Local Planning Scheme 4 Amendment 1
Environmental Review

Date: 20 September 2019

Assessment Number: 2209

REVISION RECORD SHEET

Revision	Issue Date	Description of revision(s)	Authorisation
A	13.08.2019	Draft	S. Shute (MBS Environmental) M. Willcock (TBB)
B	19.08.2019	Final Draft	S. Shute (MBS Environmental) M. Willcock (TBB)
C	20.09.2019	Final	S. Shute (MBS Environmental) M. Willcock (TBB)

Invitation to make a submission

The Shire of Exmouth invites people to make a submission on the environmental review for the proposed amendment.

The Shire of Exmouth is proposing an amendment to Local Planning Scheme 4 (LPS4). The amendment seeks to rezone up to 440 ha of land in Learmonth from Rural Zone and Foreshore Reserve to Special Use Zone No. 10. The proposed amendment (Amendment 1) is directly related to the Learmonth Pipeline Fabrication Facility (the Proposal), proposed by Subsea 7 Australia Contracting Pty Ltd (Subsea 7). The Proposal is being formally assessed separately, at the level of Public Environmental Review (PER), by the Environmental Protection Authority (EPA) under Part IV of the EP Act (Assessment number 2208).

This Environmental Review (ER) has been prepared by the Shire of Exmouth to support the assessment of Amendment 1 to LPS4 (Assessment number 2209). The ER is available for a public review period of 8 weeks from 2 October 2019, closing on 30 November 2019.

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

Why write a submission?
The Shire of Exmouth seeks information that will inform the EPA's consideration of the likely effect of the scheme amendment, if approved, on the environment. This may include relevant new information that is not in the ER, 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 ER.

When making comments on specific elements in the ER:

- 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 Shire of Exmouth 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 ER.
- Attach any reference material, if applicable. Make sure your information is accurate.

The closing date for public submissions is: 30 November 2019

The Shire of Exmouth prefers submissions to be made electronically via the following email address:

Sa1.learmonth@exmouth.wa.gov.au

Alternatively submissions can be:

- posted to: Mr Cameron Woods, Chief Executive Officer, Shire of Exmouth, PO Box 21, Exmouth WA 6707, or
- delivered to: Mr Cameron Woods, Chief Executive Officer, Shire of Exmouth, 2 Truscott Crescent, Exmouth WA 6707.

If you have any questions on how to make a submission, please contact the Shire of Exmouth on (08) 9949 3000.

Scoping Checklist

Task No.	Required Work	Section & Page No.
EPA Factor 1 – BCH		
1	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 within the scheme amendment area. 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. Note: if surveys were undertaken as part of the EPA's Assessment No. 2208 of the Learmonth Pipeline Fabrication Facility proposal, survey results/mapping and a demonstration of how the Technical Guidance – Protection of Benthic Communities and Habitats, December 2016 has been followed are to be included in the ER.	Section 5.1.3, p. 40
2	Assess the values and significance of benthic communities and habitats within the scheme amendment area 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 future development and associated infrastructure within the scheme amendment area and adjacent Exmouth Gulf.	Section 5.1.3, p. 40
3	Identify elements of the future development and associated infrastructure which may potentially affect benthic communities and habitat, including both direct and indirect impacts.	Section 5.1.4, p. 49
4	Predict the residual impacts from the future development and associated infrastructure, both direct and indirect, on benthic communities and habitat after demonstrating how the mitigation hierarchy has been applied. Impact predictions are to:	Section 5.1.8, p. 67
	(a) Include the likely extent, severity and duration of direct and indirect impacts of the scheme amendment 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.	Section 5.1.5, p. 49
	(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	Section 5.1.6.6, p. 62

Task No.	Required Work	Section & Page No.
	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 future development and associated infrastructure within the scheme amendment area and adjacent Exmouth Gulf.	Attachment 3
5	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 5.1.8, p. 67
6	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.1.7, p. 65
7	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.1.7, p. 65
EPA Factor 2 – Coastal Processes		
8	Characterise the environment by describing the current coastal processes in the proximity to the scheme amendment. 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. 69

Task No.	Required Work	Section & Page No.
9	Identify elements of the future development and associated infrastructure which may potentially affect coastal processes, including both direct and indirect impacts and for both construction and operation.	Section 5.2.4, p. 72
10	Predict the residual impacts from the scheme amendment, 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. **(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. 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. **(g)** Address the frequency, volume and potential environmental impacts of sand bypassing/backpassing adjacent to the amendment area. **(h)** Address the requirements of State Planning Policy 2.6, particularly with regard to setback and coastal risk management.	Sections 5.2.6 and 5.2.7, p. 72 and 75
11	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.2.7, p. 75
12	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.2.7, p. 75

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EPA Factor 3 – Marine Environmental Quality		
13	Conduct monitoring as necessary to characterise the existing marine environmental quality (baseline water and sediment quality) in the area potentially affected by the future development and associated infrastructure. The characterisation needs to be informed by an assessment of threats and pressures to marine environmental values, both ecological and social. The characterisation is to inform the environmental quality management required in work item 15.	Section 5.3.3, p. 79
14	Predict the extent, severity and duration of any impacts from future development and associated infrastructure, after outlining any avoidance and mitigation options that will be applied. Predicted impacts should also be presented spatially.	Section 5.3.5, p. 83
15	Identify management and mitigation measures to ensure residual impacts are not greater than predicted. The ER is to include 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 to ensure that future development and associated infrastructure achieves the proposed environmental outcomes.	Section 5.3.6, p. 84
16	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.3.6, p. 84
17	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.3.6, p. 84
EPA Factor 4 – Flora and Vegetation		
18	Identify and characterise the flora and vegetation of areas that may be directly or indirectly impacted by the scheme amendment 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. Note: if surveys were undertaken as part of the EPA's Assessment No. 2208 of the Learmonth Pipeline Fabrication Facility proposal, survey results and a demonstration of how the guidance has been followed are to be included in the ER. Ensure species database searches and taxonomic identifications are up to date.	Section 5.4.3, p. 87
19	Identify and describe the vegetation and significant flora species present and likely to be present within the scheme amendment area, and any areas that may be indirectly impacted by the scheme amendment area. Include an analysis of the significance of flora and vegetation in local, regional and State contexts as	Section 5.4.3, p. 87

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	appropriate in accordance with the relevant guidance set out below.	
20	Provide a map depicting the recorded locations of the significant flora, ecological communities and significant vegetation in relation to the scheme amendment area in accordance with the relevant guidelines set out below.	Section 5.4.3, p. 87
21	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.4.6, p. 102
22	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.4.6, p. 102
EPA Factor 5 – Subterranean Fauna		
23	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 implementation of the scheme amendment. This should include sampling inside and outside the impact areas and consider cumulative impacts. Note: Where surveys were undertaken as part of the EPA's Assessment No. 2208 of the Learmonth Pipeline Fabrication Facility proposal, survey results and a demonstration of how the guidance has been followed are to be included in the ER. Ensure species database searches and taxonomic identifications are up-to-date. Where results from previous surveys are relied on for context, justification should be provided to demonstrate that they are relevant and consistent with EPA Guidance.	Section 5.5.3, p. 105
24	Provide figure(s) showing the extent of subterranean fauna habitat in relation to the scheme amendment area and species distributions.	Section 5.5.3, p. 105
25	Describe and assess the extent of direct, indirect and cumulative impacts as a result of future development and associated infrastructure to subterranean fauna, taking into consideration the significance of subterranean fauna and subterranean fauna habitat.	Section 5.5.5, p. 109
26	Predict the residual impacts from the future development and associated infrastructure on subterranean fauna after considering and applying avoidance and minimisation measures.	Section 5.5.6, p. 112
27	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.5.6, p. 112
28	Describe the planning mechanisms that are to be applied	Section 5.5.6, p. 112

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	to ensure impacts are managed to meet the EPA's objectives.	
EPA Factor 6 – Terrestrial Fauna		
29	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 mplementation of the scheme amendment. 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. Note: if surveys were undertaken as part of the EPA's Assessment No. 2208 of the Learmonth Pipeline Fabrication Facility proposal, survey results and a demonstration of how the guidance has been followed are to be included in the ER. Ensure species database searches and taxonomic identifications are up-to-date. Where results from previous surveys are relied on for context, justification should be provided to demonstrate that they are relevant and consistent with EPA Guidance.	Section 5.6.3, p. 115
30	Describe the values and significance of fauna and fauna habitat that maybe impacted directly and indirectly by implementation of the scheme amendment and describe the significance of these values in a local and regional context.	Section 5.6.3, p. 115
31	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 scheme amendment.	Section 5.6.3, p. 115
32	Describe and assess the extent of direct and indirect impacts as a result of implementation of the scheme amendment 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 scheme	Section 5.6.5, p. 120

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	amendment.	
33	Predict the residual impacts to terrestrial fauna after considering and applying avoidance and minimisation measures.	Section 5.6.6, p. 125
34	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.6.6, p. 125
35	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.6.6, p. 125
EPA Factor 7 –Inland Waters		
36	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 5.7.3, p. 128
37	Identify water requirements for the scheme amendment and identify and discuss any associated impacts of groundwater abstraction including from drawdown.	Section 5.7.5, p. 134
38	Provide a description of the future development and associated infrastructure 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 5.7.5, p. 134
39	Undertake hydrological investigations to determine impacts from the future development on the surface and ground water quality and quantity of the likely direct and indirect impact areas taking into account cyclonic conditions, cumulative impacts and a range of climatic scenarios including probable maximum precipitation.	Section 5.7.5, p. 134
40	Predict the residual impacts on inland waters, for direct, indirect and cumulative impacts, after considering avoidance and minimisation measures.	Section 5.7.6, p. 138
41	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.7.6, p. 138
42	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.7.6, p. 138
EPA Factor 8 – Social Surroundings		
43	Characterise the heritage and cultural values of the proposed amendment area, including areas that may be indirectly impacted, to identify sites of significance and their relevance within a wider regional context.	Section 5.8.3, p. 142
44	Conduct appropriate Aboriginal heritage surveys to identify Aboriginal sites, values, and/or cultural associations.	Section 5.8.3, p. 142
45	Conduct appropriate consultation to identify concerns in	Section 5.8.3, p. 142

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	regard to environmental impacts as they affect heritage matters.	
46	Provide a detailed description and figure(s) of the proposed disturbance and impacts to heritage sites, values, and/or cultural associations associated with the scheme amendment.	
47	Assess the impacts on heritage sites, values and/or cultural associations as a direct result of the future development and associated infrastructure, including those resulting from changes to the environment which may impact on cultural and heritage significance or values.	Section 5.8.3, p. 142
48	Predict the residual impacts on heritage sites, values and/or cultural associations, for direct, indirect and cumulative impacts after considering the mitigation hierarchy.	Sections 5.8.5 and 5.8.6, p. 156 and 163
49	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 5.8.6, p. 163
50	Characterise the environment by providing a description of the visual landscape character and scenic quality values and provide maps of the visual landscape units 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.	Section 5.8.3, p. 142
51	Characterise the current, and any other reasonably foreseeable, land and recreation uses and amenity values (including for visual, noise, odour, and dust) of the scheme amendment area.	Section 5.8.3, p. 142
52	Identify and discuss the potential sources and impacts of noise, dust, light-spill and alteration to landscape from the proposed scheme amendment.	Section 5.8.5, p. 156
53	Design and undertake a visual impact assessment (VIA) for the future development and associated infrastructure to assess the impacts of it 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. Note: The visual impact assessment completed as part of the EPA's Assessment No. 2208 of the Learmonth Pipeline Fabrication Facility proposal may be used as a reference case for future development and associated infrastructure.	Section 5.8.5, p. 156
54	The VIA will identify and describe the aspects of the future development and associated infrastructure which 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	Section 5.8.5, p. 156

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	perceptions. Note: The visual impact assessment completed as part of the s part of the EPA's Assessment No. 2208 of the Learmonth Pipeline Fabrication Facility proposal may be used as a reference case for future development and associated infrastructure.	
55	Predict the residual amenity impacts from the future development and associated infrastructure 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.	Sections 5.8.5 and 5.8.6, p. 156 and 163
56	Identify management and mitigation measures for the scheme amendment to ensure residual impacts to land and recreation uses, and amenity (including visual, noise, odour and dust) are not greater than predicted.	Section 5.8.6, p. 163
57	Conduct appropriate consultation to identify the potential impacts the future development and associated infrastructure will have on the economic surroundings of people affected by the scheme amendment (related to the physical area involved in the scheme amendment), including in relation to tourism, commercial fishing and recreational fishing operations/business.	Sections 5.8.5 and 6.3, p. 156 and 168
58	Identify and discuss the potential impacts to the economic surroundings of the people referred to in scope 57 above. The discussion must include consideration of the mitigation hierarchy. Note: This should include consideration of information collected in relation to impacts to the physical or biological surroundings as required by relevant scopes within the other preliminary key environmental factors.	Sections 5.8.5 and 6.3, p. 156 and 168
59	Describe any proposed avoidance, mitigation and management measures that demonstrate the EPA's objectives can be met.	Section 5.8.6, p. 163
60	Describe the planning mechanisms that are to be applied to ensure impacts are managed to meet the EPA's objectives.	Section 5.8.6, p. 163

Table ES 1: Work Required in Accordance with the Instructions for Environmental Review (EPA 2019)

Executive Summary

INTRODUCTION, BACKGROUND, AND CONTEXT

The Environmental Protection Authority (EPA) has determined that the proposed amendment to the Shire of Exmouth Local Planning Scheme 4 (LPS4) is to be formally assessed under Part IV of the *Environmental Protection Act 1986* (EP Act).

The proposed amendment (Amendment 1) seeks to rezone up to 440 ha of land in Learmonth (the 'Amendment area') from Rural zone and Foreshore reserve to Special Use No. 10 zone. Amendment 1 is directly related to the proposal by Subsea 7 Australia Contracting Pty Ltd (Subsea 7) to construct and operate the Learmonth Pipeline Fabrication Facility (the Proposal), which is being formally assessed separately, at the level of Public Environmental Review (PER), by the EPA under Part IV of the EP Act (Assessment number 2208).

The Environmental Review (ER, this document) has been prepared to fulfil the assessment requirements (Assessment number 2209) under Section 48A of the 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 Instructions for Environmental Review (EPA 2019).

OVERVIEW OF AMENDMENT 1

The Shire of Exmouth (the Shire) initiated Scheme Amendment 1 (Amendment 1, the amendment) to the Local Planning Scheme No. 4 (LPS 4) which seeks to rezone Parts of Lots 233-235 and 1586 Minilya-Exmouth Road, Learmonth. Amendment 1 proposes to rezone the land to a Special Use No. 10 zone and include land use permissibility and planning controls to facilitate development of the Proposal. The Special Use No. 10 zone is approximately 440 ha in area and is orientated north-east in a 10 km long linear corridor between Heron Point and the Minilya-Exmouth Road.

The Rural zone classification and land use permissibility does not effectively capture the unique land use associated with the Proposal, and the Proposal cannot reasonably fit into any existing use class in LPS 4. Rezoning of the land to 'Special Use No. 10' provides the ability for the local government to specify the special use(s) and relevant conditions. Amendment 1 also proposes a land use definition for 'pipeline fabrication facility'. The content of Amendment 1 is focused to relate directly to the Proposal.

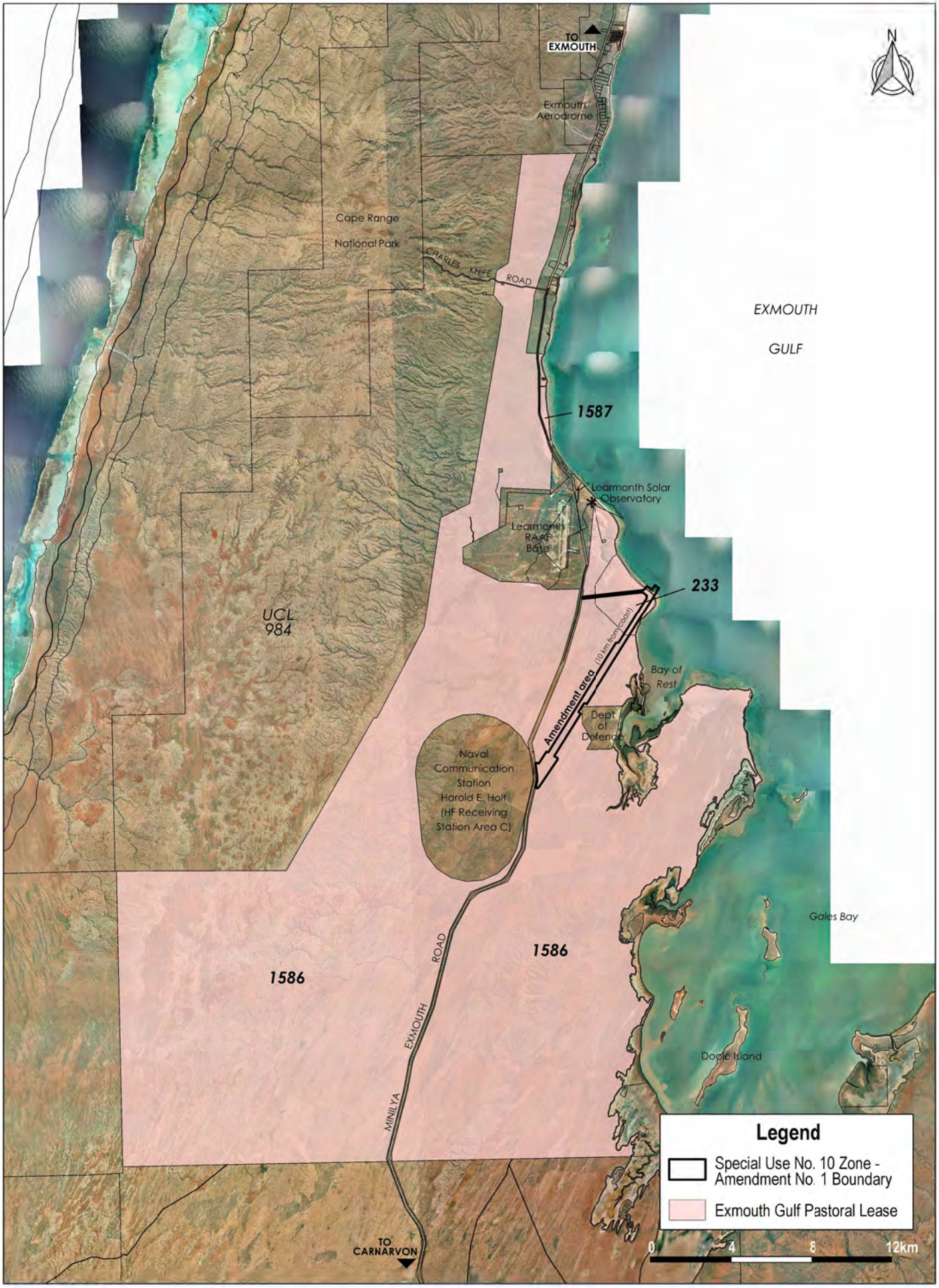
Amendment 1 is a 'complex amendment' in accordance with the Planning and Development (Local Planning Schemes) Regulations 2015 (the Regulations). The *Planning and Development Act 2005* (PD Act) requires the amendment to be referred to the Environmental Protection Authority (EPA), and the Regulations require it to be referred to the Western Australian Planning Commission (WAPC) for consent to advertise. The referral to the EPA by the Shire of Exmouth has resulted in the formal assessment of Amendment 1 at the level of Environmental Review (ER). The approval of Amendment 1 must follow the processes contained in the EP Act, PD Act and the Regulations. The Shire can advertise the scheme amendment once the EPA and WAPC have provided their advice.

The intention is for the amendment to be advertised for at least 60 days in accordance with the Regulations. The Shire must consider all submissions received on the scheme amendment (and on the ER). The Shire must also refer submissions that relate to environmental issues to the EPA, and inform the EPA of its views in relation to the environmental concerns raised in the submissions.

The amendment area lies adjacent to the western shoreline of Exmouth Gulf, at Learmonth, approximately 35 km south of the Exmouth townsite (ES Figure 1) and encompasses the majority of the Proposal Development Footprint including fabrication shed, storage area, two approximately 10 km long Bundle tracks and the proposed Bundle launchway, crossing the beach and extending 380 m into Exmouth Gulf (measured from the dune line) (ES Figure 2). A summary of the amendment is provided in ES Table 1.

Summary of Proposal	
Proposal Title	LPS4 Amendment 1
Responsible Authority	Shire of Exmouth
Location	Part of Lots 233, 234, 235 and 1586 Minilya-Exmouth Road, Learmonth
Short Description	Rezoning of up to 440 hectares of land from Rural zone and Foreshore reserve to Special Use No. 10 zone to facilitate the development of a pipeline fabrication facility (the Learmonth Pipeline Fabrication Facility).

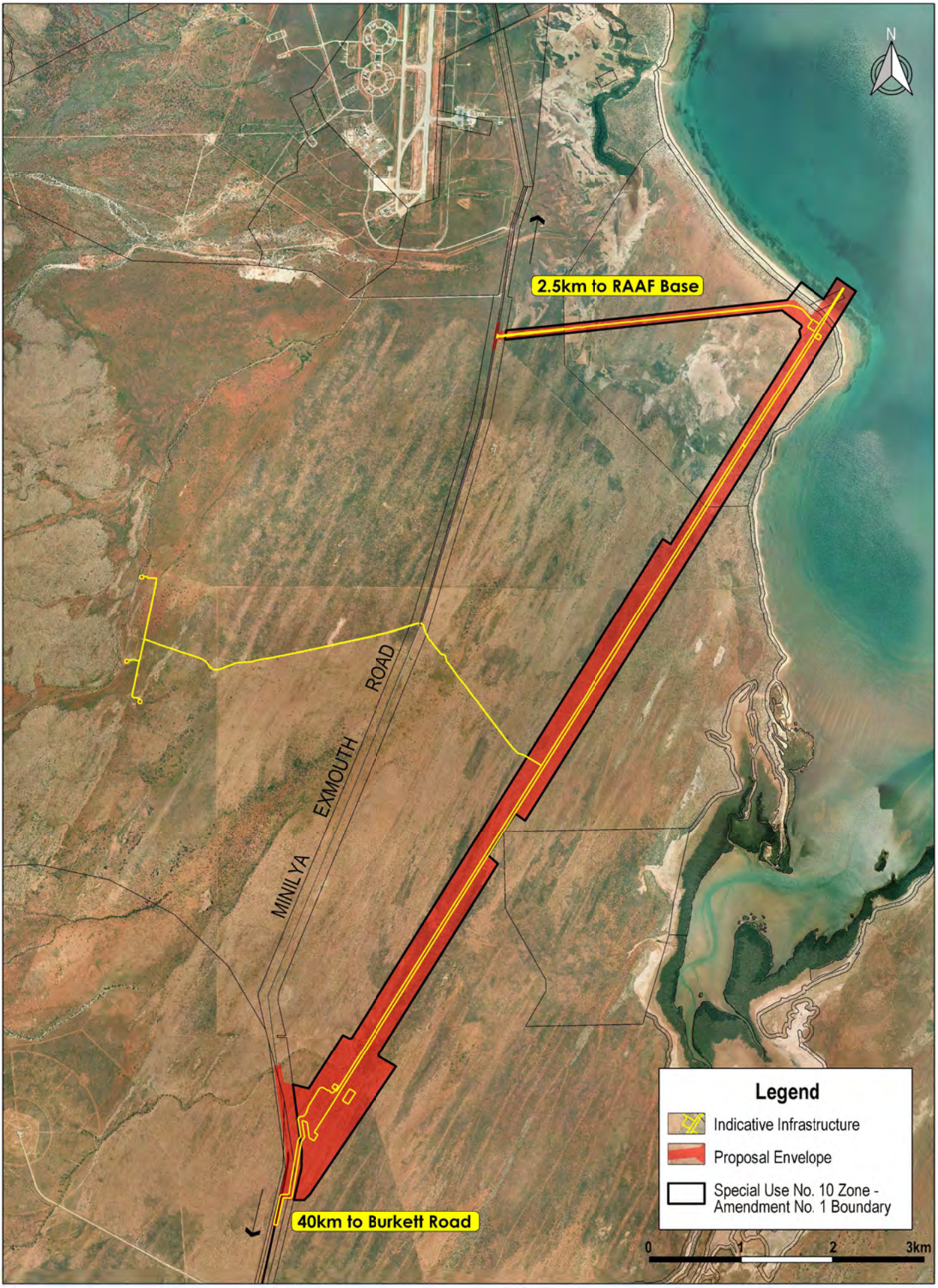
ES Table 1: Summary of the Amendment



Scale: 1:250,000
Original Size: A4
Grid: MGA Zone 50

ES Figure 1: Location of the Amendment area

Shire of Exmouth



Scale: 1:55,000
Original Size: A4
Grid: MGA Zone 50

ES Figure 2: Location of Amendment area in relation to Proposal Development Footprint

Shire of Exmouth

SUMMARY OF POTENTIAL IMPACTS, PROPOSED MITIGATION, AND OUTCOMES

ES Table 2 provides a summary of potential impacts, proposed mitigation measures, and predicted outcomes relevant to each environmental factor.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Key Environmental Factor: Benthic Communities and Habitat		
EPA Objective	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	
Ministerial approval for the proposed development would include conditions limiting the extent of direct and indirect impacts to BCH. The Marine Construction Monitoring and Management Plan (MCMMP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include protocols and procedures for the monitoring of key environmental quality indicators and management of environmental quality to ensure that the construction of coastal infrastructure achieves the appropriate level(s) of environmental protection.	<u>Zoning</u> The amendment area covers the area proposed for development (the Development Envelope). Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and could only be developed/used in a manner consistent with the purpose of the reserve. <u>Land Use Permissibility</u> The 'Special Use No. 10' zoning will facilitate the following land uses – marine support facility, pipeline fabrication facility, and telecommunications infrastructure. The Proposal currently under assessment by the EPA (Assessment number 2208) is for a pipeline fabrication facility. Subject to gazettal of Amendment 1, this land use would be a 'P' permitted use. A permitted use could proceed if it complies with all relevant development standards and requirements of the LPS 4, and any relevant environmental conditions. <u>Development Control</u> A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application.	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> Habitats within the amendment area are well represented elsewhere and the predicted direct losses represent a small proportion of the habitat present within the Heron Point Local Assessment Unit (LAU). Modelling has demonstrated that elevated turbidity during infrastructure construction is expected to be limited to the immediate surrounds (<50 m) of the work site. The adjacent habitats, and fauna using those habitats, are expected to be tolerant of short-term pulses in turbidity and suspended sediment. Significant impacts on the local wave or current conditions at Heron Point are not expected. The biological diversity and ecological

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	Environmental Conditions in LPS 4 There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	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.	
Ministerial approval for the proposed development would include conditions formalising the monitoring and management of impacts to sediment movement adjacent to coastal infrastructure. The Operational Environmental Management Plan (OEMP) will include protocols and procedures for the monitoring and management of impacts to sediment movement adjacent to coastal infrastructure, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208).	Zoning The amendment area covers the area proposed for development (the Development Envelope). Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and can only be developed/used in a manner consistent with the purpose of the reserve. Development Control A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015 Consistent with clause 67, model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to:	Related to Amendment The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. Related to the Proposal The development of a launchway is not expected to have any significant impact on the local wave or current conditions. Sand accumulation along the northern side of the launchway, and erosion to the south, could occur. Monitoring and the implementation of sand bypassing will ensure that the environmental values of the coast are protected. The dune structure will be reinstated

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	"(c) any approved State planning policy". "(q) the suitability of the land for the development taking into account the possible risk of flooding, tidal inundation, subsidence, landslip, bush fire, soil erosion, land degradation or any other risk". Development would therefore have due regard to State Planning Policy 2.6 State Coastal Planning Policy (SPP 2.6), which enables the local government to require development applications to address the provisions of the policy and related guidelines. <u>State Planning Policy 2.6 State Coastal Planning Policy</u> A coastal hazard assessment has been completed for the proposed development (Attachment 2E) to identify any risks associated with the coastal erosion or inundation hazards. It is noted that the proposed development is an industrial facility that is demonstrably dependent on a foreshore location and is therefore a variation to the general requirements of State Planning Policy 2.6 under Section 7 of Schedule One. <u>Environmental Conditions in LPS 4</u> There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	following any significant re profiling of the dune system. The geophysical processes that shape coastal morphology will be maintained so that the environmental values of the coast are protected.
Key Environmental Factor: Marine Environmental Quality		
EPA Objective	To maintain the quality of water, sediment and biota so that environmental values are protected.	
Ministerial approval for the	<u>Model Provisions of the Planning and Development</u>	<u>Related to Amendment</u>

