1 areas, the EPA expects that '*no development should take place that would adversely affect the mangrove habitat, the ecological function of these areas and the maintenance of ecological processes which sustain the mangrove habitats*' (EPA 2001).
- The salt flats, mangrove creeks and inshore waters were recommended for reservation in the report '*A Representative Marine Reserve System for Western Australia*' by the Marine Parks and Reserves Selection Working Group referred to as the Wilson Report (CALM 1994) (Figure 2-11).
- The coastal waters along the east coast of Exmouth Gulf have been recommended for the 'maximum' level of ecological protection in the Department of Environment document *Pilbara Coastal Water Quality Consultation Outcomes* (DoE 2006) (Figure 2-11). The objectives for 'maximum' water quality protection are that there be no contamination and no detectable change from natural variation in water quality.
- Humpback whales are listed as Species of Special Conservation Interest under the Biodiversity Conservation Act 2016 (BC Act), Dugong are listed as Species in need of Special Protection under the BC Act, and both Green and Hawksbill turtles are listed as Vulnerable under the BC Act. Other specially protected and migratory species regularly use the area.
- To protect the ecosystem services and recreational enjoyment that are provided along the east coast and south of Exmouth Gulf, the coastal waters have been a permanent nursery closure area for prawn trawling since 1983, and were recommended as a 'Fish Habitat Protection Area' in the draft Fisheries Environmental Management Plan for the Gascoyne Region (Shaw 2002) (Figure 2-11).
- Consolidating this body of complementary policy instruments and guidelines, the Ningaloo Coast Regional Strategy Carnarvon to Exmouth, was endorsed by the WA Government and released by the WAPC in 2004 (WAPC 2004). The strategy recommends that the southern and south eastern mangrove areas of Exmouth Gulf and adjacent coastal waters become marine protected areas, consistent with the findings of the Wilson Report (CALM 1994).

The conservation values of Exmouth Gulf are also recognised at the Commonwealth government level (Figure 2-12):

- Two Nationally Important Wetlands, listed in the 'Directory of Important Wetlands in Australia' as wetland 'Cape Range Subterranean Waterways – WA006' and 'Exmouth Gulf East Wetlands – WA007' occur in proximity to the Project site.
- The Ningaloo Coast World Heritage Area and National Heritage Place.
- The Ningaloo Marine Park (as described in Australian Marine Parks North-west Marine Parks Network Management Plan) (Director of National Parks 2018).

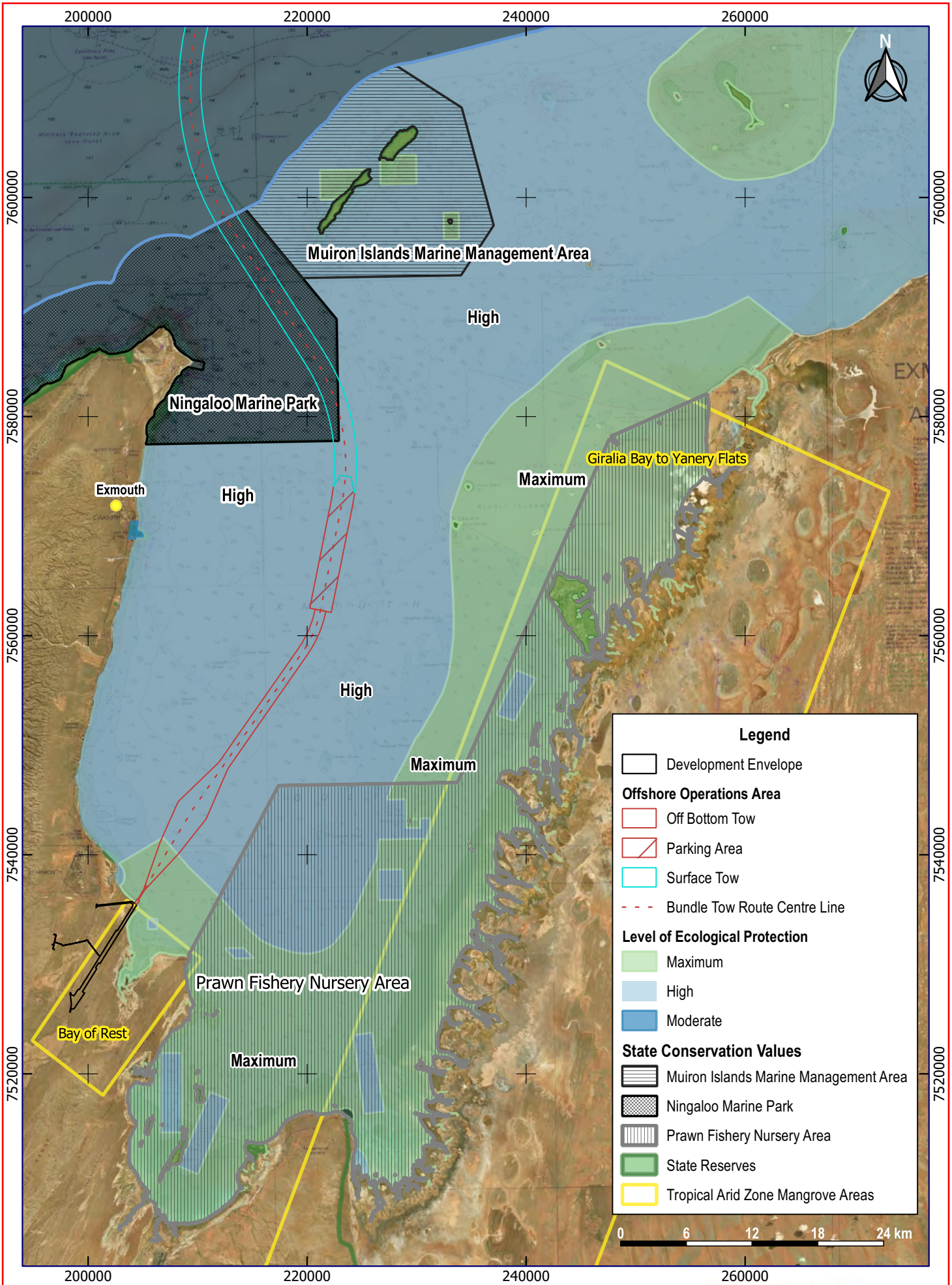
The Commonwealth Ningaloo Marine Park stretches approximately 300 km along the west coast of the Cape Range Peninsula, and is adjacent to the Western Australian Ningaloo Marine Park. The park covers an area of 2,435 km^2 and a water depth range of 30 m to more than 500 m. The Marine Park was originally proclaimed under the *National Parks and Wildlife Conservation Act 1975* on 20 May 1987 as the Ningaloo Marine Park (Commonwealth Waters), and was proclaimed under the EPBC Act on 14 December 2013 and renamed Ningaloo Marine Park on 9 October 2017. The park is assigned IUCN category IV and includes two zones assigned under this plan: National Park Zone (II) (an area approximately 40 km north of Coral Bay) and Recreational Use Zone (IV) (the remainder of the park) (Director of National Parks 2018).

The Commonwealth Ningaloo Marine Park is significant because it contains habitats, species and ecological communities associated with the Central Western Shelf Transition, Central Western Transition, Northwest Province, and Northwest Shelf Province. It includes three key ecological features:

- Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula (valued for unique seafloor features with ecological properties of regional significance).
- Commonwealth waters adjacent to Ningaloo Reef (valued for high productivity and aggregations of marine life).
- Continental slope demersal fish communities (valued for high levels of endemism and diversity).

The Marine Park provides connectivity between deeper offshore waters of the shelf break and coastal waters of the adjacent Western Australian Ningaloo Marine Park. It includes some of the most diverse continental slope habitats in Australia, in particular the continental slope area between North West Cape and the Montebello Trough. Canyons in the park are important for their role in sustaining the nutrient conditions that support the high diversity of Ningaloo Reef. The Marine Park is located in a transition zone between tropical and temperate waters and sustains tropical and temperate plants and animals, with many species at the limits of their distributions (Director of National Parks 2018). The Marine Park supports a range of species including species listed as Threatened, Migratory, Marine or Cetacean under the EPBC Act. Biologically important areas within the region include (Figure 2-13):

- A migratory pathway for Humpback whales.
- Nesting and internesting habitat for marine turtles.
- Breeding, calving and nursing habitat for Dugong.
- Foraging habitat for Whale sharks.