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
proposed development would include conditions limiting the extent of direct and indirect impacts to marine environmental quality. The Environmental Quality Plan (EQP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), spatially defines the Environmental Values (EVs), Environmental Quality Objectives (EQOs) and Levels of Ecological Protection (LEPs) that apply to the area. The Marine Construction Monitoring and Management Plan (MCMMP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include protocols and procedures for the monitoring of key environmental quality indicators and management of environmental quality to ensure that the construction of coastal infrastructure achieves the appropriate level(s) of environmental protection.	<u>(Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(o) the likely effect of the development on the natural environment or water resources and any means that are proposed to protect or to mitigate impacts on the natural environment or the water resource". Development would therefore have due regard to State Planning Policy 2.9 Water Resources (SPP 2.9), which enables the local government to require development applications to take account of the protection, conservation and enhancement of water resources, having regard to total water cycle management and water-sensitive design principles, and ensure that the development is consistent with current best management practices and best planning practices for the sustainable use of water resources. <u>State Planning Policy 2.9 Water Resources</u> Under Section 2.1 of SPP 2.9, 'water resources' refers to "wetlands, waterways (rivers, streams and creeks), floodplains, foreshores, estuaries, groundwater aquifers and the wider marine environment". The general policy measures of SPP 2.9 aim to protect water resources and prevent, or where appropriate mitigate against, adverse effects on water quality. As a minimum development should	The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> Elevated turbidity during coastal infrastructure construction 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. Rock fill (expected to be hard rock) will be screened and washed prior to use, resulting in minimal turbidity release. The quality of water, sediment and biota will be maintained so that environmental values are protected.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
The Marine Emergency Response Plan, required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include protocols and procedures for the prevention, management, control and reporting of marine emergencies, including the leak or spill of chemicals.	aim to maintain water quality and ensure water quantity is compatible with the receiving waters. SPP 2.9 can be implemented through the LPS 4 and day-to-day consideration of development proposals and applications, together with the actions and advice of agencies. <u>Development Control</u> A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. As part of a development application, details for potable and non-potable water supply, waste water treatment, and stormwater management are to be addressed to the specification and satisfaction of the Shire of Exmouth. <u>Environmental Conditions in LPS 4</u> There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	
Key Environmental Factor: Flora and Vegetation		
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	
Ministerial approval for the proposed development would include conditions formalising the allowable impacts to flora and vegetation within and adjacent to the proposed infrastructure. The Construction Environmental	<u>Zoning</u> The amendment area covers the area proposed for development (the Development Envelope). Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and can only be developed/used in a manner consistent with the purpose of the reserve.	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Management Plan (CEMP) will include protocols and procedures for the monitoring and management of impacts to flora and vegetation during the construction of onshore infrastructure, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). The OEMP will include protocols and procedures for the monitoring and management of impacts to flora and vegetation during the operations phase of the Proposal, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). A Bushfire Management Plan will also be prepared. The Decommissioning and Closure Plan (DCP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include mitigation measures for potential impacts during decommissioning and closure,	<u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67, model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(c) any approved State planning policy". "(q) the suitability of the land for the development taking into account the possible risk of flooding, tidal inundation, subsidence, landslip, bush fire, soil erosion, land degradation or any other risk". <u>Development Control</u> A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. <u>Environmental Conditions in LPS 4</u> There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	<u>Related to the Proposal</u> The flora and vegetation within the amendment area are common and widespread, with all 10 vegetation communities well represented outside of the amendment area. Dust emissions during construction will be short-term in nature and the potential impact area will be localised (< 50 m from source). Increased presence of weeds, (species and abundance) may affect flora and vegetation. However these impacts would, at worst, 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. 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 amendment area. 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.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
and protocols for monitoring following closure.		
Key Environmental Factor: Subterranean Fauna		
EPA Objective	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	
The OEMP will include protocols and procedures for the monitoring of groundwater quality and quantity (levels) associated with the proposed groundwater abstraction (outside of the amendment area). The OEMP will also address the storage and handling of chemicals. The groundwater abstraction licence will have conditions relating to the monitoring of groundwater and maximum abstraction rates/volumes. Chemical storage and handling is controlled under various legislation including: • Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids. • Australian/New Zealand Standard 1596:2014 The storage and handling of	Development Control A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application.	Related to Amendment The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. Related to the Proposal Subterranean fauna habitat was not recorded in proximity to the fabrication shed, sprayfield or the majority of the Bundle tracks. No impact expected. The EPA objective for Subterranean Fauna will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
LP Gas. • Australian Standard 4332-2004 The storage and handling of gases in cylinders. • Dangerous Goods Safety (Storage and Handlinbg of Non-explosives) Regulations 2007.		
Key Environmental Factor: Terrestrial Fauna		
EPA Objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	
Ministerial approval for the proposed development would include conditions formalising the allowable impacts to fauna habitat within and adjacent to the proposed infrastructure footprint. The CEMP will include protocols and procedures for the monitoring and management of impacts to fauna and fauna habitat during the construction of onshore and coastal infrastructure, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). The OEMP will include protocols	<u>Zoning</u> The amendment area covers the area proposed for development. Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and can only be developed/used in a manner consistent with the purpose of the reserve. <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(o) the likely effect of the development on the natural environment or water resources and any means that are proposed to protect or to	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> The fauna habitats identified within the amendment area are well represented locally and regionally. The six conservation significant fauna identified in the amendment area are marine and migratory bird species that use coastal habitat. Impacts on this habitat are low at a local and regional scale.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
and procedures for the monitoring and management of impacts to fauna and fauna habitat during the operations phase of the Proposal, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). The OEMP will also address the management of waste and freshwater resources and site speed limits. A Bushfire Management Plan will also be prepared. The Decommissioning and Closure Plan (DCP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include mitigation measures for potential impacts during decommissioning and closure, and protocols for monitoring following closure.	mitigate impacts on the natural environment or the water resource"; "(q) the suitability of the land for the development taking into account the possible risk of flooding, tidal inundation, subsidence, landslip, bush fire, soil erosion, land degradation or any other risk". <u>Development control</u> Special Use No. 10 is proposed to be inserted into Schedule 4 – Special Use Zones of LPS 4, and would include a number of conditions. One of the conditions permits rural style fencing, which could be used to prevent stock from accessing the development. Details of fencing would be submitted as part of a development application.	Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.
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.	
Ministerial approval for the proposed development would	<u>Development Control</u> A development application would be required to	<u>Related to Amendment</u> The amendment provides the ability for

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
include conditions limiting the extent of direct and indirect impacts to inland waters. The CEMP will include protocols and procedures for the management of impacts to surface water flows and quality during the construction of onshore infrastructure, as outlined in the Environmental Review Document (ER)D for the Proposal (under Assessment number 2208). The OEMP will include protocols and procedures for the management of impacts to surface water flows and quality during the operations phase of the Proposal, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). The OEMP will also address the storage and handling of chemicals and the management of waste and freshwater resources. Chemical storage and handling is controlled under various legislation including: • Dangerous Goods Safety	address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. As part of a development application, details for potable and non-potable water supply, wastewater treatment, and stormwater management are to be addressed to the specification and satisfaction of the Shire of Exmouth. <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(o) the likely effect of the development on the natural environment or water resources and any means that are proposed to protect or to mitigate impacts on the natural environment or the water resource". Development would therefore have due regard to State Planning Policy 2.9 Water Resources (SPP 2.9), which enables the local government to require development applications to take account of the total water cycle management and water-sensitive design principles, and ensure that the development is consistent with current best management practices and best planning practices for the sustainable use of water resources, particularly stormwater. <u>State Planning Policy 2.9 Water Resources</u> Under Section 2.1 of SPP 2.9, 'water resources' refers to "wetlands, waterways (rivers, streams and	development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> After installation of surface water drainage measures, surface water flow patterns are expected to remain similar to baseline flow patterns. Given the absence of Acid Sulphate Soils (ASS), appropriate storage and handling of chemicals and the small wastewater discharge volumes, no changes to surface water quality are expected. Given the small wastewater discharge volumes, low nutrient concentrations and the depth to groundwater, no changes to groundwater quality are expected. The EPA objective for inland waters will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
(Storage and Handling of Non-explosives) Regulations 2007. • Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids. • Australian/New Zealand Standard 1596:2014 The storage and handling of LP Gas. • Australian Standard 4332-2004 The storage and handling of gases in cylinders. The Decommissioning and Closure Plan (DCP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include mitigation measures for potential impacts during decommissioning and closure, and protocols for monitoring following closure.	creeks), floodplains, foreshores, estuaries, groundwater aquifers and the wider marine environment". A general policy measure of SPP 2.9 is to aim to prevent or where appropriate mitigate against adverse effects on water quality and as a minimum, development should aim to maintain water quality and ensure water quantity is compatible with the receiving waters. SPP 2.9 can be implemented through the LPS 4 and day-to-day consideration of development proposals and applications, together with the actions and advice of agencies.	
Key Environmental Factor: Social Surroundings		
EPA Objective	To protect social surroundings from significant harm.	
The CEMP will include protocols and procedures for the management of heritage values,	<u>Land Tenure</u> The coastline land tenure is Unallocated Crown land (UCL), and the Exmouth Gulf Station pastoral lease is	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
including the provision of heritage monitors during initial clearing/excavation works. The CEMP would also address potential local impacts to amenity during the construction of infrastructure, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). The OEMP will include protocols and procedures for the management of impacts to local amenity during the operations phase of the Proposal, as outlined in the Environmental Review Document (ERD) for the Proposal (under Assessment number 2208). A Bundle Launch Management Procedure will be prepared prior to the initial Bundle launch, detailing communications, exclusion zones and closure of the launchway crossing prior to and during the launch.	Crown land. The UCL and the Crown land are not under the vested management, land ownership or control of Subsea 7 or the Shire of Exmouth. The DPLH may consider, if necessary, a document to formalise access arrangements, for example an easement in gross on Crown land under section 195 of the *Land Administration Act 1997*. This is a matter separate to the environmental review process. Land tenure matters have no bearing on the amendment. <u>Zoning</u> Under the LPS 4, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and could be developed/used in a manner consistent with the purpose of the reserve. The pastoral lease surrounding the amendment area is zoned as 'Rural', and could be developed/used in a manner consistent with the objectives and provisions of the zone. <u>Land Use Permissibility</u> The 'Special Use No. 10' zoning will facilitate the following land uses – marine support facility, pipeline fabrication facility, and telecommunications infrastructure. The Proposal currently under assessment by the EPA (Assessment number 2208) is for a pipeline fabrication facility. Subject to gazettal of Amendment 1, this land use would be a 'P' permitted use. A permitted use could proceed subject to development approval and subject to it complying with any relevant development standards and requirements of the LPS 4, and any relevant environmental conditions. The amendment proposes a definition for pipeline fabrication facility, as follows:	interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> No sites or cultural places of significance were identified within the amendment area. 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.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	'pipeline fabrication facility means premises used for fabricating, testing and launching pipelines and includes: lay down and storage area(s); road access and parking area(s); workshops for fabrication facilities; facility offices and amenities; track(s), launchway(s) and coastal infrastructure used to convey pipelines to the coastline; and incidental uses and services thereto'. <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(l) the effect of the proposal on the cultural heritage significance of the area in which the development is located"; "(q) the amenity of the locality including the following — (i) environmental impacts of the development; (ii) the character of the locality; (iii) social impacts of the development"; "(p) whether adequate provision has been made for the landscaping of the land to which the application relates and whether any trees or other vegetation on the land should be preserved"; "(s) the adequacy of — (i) the proposed means of access to and egress from the site; and	

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	(ii) arrangements for the loading, unloading, manoeuvring and parking of vehicles"; "(w) the history of the site where the development is to be located"; "(x) the impact of the development on the community as a whole notwithstanding the impact of the development on particular individuals". <u>Development control</u> Special Use No. 10 is proposed to be inserted into Schedule 4 – Special Use Zones of LPS 4, and would include a number of conditions. The conditions will include requirements for a Heritage Management Plan and the provision of ongoing public access to Heron Point and the Bay of Rest from the Minilya-Exmouth Road.	

ES Table 2: Summary of Potential Impacts, Proposed Mitigation, and Outcomes

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Attachment 2: Supporting Studies
Attachment 3: BCH Risk Assessment
Attachment 4: CEMP and OEMP Outlines

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The Environmental Protection Authority (EPA) has determined that the proposed amendment to the Shire of Exmouth Local Planning Scheme 4 (LPS4) is to be formally assessed under Part IV of the *Environmental Protection Act 1986* (EP Act). The proposed amendment (Amendment 1, the amendment) seeks to rezone up to 440 ha of land in Learmonth from Rural zone and Foreshore Reserve to Special Use No. 10 Zone.

The Environmental Review (ER, this document) has been prepared to fulfil the assessment requirements (Assessment number 2209) under Section 48A of the 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 Instructions for Environmental Review (EPA 2019).

Amendment 1 is directly related to the proposal by Subsea 7 Australia Contracting Pty Ltd (Subsea 7) to construct and operate the Learmonth Pipeline Fabrication Facility (the Proposal), which is being formally assessed separately, at the level of Public Environmental Review (PER), by the EPA under Part IV of the EP Act (Assessment number 2208). The Proposal involves the production of pipeline Bundles, used in the development of offshore gas fields. Each pipeline would be 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.

1.2 RESPONSIBLE AUTHORITY

The Shire of Exmouth initiated the Scheme Amendment 1 to its LPS 4 and referred it to the EPA. The Shire is the 'Responsible Authority' under the terms of the EP Act. The Shire will be the primary contact during the assessment process for the Environmental Review. The primary contact is:

Mr Cameron Woods
Chief Executive Officer
Shire of Exmouth
2 Truscott Crescent
EXMOUTH WA 6707
(PO Box 21, Exmouth WA 6707)

1.3 ENVIRONMENTAL IMPACT ASSESSMENT AND PROCESS

1.3.1 Overview

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.

During 2018 the Shire of Exmouth finalised its draft Local Planning Strategy and draft LPS4 with modifications as required by the WAPC. The Local Planning Strategy (final, as

modified) has been approved by the WAPC and LPS4 has been approved by the Minister for Planning. The previous Scheme Amendment 32 has fallen away as TPS 3 has been revoked. A Scheme Amendment Request to rezone the area from Rural to Special Use was resubmitted under LPS 4.

1.3.2 Assessment Process

Following the EPA determination that the proposed amendment required formal assessment, the formal assessment process needs to be completed. When the EPA is satisfied that the ER (this document) has been prepared in accordance with the instructions, the ER and proposed scheme amendment can be advertised. The ER is advertised via section 48C(4) of the EP Act and the scheme amendment is advertised via section 84 of the *Planning and Development Act 2005*. The ER will be made available for 60 days, during which time the public may make submissions regarding the scheme amendment.

The Shire of Exmouth must consider all submissions on the amendment (and ER), with all submissions elating to environmental issues to be referred to the EPA. The Shire of Exmouth is required to inform the EPA of its views in relation to the environmental concerns raised in the submissions.

The EPA then reports to the Minister on the environmental factors relevant to the amendment, the conditions, if any, to which it should be subject and including any recommendations as it sees fit. If applicable, environmental conditions set by the EPA are incorporated into the scheme amendment.

1.4 OTHER APPROVALS AND REGULATION

1.4.1 Land Tenure, Tenements and/or Lease Types

The amendment area is located partially on Lot 233 (P219618) and Lot 1586 (P72986), which are subject to the Exmouth Gulf Pastoral Lease accessed from the Minilya-Exmouth Road. The details of the land tenure are presented in Table 1-1.

It is necessary for the proposal to have coastal access in order to provide an ability to launch pipelines. For pipeline Bundles to be launched, the operations would traverse the 40m wide strip of coastline comprising Lot 234, Lot 235 and Unallocated Crown Land (UCL) in order to have access to Exmouth Gulf. The 40m wide strip of UCL is not included in the Exmouth Gulf Pastoral Lease. A land use solution for the UCL will be reached in consultation with the Department of Planning, Lands and Heritage.

The linear nature of the project site means it sits within Lots 233 and 1586 which are within the 'Exmouth Gulf' Pastoral Lease (Landgate document: N50424). The Exmouth Gulf Station lease was renewed on 1 June 2015, and executed by the parties as a deed on 15 June 2015. The Pastoral Lease has a term of 39 years, 3 months, 1 day that commenced on 1 July 2015.

Lot No.	C/T Details	Plan Number	Lot Area (ha)	Area of SU10 zone within Lot (ha)	Registered Proprietor	Lease/Licence	Current zoning or reservation in LPS 4
233*	LR3109/738	P219618	681.5495	92.3541	State of WA	N50424 Lease of Crown Land	Rural zone
1586*	LR3163/273	P72986	22,695.5692	331.3884	State of WA	N50424 Lease of Crown Land	Rural zone
234	LR3109/739	P193858	0.5803	0.5803	State of WA	N/A	Foreshore reserve
235	LR3109/740	P193858	3.0202	3.0101	State of WA	N/A	No zone
UCL	N/A	N/A	71.2396	2.4577	State of WA	N/A	Foreshore reserve
UCL	N/A	N/A	N/A	10.0164	State of WA	N/A	No zone

Note: Lot 233 is to be amalgamated with Lot 1586 on Deposited Plan 72986 and has been included into the leasehold estate registered on 16 February 2016.

Table 1-1: Land Description

1.4.2 Existing Zone and Reserve classification

The existing zone and reserve classification of the amendment area is shown on the Scheme maps of the Shire of Exmouth Local Planning Scheme No. 4 (LPS 4). The current scheme text and scheme maps are available online at www.dplh.wa.gov.au.

Lot 233 (P219618) and Lot 1586 (P72986) are currently zoned 'Rural', while the UCL along the coastline is in the 'Foreshore' reserve.

1.4.2.1 Foreshore reserve (LPS 4)

The purpose of the Foreshore reserve is:

> "*(i) To set aside areas for foreshore reserves abutting a body of water or water course, particularly those required pursuant to State Planning Policy 2.6 State Coastal Planning Policy and any other Western Australian Planning Commission policy.*
> *(ii) To provide for the protection of natural values, a range of active and passive recreational uses, cultural and community activities, activities promoting community education of the environment and/or uses that are compatible with and/or support the amenity of the reservation*."

If the local government receive development applications for use and development in a reserve, it would have regard to the objectives for that reserve (such as those listed above for land in the Foreshore reserve).

1.4.2.2 Rural zone (LPS 4 zoning table)

A limited range of land uses can be considered in the Rural zone. By way of example, the range of industry land uses that could be considered in the Rural zone include 'Garden Centre', 'Industry - Cottage', 'Industry - Extractive', 'Industry - Primary Production', 'Mining Operations', 'Renewable Energy Facility' and 'Transport Depot'.

1.4.2.3 Proposed Special Use No. 10 zone

Amendment 1 proposes to rezone the land to a new Special Use No. 10 zone. The Special Use No. 10 zone introduces land use permissibility and development provisions for only three land uses, being 'marine support facility', 'pipeline fabrication facility', and 'telecommunications infrastructure'. All other uses would be prohibited. The zone therefore is specifically prepared in relation to the Proposal and results in a more limited range of uses that could be considered.

Under the current Rural zone, the 'marine support facility' land use is prohibited, 'pipeline fabrication facility' is not defined or listed in LPS 4 and 'telecommunications infrastructure' is listed as 'D' discretionary use.

Amendment 1 proposes to insert a new land use definition for 'pipeline fabrication facility' to describe the works and use that are being contemplated in the ERD for the Proposal.

1.4.3 Other Approvals

Table 1-2 identifies other approvals that would relate to the scheme amendment area.

Legislation	Description of Approval Process	Decision Making Authority	Timing	Application to Scheme Amendment 1 area
Planning and Development Act 2005 (WA)	**Scheme Amendment 1**	Shire of Exmouth Western Australian Planning Commission Minister for Planning	12-18 months (Estimated)	Initiated by the Shire of Exmouth, referred to the EPA for assessment. Thereafter, the Scheme Amdnement is advertised for a minimum 60 days. The Shire reviews submissions during a consideration period before forwarding the amendment and its recommendation to the Western Australian Planning Commission. The Western Australian Planning Commission assesses the amendment and makes a recommendation to the Minister for Planning.
Planning and Development Act 2005 (WA) Shire of Exmouth Local Planning Scheme No. 4 *Planning and Development* (Local Planning Schemes) Regulations 2015 Planning and Development (Development Assessment Panels) Regulations 2011 *Land Administration Act 1997*	**Development Application** Required for works and use, unless otherwise exempt. **Land Tenure** Lease, licence or permit to use Crown Land.	Shire of Exmouth – development application Department of Planning, Lands and Heritage – land tenure	Prior to lodgement	The Scheme Amendment area includes Unallocated Crown Land and Crown Land that would be excised from the Pastoral Lease. In this case, the Department of Planning, Lands and Heritage acts on behalf of the State, as the registered proprietor. Landowner signatures are required on Application Forms for applications for Development Approval.
		Department of Planning, Lands and Heritage		A licence/lease or permit is required to use Crown Land that would be excised from the Pastoral Lease.
		Shire of Exmouth	60-90 days (Statutory)	Works and use are considered to require Development Approval.
		Northern Joint Development Assessment Panel (JDAP)	60-90 days (Statutory)	An applicant may opt into having the JDAP determine the application if the estimated value of the development is between $2 million and $10 million. The application would go to JDAP if the estimated value of the development is over $10 million.
Building Act 2011 (WA) Building Permit	Required for the construction of any buildings or incidental structures	Shire of Exmouth	10 days (Estimated)	An applicant will be required to obtain a building permit to construct structures covered by the Building Code of Australia.

Legislation	Description of Approval Process	Decision Making Authority	Timing	Application to Scheme Amendment 1 area
	which members of the public are permitted access (i.e. site office or lunchroom).			
Building Act 2011 (WA) Occupancy Permit	Required for any buildings or ancillary structures that require a building permit.	Shire of Exmouth		In addition to an applicant obtaining a building permit, an occupancy permit will also be required.

Table 1-2: Other Approvals That Relate to the Scheme Amendment Area

1.5 STRUCTURE OF THE ER (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, as follows:

- Benthic Communities and Habitats (Section 5.1).
- Coastal Processes (Section 5.2).
- Marine Environmental Quality (Section 5.3).
- Flora and Vegetation (Section 5.4).
- Subterranean Fauna (Section 5.5).
- Terrestrial Fauna (Section 5.6).
- Inland Waters (Section 5.7).
- Social Surroundings (Section 5.8).

For each of the impact assessment sections (Section 5.1 to Section 5.8), 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 the proposed approach to avoiding and managing impacts).

1.5.2 Supporting Studies

A number of technical studies (both desktop and field studies) have been undertaken 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 is provided in Table 1-3.

Title	Date	Author	Refer
Benthic Communities and Habitats			
Learmonth Habitat Surveys	February 2017	360 Environmental	Attachment 2A
Exmouth Gulf Benthic Communities and Habitat survey report	October 2018	MBS Environmental	Attachment 2B
Coastal Processes			
Subsea 7 Bundle Facility Shoreline Movement Assessment	October 2017	MP Rogers	Attachment 2C
Coastal Processes Assessment	February 2019	MP Rogers	Attachment 2D
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 2E
Learmonth Hydrodynamic Survey Field Report	August 2018	GHD	Attachment 2F
Learmonth Sediment Dispersion Modelling Report	March 2019	RPS	Attachment 2G
Marine Fauna			
Subsea 7 Learmonth Bundle Site Invasive Marine Species and Pathogen Desktop Risk Assessment	Sept 2018	Biofouling Solutions	Attachment 2H
Exmouth Gulf aerial humpback whale survey (southern migration)	January 2019	Lyn Irvine	Attachment 2I
Migratory bird surveys report	February 2019	Western Wildlife	Attachment 2J
Flora and Vegetation			
Detailed Flora, Vegetation and Targeted Survey	October 2018	360 Environmental	Attachment 2K
Subterranean Fauna			
Desktop Assessment of Subterranean Fauna for the Learmonth Bundle Project	August 2017	Invertebrate Solutions	Attachment 2L
Review of subterranean fauna at Learmonth Bundle Project	October 2017	Bennelongia	Attachment 2M
Subsea 7 Pipeline Fabrication Facility Stygofauna Survey	May 2019	Bennelongia	Attachment 2N
Terrestrial Fauna			
Learmonth Level 1 Fauna Survey	October 2018	360 Environmental	Attachment 2O
Desktop Assessment of Short Range Endemic Invertebrates for the Learmonth	September 2017	Invertebrate Solutions	Attachment 2P

Title	Date	Author	Refer
Bundle Project			
Inland Waters Environmental Quality			
Bundle Fabrication Facility Surface and Groundwater Investigation	March 2019	GHD	Attachment 2Q
Social Surroundings			
Landscape and Visual Impact Assessment	June 2019	360 Environmental	Attachment 2R
Landscape and Visual Impact Assessment Peer Review	June 2019	GHD	
Social Impact Assessment	May 2019	360 Environmental	Attachment 2S
Terrestrial Environmental Quality			
Acid Sulphate Soils Survey Report	October 2018	MBS Environmental	Attachment 2T

Table 1-3: Overview of Supporting Studies

2. THE PROPOSED AMENDMENT TO LPS4

2.1 BACKGROUND

The proposed Scheme Amendment No. 1 (Amendment 1) seeks to rezone up to 440 ha of land in the Learmonth locality from the Rural zone and Foreshore reserve to the Special Use No. 10 zone. The amendment area is located at Heron Point on the western side of Exmouth Gulf, at Learmonth, and east of the Minilya-Exmouth Road. The Amendment 1 area is approximately 35 km south of the Exmouth townsite and 2.5 km south east of the Royal Australian Air Force (RAAF) base Learmonth (Figure 2-1).

Amendment 1 is directly related to the Learmonth Pipeline Fabrication Facility (the Proposal), which is being formally assessed separately at the level of Public Environmental Review (PER) by the EPA under Part IV of the EP Act (Assessment number 2208). 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. The Proposal includes construction of a fabrication shed, where the Bundles will be manufactured, 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 (Figure 2-2). A Bundle launchway, crossing the beach and extending into the shallow subtidal area, will facilitate the launch of each Bundle (Figure 2-2).

Figure 2-2 shows the Scheme Amendment No. 1 boundary as a thick black line. The Proposal Development Envelope (Assessment No. 2208) is depicted as a red area, while the Proposal's indicative Infrastructure Footprint (including buildings, tracks and roads) is shown in yellow. The Figure 2-2 demonstrates a relationship between the Proposal and Amendment 1. The Proposal envelope has informed the proposed Special Use No. 10 zone boundary. The comparison is further described in detail in sections 2.3 and 2.4.

A pipeline Bundle is the product that is manufactured at the facility that is part of the Proposal. A pipeline Bundle is comprised of a number of pipes and services that are protected inside a larger pipe casing (or 'carrier pipe'). A pipeline is manufactured onshore before being launched and towed offshore to its field development destination. Pipeline Bundles have been installed in a variety of configurations for both greenfield and brownfield developments, and are a proven technology.

At the Shire of Exmouth ordinary council meeting held on 28 March 2019, Council resolved to initiate and adopt Amendment 1 for advertising. Amendment 1 was then referred to the EPA pursuant to section 81 of the PD Act on 4 April 2019. The level of assessment was set by the EPA on 10 June 2019 at the level of 'Assess – Environmental Review' in relation to the Environmental Factors of social surroundings, benthic communities and habitats, coastal processes, marine environmental quality, flora and vegetation, subterranean fauna, terrestrial fauna and inland waters. The Instructions were issued by the EPA to the Shire on 17 July 2019.

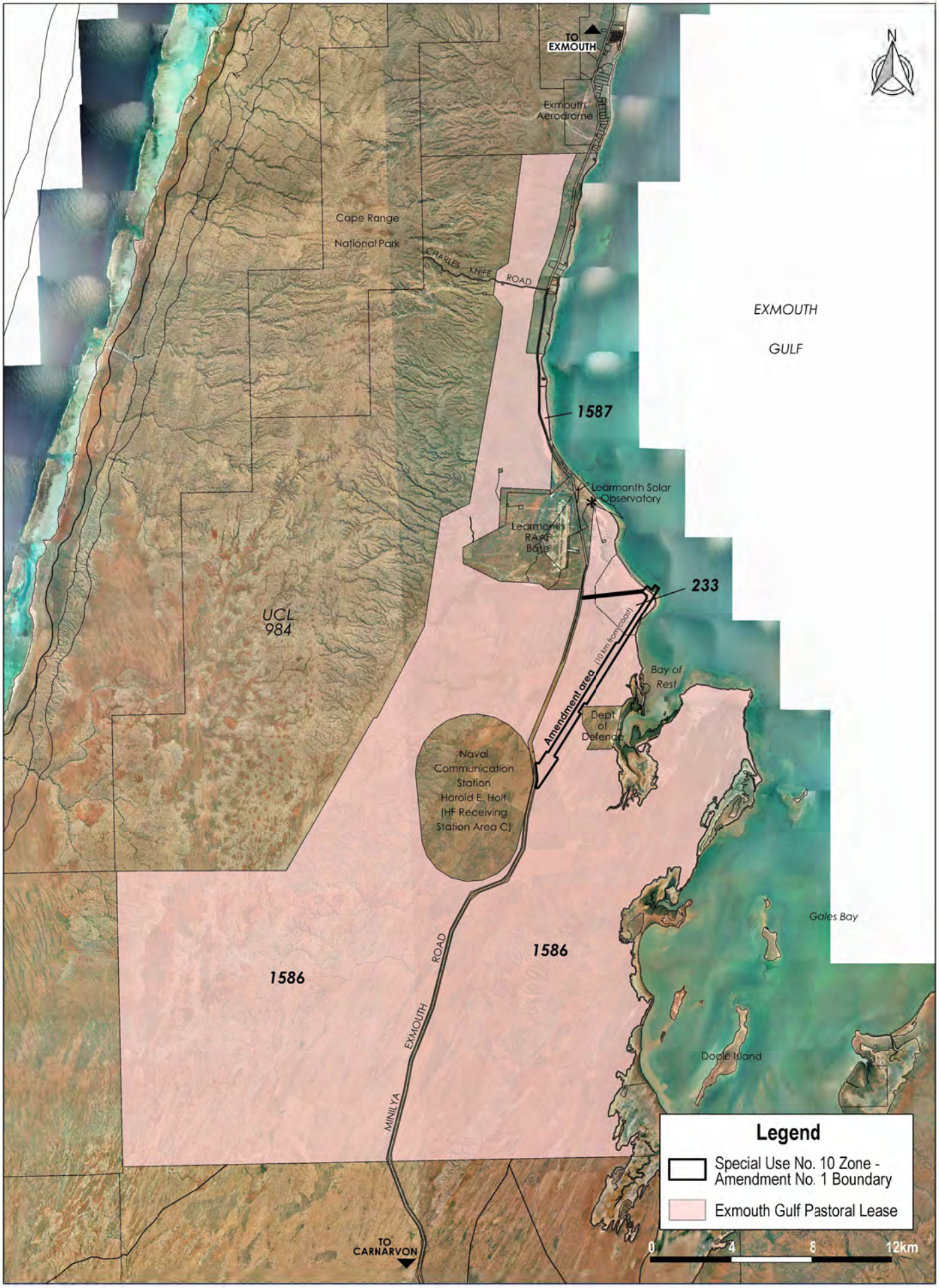
This Environmental Review (ER, Assessment No. 2209) for Amendment 1 will examine the potential impacts to the environment from the change of zone from Rural zone and Foreshore reserve, to the proposed Special Use No. 10 zone. The Environmental Review Document (ERD, Assessment No. 2208) considers the potential impacts associated with the implementation of the Proposal.

2.2 AMENDMENT DESCRIPTION

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

Summary of Proposal	
Proposal Title	Local Planning Scheme 4 Amendment 1
Responsible Authority	Shire of Exmouth
Location	Part of Lots 233, 234, 235 and 1586 Minilya-Exmouth Road Learmonth
Short Description	Rezoning of up to 440 hectares of land from Rural zone and Foreshore Reserve to Special Use No. 10 Zone to facilitate the development of a pipeline fabrication facility (the Learmonth Pipeline Fabrication Facility).

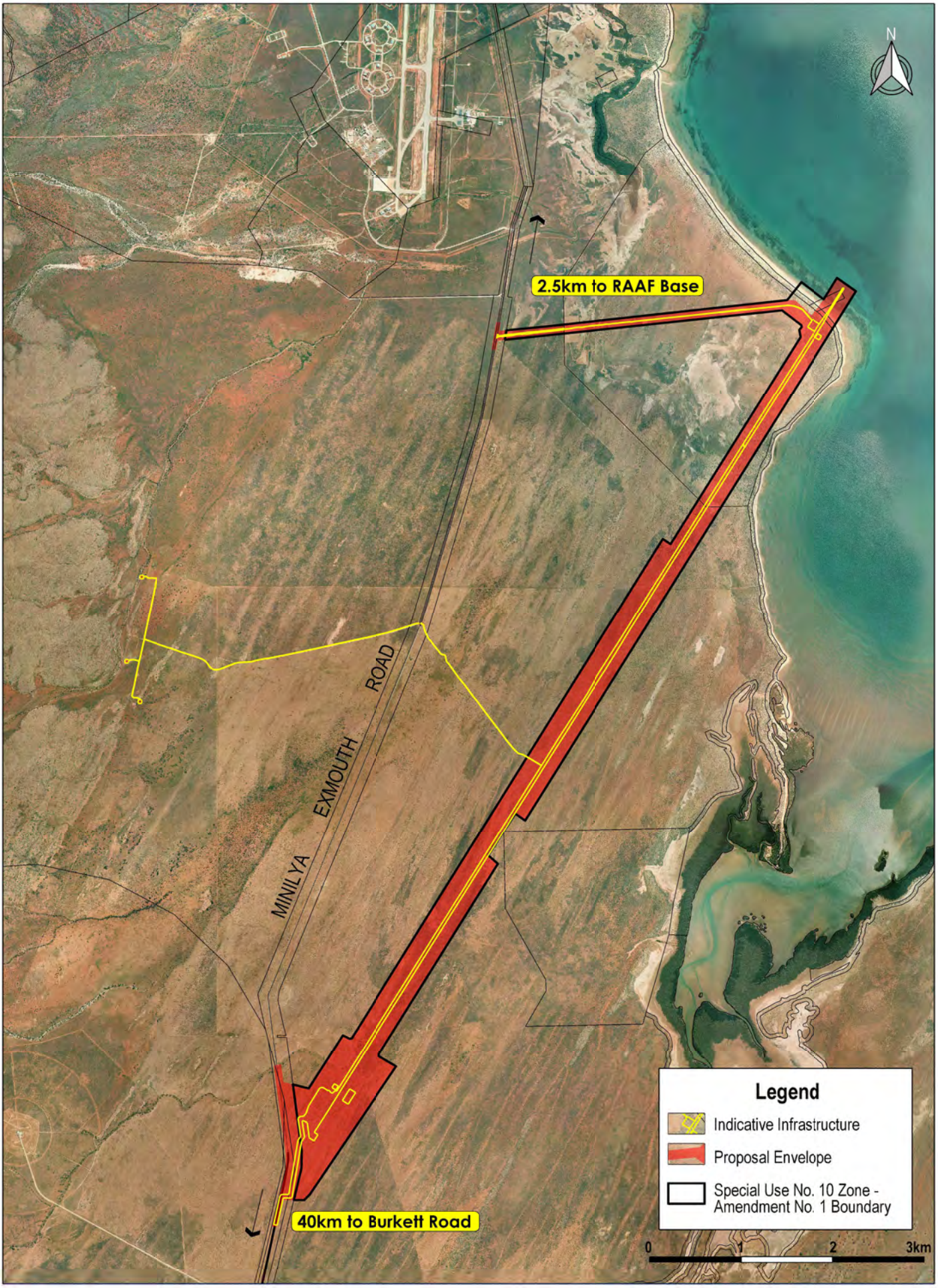
Table 2-1: Amendment Key Characteristics



Scale: 1:250,000
Original Size: A4
Grid: MGA Zone 50

Figure 2-1: Location of the Amendment area

Shire of Exmouth



Scale: 1:55,000
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Grid: MGA Zone 50

Figure 2-2: Location of Amendment area in relation to Proposal Development Footprint

Shire of Exmouth

2.3 AMENDMENT AREA

Amendment 1 covers approximately 440 ha, and is detailed further in Table 2-2.

The amendment area can be broadly described as a 10 km long linear shape, over a portion of the Exmouth Gulf Station pastoral lease and Crown land. The Special Use No. 10 zone intersects with:

- The Minilya-Exmouth Road near the RAAF Base Learmonth, to provide for road access to the launchway (refer Figure 2-2).
- The Minilya-Exmouth Road near the Naval Communications Station Harold E. Holt Site C, to provide for access to the fabrication building and associated infrastructure and services (refer Figure 2-2).
- A small extent of coastline near Heron Point for the launchway (refer Figure 2-3).

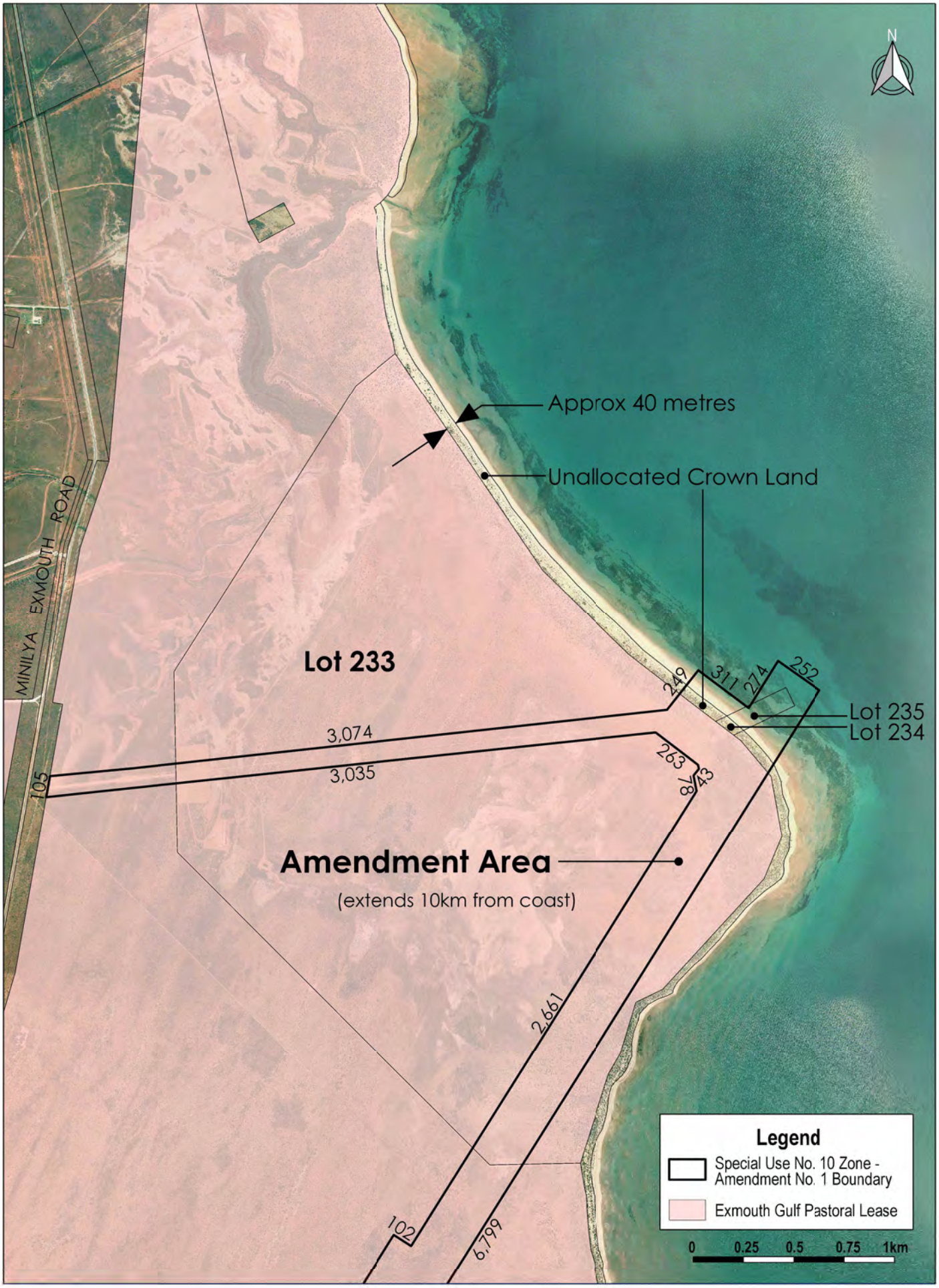
The amendment area avoids a Department of Defence disused radar site (Lot 40 on Deposited Plan 208441, Certificate of Title 1246/351) (Landgate 2019).

The Exmouth Gulf below (or seawards of) the high water mark has no zone or reserve classification under LPS 4. Above the high water mark and within Lot 233, Special Control Area 5 Floodplain applies. The existing LPS 4 Scheme maps for the Learmonth area are presented in Figure 2-4 and Figure 2-5.

Lot No.	C/T Details	Plan Number	Lot Area (ha)	Area of SU10 zone within Lot (ha)	Registered Proprietor	Lease/Licence	Current zoning or reservation in LPS 4
233*	LR3109/738	P219618	681.5495	92.3541	State of WA	N50424 Lease of Crown Land	Rural zone
1586*	LR3163/273	P72986	22,695.5692	331.3884	State of WA	N50424 Lease of Crown Land	Rural zone
234	LR3109/739	P193858	0.5803	0.5803	State of WA	N/A	Foreshore reserve
235	LR3109/740	P193858	3.0202	3.0101	State of WA	N/A	No zone
UCL	N/A	N/A	71.2396	2.4577	State of WA	N/A	Foreshore reserve
UCL	N/A	N/A	N/A	10.0164	State of WA	N/A	No zone

Note: Lot 233 is to be amalgamated with Lot 1586 on Deposited Plan 72986 and has been included into the leasehold estate registered on 16 February 2016.

Table 2-2: Land Ownership and Existing Zoning/Reservation



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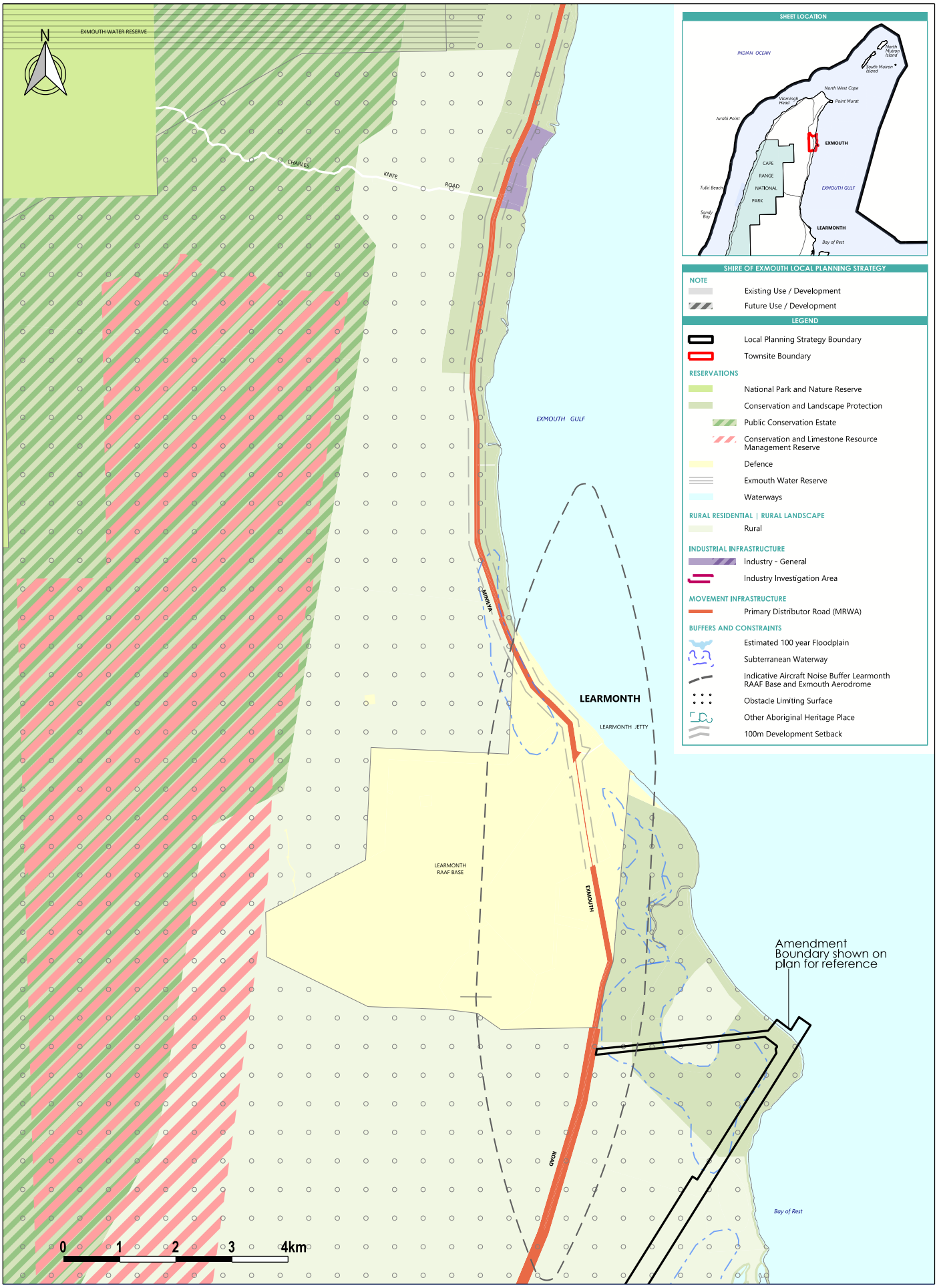
Original Size: A4
Grid: MGA Zone 50

Figure 2-3: Enlargement of Amendment area adjacent to the coastline

Shire of Exmouth



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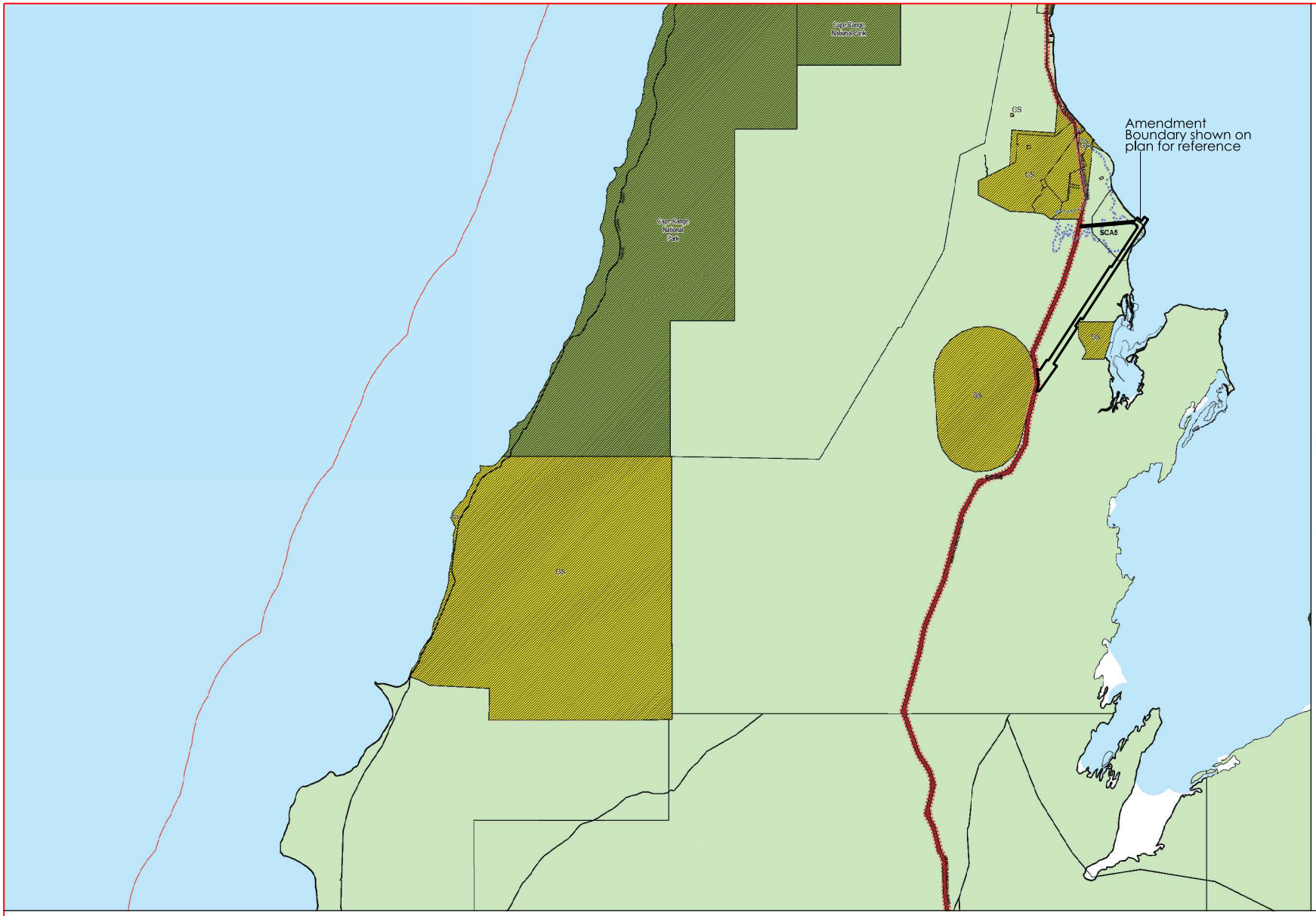
Original Size: A4
Grid: MGA Zone 50

Figure 2-4 Shire of Exmouth Local Planning Strategy
Learmonth Spatial Plan - Sheet 6
Local Planning Strategy
A Shire of Exmouth Project



LEGEND

LOCAL SCHEME RESERVES

- Civic and Community
- Drainage/Waterway
- Environmental Conservation Reserve
- Foreshore
- Local Distributor Road
- Local Road
- Primary Distributor Road
- Public Open Space
- Public Purposes
- CP Public Purposes : Car Park
- E Public Purposes : Education
- GS Public Purposes : Government Services
- H Public Purposes : Heritage
- IS Public Purposes : Infrastructure Services
- M Public Purposes : Medical Services
- R Public Purposes : Recreational
- Strategic Infrastructure

LOCAL SCHEME ZONES

- General Industry
- Industrial Development
- Light Industry
- Residential
- Rural
- Rural Residential
- Service Commercial
- Special Use
- Tourism
- Urban Development

OTHER CATEGORIES

(see scheme text for additional information)

- Scheme Area Boundary
- Local Government Boundary
- R20 R Codes
- A1 Additional Uses
- R1 Restricted uses
- RR1 Rural Residential Area
- SU1 Special Use Area
- SCA1 Exmouth Water Reserve Special Control Area 1
- SCA2 Exmouth Waste Water Treatment Plant Special Control Area 2
- SCA3 Exmouth Power Station Special Control Area 3
- SCA4 Exmouth Aerodrome Special Control Area 4
- SCA5 Floodplain Special Control Area 5
- SCA6 Minilya-Exmouth Road Special Control Area 6
- No Zone
- Waterbodies

N

0 5 10 15km

Scale: 1:325,000
Original Size: A4
Grid: MGA Zone 50

Figure 2-5 Shire of Exmouth Local Planning Scheme No. 4 (LPS 4)
Shire of Exmouth
Local Planning Scheme No. 4
(District Scheme)

VERSION No 1
Authorised: T.Servaas
Plot Date: 02 April 2019
G.Gazette: Tuesday, 12 March 2019

Shire of Exmouth
opportunity for choice

2.4 COMPARISON OF THE AMENDMENT AND THE PROPOSAL

A comparison of the physical characteristics of the Proposal (as assessed in the ERD under Assessment number 2208), and the amendment (as assessed within this document under Assessment number 2209), is presented in Table 2-3.

The scheme amendment area of 440 ha is less than the Proposal's Development Envelope of 452 ha presented in the ERD under EPA Assessment No. 2208. There are a number of town planning factors leading to the different (smaller) area for the scheme amendment, as follows:

- The proposed bores and associated pipeline on the western side of the Minilya-Exmouth Road are within the Proposal's Development Envelope but are not within the amendment area.

  The 'Rural' zone is compatible with the use and development of land for a borefield, and bores are commonly used in pastoral areas for providing livestock with access to water. Borefields are already existing in the Shire of Exmouth on Rural zoned land.

- The Proposal includes the land where intersections with the Minilya-Exmouth Road are proposed. In contrast, the amendment area aligns with, but does not overlap, the road reserve.

  The road reserve for Minilya-Exmouth Road is classified as a 'Primary Distributor Road' and the Minilya-Exmouth Road Special Control Area 6 covers land within 100 m either side of the road reserve. The amendment does not propose to rezone the Minilya-Exmouth Road from the current 'Primary Distributor Road' reserve.

- Exmouth Gulf does not have a local scheme zone or reserve nominated in LPS 4 (Shire of Exmouth 2019a). The amendment will apply suitable planning provisions and development control by zoning that area.

Physical Element	Proposed Extent	
	Proposal[1]	**Amendment**[2]
Bundle fabrication facility and associated infrastructure including: • Fabrication site. • 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, earthworks areas).	Clearing and disturbance of up to 176 ha within a 452 ha Development Envelope	Rezoning of up to 440 ha of land from Rural zone and Foreshore reserve to Special Use No. 10 zone to facilitate the development of the Proposal
Bundle Launchway	Direct disturbance of up to 1 ha of seabed (measured from mean high water)	Rezoning of coastal area to Special Use No. 10 zone to facilitate the development of the launchway
Offshore Operations Area (Off bottom tow)	Direct disturbance of up to 1,450 ha of seabed (per Bundle launch) within a 4,164 ha Offshore Operations Area (Off bottom tow)	Not included in the amendment area
Offshore Operations Area (Bundle Parking area)	Direct disturbance of up to 368 ha of seabed within a 2,426 ha Offshore Operations Area (Parking area)	Not included in the amendment area
Offshore Operations Area (Surface tow)	No ground or seabed disturbance to the extent of State Waters	Not included in the amendment area

Notes:
[1] As assessed within Public Environmental Review prepared under Assessment number 2208.
[2] As assessed within the Environmental Review (this document) prepared under Assessment number 2209.

Table 2-3: Comparison of Proposal and Amendment Physical Characteristics

2.5 LOCAL AND REGIONAL CONTEXT

2.5.1 State Planning Strategy

The State Planning Strategy (WAPC 2014) sets a vision for Western Australia to 2050 and beyond, with six inter-related principles:

- Community: enable diverse, affordable, accessible and safe communities.
- Economy: facilitate trade, investment, innovation, employment and community betterment.
- Environment: conserve the State's natural assets through sustainable development.
- Infrastructure: ensure infrastructure supports development.
- Regional development: build the competitive and collaborative advantages of the regions.
- Governance: build community confidence in development processes and practices.

The State Planning Strategy recognises the Exmouth townsite as a sub-regional service centre for the Gascoyne region. The State Planning Strategy identifies the following elements as being strategically important:

- Planning for economic development – Exmouth's location within an economic activity area and petroleum resource province.
- Planning for tourism and the environment – Exmouth's location nearby to a world heritage area and marine conservation area.
- Planning for agriculture and food – Exmouth's focus on pastoralism and aquaculture.
- Planning for movement – Exmouth's transport infrastructure includes major roads connecting with regional centres such as Carnarvon and Karratha and port facilities, and the Learmonth airport facility.
- Planning for security – Exmouth is located within a defence training area. Sites in the local government area include the Navy Pier, Naval Communication Station Harold E. Holt, RAAF Base Learmonth, Learmonth air weapons range, and Learmonth Solar Observatory.

The Ningaloo Coast, which refers to the 604,500 ha marine and terrestrial property, is recognised for its near-shore reefs, karst system and network of underground caves and water courses, which contribute to the biodiversity of the marine and terrestrial site (WAPC 2014, UNESCO 2011). The Ningaloo Marine Park, Ningaloo Coast World Heritage Property and Ningaloo Coast World Heritage Place are reflected in the State Planning Strategy. It is noteworthy that the amendment area is not within the Ningaloo Marine Park, Ningaloo Coast World Heritage Property or Ningaloo Coast World Heritage Place.

2.5.2 Shire of Exmouth Strategic Community Plan – Exmouth 2030

The Shire of Exmouth's *Strategic Community Plan – Exmouth 2030* (Shire of Exmouth 2018) was developed through the collection of the community's views and aspirations, to give voice to the community and to give insight into the aspirations for the future. The community vision is "to be a prosperous and sustainable community living in harmony with our natural environment."

During the preparation of the *Strategic Community Plan*, the Shire sought feedback from residents and ratepayers, local businesses, community groups, government agencies, non-government organisations, developers and industry. Almost 20% of the community participated in the public consultation (Shire of Exmouth 2018).

The amendment was considered by the local government in relation to the *Strategic Community Plan – Exmouth 2030*, as per Table 2-4.

Topic	Relevant objectives from Strategic Community Plan – Exmouth 2030
Economic	Diversify and grow our economy in a manner that provides year-round employment opportunities. *1.1 A diverse and environmentally aware local economy that can attract business investment and provide employment opportunities.* *1.2 Facilitate the strengthening and growth of our visitor experience.*
Environment	To protect and value our unique natural and built environment as we grow our economy. *2.1 A strong focus on environmental conservation and sustainable management of our natural environment.* *2.2 Strive to achieve a balance between the preservation of our unique environment and the delivery of sustainable economic growth.*
Social	To be a vibrant, passionate and safe community valuing our natural environment and unique heritage. *3.1 Explore opportunities to deliver services and facilities that attract and retain people living in the Shire.* *3.2 Promote facilities/services that enhance public health and safety.*
Leadership	To provide open transparent, accountable leadership working in collaboration with our community. *4.1 To provide proactive, collaborative and transparent leadership.*

Table 2-4: Relevant objectives from the Strategic Community Plan – Exmouth 2030

2.5.3 Shire of Exmouth Local Planning Strategy

The Shire of Exmouth Local Planning Strategy was endorsed by the WAPC on 5 April 2019 (Shire of Exmouth 2019b). It provides the Shire's strategic planning objectives and actions for the local government area.

The amendment area is shown on the Strategy's spatial plans as a Rural area and partly within a Conservation and Landscape Protection area (Figure 2-4 and Figure 2-5). Within the LPS 4, the current zoning is Rural, whilst Unallocated Crown Land on the coast is reserved for Foreshore (Figure 2-4 and Figure 2-5).

The endorsed Exmouth South Structure Plan (TME 2013) identified Lot 233 for industrial investigation for aquaculture. The advertised Local Planning Strategy identified Lot 233 as an aquaculture site; however, the final version removed the reference to the aquaculture site and replaced it as a Rural area (Shire of Exmouth 2019b). Therefore, a form of industrial activity (aquaculture) had previously been recognised and contemplated in the general location of the amendment area.

The amendment report considered the relevant objectives of the Local Planning Strategy and provided justification in support of the rezoning, as summarised below:

- The proposed site retains the ability for the surrounding pastoral lease to continue. The proponent has successfully negotiated a land use agreement with the Pastoral Leaseholder. The Special Use zone is considered compatible with surrounding pastoral/rural activities.
- Amendment 1 provides for economic diversification that could have long-term and sustainable benefits for the community. Whilst the amendment area is out of the townsite, it is advantageous to be in proximity to an established freight route, airport, and within reasonable commuting distance to Exmouth.

The Proposal is not capable of being located within other identified industrial precincts within the Shire due to the land dimensions and size and the unique site requirements.

2.5.4 Shire of Exmouth Local Planning Scheme No. 4 (LPS 4)

LPS 4 was gazetted on 12 March 2019 (Shire of Exmouth 2019a). The LPS 4 currently includes nine special use zones. Special use zones apply to special categories of land use which do not comfortably sit within any other zone in the scheme. Schedule 4 of the LPS 4 sets out the special use zones, the classes of special use that are permissible in that zone, and the conditions that apply in respect of the special uses. A person must not use any land, or any structure or buildings on land, in a special use zone except for a class of use that is permissible in that zone and subject to the conditions that apply to that use.

It is considered appropriate that a Special Use zone be inserted into LPS 4 for the Proposal. Hence, Amendment 1 proposed the insertion of the following table into Schedule 4 of the LPS 4 (Table 2-5).