Scale: 1:450000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

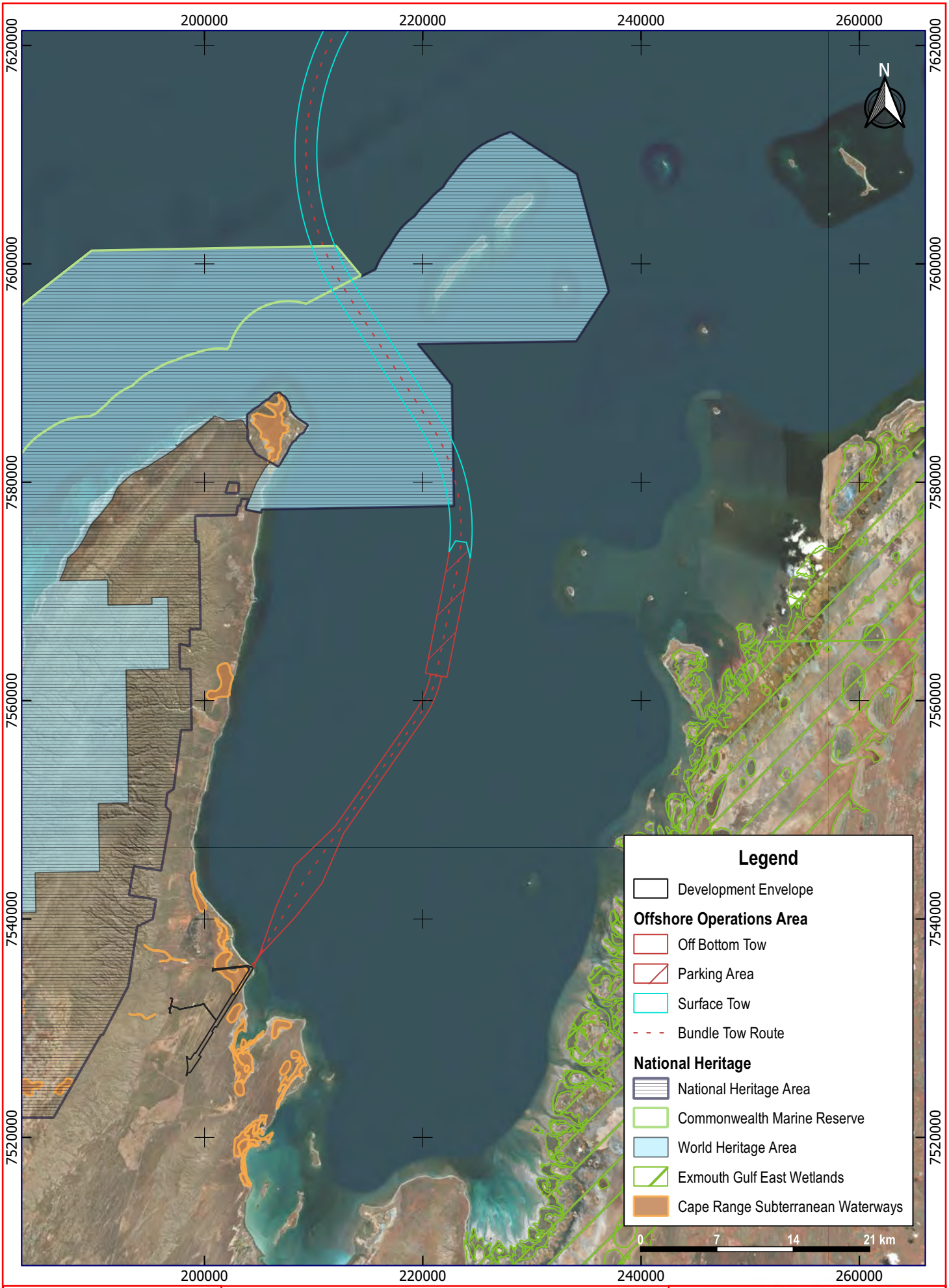
Notes: Data sourced from EPA (2018, 2011),Commonwealth of Australia (2018), and DBCA (2018). Maximum level of Ecological Protection areas are the same as those identified by CALM as 'Recommended for Reservation (1994).'

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-11: Conservation Values of Exmouth Gulf Recognised in State Publications

W:\Subsea 7\GIS\Figures\PER Figures\Learmonth Pipeline Fabrication Facility.qgs 18/06/2019



Scale: 1:450000
Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA 94 / MGA Zone 50

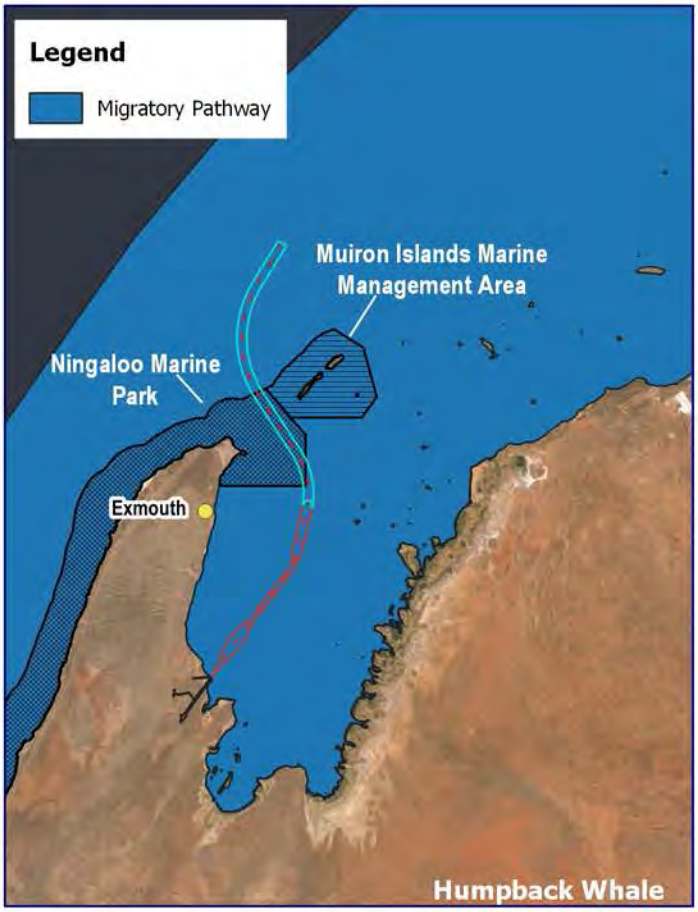
Notes: Data sourced from Commonwealth of Australia (2013 and 2018).