No	DESCRIPTION OF LAND	SPECIAL USE	CONDITIONS
SU10	Part of Lots 233-235 Minilya-Exmouth Road, Part of Lot 1586 Minilya-Exmouth Road, Lot 234 on Plan 193858, Part of Lot 235 on Plan 193858, Part of Unallocated Crown Land, Learmonth	As a 'P' use: • Marine support facility • Pipeline fabrication facility As a 'D' use: • Telecommunications infrastructure	1. Buildings (excluding gatehouse and incidental structures) shall be setback a minimum of 100 metres from any lot boundary with frontage to Minilya-Exmouth Road. 2. Rural style fencing is permitted. 3. As part of a Development Application the following shall be addressed to the specification and satisfaction of the local government: a. Details of heritage assessment processes. b. Details for a potable and non-potable water supply. c. Details for waste water treatment. d. Details for stormwater

No	DESCRIPTION OF LAND	SPECIAL USE	CONDITIONS
			management. e. Access from Minilya-Exmouth Road, in consultation with Main Roads WA. f. Details for construction management. g. Details for coastal management within the zone.

Table 2-5: Proposed Special Use No. 10 to be inserted into Schedule 4 of Local Planning Scheme No. 4

Table 2-5 mentions management under condition 3. These management items could be provided in a Construction Environmental Management Plan (CEMP) or Operational Environmental Management Plan (OEMP) and the Shire of Exmouth has power to request these as part of a development application or as a condition of approval of a development application.

Management plans can be required to accompany a development application as per clause 63 of the Deemed Provisions, Planning and Development (Local Planning Schemes) Regulations 2015. Clause 63 states that a development must be accompanied by (amongst other things):

"*63 Accompanying material*
(1) An application for development must be accompanied by —
(c) a report on any specialist studies in respect of the development that the local government requires the applicant to undertake such as site surveys or traffic, heritage, environmental, engineering or urban design studies;"

The Shire can consult with other authorities. Clause 66 of the Deemed Provisions states:

"*66. Consultation with other authorities*
(1) When, in the opinion of the local government, an application for development approval may affect any other statutory, public or planning authority, the local government is to provide a copy of the application to the authority for objections and recommendations."

The Deemed Provisions enable the Shire to require management plans, and the Shire can seek advice from other agencies such as the Department of Water and Environmental Regulation (DWER) in respect of management plans received for a development application to ensure they are fit-for-purpose.

Clause 4.7 of LPS 4 (for environmental conditions) can be amended, as part of Amendment 1, to include a requirement for management plans.

Attachment 4 provides an outline of a CEMP and OEMP that could be lodged with a development application, to address the management of environmental impacts identified in this ER. It is anticipated that a CEMP and OEMP could be submitted as accompanying information with a development application. Approval of the CEMP and OEMP could be required prior to issue of a building permit. The CEMP and OEMP would be prepared to the satisfaction of the Shire of Exmouth with advice (if required) from DWER. The proponent would then be required to implement the plans at the relevant development stage.

2.5.5 State Planning Policies

Pursuant to the PD Act, the local government had due regard to relevant state planning policies (SPP):

- SPP 2.5 Rural Planning.
- SPP 2.6 State Coastal Planning Policy.
- SPP 3.7 Planning in Bushfire Prone Areas.
- SPP 6.3 Ningaloo Coast.

Other SPPs that may apply are:

- SPP 4.1 State Industrial Buffer Policy.
- SPP 5.2 Telecommunications Infrastructure.

2.5.6 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 RAAF Base Learmonth located approximately 1.5 km north west of the amendment area (Figure 2-6). 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).

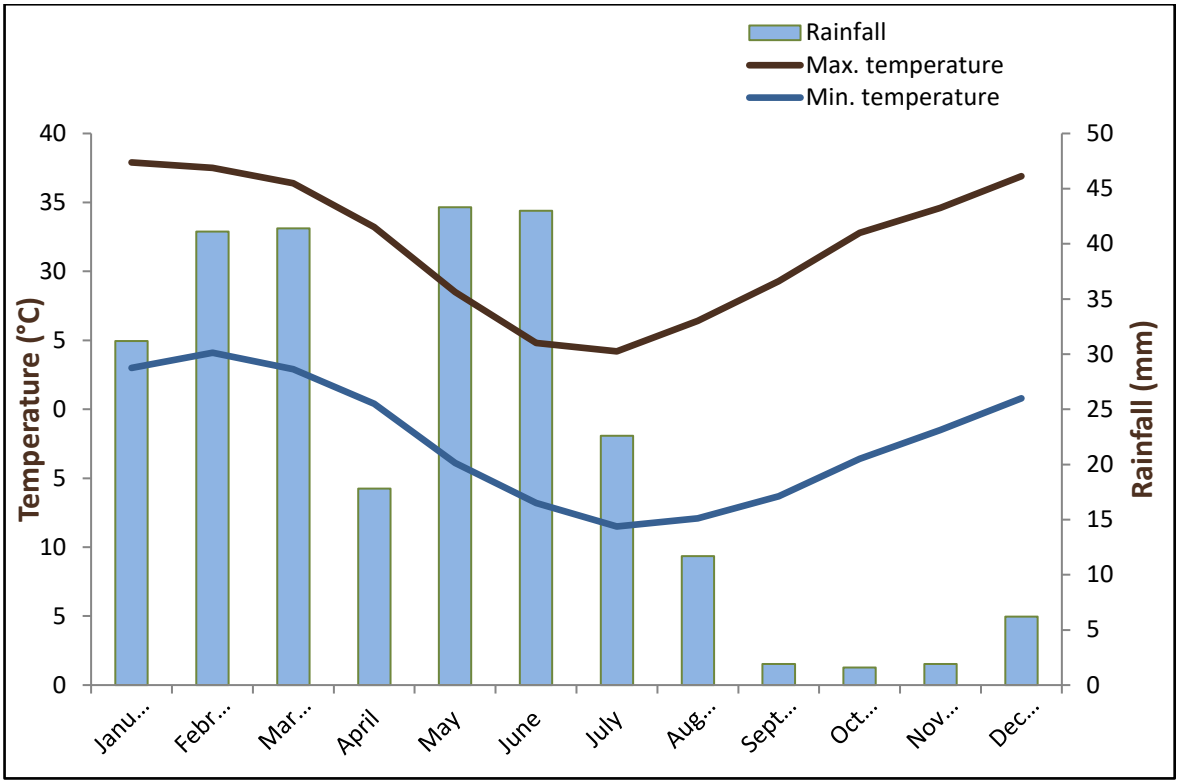


Figure 2-6: Climate Statistics for Learmonth Airport Station 1945-2017 (BoM 2017)

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).

2.5.7 Geographical and Physical

2.5.7.1 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 amendment area mainly comprises of longitudinal network dunes and residual sandplains comprised of red brown to yellow quartz sand (GHD 2017).

2.5.7.2 Surface Water

A defined watercourse intersects the amendment area 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 5.7.3).

A smaller catchment (approximately 155 ha) lies to the south of the amendment area (refer Section 5.7.3).

2.5.8 Land Tenure

The amendment area is located partially on Lot 233 (P219618) and Lot 1586 (P72986), which are subject to the Exmouth Gulf Pastoral Lease accessed from the Minilya-Exmouth Road. The amendment area 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. Land tenure is shown in Table 2-2 and mapped in Figure 2-4 and Figure 2-5.

2.5.9 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.

2.5.10 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% of 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 – Exmouth 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).

2.5.11 Other Projects or Proposals overlapping the Amendment area

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

The Cape Seafarms 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. An examination of aerial imagery suggests that approximately 170 ha of the nominated footprint area were disturbed by initial earthworks.

3. STAKEHOLDER ENGAGEMENT

3.1 INTRODUCTION

This section provides a summary of consultation undertaken in relation to the Proposal and Amendment 1, and the feedback received to date.

3.2 KEY STAKEHOLDERS

A number of meetings and briefings have been held, in relation to the Proposal, 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:

- The pastoralist of Exmouth Gulf Station.
- 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).
- Yamatji Marlpa Aboriginal Corporation – 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.

3.3 STAKEHOLDER ENGAGEMENT PROCESS

3.3.1 Engagement Process for the Proposal (Assessment No. 2208)

Formal public consultation processes associated with the State and Commonwealth environmental assessment processes for the Proposal have occurred as follows:

Referral of the original Proposal to the EPA (Assessment number 2136):

- 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 Environmental Scoping Document (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.

Referral of amended Proposal to the EPA (Assessment number 2208):

- 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 the ERD, for an eight-week period, will provide a further opportunity for stakeholder review and involvement in planning for the Proposal.

3.3.2 Engagement Process for Scheme Amendment No. 1 (Assessment No. 2209)

For Scheme Amendment No. 1, a number of meetings were held between Subsea 7, its project consultants, the Shire of Exmouth, DWER and Department of Planning, Lands and Heritage (Table 3-2).
Public advertising processes under the EP Act and the PD Act will be undertaken for Scheme Amendment No. 1. It is anticipated that the advertising of the ER document and the advertising of Amendment 1 will be undertaken concurrently.

The public release of the Environmental Review (Assessment number 2209) under the EP Act is as follows:

- The public release of the ER (this document), for an eight-week period, will provide a further opportunity for stakeholder review and involvement in planning for the Proposal.

In accordance with the *Planning and Development Act 2005* (PD Act) and the *Planning and Development (Local Planning Schemes) Regulations 2015*, public advertising of Scheme Amendment No. 1 will be undertaken for a minimum 60 days.

Pursuant to the PD Act, advertising of the amendment can commence upon completion of the following two milestones:

a. The WAPC has examined the amendment document and advised it is satisfied that the amendment is suitable to be advertised. The WAPC has provided its advice by correspondence to the Shire of Exmouth dated 11 June 2019; and
b. The EPA acted under section 48C(1)(a) of the *Environmental Protection Act 1986* to require the responsible authority to undertake the environmental review. Pursuant to section 82(2) of the PD Act, the amendment can be advertised once the local government has forwarded the environmental review to the EPA; and the EPA has advised that that review has been undertaken in accordance with those instructions, or 30 days have elapsed since that forwarding without the EPA having advised whether or not that review has been undertaken in accordance with those instructions, whichever first occurs.

3.4 CONSULTATION OUTCOMES

Consultation has resulted in improved 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, of relevance to the amendment, that has been collected over the course of the consultation between 2016 and 2019, as outlined in Sections 3.2 and 3.3. Table 3-2 provides a summary of meetings held, relating specifically to Amendment 1, between 2017 and 2019.

Stakeholders	Date(s)	Feedback Received	Incorporation of Feedback
• Exmouth Community. • Local Business, Charter Operators, Aquarium Specimen Collectors. • Exmouth Council and Shire.	4 October 2017 23 November 2017 2 August 2018 24/25 October 2018 8 November 2018	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.
Exmouth Community	4 October 2017 24 October 2018	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. 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.

Stakeholders	Date(s)	Feedback Received	Incorporation of Feedback
Gnulli Group	30 August 2017 13 February 2018 13-15 March 2018 15 August 2018 29 August 2018 30 October 2018 20 February 2019	Potential impact to the 'Dinner Time Tree'	In performing the heritage survey of the amendment area 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	5 October 2017 16 May 2018 28 June 2018 24 October 2018 1 March 2019	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.
• Cape Conservation Group. • Protect Ningaloo Campaign. • Conservation Council WA. • Exmouth Community. • Fishing Charter	5 October 2017 16 May 2018 28 June 2018 24 October 2018 1 March 2019	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 amendment area. 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 Base 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.

Stakeholders	Date(s)	Feedback Received	Incorporation of Feedback
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 Base Learmonth). Subsea 7 is committed to building infrastructure that is no higher than is necessary to support the intended operations.
• Recfishwest. • Local Flyfishing Business. • Exmouth Community.	4 October 2017 7 November 2017 24 October 2018 12 December 2018	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 2016 and 2019

Stakeholders	Date(s)	Purpose
2 May 2017	DPLH Subsea 7 project team	The meeting was held to discuss some planning process options that could be available for the proposal. The concept of lodging a modification to the draft LPS 4 was discussed.
8 May 2017	Shire of Exmouth Subsea 7 project team	The meeting broadly introduced the project. The scope of the project was discussed from a tenure, engineering, environmental, planning, and indigenous heritage and native title perspective. A number of future meetings were discussed to be held to maintain communication with the local government and engagement with other stakeholders.
30 May 2017	Shire of Exmouth Subsea 7 project team	The meeting broadly introduced the project to the new Chief Executive Officer of the Shire of Exmouth. An update on stakeholder engagement and the project programme were discussed.
21 July 2017	Office of the EPA Subsea 7 project team	The meeting provided a brief project overview including proposed schedule, construction methods, and proposed environmental approvals process. An update was provided in relation to technical studies that are being undertaken or completed. An update on stakeholder consultation was provided. The proposed modification to the draft LPS 4 was discussed. The Office of the EPA indicated that the modification should aim to align as closely as possible with the section 38 referral (being prepared).
29 August 2017	DPLH Shire of Exmouth Subsea 7 project team	The meeting provided an opportunity for the DPLH to provide feedback on a Modification Request to the draft LPS 4, which was submitted to the Shire on 18 August 2017. At the meeting, the agreed planning process was to initiate a 'complex' amendment under the Shire's TPS 3 for a 'Special Use' zone, which would include conditions in the Scheme Text and a rezoning shown on the Scheme Map. The intention was that a Complex Amendment to TPS 3 could be carried over and incorporated into LPS 4 when it was gazetted.
13 September 2017	Office of the EPA Subsea 7 project team	The meeting provided an update on the planning processes, based on outcomes from the meeting held on 29 August 2017 with the DPLH. An update was provided in relation to technical studies that were being undertaken or completed. The proposed amendment to the TPS 3 was discussed. The Office of the EPA indicated that the amendment should aim to align as closely as possible with the section 38 referral (being prepared).
10 October 2017	Shire of Exmouth Office of the EPA WAPC	Scheme Amendment 32 to TPS 3 was initiated by Council at its meeting held on 10 October 2017. Scheme Amendment 32 was referred to the EPA and the WAPC for consent to advertise. The WAPC gave consent; however, the EPA requested information that was to be included in the PER.
10 July 2018	DPLH	Subsea 7 submitted a letter to DPLH requesting support for concurrent advertising of a Scheme Amendment to LPS 4 and the PER. The letter indicated that Subsea 7 would submit a Scheme Amendment Request to the Shire, upon gazettal of LPS 4.

Stakeholders	Date(s)	Purpose
23 January 2019	Subsea 7	Subsea 7 submitted the draft Scheme Amendment Request to LPS 4 to the Shire for initial feedback and review. Shire of Exmouth administration reviewed the Request and requested additional information and a number of modifications to the amendment, based on the final version of the LPS 4.
28 March 2019	Shire of Exmouth	At its ordinary council meeting, Council resolved to initiate and adopt Amendment 1. Amendment 1 referred to WAPC and EPA.
10 June 2019	EPA	EPA set level of assessment as 'Assess – Environmental Review'. Instructions were issued by the EPA to the Shire on 17 July 2019.
11 June 2019	WAPC	WAPC advised the Shire that it is satisfied that the amendment is suitable to be advertised.

Table 3-2: Summary of Meetings for Amendment 1 between 2017 and 2019

4. KEY ENVIRONMENTAL PRINCIPLES AND FACTORS

4.1 PRINCIPLES OF THE EP ACT

Part I, section 4A of the EP Act sets out five core principles by which protection of the environment is to be achieved in Western Australia. The principles are further elaborated on in the EPA's Statement of Environmental Principles, Factors and Objectives (EPA 2018c).

These principles and the manner in which they have been applied to the amendment are described in Table 4-1.

Principle	Consideration of Principle for Amendment 1
The Precautionary Principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decision should be guided by: • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • An assessment of the risk-weighted consequences of various options.	Comprehensive environmental studies have been undertaken including in relation to BCH, terrestrial flora and fauna and coastal processes. These studies are described under the relevant preliminary key environmental factor, within the 'receiving environment' section. The amendment has, as much as practicable, taken into account the outcomes of the environmental technical studies, in consultation with the relevant agencies. The environmental implications of the amendment have been provided for each of the environmental factors. This is followed by a description of how the amendment will incorporate provisions for environmental management where appropriate.
The Principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	Environmental impacts will be managed such that the risks of adverse impacts are minimised and the quality of the environment is maintained or enhanced wherever possible.
The Principle of the conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Impacts to BCH will be minimal when assessed at the worst case and will not impact the biological diversity and ecological integrity of the Heron Point area or wider region. Impacts to terrestrial vegetation, flora and fauna are not expected to be significant, or pose a risk of loss of biological diversity and ecological integrity.
Principles relating to improved valuation, pricing and incentive mechanisms. Environmental factors should be included in the valuation of assets and services.	NA

Principle	Consideration of Principle for Amendment 1
The *polluter pays* principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. The user of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	
The principle of waste minimisation All reasonable and practicable measures should be undertaken to minimise the generation of waste and its discharge into the environment.	All reasonable and practicable measures to minimise the generation of waste and its discharge to the environment will be taken.

Table 4-1: Principles of the EP Act

4.2 PRELIMINARY KEY ENVIRONMENTAL FACTORS

The following preliminary key environmental factors require assessment, as identified within the Instructions for Environmental Review (EPA 2019):

- Benthic Communities and Habitats.
- Coastal Processes.
- Marine Environmental Quality.
- Flora and Vegetation.
- Subterranean Fauna.
- Terrestrial Fauna.
- Inland Waters.
- Social Surroundings.

5. PRELIMINARY KEY ENVIRONMENTAL FACTORS

5.1 KEY ENVIRONMENTAL FACTOR 1 – BENTHIC COMMUNITIES AND HABITAT

5.1.1 EPA Objective

To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.

In the context of this objective, 'Ecological integrity' is the composition, structure, function and processes of ecosystems, and the natural variation of these elements. The objective for this factor recognises that marine benthic communities are important components of almost all marine ecosystems, and are fundamental to the maintenance of ecological integrity and biological diversity of the marine environment as a whole.

5.1.2 Policy and Guidance

A summary of the policy and guidance relevant to benthic communities and habitats (BCH), and how these have been considered, is presented in Table 5-1.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors.
Environmental Factor Guideline – Benthic Communities and Habitats (EPA 2016d)	This guidance was consulted in the consideration of potential direct and indirect impacts to BCH as a result of the proposed development within the amendment area, including launchway.
Technical Guidance – Protection of Benthic Communities and Habitats (EPA 2016e)	This guidance was consulted in the development of the local assessment unit (LAU) for the assessment of potential impacts to BCH, the characterisation of the BCH present within the LAU, and in the calculation of cumulative impacts.
Technical Guidance Environmental Impact Assessment of Marine Dredging (EPA 2016v)	This guidance was referenced in the definition of the zones of impact as a result of the proposed development within the amendment area, including launchway.

Table 5-1: Key Policy and Guidance Relevant to BCH

5.1.3 Receiving Environment

5.1.3.1 Regional Benthic Communities and Habitats

BCH play important roles in maintaining the integrity of marine ecosystems and the ecological services they supply. There is strong evidence that the presence of benthic communities can be important for the maintenance of biodiversity through provision of structurally complex and diverse habitat, provision of refuge, and increased food supply. Some of these complex habitats are important recruitment and nursery areas for many marine fauna species and may also provide essential food resources for large marine mammals, such as dugongs and turtles. Benthic primary producer habitats form the foundation of many marine food webs that, in turn, support productive and economically important fisheries (EPA 2016d).

A number of marine studies have previously been undertaken within the region (Exmouth Gulf and adjacent areas around the Muiron Islands) in the period 1994 to 2015, as outlined in Table 5-2.

Additional site-specific studies, as listed in Table 5-2, were undertaken by various technical specialists, and are included in full within Attachment 2. They are also referred to, as appropriate, in the assessment of potential impacts and proposed management measures.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
1994	McCook *et al*.	Seagrass communities in Exmouth Gulf, Western Australia: a preliminary survey
1996	Hutchins *et al*.	Marine Biological Survey of the Muiron Islands and the Eastern Shore of Exmouth Gulf
1999	Loneragan *et al*.	Developing techniques for enhancing prawn fisheries, with a focus on Brown tiger prawns (*Penaeus esculentus*) in Exmouth Gulf
2003	Bancroft	Broad-scale regional marine habitats of selected areas in Western Australia
2006	CSIRO	Ecosystem characterisation of Australia's North West Shelf
2006-2007	Kobryn *et al*.	Ningaloo Reef: Shallow Marine Habitats Mapped Using a Hyperspectral Sensor
2013-2015	Vanderklift *et al*.	Natural dynamics: understanding natural dynamics of seagrasses in north-western Australia
Site-specific Studies		
2016	360 Environmental	Survey of benthic habitats off Heron Point (Attachment 2A)
2017	360 Environmental	Survey of benthic habitats within the Heron Point LAU (Attachment 2A)
2018	MBS Environmental	Exmouth Gulf Benthic Communities and Habitat survey report (Attachment 2B)

Table 5-2: Overview of Local and Regional BCH Studies

Habitat Mapping

Regional habitat types recorded along the western margin of Exmouth Gulf and within the Ningaloo Marine Park were as follows (Bancroft 2003, SeaMap 2017) (refer Figure 5-1):

- Biota present.
- Consolidated hard substrate.
- Coral biota.
- Hard substrata.
- Invertebrates.
- Macroalgae.
- Mangroves.
- Pavement.
- Saltmarsh.

- Sand.
- Soft substrata.

5.1.3.2 Local Benthic Communities and Habitats

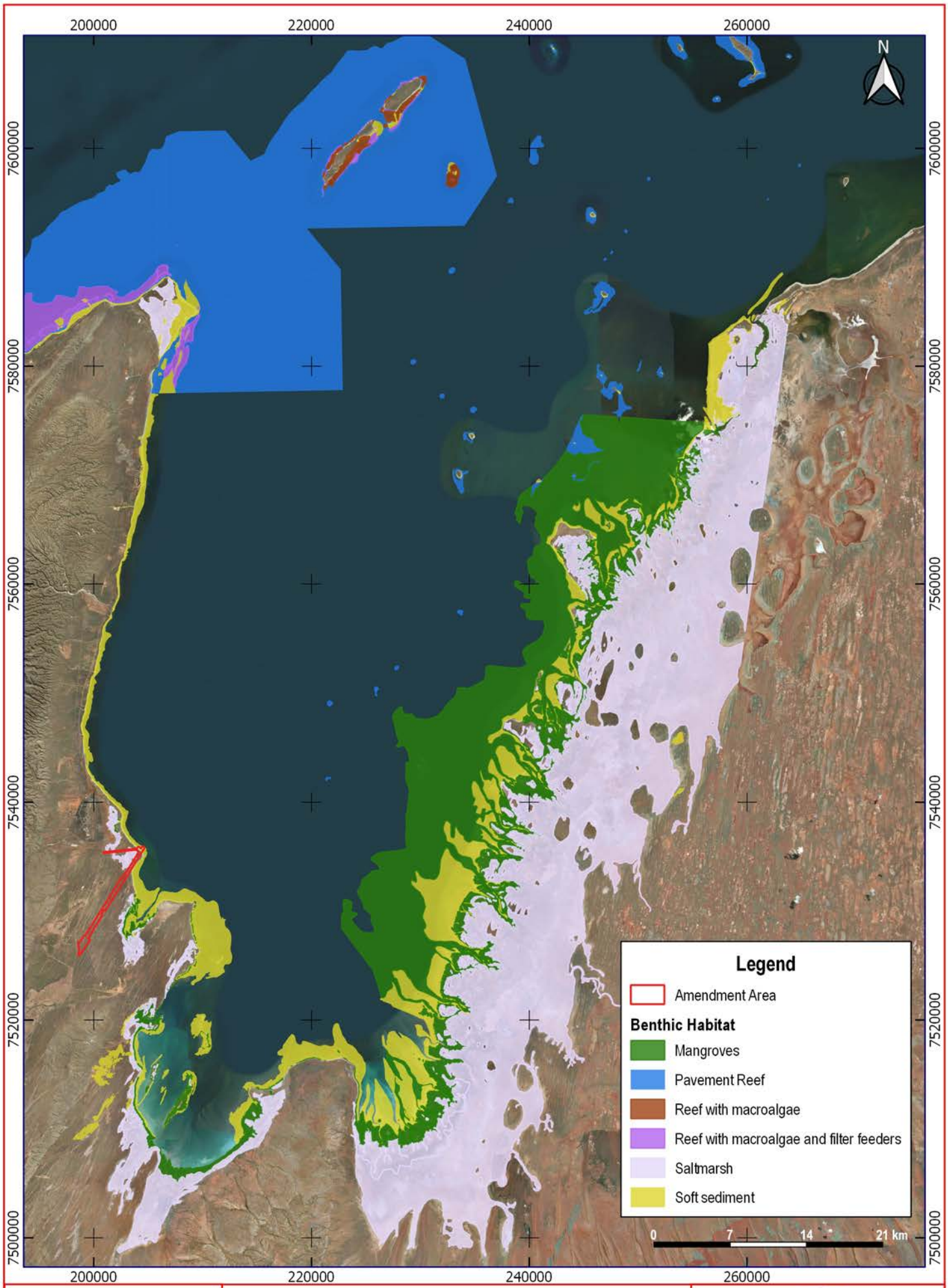
Intertidal and subtidal habitats off Heron Point were surveyed in December 2016 (Attachment 2A). A follow-up survey, to map all BCH within the Heron Point Local Assessment Unit (LAU), was completed in May/June 2017. Three intertidal BCH types were recorded (refer Table 1 in Attachment 2A):

- Fine sand (Fine sand within upper littoral zone).
- Pavement reef (Unvegetated pavement reef within the upper littoral zone).
- Reef with macroalgae:
    - Pavement reef within the mid-littoral zone with mud veneer and sparse macroalgae (*Sargassum* sp.).
    - Pavement reef within the lower-littoral zone with macroalgae (*Halimeda* sp., *Padina* sp., *Sargassum* sp.) and occasional hard corals (*Turbinaria* spp.) and soft corals (*Lobophytum* spp.)

Mangroves were recorded within the Bay of Rest (Attachment 2B). Six subtidal BCH types were recorded off Heron Point (Figure 5-2, Attachment 2A, and Attachment 2B):

- Soft sediment (Mud and sand dominated habitats with sparse turf algae).
- Soft sediment with turf algae (Mud and sand dominated habitats with turf algae/ microphytobenthos (MPB)).
- Seagrass (Mud and sand dominated habitats with sparse *H. uninervis* and *H. ovalis*).
- Soft sediment with filter feeders (Soft sediment veneer overlying low relief reef. Sparse cover of filter feeders (sponges and soft corals)).
- Reef with macroalgae (Low relief reef with macroalgae (brown)).
- Reef with macroalgae and filter feeders (Low relief reef with macroalgae (brown) and filter feeders (sponges, soft corals, hard corals)).

To facilitate the development of a consolidated map of BCH within Exmouth Gulf, the Bancroft (2003) and SeaMap (2017) data were reclassified to align with the BCH classifications developed from the site-specific studies (Figure 5-2).



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

Figure 5-1: Regional BCH Mapping Within Exmouth Gulf (Bancroft 2003 and SeaMap 2017)

Shire of Exmouth

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Corals

Ningaloo Reef is the largest fringing barrier coral reef, and the second largest coral reef system, in Australia. The most diverse coral communities in the reserves (Ningaloo Marine Park and the Muiron Island Marine Management Area) are in the relatively clear water, high energy environment of the fringing barrier reef and low energy lagoonal areas to the west of North West Cape.

Coral reefs within the Exmouth Gulf are incipient, being submerged reefs that lack defined reef flat zones, unlike the Ningaloo Reef on the western side of the Cape Range Peninsula. This morphology reflects the low energy conditions within the Gulf and the higher turbidity which affects coral community composition (Twiggs and Collins 2010, Fitzpatrick *et al*. 2019). Large-scale mass-spawning events have been reported among corals on WA reefs in the autumn period involving synchronous spawning by up to 24 coral species from a wide range of genera and families (Simpson 1988, Babcock *et al*. 1994). Some of the most abundant species of coral, including species of *Porites*, *Pavona* and *Turbinaria*, have been found to not participate in the mass spawning events and their patterns of reproduction remain uncertain (Stoddart and Gilmour 2005). More recent research on some WA coastal and offshore reefs has confirmed a smaller multispecific spawning period involving fewer species and colonies occurring during late spring or early summer (Rosser and Gilmour 2008, Gilmour *et al*. 2009, Rosser and Baird 2009). Between the release of gametes into the water by adult corals and the growth of newly settled coral spat lie three stages of development: fertilisation and embryonic development, larval growth, and settlement and metamorphosis. The natural percentage survival at each of these stages is likely to be very low and influenced by a wide range of physical (e.g. wind, waves, salinity) and biological (e.g. predator abundance) factors (Gilmour 1999).

Mangroves

Within the Bay of Rest several mangrove species were recorded; Grey Mangrove (*Avicenna marina*), Stilted Mangrove (*Rhizophora stylosa*) and Club mangrove (*Aegialitis annulata*) (Attachment 2A). No mangroves were recorded within or immediately adjacent to the amendment area.

5.1.3.3 Benthic Communities and Habitats of Importance to Marine Fauna

Australian humpback dolphins have been recorded in various habitat types including dredged channels, reefs, seagrass flats, and mangroves. Foraging behaviour has been observed mainly in nearshore habitats over intertidal rocky reefs and over shallow sub-tidal reef habitats (Parra and Cagnazzi 2016). During aerial surveys, dolphins were recorded throughout Exmouth Gulf (Attachment 2I).

Dugong activity is thought to be focused on the east coast of the Gulf associated with the shallow seagrass habitat in that area. During recent aerial surveys, Dugong were primarily recorded adjacent to the southern and eastern shores of Exmouth Gulf, with only small numbers (13) recorded adjacent to the western shore to the north of Heron Point (Attachment 2I).

Aerial surveys have shown that turtles occur throughout Exmouth Gulf, with densities greatest in the shallow southern and eastern portions of the Gulf. The majority of animals sighted were identified as Green turtles (Oceanwise 2005, Oceanica 2006). During recent aerial surveys, marine turtles were widely recorded. The greatest numbers were recorded adjacent to the southern and eastern shores of Exmouth Gulf (Attachment 2I).

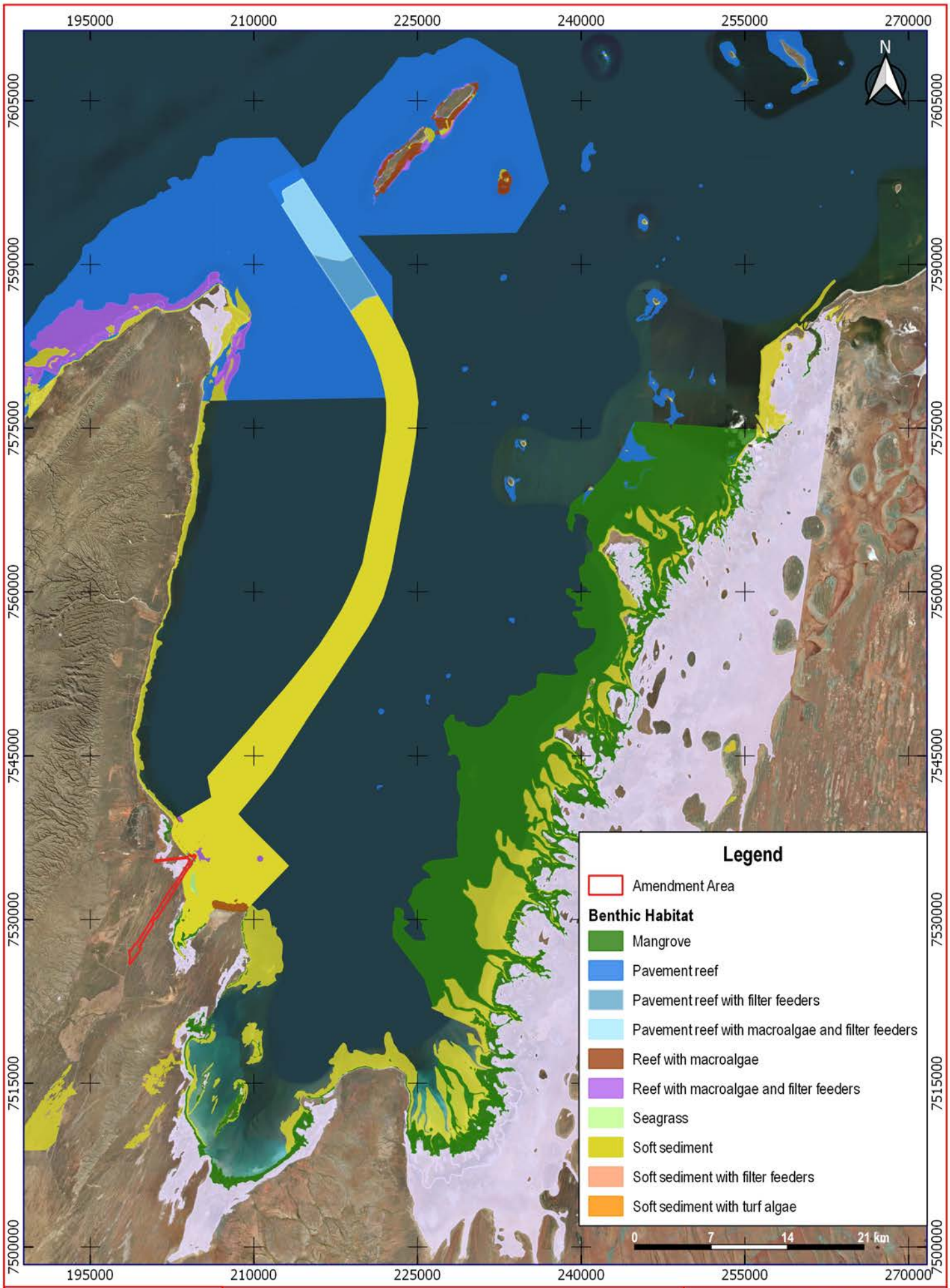

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Figure 5-2: Combined Regional and Proposal-specific BCH Mapping

Shire of Exmouth

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5.1.3.4 Benthic Communities and Habitats of Importance to Recreational or Commercial Fisheries

Recreational fishing effort in the Gascoyne region was monitored during a 12-month creel survey between April 1998 and March 1999. The estimated total annual recreational boat-based angling effort for the region was 53,336 fisher days, with approximately half of this fishing effort occurring within Ningaloo Marine Park.

The estimated total annual recreational shore-based angling effort for the region was 77,196 fisher days, with the greatest effort in Exmouth Gulf. The area between Exmouth and Wapet Creek was particularly popular (Figure 5-3), with retirees targeting whiting and western yellowfin bream. The shore-based fishing effort in Ningaloo Marine Park was also high (Sumner *et al*. 2002) (Figure 5-3).

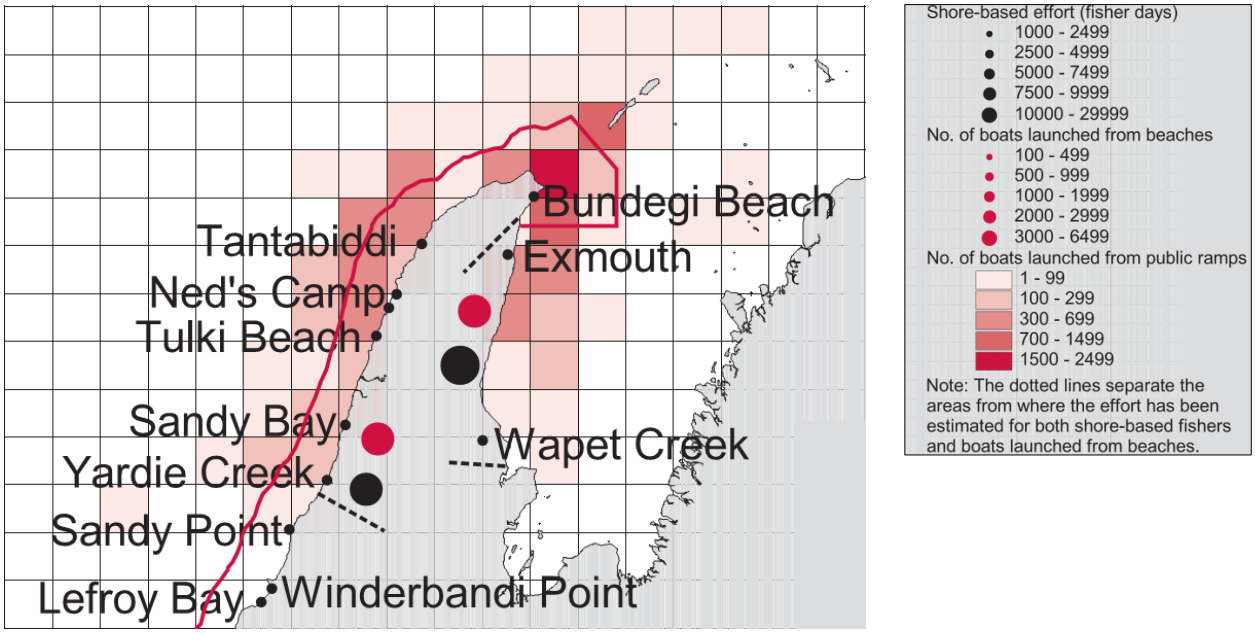

Figure 5-3: Recreational Fishing Effort Within Exmouth Gulf and Along the North West Cape (from Sumner *et al*. 2002)

The Exmouth Gulf prawn fishery utilises a large portion of the soft sediment habitat within the deeper basin of Exmouth Gulf. A designated prawn fishery nursery area has been defined within the eastern and southern portions of Exmouth Gulf. Trawling does not occur inshore at Heron Point adjacent to the amendment area (Figure 5-4).

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.

It is difficult to reconcile the habitats of most importance to aquarium specimen collectors and charter fishing operators due to the coarse nature of the information available from DPIRD. A single aquarium specimen collector has identified the filter feeder habitat off Heron Point as a key fishing area, and potential impacts to this habitat have been discussed with this operator.

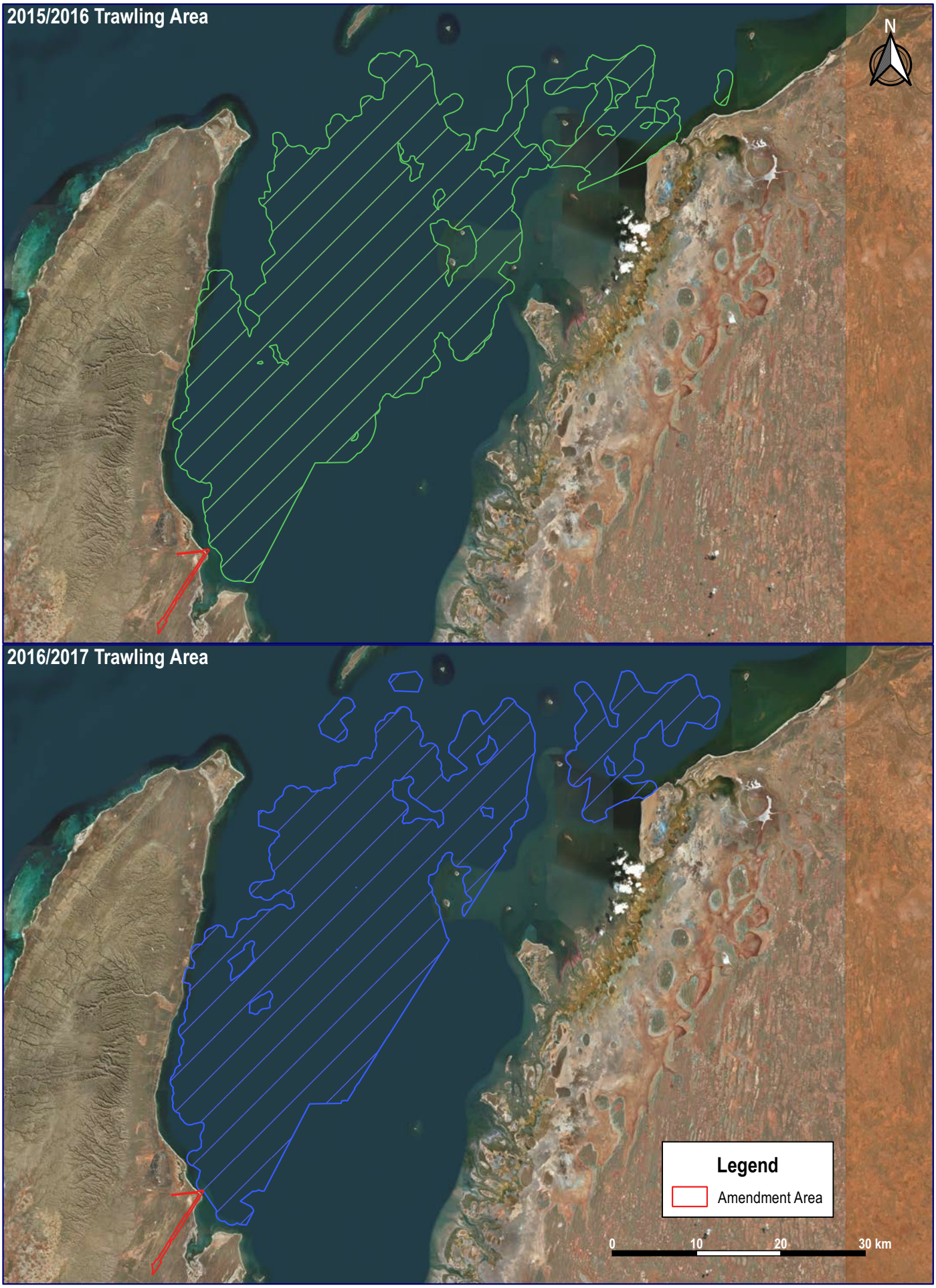

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Figure 5-4: Exmouth Gulf Prawn Fishery – Areas Fished (2015/2016 and 2016/2017)

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5.1.4 Potential Impacts

The future development of infrastructure within the amendment area has the potential to directly and indirectly impact BCH. Table 5-3 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Construction	Direct disturbance or loss of BCH through future development of the launchway
	Reduction in marine environmental quality that supports healthy BCH
	Loss or degradation of BCH representing marine fauna habitat (e.g. breeding and or foraging habitat) due to launchway construction
	Reduction in abundance of commercial and recreational fishing species due to loss of habitat and/or changes in marine water quality
Operations	Indirect impacts to BCH due to altered sediment and water movement and flows caused by the launchway

Table 5-3: Potential Impacts to BCH

5.1.5 Assessment of Impacts

5.1.5.1 Local Assessment Units

The EPA uses a spatial assessment framework for evaluating cumulative temporary and irreversible loss of and/or serious damage to BCH. The evaluation scheme is based on cumulative changes within a defined area and includes determining the spatial extent of benthic communities and their habitats:

- Prior to all human-induced disturbance.
- Existing at the time of the proposal.
- Remaining after implementation of the proposal (EPA 2016d).

EPA (2016e) states that '*Local assessment units (LAUs) are location specific and should be configured to take into account aspects of the local marine environment such as bathymetry and position of offshore reefs/islands, substrate type, water circulation patterns, exposure to waves and currents and biological attributes such as habitat types'.* The LAUs were defined taking account of this guidance and in consultation with DWER.

It is noted that the amendment area is within an area of Heron Point previously nominated for reservation, and within the Bay of Rest mangrove area (EPA 2001). A single nearshore LAU (LAU 'Heron Point') was developed based on these datasets (Figure 5-5). The LAU was developed to be broadly consistent with the general guidance presented in Section 4.2 of EPA (2016e), and utilises the existing mapped boundaries of the above proposed conservation zones. LAU 'Heron Point' was discussed with the Marine Ecosystems Branch of the EPA, and endorsed, prior to completion of habitat mapping across this area (Attachment 2A).

The sub-sections below provide an assessment of potential direct and indirect impacts to BCH resulting from the future development of infrastructure within the amendment area.

5.1.5.2 Impact Zonation Scheme

The EPA has developed a spatially-based zonation scheme for proponents to use as a common basis to describe the predicted extent, severity, and duration of impacts associated with dredging proposals (EPA 2016v).

The spatially-based zonation scheme consists of three zones that represent different levels of impact:

- The Zone of High Impact (ZoHI) is the area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.
- The Zone of Moderate Impact (ZoMI) is the area within which predicted impacts on benthic organisms are recoverable within a period of five years.
- The Zone of Influence (ZoI) is the area within which changes in environmental quality are predicted and anticipated at some point during the dredging operations, but where these changes would not result in a detectible impact on benthic biota.

The approach outlined above was referenced to assist in the spatial representation of the zones of potential impact to BCH.

5.1.6 Risk Assessment

A risk assessment identifying potential impacts to BCH, including potential habitat for conservation significant or locally important marine fauna or commercial and recreational fisheries, is presented in Attachment 3. The potential impacts are also assessed in the sub-sections below.

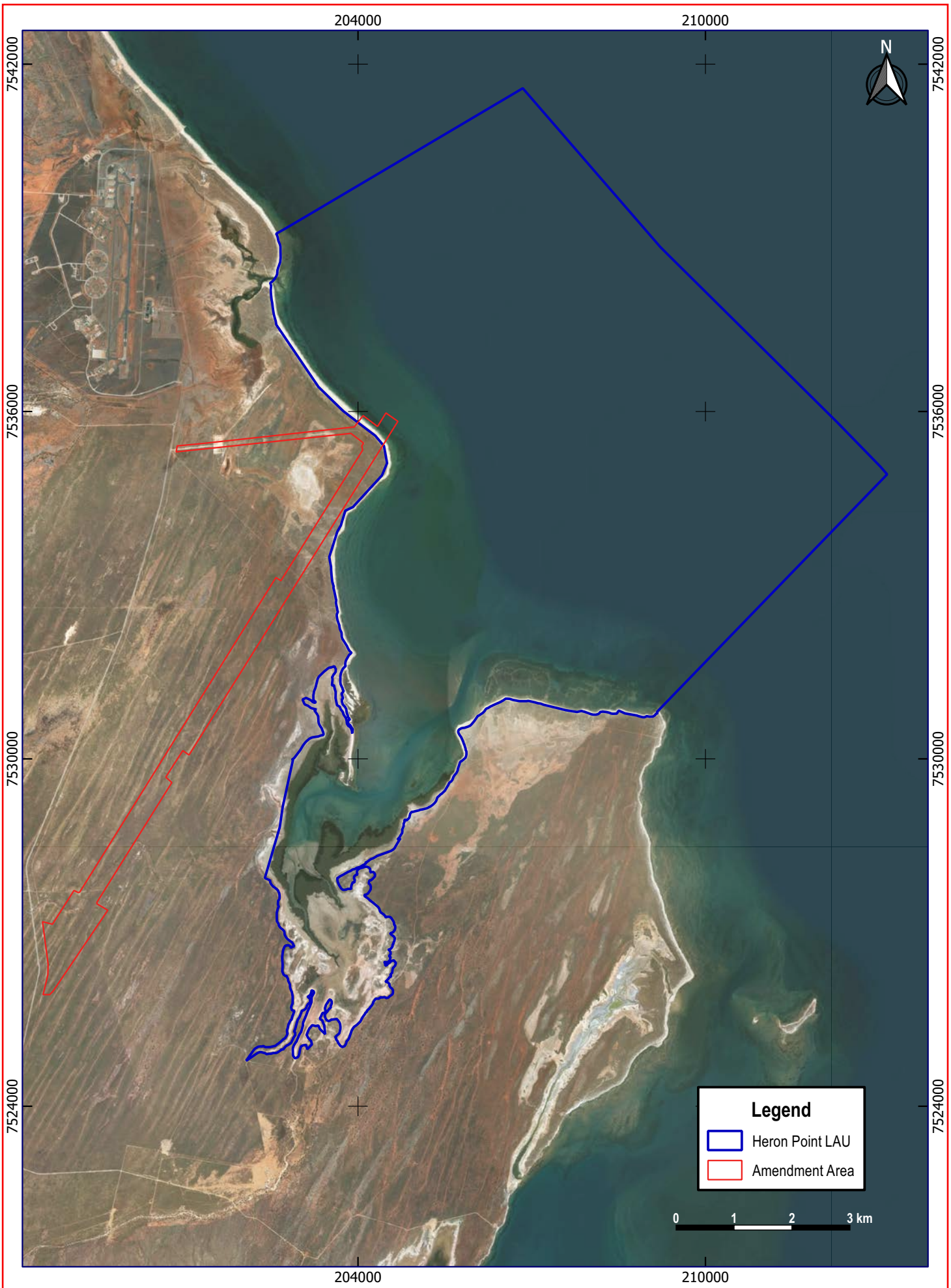

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Figure 5-5: Heron Point Local Assessment Unit used for the Assessment of Amendment 1

Shire of Exmouth

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5.1.6.1 Direct disturbance or loss of BCH through future development of the launchway

The following assessment is based on the future development of the proposed launchway (as is being assessed by the EPA under Assessment number 2208).

The following construction sequence is expected during launchway construction:

- Shallow excavation of sand on land including the area through the sand dunes.
- Shallow excavation or compaction of sand on the beach.
- Progressively construct the launchway from the landward extent to the seaward extent, by repeating the following steps:
    - Place rock fill.
    - Place concrete panels.
    - Place concrete mattress or rock armour.

Rock fill will be placed from the shoreline, being pushed seaward down the onshore end of the launchway. For the offshore end of the launchway, the rock fill will be placed from a barge.

The launchway footprint has been used to define the ZoHI for BCH in this area, where impacts on BCH are predicted to be irreversible. Predicted BCH losses as result of the launchway footprint are as follows:

- Soft sediment (0.2 ha) (< 0.1% of that mapped within the Heron Point LAU).
- Reef with macroalgae (0.3 ha) (0.1% of that mapped within the Heron Point LAU).
- Pavement reef (0.1 ha) (3.2% of that mapped within the Heron Point LAU) (refer Figure 5-6).

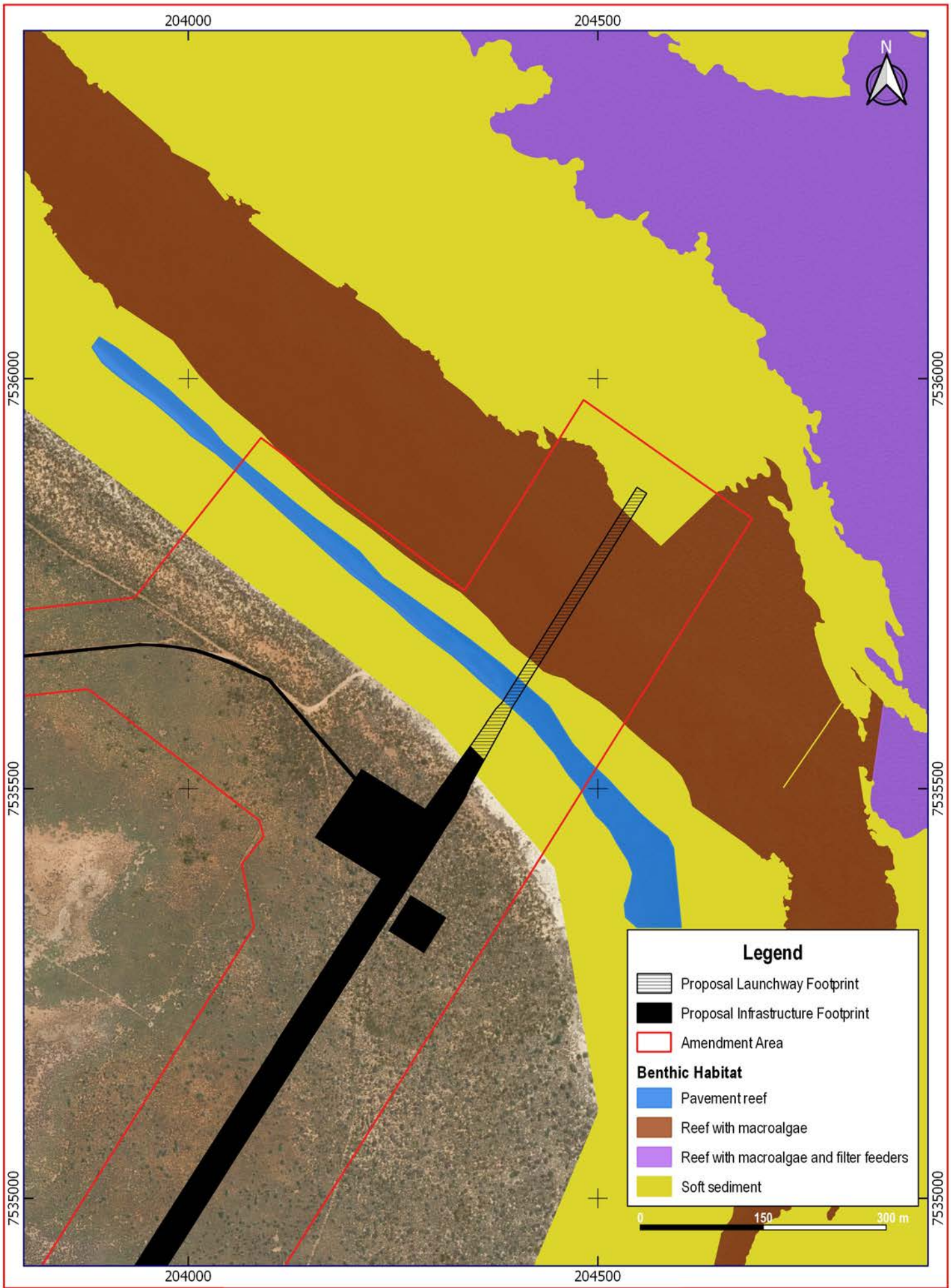

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Figure 5-6: Direct Losses of BCH Within the Heron Point LAU

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5.1.6.2 Reduction in marine environmental quality that supports healthy BCH

Launchway construction will occur during daylight hours only, so any sediment resuspended during a shift will be likely to dissipate prior to commencement of the next shift.

Sediment may be resuspended, resulting in elevated turbidity, as a result of:

- Disturbance of the seabed in areas of soft sediment (i.e. when the rock fill material makes contact with the seafloor and displaces superficial material).
- Any rock 'fines'[1] contained within the rock fill, or generated as the fill is placed and rocks come into contact with each other.
- Disturbance of the seabed by construction equipment, including when an approximately 300 mm layer of sediment is removed from the last 24 m length of the launchway footprint.

The inshore BCH at Heron Point are likely to be tolerant to short-term extremes in water column turbidity as such events occur under natural conditions (refer Section 5.3.3). The macroalgae (*Halimeda* sp., *Padina* sp., *Sargassum* sp.) and occasional hard corals (*Turbinaria* spp.) and soft corals (*Lobophytum* spp.) recorded within the lower-littoral reef habitat are known to occur widely across North West Australia (Hanley and Morrison 2012).

In studies to investigate the tolerance of sponges in the north west of Western Australia, it has been noted that '*most sponges survived under low to moderate turbidity scenarios (suspended sediment concentrations of ≤ 33 mg/L, and a daily light integral of ≥0.5 mol photons/m^2/day) for up to 28 days*' and '*all three sponge species exhibited mechanisms to effectively tolerate dredging-related pressures in the short-term (e.g. oscula closure, mucus production and tissue regression)*' (Pineda *et al*. 2017). Coral communities recorded adjacent to the Port of Dampier, at Port Hedland, at Cape Preston and throughout the wider Dampier Archipelago are generally similar, with Faviid, Porites and Turbinaria coral groups making up ~70% of all hard corals (WorleyParsons 2009). *Turbinaria* spp. corals were by far the most dominant of the corals present within the nearshore habitats off Heron Point, though their absolute density was low (Attachment 2A). These coral groups are all relatively resistant to bleaching, are able to withstand strong wave action and can cope with high levels of sedimentation (Ayling and Ayling 2006, Berkelmans and Oliver 1999, GHD 2008). Post-construction monitoring of coral communities adjacent to the Coral Bay Boating Facility, which was constructed over eight months in 2007, and involved significant rock (limestone) dumping, concluded that the construction works had not impacted coral communities noticeably at distances of more than 50 m from the physical structure (MScience 2007). Thus impacts to less sensitive, turbidity tolerant, corals at Learmonth are not expected beyond the immediate vicinity (50 m) of the launchway footprint.

Given the short-term and 'pulse' nature of the expected sediment resuspension, significant losses of BCH are not expected. Local and minor changes to BCH health could occur, dependent upon the effectiveness of the mitigation measures. As such, the area within the immediate vicinity of the launchway footprint (<50 m) has been defined as a ZoMI within which impacts on benthic organisms may occur, but are recoverable within a period of five years following completion of construction (Figure 5-7). In reality, given the tolerance of such BCH types (refer above), any impacts resulting from the up to six months' construction duration are expected to be more short-term (<1 year).

[1] Particles with a diameter of less than 63 µm

Predicted indirect BCH impacts (recoverable) as a result of the launchway construction are as follows:

- Reef with macroalgae (2.5 ha) (0.7% of that mapped within the Heron Point LAU).
- Soft sediment (2.0 ha) (< 0.1% of that mapped within the Heron Point LAU).
- Pavement reef (0.4 ha) (12.9% of that mapped within the Heron Point LAU, noting the lack of macroalgae or fauna within this habitat).

Activities that generate suspended sediment concentrations of tens of mg/L can impact coral spawning, affecting the egg–sperm bundles and sperm viability. Under some circumstances the use of the coral spawning 'critical windows of environmental sensitivity' can be adopted to protect spawning and fertilisation. However, where coral spawning occurs at a distance from activities and developing embryos and larvae drift into a turbid plume, there is comparatively little risk of negative effects on embryo and larval survivorship (Negri *et al*. 2019). Given the absence of significant coral cover in the vicinity of the launchway area (the nearest appreciable coral cover was recorded at Cooper Shoal), the likelihood of impacts to coral spawning, due to locally elevated suspended sediment concentrations, is considered negligible.