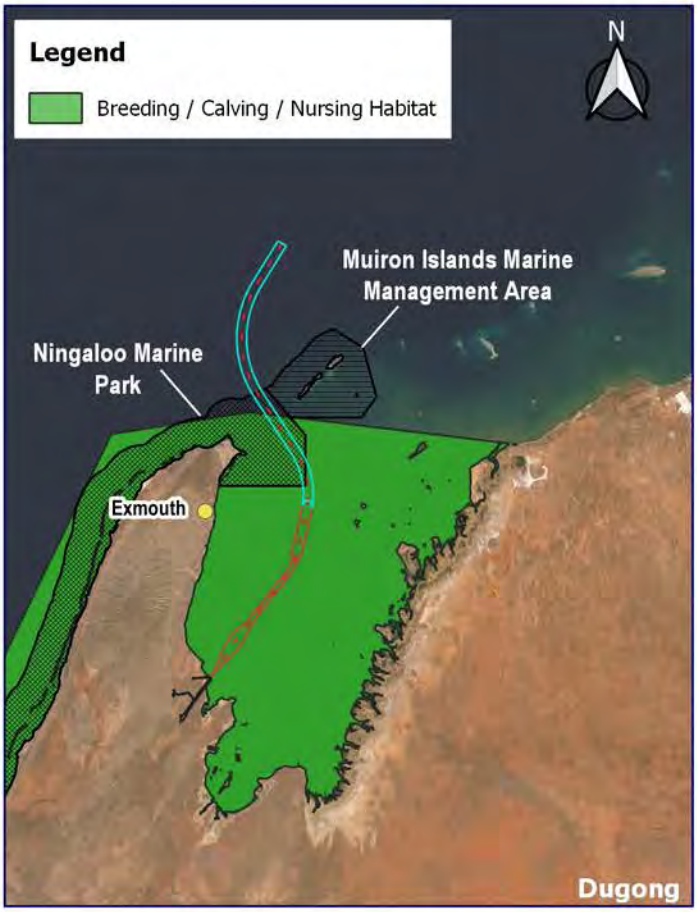
Subsea 7 Pipeline Fabrication Facility

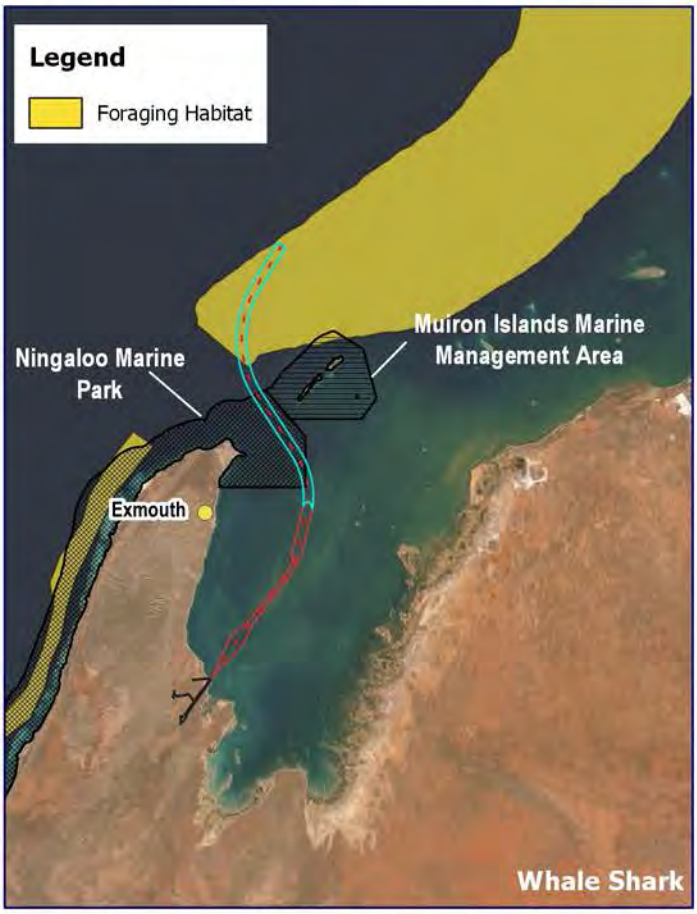
subsea 7

Figure 2-12: Conservation Values of Exmouth Gulf Recognised at the Commonwealth Level

W:\Subsea 7\GIS\Figures\PER Figures\Learmonth Pipeline Fabrication Facility_National Heritage.qgs 14/06/2019







0 15 30 45 km

Legend

Development Envelope | Off Bottom Tow | Parking Area | Surface Tow | Bundle Tow Route Centre Line

Scale: 1:1250000
Original Size: A4
Aerial Photo: ESRI Satellite
Grid: GDA 94

Notes: Data sourced from DoEE (2015).

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-13: Biologically Important Areas for Humpback Whale, Dugong, Marine Turtles and the Whale Shark Within Exmouth Gulf and Ningaloo Marine Park

W:\Subsea 7\GIS\Marine Fauna.qgs 19/09/2019

2.5.6 Social Surroundings

The Gascoyne covers an area of approximately 138,000 km^2 representing about 5.5% of WA (DPIRD 2019). The Gascoyne is made up of four local government areas − Carnarvon, Exmouth, Shark Bay, and Upper Gascoyne. The Gascoyne is known as WA's food bowl with 84% of the land covered by Pastoral Leases and home to WA's biggest prawn fishery in Shark Bay (DPIRD & Gascoyne Development Commission [GDC] 2018).

In 2016, the Gascoyne population was 9,485; the lowest estimated resident population of all the regions in WA (ABS 2016b, GDC 2017). Of the population, 52.7% were male and 47.3% were female. Aboriginal and/or Torres Strait Islander people made up 13.4% of the population, which is significantly higher than the 3.1% that makes up the WA population.

The Shire of Exmouth is situated 1,270 km north of Perth and covers an area of 650,300 ha. Over the past decade the population within the Shire of Exmouth has increased by approximately 32% (2,063 persons in 2006 to 2,728 in 2016) (ABS 2006; 2016a). Every year, during the cooler winter months (May−August), the resident population in Exmouth triples due to an influx of holiday-makers (Shire of Exmouth 2018).

Tourism is now the largest industry and major economic contributor in the Shire with hospitality, accommodation and retail also accounting for a large proportion of Exmouth's economy and job market (SGS Economics & Planning [SGS] 2012, ABS 2016a). Other key industries include fishing, aquaculture, pastoralism and mining. A key finding from the public consultation process in the Shire of Exmouth's Strategic Community Plan 2030 was the need for greater fulltime employment opportunities. The community would also like to see a stronger and more diverse local economy enabling year-long employment opportunities (Shire of Exmouth 2018).

2.5.7 Heritage

2.5.7.1 Ningaloo Coast World Heritage Area

The Ningaloo Coast World Heritage Area (Reference 1369) was inscribed on the World Heritage List on 1 November 2011 under the following criteria:

- Criterion (vii) contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.
- Criterion (x) contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing Threatened species of outstanding universal value from the point of view of science or conservation.

The adopted boundary includes the Ningaloo Marine Park (Commonwealth Waters), Ningaloo Marine Park (State Waters) and the Muiron Islands Marine Management Area (including the Muiron Islands), Jurabi Coastal Park, Bundegi Coastal Park, Cape Range National Park and Learmonth Air Weapons Range (Figure 2-12).

Key threats identified (UNESCO 2011) include:

- Future bombing activities within the Learmonth Air Weapons Range Facility, which may pose a threat to the Bundera sinkhole.
- Increasing tourism potentially leading to damage to vegetation, illegal fishing, sewage and waste disposal and disturbance to wildlife.
- Increased water demand leading to water abstraction with potential effects on the groundwater systems.

- Fire, historically part of local indigenous management, is a potential threat to the terrestrial vegetation.
- Offshore hydrocarbon extraction in the region potentially increasing the risk of pollution and disturbance.
- Sea level rises and increases in seawater temperatures associated with climate change.
- Invasive alien species, primarily foxes, cats, goats, and weeds (on land) and some marine species.

2.5.7.2 Ningaloo Coast National Heritage Place

The Ningaloo Coast National Heritage Place covers approximately 710,000 ha, comprising Ningaloo Marine Park, Muiron Islands Marine Management Area (including the Muiron Islands), Jurabi Coastal Park, Bundegi Coastal Park, Cape Range National Park, Learmonth Air Weapons Range and portions of Exmouth, Ningaloo, Cardabia, Warroora, Gnaraloo, and Quobba Pastoral Leases (Figure 2-12).

The National Heritage Place was listed under the following criteria:

- Criterion (a): the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.
- Criterion (b): the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.
- Criterion (c): the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.
- Criterion (d): the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments.
- Criterion (f): the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.

2.5.8 Other Nearby Projects or Proposals

2.5.8.1 Exmouth Gulf Prawn Fishery

Summary

Prawn trawling commenced in 1963 targeting schooling Banana prawns (*Penaeus merguiensis*) during daylight hours (Penn *et al*. 1997). As the catch of Banana prawns declined over the ensuing four years, the trawl fleet transferred effort to night time fishing on King (*Penaeus latisulcatus*), Tiger (*Penaeus esculentus*) and Endeavour prawns (*Metapenaeus endeavouri*). Annual nominal effort in the fishery gradually increased to about 50,000 hours trawled in the late 1970's to the early 1980's when a maximum of 23 trawlers operated in the fishery. In 1985, the number of trawlers was reduced to 17, to 16 in 1990, another boat was removed in 1998 and in 2000 two more were removed bringing the total to 13 (Kangas *et al*. 2006a).

The Exmouth Gulf Prawn Fishery is one of the largest trawl fisheries in WA and has had catches ranging from 771 to 1,456 tonnes per year over the past 11 years (since 2006). The commercial catch for 2016 was a total of 822 tonnes. Banana, Tiger, and Endeavour

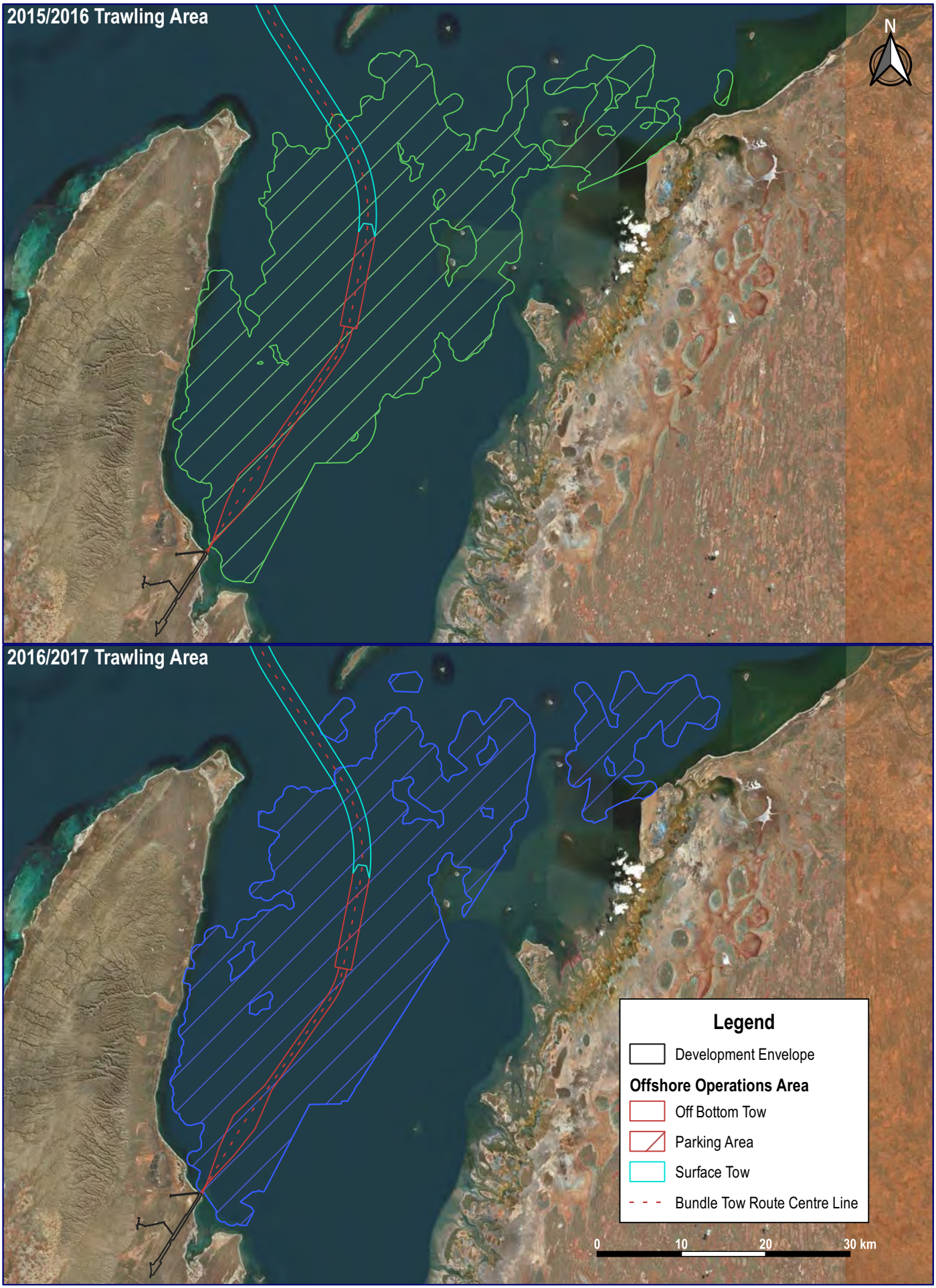
prawns were all below the designated accepted annual catch limits (Gaughan and Santoro 2018).

During the open season, trawling is only permitted between 17:00 hours and 08:00 hours except when Banana prawns are available, when daylight trawling can occur. Trawl duration in this fishery is generally between one and three hours. Trawling ceases for 3 to 5 days around the period of the full moon each month when prawns tend to bury themselves in sediment making trawling less economical. The average trawl speed is 3.5 to 4 knots (Kangas *et al*. 2006a).

The Offshore Operations Area overlaps with the area currently trawled (Figure 2-14).

The trawling grounds comprise mud and sand habitats, and therefore the physical impact of the trawl gear has limited impact. The overall environmental effect is considered to be low due to the habitat type and control measures in place (Kangas *et al*. 2015). A study by Kangas *et al*. (2006a) reported that no major detrimental ecological impacts were identified as a result of the ongoing prawn fishery, although some evidence of lower faunal abundance at heavily trawled sites was recorded. It was also reported that some species such as the Large-scaled lizardfish (*Saurida undosquamis*), the Asymmetrical goatfish (*Upeneus asymmetricus*), the Hair-finned leatherjacket (*Paramonacanthus choirocephalus*), commercial prawn species, and Portunid crabs, preferred the disturbed, low-relief, soft sediment habitats modified by trawling.

In 2016, a total of 325 square nautical miles (28.5%) of the trawlable grounds were fished. This is in line with the set performance measures for habitat impact relating to the spatial extent of the licenced trawling area (SoF 2017).



Scale: 1:600000
Original Size: A4

Notes: Data sourced from DPIRD (2018) and Subsea 7 (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-14: Exmouth Gulf Prawn Fishery – Areas Fished (2015/2016 and 2016/2017)

W:\Subsea 7\GIS\Figures\PER Figures\Learmonth Pipeline Fabrication Facility_Fisheries Data.qgs 29/08/2019

Regional Impacts

In the early days of trawling in Exmouth Gulf, the grounds were unknown and echo-sounding and navigation devices were very primitive. Suitable areas for trawling were discovered by trawling the seabed. In some areas, a technique called 'breaking the ground' was employed where chains would be strung between trawlers and dragged, to remove obstacles for the nets. The effects of the early trawling practices are unknown, but are likely to have caused significant habitat modification towards soft substrates (RPS 2004). Impacts of trawling are likely to be often underestimated because there are no documented examples where pre-trawling communities are described and quantified for comparison to post-trawl communities at the same location (Hobday *et al*. 2006). Prawns are one of the groups that are apparently facilitated by moderate levels of trawling (Cushing 1984).

The Department of Fisheries (2002) conducted an assessment into the sustainability of the fishery, which was reviewed by the Department of Environment and Heritage (2002). The assessment considered the potential impact on the mud and sand habitats in Exmouth Gulf, as a result of the prawn trawling operations, unlikely to have had even a minor consequence. Of the area that is permitted to be trawled, approximately 35% is actually trawled due to the targeting of known favourable grounds. Furthermore, 28% of the area is permanently closed to trawling. Studies of actual impacts from prawn trawling suggest only minimal impacts to infaunal communities. After forty years of trawling in Exmouth Gulf, the areas that are the subject of ongoing trawling activity are likely to have become stable habitats. Visual observation of these areas has encountered mostly bare sands with virtually no epibenthos, and very limited motile organisms present (RPS 2004, MBS Environmental 2018a).

2.5.8.2 Exmouth Artificial Reef 'King Reef'

Summary

An artificial reef has been constructed using a mix of steel towers salvaged from decommissioned offshore oil and gas facilities and purpose-made concrete sections. The reef lies to the north east of Exmouth Marina (Figure 2-15), covers approximately 0.8 ha and was put in place in August 2018.

Regional Impacts

Negligible impact to BCH is considered to have occurred at a local and regional scale given the small footprint of the artificial reef (0.8 ha) within an area of soft sediment.

2.5.8.3 Exmouth Marina

Summary

In March 1991, the EPA formally assessed a proposal by the Department of Transport for an inland marina, residential subdivision and quarry. Environmental approval was issued on 20 January 1992. The Department of Transport proposed some changes to the project in 1995, including a re-design of the marina from an inshore harbour basin to a smaller offshore harbour basin and deferral of the residential component. Environmental approval was issued by the Minister on 11 March 1996 (Ministerial Statement 406).

On 3 December 1996, a proposal to construct an inland marina, resort and residential/canal development, as a land-backed extension to the Exmouth Boat Harbour, was referred to the EPA by LandCorp. This was treated as a new proposal and was assessed at a level of PER. The EPA concluded that the proposal could be managed in a manner to avoid an unacceptable impact on the environment. Approval was granted, via Ministerial Statement 474, in April 1998.

Construction of Exmouth Boat Harbour was completed in 1997. In 2016-2017 additional dredging and construction of a heavy lift facility within the harbour was undertaken. The current footprint is shown in Figure 2-15.

Regional Impacts

The marina footprint is approximately 87 ha onshore and 37 ha offshore. It is likely that the nearshore habitats impacted during construction of the rock walls and deepening of the harbour were consistent with those found immediately adjacent to the site i.e. soft sediment. Benthic Primary Producer Habitat (BPPH) (now termed Benthic Communities and Habitat) were not a key environmental factor during the EPA's assessment of the project (EPA 1997c).

The native vegetation within the onshore footprint is likely to have been consistent with the vegetation types found broadly across the region. The EPA (1997c) noted that:

- '*The coastal dunes between the proposed marina site and the Exmouth Gulf form a distinct vegetation zone. A number of pioneer species as Spinifex longifolius, Salsola kali, Cakile maritima, Ipomea brasiliensis, and Tetragonia decumbens occur in the foredune/primary dune with Ptilotus spp., Atriplex isatidea, Olearia axillaris, Scaevola crassifolia and Euphorbia sp. in the swales. These plants are important as they trap sediments and protect the dunes from wind erosion. Existing foredunes are badly degraded in places due to uncontrolled access. Weed invasion has also occurred in a number of areas'*.
- '*In contrast with the coastal areas of the Cape Range peninsula, the coastal dunes within the site are in moderate to very poor condition due to disturbance of the vegetation by activities such as pony/horse riding, camel rides, 4-wheel driving and uncontrolled pedestrian access to the beach. Weeds such as Buffel grass have also been introduced to the coastal dunes, and the weeds are now common on the coastal plain'*.