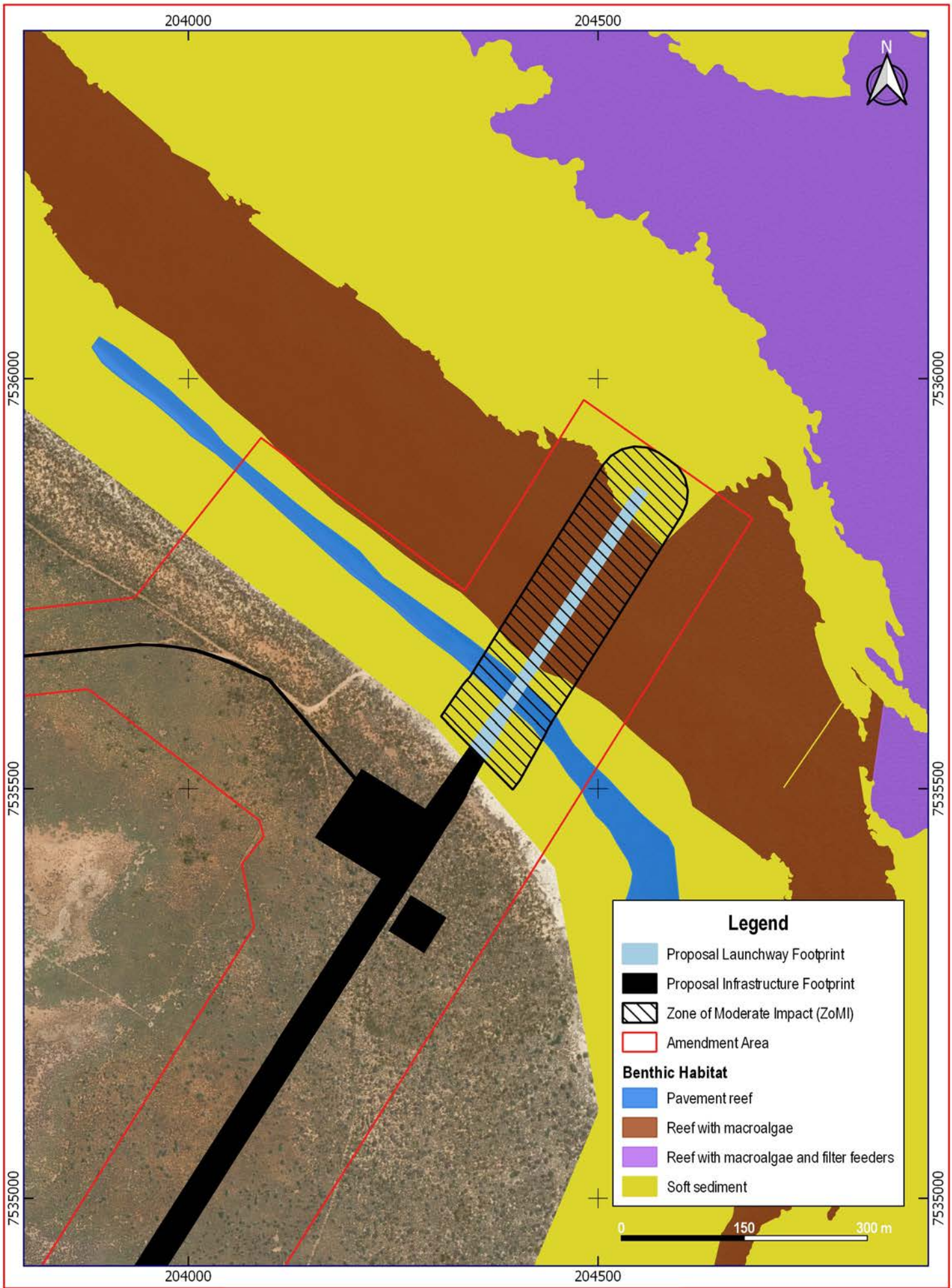

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Figure 5-7: Potential Indirect Impacts to BCH Adjacent to Launchway due to Changes in Water Quality

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5.1.6.3 Loss or degradation of BCH representing marine fauna habitat (e.g. breeding and or foraging habitat) due to launchway construction

Minor direct losses of the BCH types 'Soft sediment' (0.2 ha), 'Reef with macroalgae' (0.3 ha) and 'Pavement reef' (0.1 ha) are predicted as a result of future development and associated infrastructure, based on assessment of the construction of a launchway (Figure 5-6). In addition, minor reversible impacts are predicted, as a result of elevated turbidity during launchway construction, to BCH within 50 m of the launchway footprint including 'Reef with macroalgae' (2.5 ha), 'Soft sediment' (2.0 ha) and 'Pavement reef' (0.4 ha) (Figure 5-7). It is noted that 'Pavement reef' is not considered to represent potential fauna habitat and 'Soft sediment' habitat is unlikely to be impacted by elevated turbidity due to the absence of primary producers or filter feeders.

Some benthic communities are critical to the long-term viability of marine fauna species protected under State or Commonwealth legislation or of particular iconic status or commercial importance. They may either function as recruitment sites, nursery areas, or as important feeding areas. The EPA expects proponents to identify any critical associations between important marine fauna and key BCH that are likely to be impacted (EPA 2016d). The text below assesses the potential value of the BCH adjacent to the launchway to marine fauna.

Marine turtles are known to occur within Exmouth Gulf, and nest on the beaches of the North West Cape and Muiron Islands, with internesting likely to occur adjacent to these nesting sites. The BCH within the amendment area is not considered to represent important foraging habitat, or breeding habitat, to any marine turtle species.

The Department for Sustainability, Environment, Water, Population and Communities (DSEWPaC), during development of the draft Marine Bioregional Plan for the North-west Marine Region (DSEWPaC 2011c), identified biologically important areas for four species of cetacean in the North-west Marine Region: the Humpback whale, Australian snubfin dolphin, Indo-Pacific humpback dolphin and Indo-Pacific bottlenose dolphin. Such areas are those where aggregations of individuals of a species display biologically important behaviours. Behaviours that have been used to define biologically important areas are breeding, calving, and foraging. The areas identified are all well north of the amendment area, ranging from Broome in the south to just short of the Northern Territory border in the north (DSEWPaC 2011c).

Exmouth Gulf has been identified as a biologically important area in recognition of its value as a resting area for migrating Humpback whales, with very high densities of nursing cows with calves during the southern migration (DSEWPAC 2012b). However, Humpback whales do not forage during their southern migration (Lyn Irvine, pers. Comm 2018b), are not dependent upon any BCH and are unlikely to occur within the amendment area.

The Australian humpback dolphin (*Sousa sahulensis*) (previously named the Indo-Pacific humpback dolphin (*Sousa chinensis*)) shows selection for various types of habitats including dredged channels, reefs, seagrass flats, and mangroves (Parra and Cagnazzi 2016). Around the North West Cape, dolphins have been sighted in clear waters over Ningaloo Reef, and in turbid waters in Exmouth Gulf and in depths ranging from 1 to 40 m deep (Parra & Cagnazzi 2016). It is not expected that the BCH within the amendment area represents critical habitat to any dolphin species. Whilst dolphins may feed in the amendment area, this habitat (and the associated prey items) is widely distributed both locally and regionally and loss of the small area of potential foraging habitat (Soft sediment (0.2 ha) and Reef with macroalgae (0.3 ha)) is considered unlikely to adversely impact dolphins.

While Exmouth Gulf has been identified as a biologically important area for foraging and nursing by Dugong (DSEWPAC 2012b), Dugong activity is focused on the east coast of the Gulf associated with the shallow seagrass habitat (Oceanwise 2005). This conclusion was supported by data collected during aerial surveys between August and November 2018 (Attachment 2I). It is not expected that the BCH within or adjacent to the amendment area represents critical habitat to Dugong. No impact to Dugong is expected as a result of the potential local impacts to BCH as a result of future development within the amendment area.

5.1.6.4 Reduction in abundance of commercial and recreational fishing species due to loss of habitat and/or changes in marine water quality

Minor direct losses of the BCH types 'Soft sediment' (0.2 ha), 'Reef with macroalgae' (0.3 ha) and 'Pavement reef' (0.1 ha) are predicted as a result of future development and associated infrastructure, based on assessments undertaken for construction of a launchway (Figure 5-6). In addition, minor reversible impacts are predicted, as a result of elevated turbidity during launchway construction, to BCH within 50 m of the launchway footprint including 'Reef with macroalgae' (2.5 ha), 'Soft sediment' (2.0 ha) and 'Pavement reef' (0.4 ha) (Figure 5-7). It is noted that 'Pavement reef' is not considered to represent potential fauna habitat and 'Soft sediment' is unlikely to be impacted by elevated turbidity due to the absence of primary producers or filter feeders.

The text below assesses the potential impacts to key commercial and recreational fishery species due to loss of habitat or changes to water quality.

<u>Exmouth Gulf Prawn Fishery</u>

The Exmouth Gulf prawn fishery utilises a large portion of the soft sediment habitat within the deeper basin of Exmouth Gulf. A designated prawn fishery nursery area has been defined within the eastern and southern portions of Exmouth Gulf. Trawling does not occur inshore at Heron Point adjacent to the amendment area.

The Exmouth Gulf Prawn Fishery targets Banana, Tiger, King, and Endeavour prawns with a focus of Tiger, King, and Endeavour prawns (DPIRD 2018). Prawns may occur within the amendment area, but this area, consisting or shallow macroalgae-covered reef and fine sand sediment (refer Attachment 2A), is not considered key habitat. Suspended sediment tolerances of cultured prawn species, noted as similar to Banana and Brown tiger prawns, were recorded to be in excess of 130 mg/L (Preston *et al*. 2001).

Given the minor loss of habitat, the limited extent of changes in water quality and the reported tolerances of sediment-dwelling prawns, no impacts to the abundance of these species are expected as a result of future development and associated infrastructure within the amendment area.

<u>Aquarium Specimen Collectors</u>

A single aquarium specimen collector has identified the filter feeder habitat off Heron Point as a key fishing area, for the sponge *Trikentrion flabelliforme* (more commonly referred to as the 'Spider Sponge') and potential impacts to this habitat have been discussed with this operator.

Based on the historical records and Learmonth towed video recordings and observations, *T. flabelliforme* appears to be commonly found within shallow soft sediment/low relief reef habitat in waters less than 10 m deep with elevated turbidity, and is therefore expected to be tolerant of elevated suspended sediment concentrations. Given the absence of records

of this species immediately adjacent to the launchway, no direct or indirect impacts are expected.

Charter Fishers

Four key charter (tour operator) target fish species were highlighted during Subsea 7's consultation with the local community. The four key target species were:

- Permit (or Snubnose dart) (*Trachinotus blochii*).
- Bonefish (*Albula vulpes*).
- Barramundi (*Lates calcarifer*).
- Giant trevally (*Caranx ignobilis*).

Data obtained from DPIRD (2018) identifies the key areas where these species are targeted. Snubnose dart (also called Permit) were reported as caught in seven fisheries' blocks, with four of these blocks lying inside Exmouth Gulf. Bonefish were only fished outside Exmouth Gulf. Barramundi were fished within three shallow inshore fishery blocks in the southern and eastern parts of Exmouth Gulf and Giant trevally were fished within 11 fishery blocks in Exmouth Gulf and another 12 fishery blocks outside Exmouth Gulf (DPIRD 2018). The data suggest that Giant trevally and Snubnose dart are targeted off Heron Point, and other coastal areas to the south.

Giant trevally are regularly targeted adjacent to significant reef structures, while Snubnose dart are known to frequent shallow sand flats. The shallow macroalgae-covered reef and fine sand sediment habitats within and adjacent to the amendment area are not considered key habitat for these species.

A recent study (Wenger *et al*. 2018) was undertaken to assess the potential vulnerability of coastal fish and fisheries to dredging activities on a global scale. The study found that exposure of fish larvae (more sensitive than adults) to concentrations up to 60 mg/L did not have a lethal impact until after 24 hours (Wenger *et al*. 2018). The data also suggested that a small minority of species included within the study were highly sensitive to suspended sediment concentrations below 26 mg/L, compared to the majority that were not. Within an environment that regularly experiences elevated suspended sediment concentrations, such as Exmouth Gulf, it can be assumed that the majority of species, including Giant trevally and Snubnose dart, would have a degree of tolerance to suspended sediment but would be able to avoid affected waters if needed.

Given the wide distribution of fishing effort for these species, the broad representation of the same BCH types outside of the amendment area and the limited concentrations and spatial extent of elevated suspended sediments expected during development of the launchway within the amendment area (Section 5.1.6.2), no significant impacts on commercial or recreational fish species are expected.

Recreational Fishers

It is understood that recreational fishers target Blue swimmer crabs (*Portunus armatus*) adjacent to Heron Point and more broadly along the western side of Exmouth Gulf.

The shallow macroalgae-covered reef and fine sand sediment habitats within and adjacent to the amendment area are not considered key habitat for the Blue swimmer crab (*Portunus armatus*). The Blue swimmer crab, fished recreationally, is also expected to be tolerant of suspended sediments. For the Dungeness crab, which has been used as a proxy due to it's similar characteristics, exposure of adults to a very high suspended sediment concentration of 3,500 mg/L, for 28 days, resulted in a 10% mortality. There was little variation of

mortality with increasing suspended sediment concentrations (up to 18,900 mg/L) over a short duration (eight days) (Peddicord and McFarland 1976).

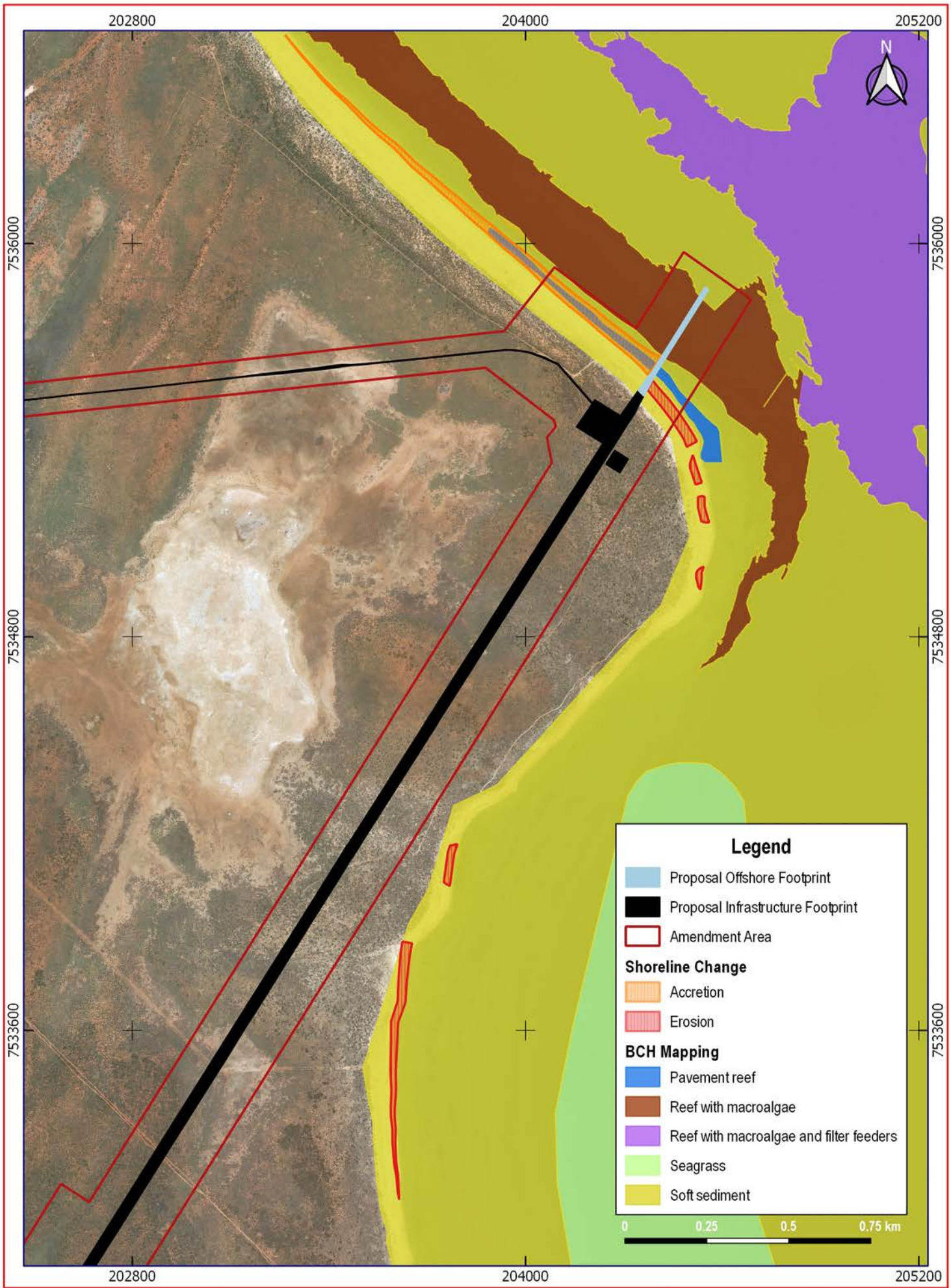
Given the limited spatial extent of elevated total suspended sediment (TSS) expected during future development within the amendment area, and the reported tolerances of a proxy species, no indirect impacts to the abundance of these species are expected.

5.1.6.5 Indirect impacts to BCH due to altered sediment and water movement and flows caused by the launchway

There is a net longitudinal migration of sediment from north to south along the beach at Heron Point (Attachment 2D). It is anticipated that sediment transport over the proposed launchway would be limited until the beach has accreted to the point that the beach berm roughly aligns with the top of the launchway rail. Once this occurs sediment would begin to be transported over the structure during high water level and wave energy conditions. Once sediment begins to be transported past the structure, the rate of beach accretion on the northern side would slow. It would be expected that the beach would continue to accrete until such time as the shoreline on the northern side is sufficiently advanced that the sediment will transport past the launchway at the same rate as it is transported into the area (Attachment 2D). The area of potential sediment accretion, in relation to mapped BCH, is shown in Figure 5-8. In the absence of any mitigation measures, sediment accretion is predicted to occur across existing beach sands and across intertidal, unvegetated, pavement reef habitat, which does not support BCH.

Sediment deposition on the northern side of the launchway would temporarily impact the quantity of sediment available to the south. Temporary impacts to the south of the launchway are likely to be limited to a narrowing or possible loss of the small perched beach formations that exist seaward of the onshore rock platforms and bluffs (Attachment 2D), which occur above sea level and do not support BCH (Figure 5-8).

It is anticipated that sand bypassing rates of 2,500 to 5,000 m^3 could be required per year on average, though this could vary depending on prevailing weather conditions. In the event that any erosion, attributable to the construction of the launchway, causes recession of the vegetation line by > 5 m then sand bypassing will be initiated.



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Grid: GDA 94 / MGA Zone 50

Figure 5-8: Predicted Indirect Losses of BCH due to Sediment Accretion Adjacent to Launchway

Shire of Exmouth

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5.1.6.6 Potential Cumulative Impacts

Approach

EPA 2016e advises that the approach to determine cumulative losses within a defined LAU includes determining the spatial extent of BCH:

- Prior to all human-induced disturbance.
- Existing at the time of the proposal.
- Remaining after implementation of the proposal.

Table 5-4 presents the predicted pre-European habitation coverage of BCH within the Heron Point LAU. The Exmouth Gulf Prawn Managed Fishery has impacted on some shallow water areas (less than 12 m in depth) containing sponge habitats, but the trawling has focused in the deeper central and north western sectors of Exmouth Gulf since the 1980's (Kangas *et al*. 2015). It has been assumed that the current habitat distributions within the Heron Point LAU reflect the historic habitat distributions, based on consistent water depths and substrate types.

Table 5-4 also presents the predicted direct and indirect losses of BCH as a result of the development of infrastructure within the amendment area, and presents the cumulative loss total for each BCH type within the Heron Point LAU. Figure 5-9 presents the ZoHI associated with the launchway footprint and the ZoMI associated with the area expected to experience changes in water quality during launchway construction.

Overall the potential cumulative impacts to BCH are minor and the EPA Objective will be met.

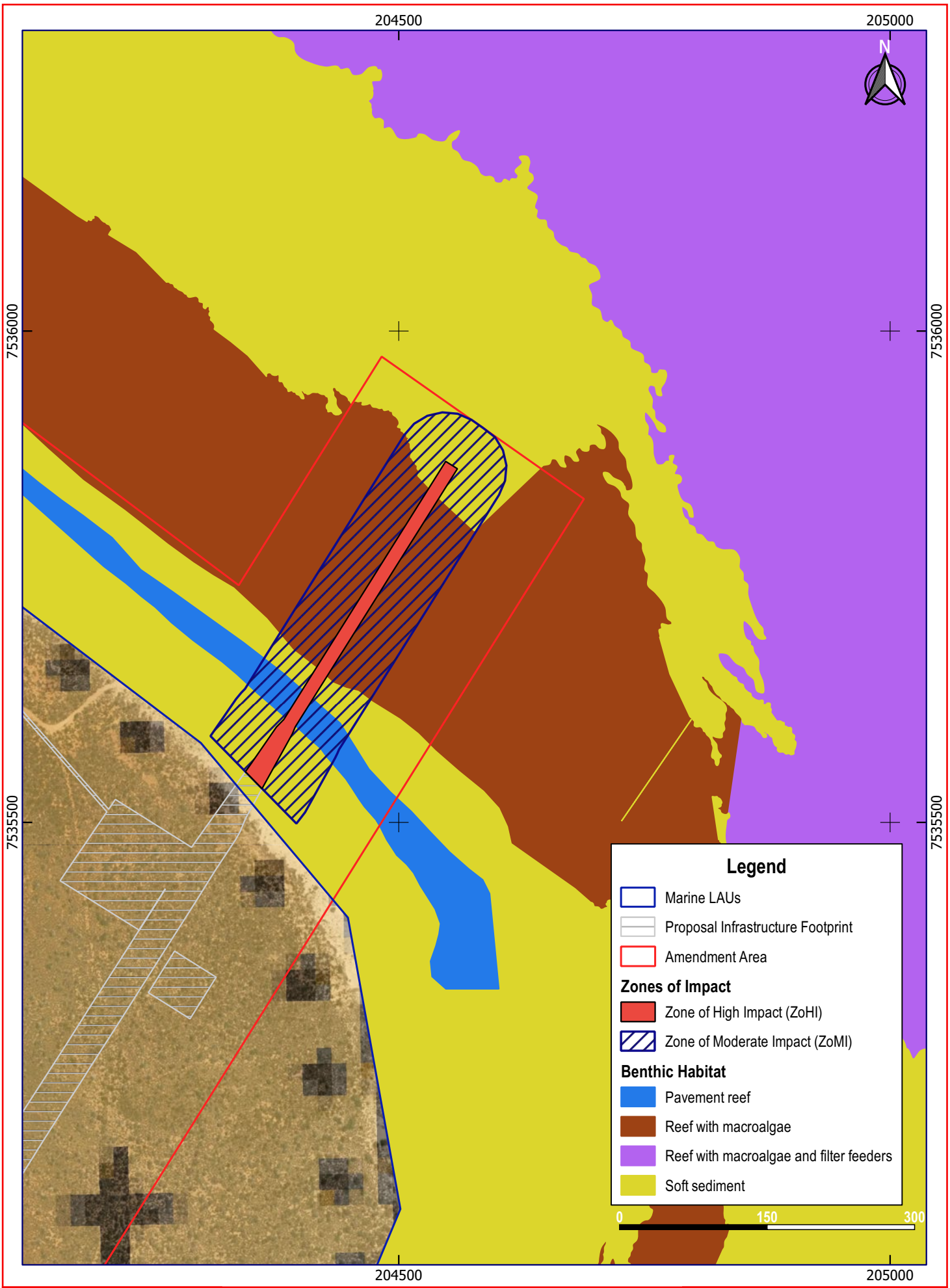
Calculations

Table 5-4 presents the estimated pre-European habitation coverage of BCH, the historic loss of BCH, the predicted direct and indirect loss of BCH as a result of the Proposal, and the cumulative loss total for each BCH type within the Heron Point LAU.

BCH Type	Pre-European Habitation Coverage (ha)	Historic Losses (ha)	Direct Proposal Impacts (ZoHI) (ha)[2]	Direct Proposal Impacts (ZoHI) (%)	Cumulative Impacts (%)	Indirect Proposal Impacts (ZoMI) (ha)[3]	Indirect Proposal Impacts (ZoMI) (%)
Heron Point LAU							
Soft sediment	6,930.7	0.0	0.2	< 0.1	< 0.1	2.0	< 0.1
Reef with macroalgae	347.8	0.0	0.3	0.1	0.1	2.5	0.7
Pavement reef	3.1	0.0	0.1	3.2	3.2	0.4	12.9
Reef with macroalgae & filter feeders	203.4	0.0	0.0	0.0	0.0	0.0	0.0
Soft sediment with filter feeders	6.8	0.0	0.0	0.0	0.0	0.0	0.0
Soft Sediment with turf algae	6.3	0.0	0.0	0.0	0.0	0.0	0.0
Seagrass	109.7	0.0	0.0	0.0	0.0	0.0	0.0
Mangrove	261.3	0.0	0.0	0.0	0.0	0.0	0.0

Table 5-4: Cumulative Impacts to BCH in the Heron Point LAU

[2] Launchway footprint.
[3] 50 m buffer surrounding launchway footprint to account for indirect impacts during construction



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Original Size: A4
Grid: GDA94 / MGA zone 50

Figure 5-9: Zones of High and Moderate Impact

Shire of Exmouth

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5.1.7 Mitigation, Monitoring, and Predicted Outcome

The proposed mitigation measures to address potential impacts to BCH as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective, are provided in Table 5-5.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Ministerial approval for the proposed development would include conditions limiting the extent of direct and indirect impacts to BCH. The Marine Construction Monitoring and Management Plan (MCMMP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include protocols and procedures for the monitoring of key environmental quality indicators and management of environmental quality to ensure that the construction of coastal infrastructure achieves the appropriate level(s) of environmental protection.	Zoning The amendment area covers the area proposed for development (the Development Envelope). Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and could only be developed/used in a manner consistent with the purpose of the reserve. Land Use Permissibility The 'Special Use No. 10' zoning will facilitate the following land uses – marine support facility, pipeline fabrication facility, and telecommunications infrastructure. The Proposal currently under assessment by the EPA (Assessment number 2208) is for a pipeline fabrication facility. Subject to gazettal of Amendment 1, this land use would be a 'P' permitted use. A permitted use could proceed if it complies with all relevant development standards and requirements of the LPS 4, and any relevant environmental conditions. Development Control A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. Environmental Conditions in LPS 4 There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7	Related to Amendment The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. Related to the Proposal Habitats within the amendment area are well represented elsewhere and the predicted direct losses represent a small proportion of the habitat present within the Heron Point LAU. Modelling has demonstrated that elevated turbidity during infrastructure construction is expected to be limited to the immediate surrounds (<50 m) of the work site.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	The adjacent habitats, and fauna using those habitats, are expected to be tolerant of short-term pulses in turbidity and suspended sediment. Significant impacts on the local wave or current conditions at Heron Point are not expected. The biological diversity and ecological integrity of BCH will be maintained.

Table 5-5: Proposed Mitigation Measures, Planning Mechanisms and Predicted Outcome for BCH

5.1.8 Assessment of Residual Impacts to Biological Diversity and Ecological Integrity

In the context of this objective 'Ecological integrity' is the composition, structure, function, and processes of ecosystems, and the natural variation of these elements. The objective for this factor recognises that marine benthic communities are important components of almost all marine ecosystems, and are fundamental to the maintenance of ecological integrity and biological diversity of the marine environment as a whole.

As defined by the EPA, '*Ecosystem integrity is considered in terms of structure (e.g. the biodiversity, biomass and abundance of biota) and function (e.g. food chains and nutrient cycles)*' (EPA 2000). Habitat structure varies from the two-dimensional habitats of unvegetated soft sediment areas to the complex three-dimensional habitat available on reefs, with the latter offering more ecological 'niches' for colonisation by macroalgae and fauna. Habitat function includes the following:

- Primary production: a measure of the growth rates and therefore potential contribution to food webs of the main groups of aquatic plants on the seabed (benthic primary production).
- Secondary production: a measure of the growth rates of invertebrates.
- Water filtering capacity: a measure of the rate at which particulate organic matter (phytoplankton, zooplankton, detritus) in the water column is removed by filter-feeding organisms (e.g. bivalves, sponges, soft corals).
- Biogeochemical cycling: an estimate of the rate at which biologically significant materials (in this case nitrogen) are converted from inorganic forms into organic forms (nitrogen cycling by plants), or cycled within the sediments (e.g. as represented by the degree of sediment bioturbation by invertebrates, as this affects sediment oxygen levels that in turn affect nitrogen cycling within sediments).

For the assessment of the potential impacts to biological diversity and ecological integrity, the maximum cumulative impact to each habitat type has been considered. Where an impact to less than 1% of a particular BCH type is predicted, it is considered that the risk of a significant impact to the biological diversity or ecological integrity within the LAU is unlikely. This is based on the previous guidance from the EPA that, for areas defined as 'High Protection Areas', which included areas recommended for inclusion in WA's marine reserve system (i.e. 'Wilson Report' areas, CALM 1994), a cumulative loss threshold of 1% be applied. This guidance suggests that losses of less than 1% are considered unlikely to significantly affect the ecological integrity of the wider ecosystem.

Where a loss of more than 1% of a particular BCH type is predicted, further analysis of the potential impacts to biological diversity and ecological integrity has been undertaken. An impact of > 1% is predicted for 'Pavement reef within the Heron Point LAU (Table 5-4).

The Pavement reef habitat was described as '*Unvegetated pavement reef within the upper littoral zone*' (Attachment 2A). Given the lack of macroalgae or fauna, likely due to the position of this habitat in the upper littoral zone and periodic smothering by beach sediment, the loss of this habitat will not result in an impact to biological diversity and ecological integrity.

Overall the potential cumulative impacts to BCH are low and no impact to biological diversity and ecological integrity is predicted. The EPA objective '*to protect benthic communities and habitats so that biological diversity and ecological integrity are maintained*' will be met.

5.2 KEY ENVIRONMENTAL FACTOR 2 – COASTAL PROCESSES

5.2.1 EPA Objective

To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.

5.2.2 Policy and Guidance

A summary of the policy and guidance relevant to coastal processes, and how these have been considered, is presented in Table 5-6.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors.
Environmental Factor Guideline – Coastal Processes (EPA 2016f)	This guidance was consulted in the consideration of potential impacts to geophysical processes and how these may impact natural coastal dynamics causing an impact to coastal ecosystems and associated values such as landforms, recreation and tourism. Consideration of this factor in the context of climate change was also completed.
State Planning Policy No. 2.6 – State Coastal Planning Policy (WA Planning Commission 2006)	This policy was consulted in the assessment of potential impacts to coastal processes. It is noted that the proposed facility is an industrial facility that is demonstrably dependent on a foreshore location and is therefore a variation to the general requirements of State Planning Policy 2.6 (WAPC 2013) under Section 7 of Schedule One. Coastal erosion and inundation hazards were considered in accordance with SPP 2.6, including the definition of 'worst case' cyclone conditions, the modelling of cross-shore erosion, the tracking of historic shoreline trends and the choice of a sea level rise scenario to inform the development of coastal erosion hazard allowances (refer Attachment 2D).

Table 5-6: Policy and Guidance Relevant to Coastal Processes

5.2.3 Receiving Environment

A number of marine studies have been undertaken within the region, as outlined in Table 5-7.