2.5.8.4 Cape Seafarms Project

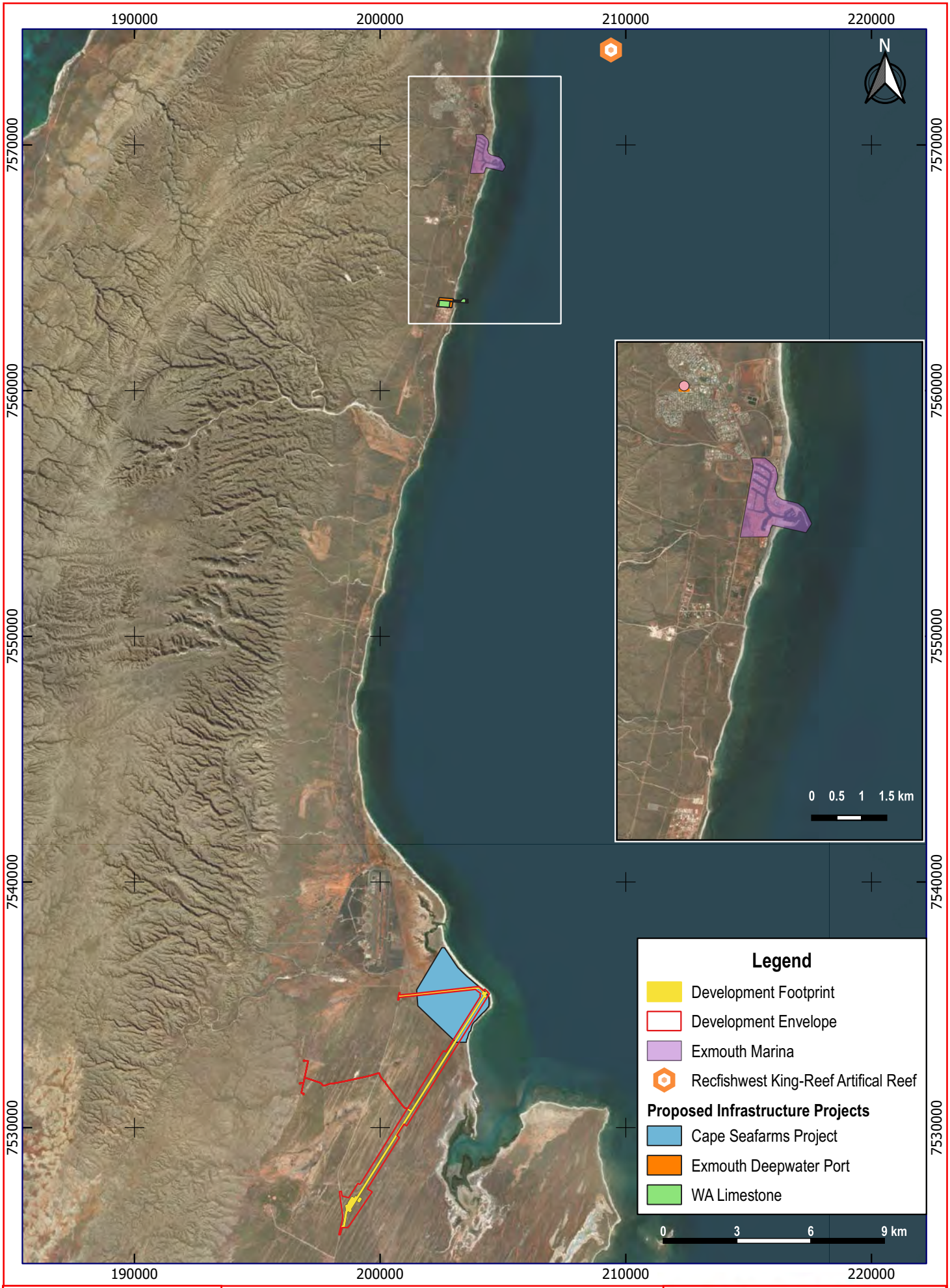
Summary

Cape Seafarms Pty Ltd proposed to develop a 120 ha onshore prawn farm at Heron Point including a total footprint of 250 ha (Figure 2-15). The proposal was referred to the EPA and was assessed via a Consultative Environmental Review (CER) (EPA 1997a).

The project was recommended for approval by the EPA and was approved, via Ministerial Statement 456, on 27 August 1997. Initial earthworks were undertaken, but the project has since been abandoned.

Regional Impacts

An examination of aerial imagery suggests that approximately 170 ha of the onshore footprint were disturbed by initial earthworks. It is assumed that the flora species and vegetation associations across this area are similar to those recorded within the Development Envelope. No Declared Rare or Priority listed flora were found in the project area and all species are described as common in the Exmouth area and in most coastal regions of the north west of Western Australia (EPA 1997a). No marine impacts have occurred as a result of this project.



Scale: 1:200000
Original Size: A4
Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

Notes: Data representing indicative existing and proposed infrastructure developed by MBS Environmental (2018).

Subsea 7 Pipeline Fabrication Facility

subsea 7

Figure 2-15: Location of Existing or Reasonably Foreseeable Developments in the Vicinity of the Proposal

W:\Subsea 7\GIS\Infrastructure Map.qgs 29/08/2019

2.5.8.5 WA Limestone

Summary

Whitecrest Enterprises Pty Ltd proposed to construct and operate a barge loading facility south of Mowbowra Creek, to the south of Exmouth Marina within Exmouth Gulf. The facility was proposed for export of limestone mined from the nearby Whitecrest Limestone Mine.

The Exmouth Limestone Project Barge Loading Facility proposal was described in a CER document (Halpern Glick Maunsell 1997). EPA Bulletin 871, recommended approval of the proposal, with conditions, was published in November 1997. Ministerial Statement 465 was published on 19 January 1998.

The proposal included a 650 m rockfill causeway, including a reclaimed offshore storage area, an onshore laydown/plant area (Figure 2-15) and a haul road from the proposed Whitecrest Mine to the barge loading facility. Under proposed maximum quarry production rates (1 mtpa), a shipment would leave Exmouth Gulf every two weeks.

A future proposal to develop a larger shipping facility, including a dredged shipping approach, was envisaged, but was not considered as a part of the EPA's assessment.

Regional Impacts

The direct impacts to BCH were predicted to be as follows (EPA 1997b):

- Rocky shores (0.06 ha).
- Intertidal limestone pavement (1.0 ha).
- Subtidal limestone pavement (1.0 ha).
- Seafloor (supporting holothurians, echinoids, molluscs and prawns) (4.2 ha).

These habitats were mapped to the north and south of the infrastructure footprint, are expected to be widely represented along the western shore of Exmouth Gulf, and are similar to the habitats recorded at Heron Point extending north to Learmonth Jetty. Thus impacts were not considered significant at a local scale.

An onshore footprint of 20.6 ha was expected as a result of the project (based on the estimated footprint presented in Figure 2-15). To date the project has not been implemented.

2.5.8.6 Exmouth Deepwater Port

Summary

Several groups are investigating the prospect of a deep-water port to service larger vessels, including cruise ships, defence and resources sector vessels. Visiting cruise ships are currently anchored offshore within Exmouth Gulf for a few hours and passengers are brought ashore for sightseeing and shopping, if the weather allows.

The Shire of Exmouth secured funding from the Gascoyne Development Commission to investigate the development of the proposed terminal. Two potential sites were being looked at, the first immediately to the south of Exmouth Marina, the second to the south of Mowbowra Creek (Figure 2-15). Mowbowra Creek is the same location as the proposed Exmouth Limestone Project Barge Loading Facility. Only one of the proposals would occur at this site.

Regional Impacts

The project, based on the estimated footprint presented in Figure 2-15, would result in the loss of 13.2 ha of native vegetation onshore and of 1.8 ha of nearshore soft sediment habitat offshore.

2.5.8.7 General Recreational and Commercial Vessel Operations

Summary

Currently extensive vessel activity occurs within Exmouth Gulf as a result of the Exmouth Gulf Prawn Fishery (13 boats) (Section 2.5.8.1), charter fishing and tour operators, recreational fishers and commercial operations (including those associated with oil and gas projects (refer Section 2.4.8.1)).

There are 15 tour operators, licensed to operate within the Ningaloo Marine Park, undertaking Whale shark and Humpback whale swim tours. All operations occur within Ningaloo Marine Park, with the majority to the west of the North West Cape and within the northern portion of Ningaloo Marine Park. There are also 5-10 whale-watching operators who operate within Exmouth Gulf (Hogstrom, A. pers comm. 2019).

Regional Impacts

Current recreational and commercial vessel traffic in Exmouth Gulf poses a risk of direct (e.g. vessel collision) and indirect (e.g. underwater noise) impacts to marine fauna. Currently the soundscape in Exmouth Gulf is mainly dominated by biological sounds from wave action, Humpback whales and snapping shrimp, with a low noise contribution from shipping, boating and other anthropogenic activities (Bejder *et al*. 2019). Increased development within or adjacent to Exmouth Gulf would see an increase in marine traffic and a concomitant increase in anthropogenic noise within Humpback whale breeding/resting habitat, with the potential for increased risk of ship strikes and acoustic disturbance to resting and nursing mother and calf whales (Bejder *et al*. 2019).

A recent project attempted to quantify the current risk from shipping to large marine fauna around Australia by combining vessel data (density, speed and noise levels) with species distribution/habitat models to produce fine-scale relative spatial risk profiles (Peel *et al*. 2019). The modelled total relative risk of vessel strike on Humpback whales across the whole of Exmouth Gulf was greatest as a result of vessels under 80 m in length (compared to vessels greater than 80 m in length, vessels travelling at greater than 15 knots and recreational vessels). However, the highest risk identified was in the area adjacent to Exmouth marina, from vessels travelling at greater than 15 knots.

3. STAKEHOLDER ENGAGEMENT

3.1 INTRODUCTION

This section provides a summary of consultation undertaken and the feedback received to date. In many instances, the comments and advice received are beyond the environmental scope of this ERD. Subsea 7 has included these matters in the summary to provide a full and balanced account of the consultation outcomes and stakeholder sentiment. Subsea 7's programme of consultation is ongoing and provides a forum for engagement on environmental and non-environmental matters that extends the opportunities presented in the formal environment impact assessment process.

3.2 KEY STAKEHOLDERS

A number of meetings and briefings on the Proposal have been held with the local community, local, State and Federal government agencies, other industry participants, non-government organisations, Traditional Owner groups and the pastoralist. Key stakeholders are considered to include:

- Jane Lefroy and Phil Kendrick (Pastoralist).
- Shire of Exmouth.
- Department of Jobs, Tourism, Science and Innovation (DJTSI).
- Department of Premier and Cabinet (DPC).
- Department of Water and Environmental Regulation (DWER) including the Environmental Protection Authority (EPA) Service Unit.
- Exmouth Community Reference Group.
- Exmouth Chamber of Commerce and Industry.
- Gascoyne Development Commission – Exmouth Branch.
- Department of Planning, Lands and Heritage (DPLH).
- Gnulli Working Group (Traditional Owners).
- YMAC – Native Title Representative Body.
- Exmouth Community.
- Cape Conservation Group (CCG).
- Department of Biodiversity Conservation and Attractions (DBCA).
- Department of Transport (DoT).
- Department of the Environment and Energy (DoEE).
- Kailis Group.

In addition to the key stakeholders identified above, Subsea 7 has taken the approach, since the Proposal was made public, to endeavour to reasonably respond or engage with any interested person or group that has expressed an interest in the Proposal. This has resulted in engagement with a wide range of parties. The full stakeholder engagement record/matrix is contained in Attachment 2T.

3.3 STAKEHOLDER ENGAGEMENT PROCESS

The format and frequency of communications with stakeholders and decision-makers has been related to the nature of matters under discussion and the rate of progress of the Proposal definition and technical studies.

A broad cross-section of community and service organisations local to Exmouth, including conservation groups, has also been contacted regarding the Proposal. The subjects of discussion have varied through the range of stakeholders, and valuable input has been gained for development of the environmental investigation programmes and design of the Proposal.

The method of consultation employed by Subsea 7 has varied depending on the forum, subject matter and purpose. The main forms of communication can be categorised as:

- Broad project briefings and presentations.
- Stakeholder workshops.
- Stakeholder meetings and discussions, including those undertaken on Subsea 7's behalf by consultants (e.g. specific environmental technical study methods and approach).
- Written communications and the distribution of project updates.
- Telephone discussions.

In addition to Subsea 7-led stakeholder engagement, formal public consultation processes have occurred associated with the State and Commonwealth environmental assessment processes including:

- Subsea 7's initial referral of the original Proposal to the EPA under Section 38 of the EP Act was advertised for public consultation between 14 and 28 February 2018.
- Subsea 7's referral to the DoEE was advertised for public consultation on 31 October 2018, in accordance with the EPBC Act.
- The Native Vegetation Clearing Permit required for the minimal land clearing associated with the commencement of the subterranean fauna investigations, required under the ESD, was issued for public comment between 7 and 28 February 2018. This consultation included the provision of all contemporary flora and vegetation survey reports, thus representing another form of public consultation in connection with the Proposal.
- The release of the ESD for public comment, for a two-week period between 14 and 28 February 2018, provided opportunity for public input on the scope of the technical studies required to support the environmental impact assessment (as presented within this document).
- The request to change the Proposal under Section 43A of the EP Act was advertised for public review between 1 and 15 March 2019.
- Subsea 7's referral of the amended Proposal to the EPA under Section 38 of the EP Act was advertised for public consultation between 20 and 26 May 2019.
- The public release of this ERD, for an eight-week period, will provide a further opportunity for stakeholder review and involvement in planning for the Proposal.

It is noted that a number of these consultation periods are not legislative or mandatory, but have been conducted to ensure the fullness of public consultation is maintained for this Proposal.

Engagement with the Gnulli people, who hold a Native Title claim over an area that includes the Proposal Envelope, will be maintained through the Heritage and Indigenous Land Use Agreement (ILUA) process. Subsea 7 has established an open and consultative process with the Gnulli Group, where engagement has been performed in the form of:

- Regular attendance and presentations at the Gnulli Working Group meetings.
- Multiple site visits with members of the Gnulli Group.
- Multiple heritage surveys performed with members of the Gnulli Group.
- Ongoing and regular engagement with YMAC, acting as representatives of the Gnulli Group in the Native Title claim.

Where relevant, feedback and outcomes from the engagement with the Gnulli have been incorporated into this ERD.

3.4 CONSULTATION OUTCOMES

Consultation was successful in improving stakeholder awareness of the Proposal, in obtaining feedback for consideration in project design and in identifying opportunities for environmental and social initiatives.

Table 3-1 presents a summary of the feedback provided by stakeholders to date. Note that this is not intended to be an exhaustive record of all questions and queries that were received during stakeholder engagement, but is intended to summarise themes of feedback received, and how these has been implemented or addressed.

Stakeholders	Feedback Received	Incorporation of Feedback
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Exmouth Community. • Local Businesses, particularly Tourism Operators. • DWER. • DoEE.	Whale Interaction in Exmouth Gulf – concern was raised regarding the potential for whale interactions in Exmouth Gulf, particularly during the Southern Whale Migration.	Subsea 7, in advance of performing any public consultation or stakeholder engagement, mandated that no Bundle launch and tow operations would occur during the peak of the southern whale migration and occupation of Exmouth Gulf. During the conduct of the environmental investigations, a contemporary study of the Humpback whale migration was commissioned by Subsea 7, to inform the proposed no-launch period. This period is now proposed as a 3-month window encompassing the months of August, September and October. As part of the impact assessment, research has also been commissioned to understand the potential reduction in marine use of the Exmouth Gulf by vessels directly connected to the offshore construction industry. This has shown that there are potentially large reductions in offshore vessel operations following the adoption of Bundle technology.
• Exmouth Community. • Local Business, Charter Operators, Aquarium Specimen Collectors. • Exmouth Council and Shire.	Access – stakeholder feedback identified the following areas as important to the public, and required that access be maintained: • Heron Point. • Bay of Rest.	The following has been included in the Proposal to ensure access is maintained: • Launchway crossing to maintain beach access. • Development of alternative access tracks from Minilya-Exmouth Road to the Bay of Rest.