Additional site-specific studies, as listed in Table 5-7, were undertaken by various technical specialists, and are included in full within Attachment 2. They are also referred to, as appropriate, in the assessment of potential impacts and proposed management measures.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
2012	Eliot *et al*. (Damara WA Pty Ltd) and Geological Survey of Western Australia	The Coast of the Shires of Shark Bay to Exmouth, Gascoyne, Western Australia: Geology, Geomorphology & Vulnerability
Site-specific Studies		
2017	MP Rogers	Subsea 7 Bundle Facility Shoreline Movement Assessment
2017	360 Environmental	Learmonth Habitat Surveys
2017	GHD	WA Bundle Fabrication Facility – Site Designs. Design Report (Drainage & Coastal Engineering)
2018	MP Rogers	Subsea 7 Bundle Facility Coastal Processes Assessment

Table 5-7: Overview of Local and Regional Coastal Processes Studies

Limited regional studies have been conducted within Exmouth Gulf. Eliot *et al*. (2012) described the Exmouth Gulf region's susceptibility to change and landform instability as low. This was concluded from the following regional attributes including:

- Partial sheltering from swell.
- Presence of subtidal terraces and rocky features.
- Sheltered beach faces.
- Perching of beaches on inshore rock and moderately stable foredunes.

Several site-specific studies, conducted by MP Rogers, 360 Environmental, and GHD, have been carried out to provide further information for the proposed amendment area.

A shoreline movement assessment was undertaken by MP Rogers (2017) (Attachment 2C) evaluating the sediment transport regimes and erosion patterns adjacent to the Learmonth Jetty over the past 60-70 years. This jetty provides a useful case study for what could be expected following the development of coastal infrastructure within the amendment area, given the similarities in exposure, aspect, and nearshore bathymetry.

The shoreline movement assessment for the Learmonth Jetty site shows a degree of change in the adjacent shoreline between 1949 and 2013. The shoreline adjacent to the northern side of the jetty abutment has averaged 70-100 m of accretion, measured as a seaward movement in shoreline position, over a 800 m length of shoreline, while the average accretion on the southern side was in the order of 20 m over 700 m. The assessment concluded that although some impediment to longshore sediment transport does occur, there has been no net erosion over the long-term (Attachment 2C). However, short-term erosion of the southern shoreline occurred for a period of years after construction of the jetty with erosion peaking in 1968. The erosion extent during this time may have peaked at 40 m in certain areas.

The main findings from the shoreline movement assessment were:

- A varying degree of fluctuation in the shoreline position, with an overall net accretion trend.
- A long-term accretion trend between 1949 – 2001, with an average net accretion of 30 m.
- A predominately medium grain sand shoreline, with median grain sizes ranging from 0.15 to 0.5 mm (diameter). Due to the sandy nature of these materials, longshore transport processes would be expected along these shorelines, however small sediment transport quantities are predicted as a result of the calm nature of the site.

Of note, the total net accretion average of 30 m may be influenced by the ephemeral vegetation during a calm period when the 2013 aerial imagery was taken. Discounting the 2013 shoreline position, the average net accretion from 1949-2001 was approximately 20 m (Attachment 2C).

A subsequent study was completed to improve the understanding of existing coastal dynamics so that potential impacts of coastal development could be assessed with greater certainty, and to inform the development of appropriate monitoring and management measures for the Proposal (M P Rogers 2019; Attachment 2D). Shoreline movement plans show that the shoreline north of the launchway site has experienced accretion over the period between 1949 and 2018, although this overall trend has been interspersed with periods of apparent erosion (Figure 5-10). The most significant accretion appears to have occurred between 1976 and the early 2000s. Thereafter the shoreline has appeared to erode slightly. South of the launchway site the shoreline has experienced far less movement, although available aerial imagery in these areas generally only extends back to 2000. The limited movement of the shoreline along the southern part of Heron Point may be attributable to the extent of visible rock in this area (Attachment 2D). For the shoreline at Heron Point there is potential for both northerly and southerly sediment transport to occur due to the difference in wave exposure angle that is possible. For the shoreline along the southern part of Heron Point it is expected that sediment could only be transported in a southerly direction, since there is insufficient fetch length from the south west to generate any significant transport of sediment in a northerly direction.

Seasonal, inter-annual and episodic changes in the shoreline position have not been specifically studied. While such shorter-term variations may occur, particularly following the passage of a cyclone, the longer-term record demonstrates that any such changes are relatively short lived, with the shoreline position returning to its ambient state (Attachment 2D).

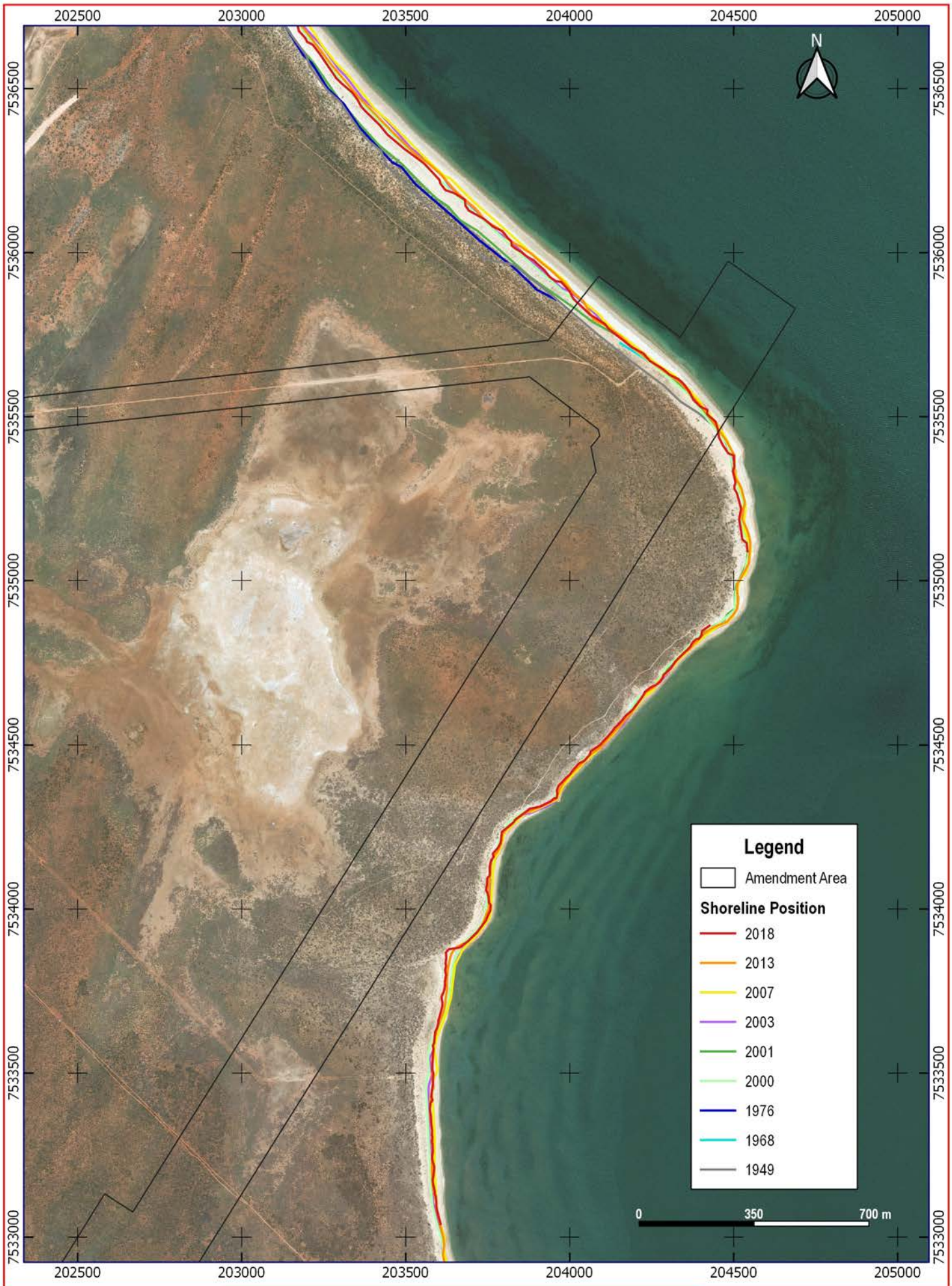

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Figure 5-10: Long term Changes in Shoreline Position Adjacent to Heron Point (1949 to 2013)

Shire of Exmouth

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5.2.4 Potential Impacts

The future development of coastal infrastructure within the amendment area has the potential to directly and indirectly impact coastal processes at Heron Point. Table 5-8 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Construction	Construction of the launchway may trap sediment and cause loss of nearshore BCH.
Operations	Alteration of wave and current conditions, interrupting existing longshore and cross-shore sediment dynamics through future development of launchway.
	Disruption of longshore sediment transport may alter downdrift sediment supply, causing dune and beach erosion adjacent to the launchway.
	Altered wave overwash and drainage during extreme flooding events, with possible implications for dune stability.

Table 5-8: Potential impacts to Coastal Processes

5.2.5 Potential Cumulative Impacts

Several third party projects or proposals have resulted in, or have the potential to result in, impacts to coastal processes within Exmouth Gulf. However, such impacts would be restricted to the immediate vicinity of the coastal infrastructure, and no third party project or proposal is situated in proximity to the amendment area. Cumulative impacts to coastal processes as a result of the Proposal, and a third party project or proposal, are considered unlikely.

5.2.6 Assessment of Impacts

The sub-sections below provide an assessment of potential direct and indirect impacts to coastal processes resulting from the future development of infrastructure within the amendment area.

5.2.6.1 Construction of the launchway may trap sediment and cause loss of nearshore BCH

Refer Section 5.1.6.5.

5.2.6.2 Alteration of wave and current conditions, interrupting existing longshore and cross-shore sediment dynamics through future development of launchway

The studies associated with the future development of the launchway predicted no significant impacts to the local wave or current conditions (Attachment 2D). Thus no significant indirect impacts to longshore and cross-shore sediment dynamics are expected.

5.2.6.3 Disruption of longshore sediment transport may alter downdrift sediment supply, causing dune and beach erosion adjacent to the launchway

Investigations associated with the future development of the launchway determined that the sediment transport along this section of the coastline is predominately from north to south. There will be periods where this trend may reverse, most likely associated with the passage of tropical cyclones; however, over the longer-term an accretion on the northern side of the launchway would be expected (Attachment 2D). It is anticipated that sediment transport over the launchway would be limited until such time as the beach has accreted to the point that the beach berm roughly aligns with the top of the rail. Once this occurs sediment

would begin to be transported over the structure during high water level and wave conditions. Once sediment begins to be transported past the structure, the rate of beach accretion on the northern side would slow. It would be expected that the beach would continue to accrete until such time as the shoreline on the northern side is sufficiently advanced that the sediment will transport past the launchway at the same rate as it is transported into the area (Attachment 2D). The area of potential 'worst case' sediment accretion is shown in Figure 5-11.

Sediment deposition on the northern side of the launchway would temporarily impact the quantity of sediment available to the south. However, the response of the southern shoreline will be limited by the presence of rock on Heron Point and along the shoreline further south. Due to the presence of this rock, limited changes to the shoreline are expected to the south of the launchway (Attachment 2D). Any changes that do occur are likely to be limited to a narrowing or possible loss of the small perched beach formations that exist seaward of the onshore rock platforms and bluffs (Attachment 2D). The area of potential 'worst case' sediment erosion is shown in Figure 5-11.

The assessment of alternative 'best' and 'most likely' cases is presented in Table 6.1 of Attachment 2D. It is anticipated that sand bypassing rates of 2,500 to 5,000 m^3 could be required per year on average, though this could vary depending on prevailing weather conditions. In the event that any erosion, attributable to the construction of the launchway, causes recession of the vegetation line by > 5 m then sand bypassing will be initiated.

5.2.6.4 Altered wave overwash and drainage during extreme flooding events, with possible implications for dune stability

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 m Australian Height Datum (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 to the land side of the dune.

Wapet Creek and the connection of this system to the salt flats inland from the site already provide an avenue for ingress of seawater during extreme events. It is expected that this area would be at least partially inundated prior to any breach of the launchway cut. Nevertheless, 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 (Attachment 2D). Such an event might be associated with the nearby passage of a cyclone.

Following any event that causes significant re-profiling of the dune system during the operation of the Proposal (when the cut is in place), the dune structure would be reinstated, and the cut embankments stabilised. This reinstatement will be stabilised to an appropriate standard to prevent wind generated sediment transport and would match the shape and structure of the adjacent, non-impacted, dunes.

No long-term impacts to dune stability are expected as a result of the development of the Proposal. At the end of the service life of the facility, the dune will be reinstated and monitored for stability.

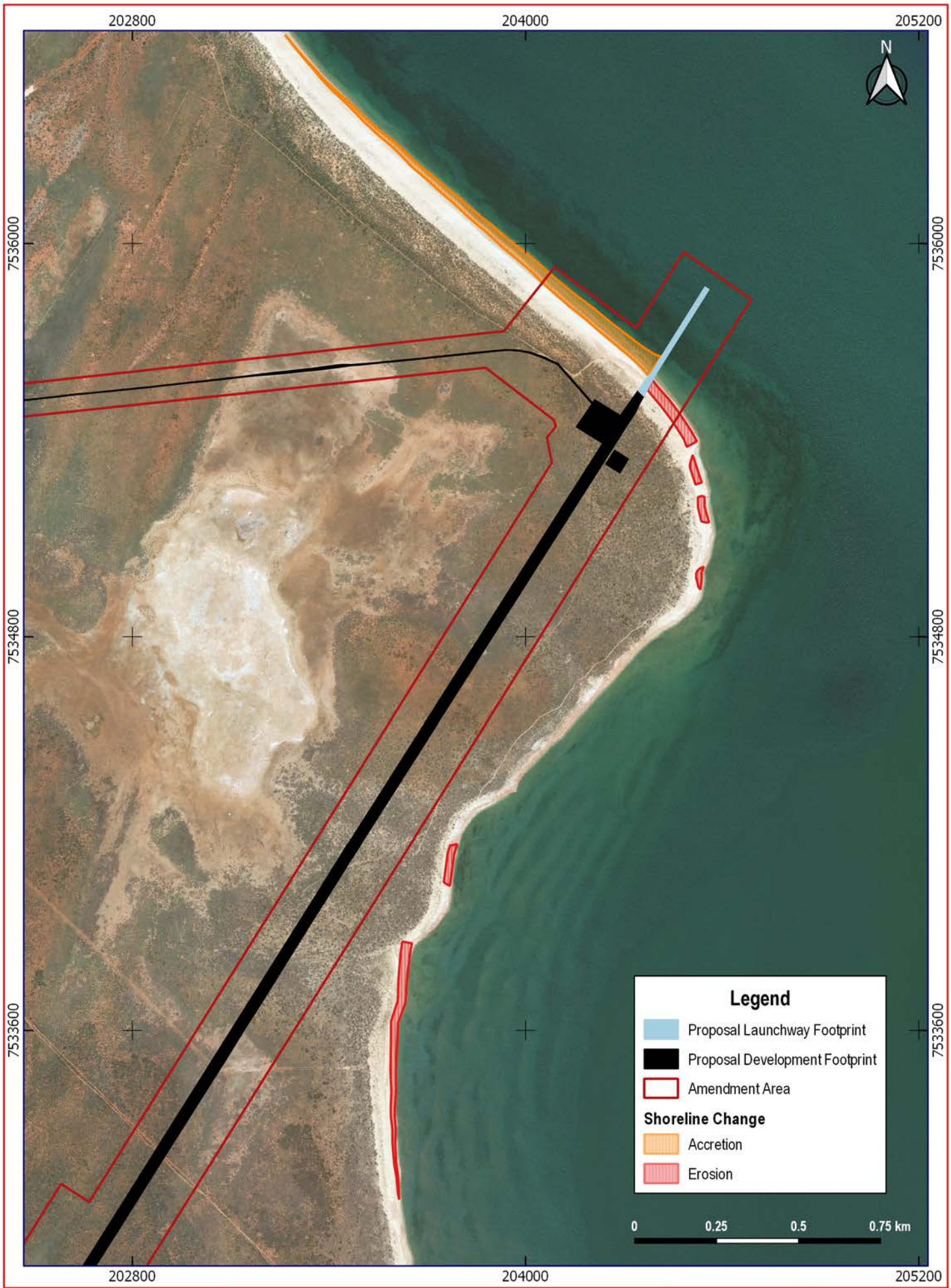

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Figure 5-11: Potential Changes in Sediment Transport Adjacent to the Bundle Launchway (M P Rogers 2019)

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5.2.7 Mitigation, Management, and Predicted Outcome

The proposed mitigation measures to address potential impacts to coastal processes as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-9.

Overall the changes to coastal processes will be localised and minimal and the EPA objective '*to maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected*' will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Ministerial approval for the proposed development would include conditions formalising the monitoring and management of impacts to sediment movement adjacent to coastal infrastructure. The OEMP will include protocols and procedures for the monitoring and management of impacts to sediment movement adjacent to coastal infrastructure, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208).	Zoning The amendment area covers the area proposed for development (the Development Envelope). Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and can only be developed/used in a manner consistent with the purpose of the reserve. Development Control A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015 Consistent with clause 67, model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(c) any approved State planning policy". "(q) the suitability of the land for the development taking into account the possible risk of flooding, tidal inundation, subsidence, landslip, bush fire, soil erosion, land degradation or any other risk". Development would therefore have due regard to State Planning Policy 2.6 State Coastal Planning Policy (SPP 2.6), which enables the local government to require development applications to address the provisions of the policy and related guidelines.	Related to Amendment The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. Related to the Proposal The development of a launchway is not expected to have any significant impact on the local wave or current conditions. Sand accumulation along the northern side of the launchway, and erosion to the south, could occur. Monitoring and the implementation of sand bypassing will ensure that the environmental values of the coast are protected. The dune structure will be reinstated following any significant re profiling of the dune system.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	State Planning Policy 2.6 State Coastal Planning Policy A coastal hazard assessment has been completed for the proposed development (Attachment 2D) to identify any risks associated with the coastal erosion or inundation hazards. It is noted that the proposed development is an industrial facility that is demonstrably dependent on a foreshore location and is therefore a variation to the general requirements of State Planning Policy 2.6 under Section 7 of Schedule One. Environmental Conditions in LPS 4 There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	The geophysical processes that shape coastal morphology will be maintained so that the environmental values of the coast are protected.

Table 5-9: Proposed Mitigation Measures, Planning Mechanisms and Predicted Outcome for Coastal Processes

5.3 KEY ENVIRONMENTAL FACTOR 3 – MARINE ENVIRONMENTAL QUALITY

5.3.1 EPA Objective

To maintain the quality of water, sediment and biota so that environmental values are protected.

5.3.2 Policy and Guidance

A summary of the policy and guidance relevant to marine environmental quality, and how these have been considered, is presented in Table 5-10.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c, 2019)	Referred to in the identification and assessment of Preliminary Key Environmental Factors
Environmental Factor Guideline – Marine Environmental Quality (EPA 2016g)	Referred to in the assessment of potential impacts to marine water quality as a result of development associated with the amendment
Technical Guidance – Protecting the quality of Western Australia's marine environment (EPA 2016h)	Referred to in the identification of the relevant environmental values and environmental quality objectives for the waters of Exmouth Gulf and in the assessment of potential impacts to marine environmental quality
Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives (DoE 2006)	Referred to in the identification of the relevant environmental values and environmental quality objectives for the waters of Exmouth Gulf

Table 5-10: Policy and Guidance Relevant to Marine Environmental Quality

The 'Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives' (DoE 2006) recommends the Levels of Ecological Protection (LEPs), Environmental Values (EVs) and Environmental Quality Objectives (EQOs) for Pilbara waters, including Exmouth Gulf (Table 5-11).

Environmental Values	Environmental Quality Objectives (EQOs)
Ecosystem Health (ecological value)	EQO1: Maintain ecosystem integrity at a: • Maximum level of ecological protection. • High level of ecological protection. • Moderate level of ecological protection. • Low level of ecological protection. This means maintaining the structure (e.g. the variety and quantity of life forms) and functions (e.g. the food chains and nutrient cycles) of marine ecosystems.
Fishing and Aquaculture (social use value)	EQO2: Seafood (caught or grown) is of a quality safe for eating EQO3: Water quality is suitable for aquaculture purposes.
Recreation and Aesthetics (social use value)	EQO4: Water quality is safe for primary contact recreation (e.g. swimming and diving) EQO5: Water quality is safe for secondary contact recreation (e.g. fishing and boating) EQO6: Aesthetic values of the marine environment are maintained
Cultural and Spiritual (social use value)	EQO7: Cultural and spiritual values of the marine environment are protected.

Table 5-11: Environmental Values and Environmental Quality Objectives for Exmouth Gulf

5.3.3 Receiving Environment

A number of marine studies have previously been undertaken within the region, as outlined in Table 5-12.

Additional site-specific studies, as listed in Table 5-12, were undertaken by various technical specialists, and are included in full within Attachment 2. They are also referred to, as appropriate, in the assessment of potential impacts and proposed management measures.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
2000	Department of Fisheries (Pearce *et al*.)	Review of productivity levels of Western Australian coastal and estuarine waters for mariculture planning purposes.
2001	Brunskill *et al*.	Geochemistry and particle size of surface sediments of Exmouth Gulf, North West Shelf, Australia.
2006	Department of Environment and Conservation	Background water quality of the marine sediments of the Pilbara coast.
2006	Oceanica	Yannarie Salt Project: Marine and coastal environment of the eastern Exmouth Gulf.
2006	Wenziker *et al*.	Background quality for coastal marine waters of the North West Shelf, Western Australia.

Survey Date	Researcher/Consultant	Study Description/Title
2014	IMOS	West Australian Integrated Marine Observing System (WAIMOS) Node Science and Implementation Plan 2015-25.
2016	Vanderklift *et al*.	Western Australian Marine Science Institution (WAMSI) Dredging Science Node Project 5.3.
Site-specific Studies		
2017	360 Environmental	Baseline Water and Sediment Quality Assessment.
2018	GHD	Exmouth Gulf Current Monitoring Field Report.

Table 5-12: Overview of Local and Regional Marine Environmental Quality Studies

The Exmouth Gulf region has had a limited number of studies carried out characterising the water and sediment quality. Therefore, along with the limited assessments undertaken within the region, general water and sediment quality documents have been reviewed and applied to the context of the Exmouth Gulf region.

Previous regional studies have characterised Exmouth Gulf as having a naturally turbid state due to wind, waves and tidal currents causing resuspension of the fine sediments found throughout the gulf. Primary productivity within the region from phytoplankton biomass is relatively low and is limited by the availability of nitrogen within the system. Water temperatures range from 18° to 30°C (tropical) depending on season, with salinity ranges similar to oceanic measurements (34 to 36 PSU).

A sediment quality survey to determine background concentrations of a range of selected heavy metals and organic chemicals in the Pilbara marine waters from Exmouth Gulf to Port Hedland found the sediments from five sites within Exmouth Gulf to exhibit relatively low levels of contaminants (DEC 2006), as follows:

- Arsenic (7-19 mg/kg).
- Cobalt (0.5-27 mg/kg).
- Copper (0.5-2.1 mg/kg).
- Nickel (1.0-4.8 mg/kg).
- Lead (<1-3 mg/kg).
- Zinc (1.2-9.8 mg/kg).

The differences between sites were predominantly driven by the sediment particle size, with contaminants known to bind to fine (<63 µm) particles. The percentage of fines recorded within the samples varied from 0.5 to 11.3% (DEC 2006).

360 Environmental (2017b) conducted a site-specific water and sediment quality assessment. The main findings of the assessment were:

- The physical parameters (temperature, salinity, and dissolved oxygen) were typical of the north western Australian coastline. No significant variation was observed vertically throughout the water column, except for measurements of higher turbidity nearer to the seabed.
- Turbidity was recorded to increase with distance from the shoreline (ranging from 1.1 to 2.4 NTU). This was attributed to the change in sediment composition with offshore locations characterised by a greater proportion of fine sediments (mud and

sand). Even with this increased turbidity offshore, the levels of light attenuation fell well within regional measurements for the Exmouth Gulf.

- Consistent with results of previous regional studies, the total and dissolved nutrients within the gulf are limited and not readily available for benthic primary producers (BPP), but this may be due to them being utilised prior to measurements being taken. The chlorophyll and overall nutrient content measured was consistent within the regional and local context of the gulf area.
- Sediment within Exmouth Gulf was found to increase in fine sand proportion with increasing distance offshore.
- There was no indication of contamination within the study area, and therefore it was concluded that the risk of contaminant release from sediment disturbance was low.
- Short-term disturbances were concluded likely to have minimal impact on the local and regional environmental values (ecological and social).

A recent ocean current monitoring programme was completed by GHD (2018a) within Exmouth Gulf. The average turbidity off Heron Point was 4.3 NTU (or 3.6 if the storm of 5 June 2018 was excluded from the dataset) (Figure 5-12). Generally there was a slight trend of increasing turbidity through the spring tidal cycle, although numerous short-term variations in turbidity were superimposed over this trend. There was no clear trend between wave height and turbidity.

Additional turbidity measurements were made in November/December 2018, at a site 2 km offshore (site KP2) and at a site 4.5 km offshore (site KP4.5). Numerous short-term turbidity peaks were recorded at up to approximately 30 NTU (Figure 5-13). Turbidities of above 10 NTU were recorded for longer durations (Figure 5-13). A comprehensive analysis of the water quality data has been completed, with observed turbidity peaks compared to available wave, wind and tidal data. No clear trend against any of these datasets was found. It is likely that the occurrences of elevated turbidity are related to a number of factors, including wind speed and direction, tidal state (both range and state during periods of strong wind) and potentially adjacent prawn trawling activity. It has been suggested anecdotally that elevated turbidity can occur a few days following the peak of a spring tide cycle, though such a trend was not clearly apparent from the available data.

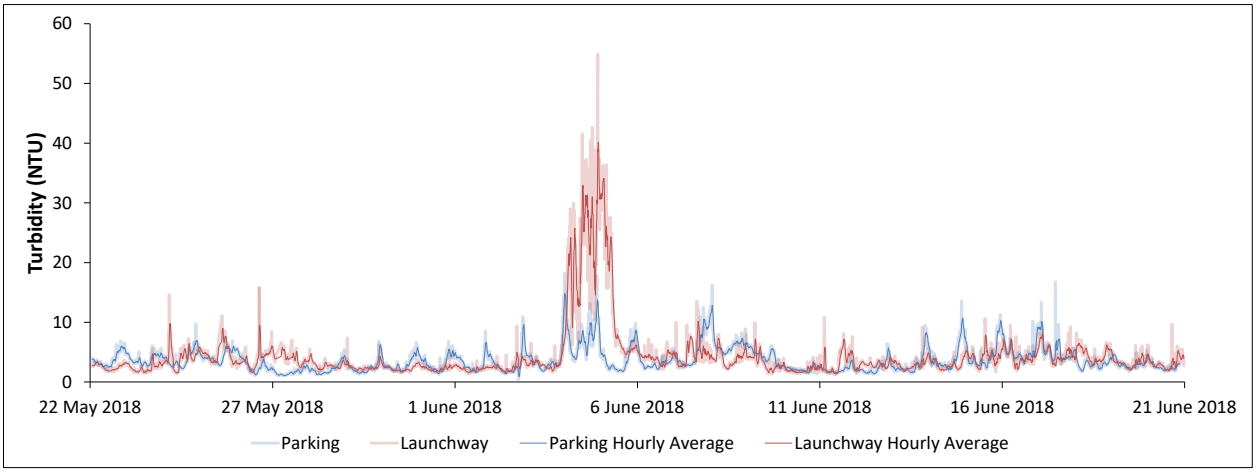


Figure 5-12: Background Turbidity within Exmouth Gulf (May/June 2018)

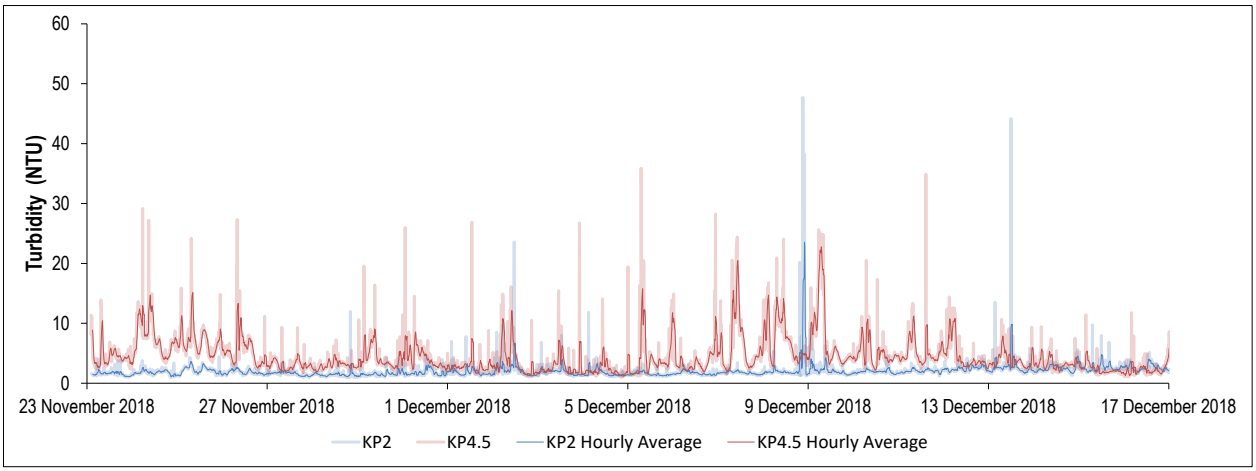


Figure 5-13: Background Turbidity within Exmouth Gulf (November/December 2018)

5.3.4 Potential Impacts

The future development of coastal infrastructure within the amendment area has the potential to impact marine environmental quality at Heron Point. Table 5-13 summarises the potential impacts during the infrastructure construction phase.