Stakeholders	Feedback Received	Incorporation of Feedback
Exmouth Community	Road Traffic – initial presentations to the Exmouth community identified a concern about increased traffic flow on the Minilya-Exmouth Road heading into Exmouth.	Subsea 7 commissioned a full survey of transit routes, as well as a traffic study to understand the potential impacts. This included engagement with Main Roads WA MRWA). The outcome of the study was that the traffic related to the operation of the Bundle facility would have a relatively minor impact to the numbers of vehicles that are utilising those roads. As an example, using July as an example (the peak period of travel based on MRWA data) the Minilya-Exmouth Road (north of Burkett Road) would experience an increase from 733 vehicles per day to 759 vehicles per day. The proportion of heavy vehicle movements would increase from 17.1% to 17.8% with the additional movements. This is based on a 2017 MRWA dataset. Given this outcome, MRWA feedback was that these are considered to be small changes that do not require a redevelopment (e.g. passing lanes) of the Minilya-Exmouth Road. The study did include a recommendation to ensure right turns into the Bundle site can be made safely without impacting traffic (e.g. add a right turn road widening), which has been incorporated into the Proposal.
Exmouth Community	Employment – ensuring employment opportunities are available for local community members	A number of measures are proposed to ensure that employment opportunities exist for local personnel: • The site does not include any accommodation facilities. Therefore, all personnel working at the site will be required to reside in the Exmouth town. • Subsea 7's global track record for similar site operations shows a strong culture of local employment. For example, the only other Bundle facility in the world, based in Wick, Scotland, has a 100% local management team and typically has a 95% local workforce. • Subsea 7's Proposal includes for the establishment of development schemes (such as apprenticeship schemes) to ensure that local personnel are adequately trained for work on the site. • In March 2019, Subsea 7 employed its first member of the Bundle Site Team (Site Manager), with this role being sourced from the local community.

Stakeholders	Feedback Received	Incorporation of Feedback
• Exmouth Community. • Local Businesses.	Local content and business opportunities – businesses have often questioned the opportunities that would be available during site construction and operation	Subsea 7 remains committed to supporting local businesses, and has regularly acknowledged the Proposal's reliance on the local supply chain for the Proposal to be viable. In response to this feedback: • Subsea 7 arranged an information session and presentation, made by both Subsea 7 and their engineering consultancy (GHD), with an open invitation to all local businesses and members of the Exmouth community. • Information regarding the typical packages and work scopes required during construction and operation has been communicated. • Information regarding supplier qualification requirements for Subsea 7 and GHD has been communicated, including recommendations to seek appropriate partnerships or close any gaps to ensure suitability to bid for the work. • Key contacts within Subsea 7 and GHD have been provided to enable local businesses to commence communications and seek feedback well in advance of any onsite operations. • A commitment to set and be held to targets regarding local content has been made.
Gnulli Group	Potential impact to the 'Dinner Time Tree'	In performing the heritage survey of the Development Envelope in February 2019, the survey group identified a particular tree as the 'Dinner Time Tree', and communicated a preference for this tree to remain unimpacted by the site development. This feedback has been welcomed, and Subsea 7 remains committed to ensuring that this tree remains unimpacted. Subsea 7 will continue to work with the Gnulli group to identify opportunities for cultural awareness development, potentially involving this tree.
Cape Conservation Group and local Sea Shepherd Member	Personnel logistics and transportation – the suggestion was made that utilising buses for the transportation of the work force to the site would be more environmentally sustainable than individuals driving themselves	This feedback was well received. Since this discussion, Subsea 7 has based Proposal planning around utilising a bus service to transport the work force to and from the site. Not only would this represent an environmentally preferred approach, this would also represent a business opportunity for the local community.
Cape Conservation Group and local Sea Shepherd Member	Light spill and management – in this discussion, the potential for light spill from the Bundle site operations, and its potential impact, was raised	In response to this feedback, Subsea 7 has confirmed that the vast majority of site operations and construction activity would be performed during daylight hours, thereby limiting the lighting requirements for the site. To address the potential impact of light spill, mitigating measures have been proposed as part of this ERD, which can include timed and directional lighting.

Stakeholders	Feedback Received	Incorporation of Feedback
• Cape Conservation Group and local Sea Shepherd Members. • Exmouth Community.	Power supply – interested stakeholders queried whether or not there would be an option to utilise renewable energy to power the site	As a result of receiving this feedback, Subsea 7 amended the site basis of design to propose that general site power for activities such as general lighting, office and ablutions power and general power outlets will all be supplied by solar power (when available).
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Exmouth Community. • Fishing Charter Business.	Towhead launching – during engagement, feedback was received expressing concern regarding the potential for towheads to impact the seabed during launch	Subsea 7 performed a 12 month engineering study with Bundle experts from their centre of excellence in Aberdeen, and driven by a highly respected Bundle Towmaster, to develop a specific launch and tow methodology for Bundles in Exmouth Gulf. As a result of the study, the potential for interaction between the towheads and seabed has been reduced, as well as the potential for seabed interaction from the launch tow tugs. Subsea 7's target is that towheads do not touch the seabed.
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Ningaloo Coast World Heritage Committee. • Exmouth Community. • DWER. • DoEE.	Potential impact to Ningaloo Reef – during stakeholder engagement, regular feedback was received that highlighted the importance of the Ningaloo marine area, noting that the Proposal included marine operations in the Ningaloo Marine Park	Initial feedback to stakeholders regarding this concern highlighted that the operations inside the Ningaloo Marine Park were limited to vessel movements and towing operations, which are already undertaken safely and regularly for other operations and developments. To address the Bundle tow specifically, Subsea 7 commissioned an extensive engineering study to consider the tow of a Bundle through the Ningaloo Marine Park. The tow methodology was subsequently amended slightly to incorporate a 'Surface tow' method for a Bundle when in the Ningaloo Marine Park. The 'Surface tow' method increases the clearance between Bundle chains and the seabed, and therefore further reduces the low risk of potential impact.
• DWER	Groundwater abstraction rate – to ensure water abstraction does not affect groundwater levels, the use of multiple bores, and a limit on the extraction rate, was proposed.	Upon receipt of this feedback, the water sourcing strategy for the site was updated to include the use of three (3) separate water bores, each with a limited extraction rate. Modelling shows that extraction will be limited to only 0.14 L/s per bore, which Subsea 7 considers to be a low extraction rate.

Stakeholders	Feedback Received	Incorporation of Feedback
• Gnulli Group. • Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA.	Groundwater abstraction volume – feedback was received raising concern regarding the volume of proposed water extraction	To address this feedback, Subsea 7 completed a broad investigation into water supply options. From this investigation, water bore locations were identified where the water quality is of sufficient quality that the initially proposed reverse osmosis (RO) water treatment plant is not required. This has a major positive impact (reduction) to the water abstraction volumes due to the removal of any inefficiency associated with water treatment (can be 30-40%). Further investigation into current groundwater licences for the area indicated that only 2% of the total aquifer allocation is currently allocated.
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Exmouth Community. • Fishing Charter Business.	Visual impact at the beach – concern has been raised that the site may impact the visual amenity of the beach at Heron Point.	Subsea 7's Proposal has been developed to minimise any permanent infrastructure at the beach/Heron Point end of the Development Envelope. In contrast to the site at Wick, the Proposal includes only minimal infrastructure at the seaward end of the site (the launchway, hydrotest water pond and launchway facilities area (a clear and flat area with no permanent structures)). The vast majority of infrastructure has been located adjacent to Minilya-Exmouth Road, where it is in keeping with nearby facilities (i.e. RAAF Learmonth). Further, Subsea 7 has developed a design for the launchway that targets the lowest profile possible, to ensure its visibility is minimised. The structure would be considerably smaller than the nearby Learmonth jetty. A Visual Impact Assessment has been performed, which demonstrates the limited/minimal impact to the visual amenity.
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Exmouth Community. • Fishing Charter Business.	Visual impact of fabrication site – concern has been raised that the site may impact the visual amenity at the fabrication end of the site (i.e. fabrication shed visible from Minilya-Exmouth Road).	In response to the concern regarding visual impact due to the fabrication shed, a Visual Impact Assessment has been performed and independently peer reviewed. This assessment demonstrates the limited/minimal impact to the visual amenity. In general, the infrastructure proposed at the fabrication site is considered to be in keeping with that in the near vicinity (i.e. RAAF Learmonth). Subsea 7 is committed to building infrastructure that is no higher than is necessary to support the intended operations.

Stakeholders	Feedback Received	Incorporation of Feedback
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Shire of Exmouth. • Exmouth Community. • Jock Clough.	Gulf industrialisation – in general, opposition to the Proposal has voiced concern regarding the potential for the Proposal to lead to a general 'industrialisation' of Exmouth Gulf.	Subsea 7 has approached the Proposal with a planning strategy that considers the regional context. Subsea 7's scheme amendment request proposes a Special Use Zone. This recognises that the Proposal and associated technology is unique (only one other site exists in the world of its type). The re-zoning request concerns only the Development Envelope for this Proposal. The remainder of the nearby area would remain largely zoned for pastoralism, and cannot be developed without further extensive planning and environmental approval processes. The Proposal also provides opportunity to reduce some aspects of 'industrialisation' of Exmouth Gulf, by transferring pipeline installation operations from predominantly marine-based activities, to predominantly land-based activities, providing a net reduction in marine operations within Exmouth Gulf.
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Exmouth Community.	Leaks/spills in Exmouth Gulf – concern has been raised regarding the potential for leaks or spills to occur as a result of Bundle towing operations.	General concern has been raised regarding the potential for leaks or spills to occur in Exmouth Gulf during Bundle launch and tow operations. There was a general misunderstanding of the contents of the Bundles. The initial response has been to clarify that the pipelines do not contain hydrocarbons. A full, detailed assessment of the risk potential and consequences of a leak/spill has been undertaken and the outcomes included in the ERD.
MRWA	Site access – feedback was received that the proposed location of the site access road may present a road safety hazard.	Following collaboration and discussion between Subsea 7, GHD (engineering consultancy) and MRWA, two alternative locations for the site access road have been identified and are under consideration for the site. The final selection will be performed during the detailed design phase, but the opportunity to incorporate either has been captured in the ERD, ensuring that this feedback is accounted for.
• Recfishwest. • Local Flyfishing Business. • Exmouth Community.	Marine access to the Bay of Rest, Muiron Islands, etc. – concern was raised that access to areas such as the Bay of Rest and the Muiron Islands would be impacted by site operations.	In all cases, access will be maintained to these areas of value. Upon receipt of this feedback, Subsea 7 has endeavoured to understand the different marine access options that are utilised by water users. It is understood that users wishing to access the Bay of Rest often launch from the beach adjacent to the Bay of Rest. This access would not be impacted by Bundle site operations. Access to the Muiron Islands will also be maintained, though for a short period during a Bundle launch (~6 hours) a detour around the Bundle tow route (and associated exclusion zone) may be required.

Table 3-1: Summary of Feedback Provided by Stakeholders Between November 2016 and December 2018

3.5 SECTION 43A CHANGE TO PROPOSAL (UNDER ASSESSMENT NUMBER 2136)

On 28 February 2019 the EPA published Subsea 7's request to change the Proposal under Section 43A of the EP Act. The consultation period closed on 15 March 2019.

A total of 2,321 comments were received during the public comment period, with the vast majority being brief, pro forma type, responses. All of these responses were considered by the EPA during the consideration of the request to change the Proposal. Subsea 7 subsequently requested the termination of the assessment to allow a new referral to be submitted. Table 3-2 identifies a selection of the key issues raised during the public review period for the Section 43A process, and provides Subsea 7's responses.

Feedback Topic	Subsea 7 Response
Numerous submissions called for a full assessment of the Proposal and challenged the level of work presented in the S43A documentation	It is noted that the S43A only provided information that was relevant to the specific updates, not the overall Proposal. The S43A documentation provided the following, as required by the EPA: • Details of the proposed change. • Statement of the significance of the change. • Rationale for the change. The documentation was not intended to represent a full environmental impact assessment (EIA) of the Proposal. Rather, the documentation was prepared to support Subsea 7's conclusion that the proposed changes to the Proposal are unlikely to significantly increase any impact that the Proposal may have on the environment. The full EIA is presented in the PER (this document).
Industrialisation of the Gulf	Numerous submissions referenced the Proposal as a 'gateway' project, which will lead to a subsequent increase in development and marine operations in the area. The Exmouth township was founded on the defence industry (both naval and air force defence), in combination with the fishing industry. Pastoralism has also been present throughout this time. Industry has been present in Exmouth Gulf for some time, and continues to be so today, so it is inaccurate to label this Proposal a gateway project. Exmouth Gulf is currently regularly utilised for commercial marine operations, as the majority of residents would realise. The Proposal represents an opportunity for the volume of marine operations in Exmouth Gulf, associated with offshore developments, to be reduced (refer Section 2.4.8.1). Subsea 7's approach for the proposed re-zoning of the site, under the Exmouth local planning scheme, was to request a Special Use Zone to ensure that the site is only able to be utilised for this Proposal. The re-zoning request applies only to the land that is required for this Proposal and would not facilitate other industrial developments.

Feedback Topic	Subsea 7 Response
Seabed disturbance due to Bundle chains	Following the original referral of the Proposal to the EPA (refer Section 1.3.2) additional Bundle launch and tow engineering work was completed which determined that some of the ballast chains which hang below the Bundle, forming a component of the Controlled Depth Tow Method (CDTM), will be in contact with the seabed out to the Bundle Parking area. This change was promptly communicated to stakeholders (including to the EPA in July 2018 and to the Exmouth community on 24 October 2019 (refer Attachment 2T). Seabed disturbance due to the ballast chains will occur within a narrow corridor and this disturbance has been clearly described, and is assessed, within the PER (this document). Various submissions stated that the chains would disturb the full Offshore Operations Area. To clarify, the Offshore Operations Area covers the potential disturbance from multiple Bundle launches, based on the modelling of various Bundle lengths being launched under varied environmental conditions. In keeping with EPA guidelines, the worst-case scenario is presented and assessed.
Seabed disturbance due to Bundle towheads	Design studies were undertaken to increase the buoyancy of the Bundle towheads, to facilitate the early floatation of the towheads and provide a reduction in seabed interaction adjacent to Heron Point. The continued assertion that the towheads will skid along the seabed for a distance of over 1.5 km is incorrect.
Offshore Operations Area and chain footprint	EPA guidance (EPA 2017) states that the following spatial data should be defined: • Development envelope: the maximum area within which the proposal footprint will be located. • Development footprint: the location where the physical proposal elements occur. To align with EPA guidance, and to reflect the revised seabed disturbance area, the Offshore Operations Area (representing an offshore 'development envelope') has been defined to cover the maximum area within which the chain footprint will be located. The chain footprint associated with several differing Bundle launch scenarios is also presented. Submissions suggesting that the entire Offshore Operations Area, or Development Envelope, will be disturbed are incorrect.
Loss of access to Heron Point or the Bay of Rest	Subsea 7 first learnt of the community's concern regarding continued access to Heron Point or the Bay of Rest in August 2017. In response, Subsea 7 revised the design of the launchway to allow for a vehicle crossing. This was presented to the Exmouth community on 24 October 2019 (refer Attachment 2T). The continued assertion that access will be prevented is wholly incorrect. Further, Subsea 7 proposes to provide alternative access tracks to ensure access is maintained to Heron Point or the Bay of Rest (Figure 5-56). The continued accessibility of these areas remains of paramount importance and Subsea 7 is committed to ensuring access is maintained.

Feedback Topic	Subsea 7 Response
Numerous submissions referenced 'biodiverse' or 'structurally complex' BCH within the Offshore Operations Area	Several surveys have confirmed that the majority of BCH within the Offshore Operations Area is composed of low relief (flat) soft sediment (mud) habitat. This habitat does not represent 'biodiverse' or 'structurally complex' habitat. The majority of disturbance will occur in an area that is already utilised by the fishing industry, with no cumulative impact to BCH expected.
Exmouth Gulf as 'nursery' and 'engine room' of Ningaloo	Benthic communities play important roles in maintaining the integrity of marine ecosystems and the supply of ecological services. There is strong evidence that benthic communities are important for the maintenance of biological diversity by providing structurally complex and diverse habitat, refuge for vulnerable life stages and a varied and increased food supply. In Western Australia it is the benthic primary producer communities that form the foundation of many of our coastal food webs, which in turn support productive and economically-important fisheries (EPA 2016e). Algal mat and mangrove habitats are widely reported as being important in nutrient recycling and primary production. Mangroves are also recognised as contributing to coastal protection and in representing nursery habitat for juvenile fish. The algal mat and mangroves habitats along the southern and eastern shores of Exmouth Gulf are extensive and their values well recognised (refer Section 2.5.5). The Proposal will not have any impact on algal mat or mangrove habitats. Hydrodynamic modelling (Massel *et al*. 1997) has shown that the tidal movement of water within Exmouth Gulf is predominantly north-south, with the tidal excursion length (the distance a parcel of water travels before the tide turns) being less than 5 km. This is too short to allow significant quantities of water to leave the Gulf on any one tide. Only a localised area of Exmouth Gulf exchanges directly with the Ningaloo region, with the remainder of the water in Exmouth Gulf tending to move north east towards the Onslow region. Thus while some habitats within Exmouth Gulf may represent foraging or nursery habitat for species that may subsequently travel to Ningaloo Reef or the Onslow area, Exmouth Gulf is not thought to significantly contribute to the productivity of Ningaloo Reef.

Table 3-2: Key Issues Raised on Section 43A Change to Proposal Application