Project Phase	Potential Impact
Construction	Temporary impacts to water quality through the future development of the launchway
	Temporary turbidity through placement of material for the launchway and leaching of fines from the material

Table 5-13: Potential Impacts to Marine Environmental Quality

5.3.5 Assessment of Impacts

5.3.5.1 Temporary impacts to water quality through the future development of the launchway

During construction the following sequence of activities is expected:

- Excavate sand on land including the area through the sand dunes.
- Excavate or compact sand on the beach.
- Progressively construct the launchway from the landward extent to the seaward extent, by repeating the following steps:
    - Place rock fill.
    - Place concrete panels.
    - Place concrete mattress or rock armour.

Rock fill will be placed from the shoreline, being pushed seaward down the onshore end of the launchway. For the offshore end of the launchway, the rock fill will be placed from a barge. Sediment may be resuspended as a result of:

- Disturbance of the seabed in areas of soft sediment (i.e. when the rock fill material makes contact with the seafloor and displaces superficial material).
- Disturbance of the seabed by construction equipment, including when an approximately 300 mm layer of sediment is removed from the last 24 m length of the launchway footprint.

The proposed launchway construction is expected to take up to six months, during which periodic, local, impacts to water quality will occur.

The naturally low nutrient and contaminant status of sediments within the launchway and adjacent areas means that release of nutrients or contaminants from sediments during launchway construction, in concentrations above naturally occurring levels, is unlikely. Elevated TSS concentrations are expected in the immediate vicinity of the launchway, within the amendment area, during the construction period, with the area within 50 m of the launchway footprint nominated as a ZoMI (refer Section 5.1.6.2), due to potential impacts on benthic organisms (recoverable within a period of five years following completion of construction).

EPA guidance (EPA 2016h) states that *'in cases where 'short-term' non-compliance with an EQO or level of ecological protection over a 'small' area is predicted and appears to be unavoidable, proponents could consider proposing temporary exclusion of an EQO or lower level of ecological protection for the small area……..'* and *'When determining the acceptability of such a proposal the EPA would consider the nature and reversibility of the effects, the spatial extent of the impact, timeframes for recovery and any other relevant matters.'*

Given the short (six months) period of construction and the low concentrations of naturally occurring nutrients and other contaminants in sediments, it is considered unlikely there would be any significant adverse impact to marine environmental quality over the longer-term. No ongoing impacts to ecosystem processes, biodiversity, abundance, and biomass of marine life, water or sediment quality are expected. The environmental quality objective, to maintain ecosystem integrity, will be met.

5.3.5.2 Temporary turbidity through placement of material for the launchway and leaching of fines from the material

Rock fill will be placed from the shoreline, being pushed seaward down the onshore end of the launchway. For the offshore end of the launchway, rock fill will be placed from a barge.

Any rock 'fines' contained within the rock fill, or generated as the fill is placed and rocks come into contact with each other, could mix with the surrounding seawater and create localised turbidity. Such turbidity is likely to be minimal given that screened hard rock will be used as the rock fill material. Hard rock or concrete mattress will be used for the armour and pre-cast concrete panels will be used for the main structure of the launchway.

The risk of significantly increased turbidity during construction resulting from construction materials is considered minor.

5.3.6 Mitigation, Monitoring and Predicted Outcome

The proposed mitigation measures to address potential impacts to marine environmental quality as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-14.

The EPA objective '*to maintain the quality of water, sediment and biota so that environmental values are protected*' will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Ministerial approval for the proposed development would include conditions limiting the extent of direct and indirect impacts to marine environmental quality. The Environmental Quality Plan (EQP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), spatially defines the Environmental Values (EVs), Environmental Quality Objectives (EQOs) and Levels of Ecological Protection (LEPs) that apply to the area. The Marine Construction Monitoring and Management Plan (MCMMP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include protocols and procedures for the monitoring of key environmental quality indicators and management of environmental quality to ensure that the construction of coastal infrastructure achieves the appropriate level(s) of environmental protection.	<u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(o) the likely effect of the development on the natural environment or water resources and any means that are proposed to protect or to mitigate impacts on the natural environment or the water resource". Development would therefore have due regard to State Planning Policy 2.9 Water Resources (SPP 2.9), which enables the local government to require development applications to take account of the protection, conservation and enhancement of water resources, having regard to total water cycle management and water-sensitive design principles, and ensure that the development is consistent with current best management practices and best planning practices for the sustainable use of water resources. <u>State Planning Policy 2.9 Water Resources</u> Under Section 2.1 of SPP 2.9, 'water resources' refers to "wetlands, waterways (rivers, streams and creeks), floodplains, foreshores, estuaries, groundwater aquifers and the wider marine environment". The general policy measures of SPP 2.9 aim to protect water resources and prevent, or where appropriate mitigate against, adverse effects on water quality. As a minimum development should aim to maintain water quality and ensure water quantity is compatible with the receiving waters. SPP 2.9 can be implemented through the LPS 4 and day-to-day consideration of development proposals and applications, together with the actions	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> Elevated turbidity during coastal infrastructure construction 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. Rock fill (expected to be hard rock) will be screened and washed prior to use, resulting in minimal turbidity release. The quality of water,

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
The Marine Emergency Response Plan, required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include protocols and procedures for the prevention, management, control and reporting of marine emergencies, including the leak or spill of chemicals.	and advice of agencies. <u>Development Control</u> A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. As part of a development application, details for potable and non-potable water supply, waste water treatment, and stormwater management are to be addressed to the specification and satisfaction of the Shire of Exmouth. <u>Environmental Conditions in LPS 4</u> There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	sediment and biota will be maintained so that environmental values are protected.

Table 5-14: Proposed Mitigation Measures and Predicted Outcome for Marine Environmental Quality

5.4 KEY ENVIRONMENTAL FACTOR 4 – FLORA AND VEGETATION

5.4.1 EPA Objective

To protect flora and vegetation so that biological diversity and ecological integrity are maintained.

5.4.2 Policy and Guidance

A summary of the policy and guidance relevant to flora and vegetation, and how these have been considered, is presented in Table 5-15.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors.
Environmental Factor Guideline – Flora and Vegetation (EPA 2016j)	Referred to in the assessment of potential impacts as a result of the Proposal
Technical Guidance – Flora and vegetation surveys for environmental impact assessment (EPA 2016k)	Referred to in the survey design

Table 5-15: Policy and Guidance Relevant to Flora and Vegetation

5.4.3 Receiving Environment

The Interim Biogeographic Regionalisation of Australia (IBRA7) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (DoEE 2016). The amendment area is located in the Cape Range subregion of the Carnarvon Bioregion. The Carnarvon bioregion is composed of quaternary alluvial, aeolian, and marine sediments overlying Cretaceous strata. It is characterised by a mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrub on clay flats, and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia stuartii* or *A. bivenosa* shrubland outcrop in the north, where extensive tidal flats in sheltered embayment support Mangal (Kendrick and Mau 2002).

Land systems of the Western Australian rangelands have been mapped and described by the Department of Agriculture and Food WA (DAFWA), providing comprehensive descriptions and maps of the biophysical resources of the region, together with an evaluation of the condition of the soils and vegetation throughout. Two land systems occur within the Proposal area, the Cardabia and Littoral systems (Attachment 2K):

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

Mapping of Pre-European vegetation within Western Australia was completed on a broad scale (1:1,000,000) by Beard (1975) and later re-assessed by Shepherd *et al*. (2001) with some larger vegetation units divided into smaller units. Two broad vegetation types were identified and mapped over the amendment area:

- Cape Range 117: Grass-steppe – Hummock grassland *Triodia* spp. (87.8% of Pre-European extent in Cape Range subregion remaining).
- Coastal Dunes 662 – Hummock grassland; shrub steppe; mixed Acacia scrub and dwarf scrub with soft spinifex and *Triodia basedowii* (99.6% of Pre-European extent in Cape Range subregion remaining) (Attachment 2K).

A limited number of terrestrial flora and vegetation studies have previously been undertaken within the region, as outlined in Table 5-16.

Additional site-specific studies, as listed in Table 5-16, were undertaken by various technical specialists, and are included in full within Attachment 2. They are also referred to, as appropriate, in the discussion on the assessment of potential impacts and proposed management measures.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
1993	Keighery and Gibson	Survey of the limestone hills, ranges and calcarenite outcrops extending north from Lake MacLeod to Vlamingh Head
2010	Department of Environment and Conservation (DEC)	Priority flora survey in the Cape Range National Park
2015	360 Environmental	Level 1 Flora and Vegetation Assessment on Truscott Crescent, Exmouth.
2018	360 Environmental	Level 2 Flora and Vegetation Assessment within Shark Bay and the Minilya-Exmouth Road area
Site-specific Studies		
2017	360 Environmental	Detailed flora and vegetation field surveys (May and September) of the entire amendment area and vegetation habitat and condition mapping
2017	360 Environmental	Detailed Flora and Vegetation Survey for additional quadrat surveys, within and adjacent to the amendment area
2018	360 Environmental	Targeted Flora survey for priority flora within and adjacent to the amendment area

Table 5-16: Overview of Local and Regional Flora and Vegetation Studies

The flora of the Cape Range peninsula has not been extensively surveyed, with limited regional surveys undertaken, particularly within the Learmonth area. Surveys conducted by Keighery and Gibson (1993), DEC (2009) and 360 Environmental (2015, 2018b) have provided a regional context of the flora and vegetation in the Cape Range peninsula.

The Keighery and Gibson 1993 regional survey identified five distinctive community types throughout the Cape Range peninsula region, extending north from Lake MacLeod to Vlamingh Head, as follows:

- Low heaths dominated by *Grevillea variifolia*, *Melaleuca cardiophylla* or *Acacia tetragonophylla* over *Triodia* sp.
- Red Quaternary sands over limestone, with shrubland dominated by *Banksia ashbyii*, *Hibbertia spicata* and *Hakea stenophylla*.
- Tertiary limestones of the Gnargoo and Giralia Ranges, dominated by *Acacia startii*, *A. victoriae* or *A. tetragonophylla*.

- Tertiary limestones of the Cape Range consisting of shrublands dominated by *Acacia tetragonophylla*, *A. bivenosa*, *Grevillea variifolia* subsp. *variijolia*, *G. calcicola*, and *Melaleuca cardiophylla*. The terraces north of Yardie Creek were dominated by *Ipomoea yardiensis, Triodia wiseana* or *T. pungens* hummock grasses.
- Younger limestones of the western coastal plain and the Rough Range, which is generally dominated by *Melaleuca cardiophylla* and/or *Hibbertia spicata* low heaths over *Triodia* spp. Occasionally they are dominated by Acacia low heaths.

Three flora and vegetation surveys (two detailed and one targeted) have been undertaken within the amendment area between 2017 and 2018 (Table 5-16). The flora and vegetation surveys were undertaken with reference to *Technical Guidance – Flora and Vegetation surveys for environmental impact assessment* (EPA 2016k). The Detailed flora and vegetation survey area was approximately 540 ha and the Targeted Flora survey area was approximately 793 ha. Inside the two survey areas is the amendment area (440 ha).

The site-specific surveys identified 126 flora species, representative of 87 genera and 32 families within the survey area. The taxa recorded within the survey area included:

- Fabaceae (24 taxa).
- Chenopodiaceae (10 taxa).
- Poaceae (10 taxa).

Surveys identified *Acacia spp.* as the most frequently occurring genus.

5.4.3.1 Vegetation Communities

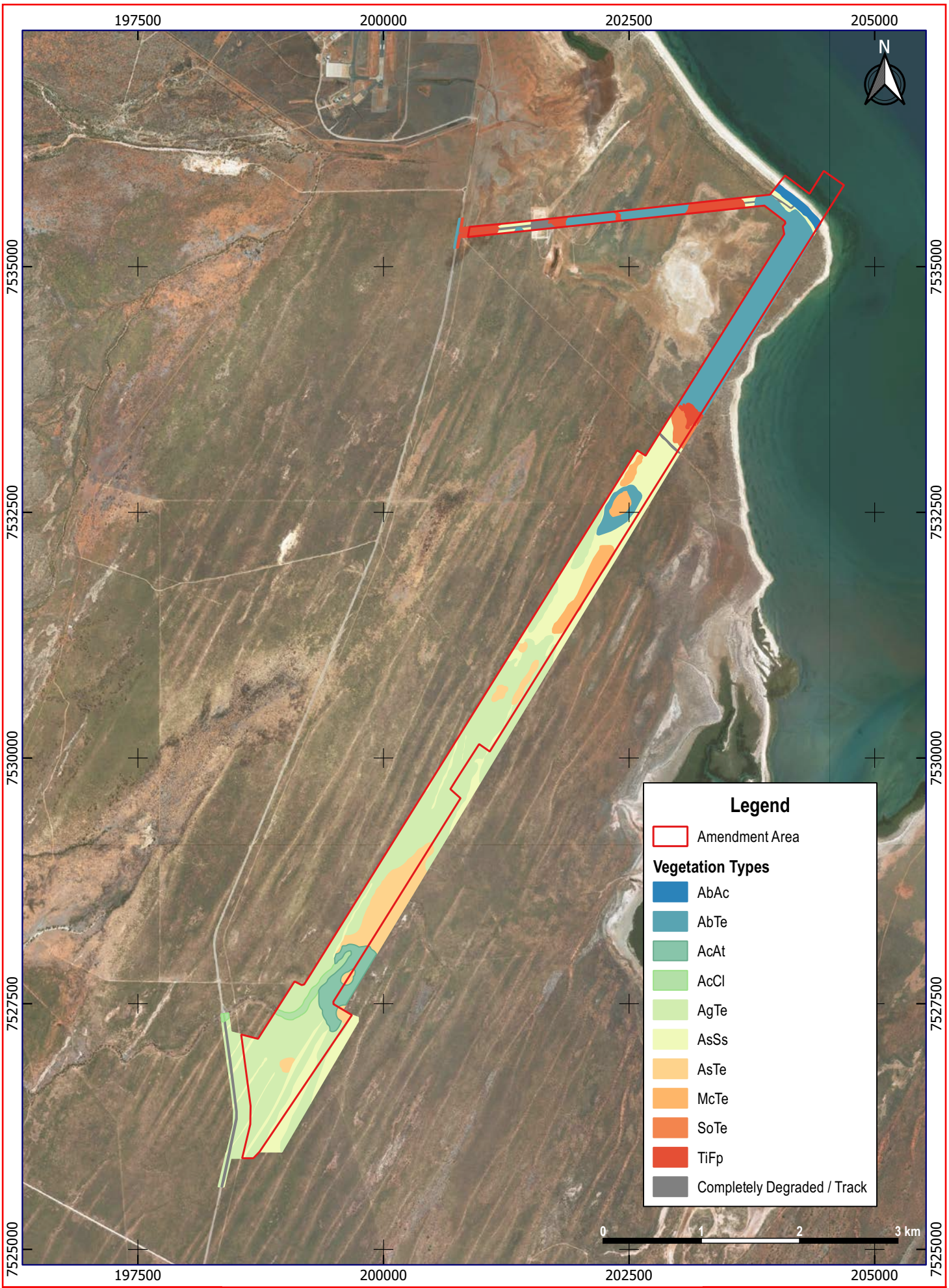
Ten vegetation communities were defined and mapped within the amendment area and surrounds (360 Environmental 2018a) as shown in Table 5-17 and Figure 5-14. In addition, 7.8 ha of disturbed area/existing tracks were mapped. Three *Acacia* shrubland vegetation communities (AbTe, AgTe, and AsSs) accounted for approximately 77% of the survey area.

Vegetation Code	Description	Total Mapped (ha)
AgTe	*Acacia gregorii* low open shrubland over *Triodia epactia* closed grassland	209.8
AsTe	*Acacia sclerosperma* subsp. *sclerosperma* shrubland over *Triodia epactia* hummock grassland	43.3
McTe	*Melaleuca cardiophylla* low shrubland over *Triodia epactia* hummock grassland	18.7
AbTe	*Acacia bivenosa* open shrubland over *Triodia epactia* hummock grassland	84.9
SoTe	*Stemodia sp. Onslow* low open shrubland over *Triodia epactia* hummock grassland	5.8
AbAc	*Acacia bivenosa* and *Acacia coriacea* open shrubland over *Spinifex longifolius* and *Triodia epactia* open grasssland	4.4
AcAt	*Acacia coriacea* and *Acacia tetragonophylla* open shrubland over *Triodia epactia* hummock grassland	21.1
AsSs	*Acacia stellaticeps* and *Scaevola sericophylla* open shrubland over *Triodia epactia* hummock grassland	122.4

Vegetation Code	Description	Total Mapped (ha)
AcCl	*Acacia coriaecea* and *Cullen* sp. shrubland over *Sida rohlenae* subsp. *rohlenae* low shrubland over *Triodia epactia*	7.3
TiFp	*Tecticornia* spp. and *Frankenia pauciflora* low shrubland on saline flat	13.8
CD	Completely Degraded/Track	7.8
Other	Beach (unvegetated, considered under fauna habitat), access tracks and borefield (cleared), offshore area within launchway envelope (considered under BCH)	0
Total Area		**539.2**

Table 5-17: Proposal Area Vegetation Communities

Statistical analysis of the 10 identified vegetation communities indicated that there was up to 90% similarity of flora species identified between all surveyed quadrats due to the mosaic nature of the landscape (360 Environmental 2018a). These groupings helped confirm field identification of vegetation types, and the similarity between quadrats within, and outside of, the amendment area.



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Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

Figure 5-14: Vegetation Communities Mapped Within the Survey Area

Shire of Exmouth

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All vegetation types mapped during the surveys are considered typical in the Carnarvon bioregion (Keighery and Gibson 1993). No vegetation associated with groundwater dependent ecosystems (GDEs) was recorded within the survey area (360 Environmental 2018a). There are no Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) within 10 km of the amendment area.

5.4.3.2 Conservation Significant Flora

No flora designated as Critically Endangered (CR) under the *Biodiversity and Conservation Act 2016* (BC Act) or EPBC Act were recorded within the survey area (360 Environmental 2018a, Attachment 2K).

A targeted survey for Priority species undertaken by the Department of Environment and Conservation (DEC 2010a) identified five Priority listed species in the Cape Range National Park; *Brachychiton obtusilobus* (Priority 4), *Grevillea calcicola* (Priority 3), *Eremophila forrestii* subsp. *capensis* (Priority 3), *Corchorus congener* (Priority 3), and *Tinospora esiangkara* (Priority 2). The majority of the Priority listed taxa identified are associated with limestone, red sands or rocky soils that are present on the west side of the Cape or on the Cape Range. As none of these specific habitats occur in the amendment area, the majority of the Priority taxa were considered unlikely to occur (360 Environmental 2018a).

One Priority species was recorded in the survey area, *Corchorus congener* (P3). *Corchorus congener* is a spreading shrub endemic to the Cape Range peninsula, with a preferred habitat of red sand or sandy loam with limestone on sand dunes and plains (WAH 2018). *C. congener* was found to be locally common both within and outside the survey area, occurring readily along tracks and road sides. Regional locations were also surveyed outside of the amendment area during the targeted survey to gather population details in a regional context (360 Environmental 2018a).

5.4.3.3 Flora of Interest

Calytrix sp. was recorded on a rocky hilltop near the northern end of the survey area (outside of the amendment area). Additional targeted searches for the species were undertaken, however none were found. It is considered unlikely that *Calytrix* sp. occurs within the amendment area (360 Environmental 2018a).

A total of 13 species records were considered to be an extension of their known range as follows:

- *Calandrinia ? polyandra.*
- *Chenopodium murale.*
- *Clerodendrum tomentosum* var. *lanceolatum.*
- *Corynotheca micrantha.*
- *Cucumis variabilis.*
- *Cyperus bulbosus.*
- *Hibiscus sturtii* var. *platychlamys.*
- *Indigofera chamaeclada* subsp. p*ubens.*
- *Indigofera trita.*
- *Lotus australis.*
- *Maireana lanosa.*

- *Pimelea ammocharis.*
- *Tephrosia uniovulata.*

All are likely to be common throughout the region and not of conservation significance (Attachment 2K). The range extensions are considered likely to be associated with the low level of survey in the Exmouth area. Specimens recorded and collected within the survey area have been vouchered at the WA Herbarium.

5.4.3.4 Vegetation condition

The vegetation condition of the survey area ranged from Very Good to Completely Degraded, with the majority (83%) of the area considered Very Good (360 Environmental 2018a).

5.4.3.5 Environmentally Sensitive Areas (ESAs)

The Cape Range National Park occurs approximately 4 km to the west of the amendment area. The amendment area intersects the Cape Range Subterranean Waterways which is designated as an ESA. This ESA is related to the underground aquifer system that has been identified in the Directory of Important Wetlands in Australia and is not related to flora and vegetation values.

5.4.3.6 Introduced Flora

Eight introduced species were recorded within the survey area, representing approximately 6% of the total taxa, and included:

- *Aeva javanica.*
- *Bidens subalternans* var. *simulans.*
- *Cenchrus ciliaris.*
- *Chenopodium murale.*
- *Solanum nigrum.*
- *Sonchus oleraceus.*
- *Sisymbrium orientale.*
- *Vachellia farnesiana.*

Cenchrus ciliaris (Buffel Grass) is a widespread weed, widely planted in pastoral regions as a pasture grass. It has become common along roadsides, creeklines, river edges and most vegetation types from Shark Bay to the Pilbara and adjacent desert.

No listed Declared Pests or Weeds of National Significance (WoNS) under the *Biodiversity and Agriculture Management Act 2007* (BAM Act) were recorded during the surveys undertaken.

5.4.4 Potential Impacts

The future development of infrastructure within the amendment area has potential to directly and indirectly impact flora and vegetation. Table 5-18 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Construction	Direct loss of flora and vegetation of up to 176 ha
	Indirect impacts to flora and vegetation from dust during construction
	Indirect impacts to flora and vegetation from the introduction and spread of weeds
	Indirect impacts to flora and vegetation from fragmentation of vegetation
Operations	Indirect impacts to flora and vegetation from changes in surface water flows and quality
	Indirect impacts to flora and vegetation from changes in groundwater flows and quality

Table 5-18: Potential Impacts to Flora and Vegetation

5.4.5 Assessment of Impacts

5.4.5.1 Direct loss of flora and vegetation of up to 176 ha

Up to 176 ha of native vegetation will be cleared within the amendment area (and within the adjacent road reserve for the Minilya-Exmouth Road) for the development of infrastructure associated with the Proposal (refer Figure 5-15 and Table 5-19).

Vegetation Code	Description	Total Mapped (ha)	Clearing Area (ha)	Impact (%)
AgTe	*Acacia gregorii* low open shrubland over *Trioida epactia* closed grassland	209.8	64.9	31
AsTe	*Acacia sclerosperma* subsp. *sclerosperma* shrubland over *Triodia epactia* hummock grassland	43.3	10.8	25
McTe	*Melaleuca cardiophylla* low shrubland over *Triodia epactia* hummock grassland	18.7	4.9	26
AbTe	*Acacia bivenosa* open shrubland over *Triodia epactia* hummock grassland	84.9	38.2	45
SoTe	*Stemodia sp. Onslow* low open shrubland over *Triodia epactia* hummock grassland	5.8	2.5	42
AbAc	*Acacia bivenosa* and *Acacia coriacea* open shrubland over *Spinifex longifolius* and *Triodia epactia* open grasssland	4.4	0.3	8
AcAt	*Acacia coriacea* and *Acacia tetragonophylla* open shrubland over *Triodia epactia* hummock grassland	21.1	3.9	18

Vegetation Code	Description	Total Mapped (ha)	Clearing Area (ha)	Impact (%)
AsSs	*Acacia stellaticeps* and *Scaevola sericophylla* open shrubland over *Triodia epactia* hummock grassland	122.4	33.7	27
AcCl	*Acacia coriaecea* and *Cullen* sp. shrubland over *Sida rohlenae* subsp. *rohlenae* low shrubland over *Triodia epactia*	7.3	1.9	26
TiFp	*Tecticornia* spp. and *Frankenia pauciflora* low shrubland on saline flat	13.8	7.6	55
CD	Completely Degraded/Track	7.8	5.0	63
Other	Beach (unvegetated, considered under fauna habitat), access tracks and borefield (cleared), offshore area within launchway envelope (considered under BCH)	0	2.3	0
Total		**539.3**	**176**	**-**

Table 5-19: Potential Vegetation Community Disturbance Within the Amendment area

The majority of clearing will occur in vegetation communities AbTe (loss of 38.2 ha or 45% of the total mapped area), AgTe (loss of 64.9 ha or 31% of the total mapped area), AsSs (loss of 33.7 ha or 27% of the total mapped area), and AsTe (loss of 10.8 ha or 25% of the total mapped area) (Table 5-19).

It is noted that the survey area was only marginally larger than the amendment area. A large proportion of the pre-European extents of the broad vegetation types within the region (Shepherd *et al*. 2001) remain:

- Cape Range 117 (Grass steppe – Hummock grassland *Triodia* spp.) remains at 87.8%.
- Coastal Dunes 662 (Hummock grassland; shrub steppe; mixed *Acacia* scrub and dwarf scrub with soft spinifex and *Triodia basedowii)* remains at 99.6%.

The Development footprint utilises cleared and degraded areas where possible.

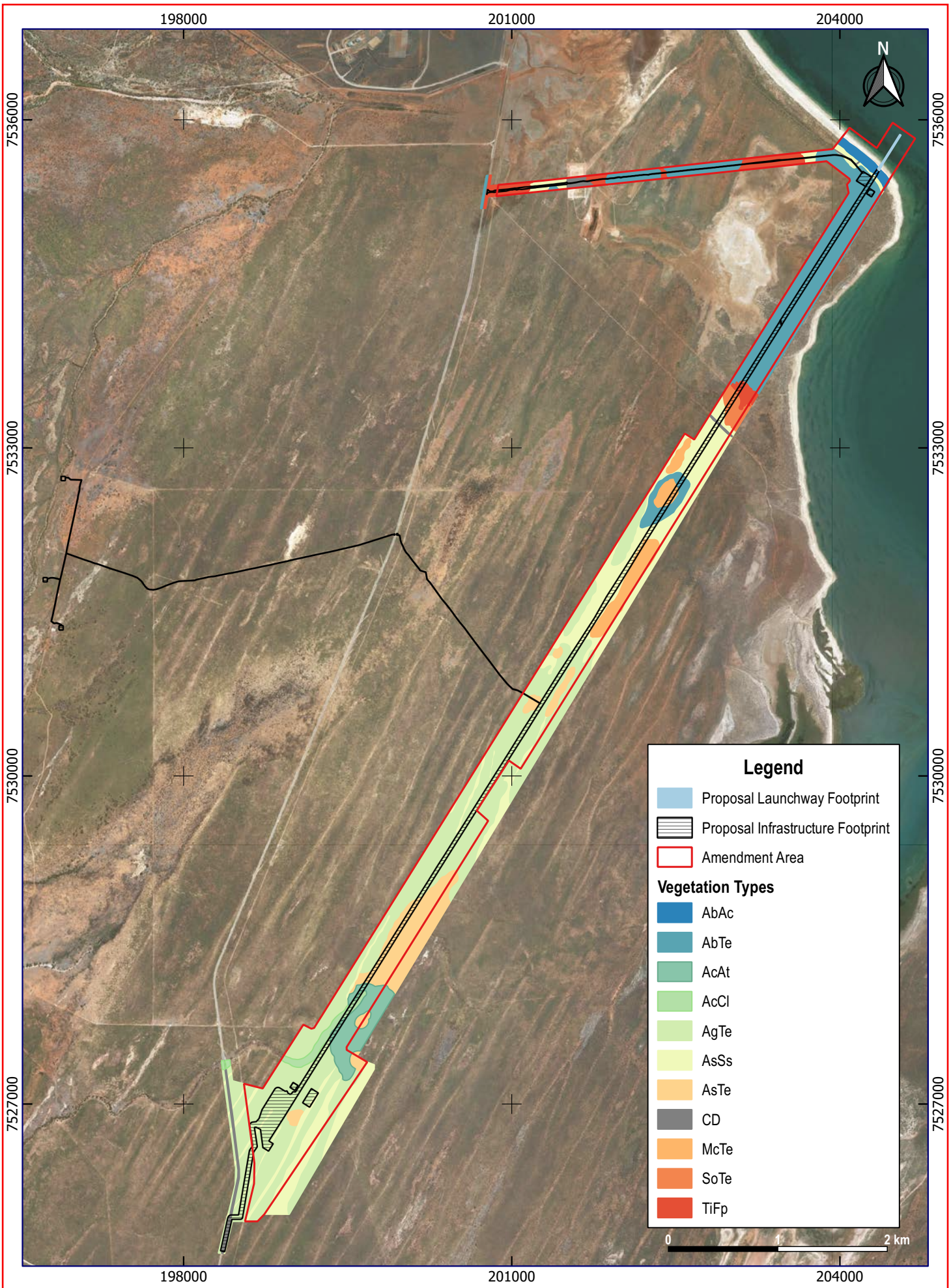
One Priority flora species, *Corchorus congener*, (Priority 3) has been recorded as abundant within the Development Envelope and across the wider regional area (Figure 5-16). During the targeted flora surveys, 1,200 locations of *C. congener* and approximately 2,400 individual plants were recorded (Attachment 2K). It is estimated that out of 2,400 plants approximately 400 (16.6%) will be removed.

A total of 793 ha of *C. congener* habitat was recorded during the targeted flora survey, of which 176 ha (22%) are proposed to be cleared for the Proposal.

It is noted that 1,200 specimens of *C. congener* were recorded (i.e. georeferenced using a handheld GPS), however the species was observed extensively outside of the amendment area and it was not feasible to record each individual at a a regional scale due to the vast

numbers present. It was also noted during the surveys that *C. congener* appeared to be a disturbance species, occurring readily along tracks and roadsides (Attachment 2K).

Additionally, DBCA database search results identified an additional nine confirmed records of the species within a 50 km radius of the Development Envelope. The majority of these locations are in the DBCA protected nature reserve of Cape Range National Park (Attachment 2K).



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

Figure 5-15: Potential Loss of Vegetation Communities from the Proposed Infrastructure Footprint

Shire of Exmouth

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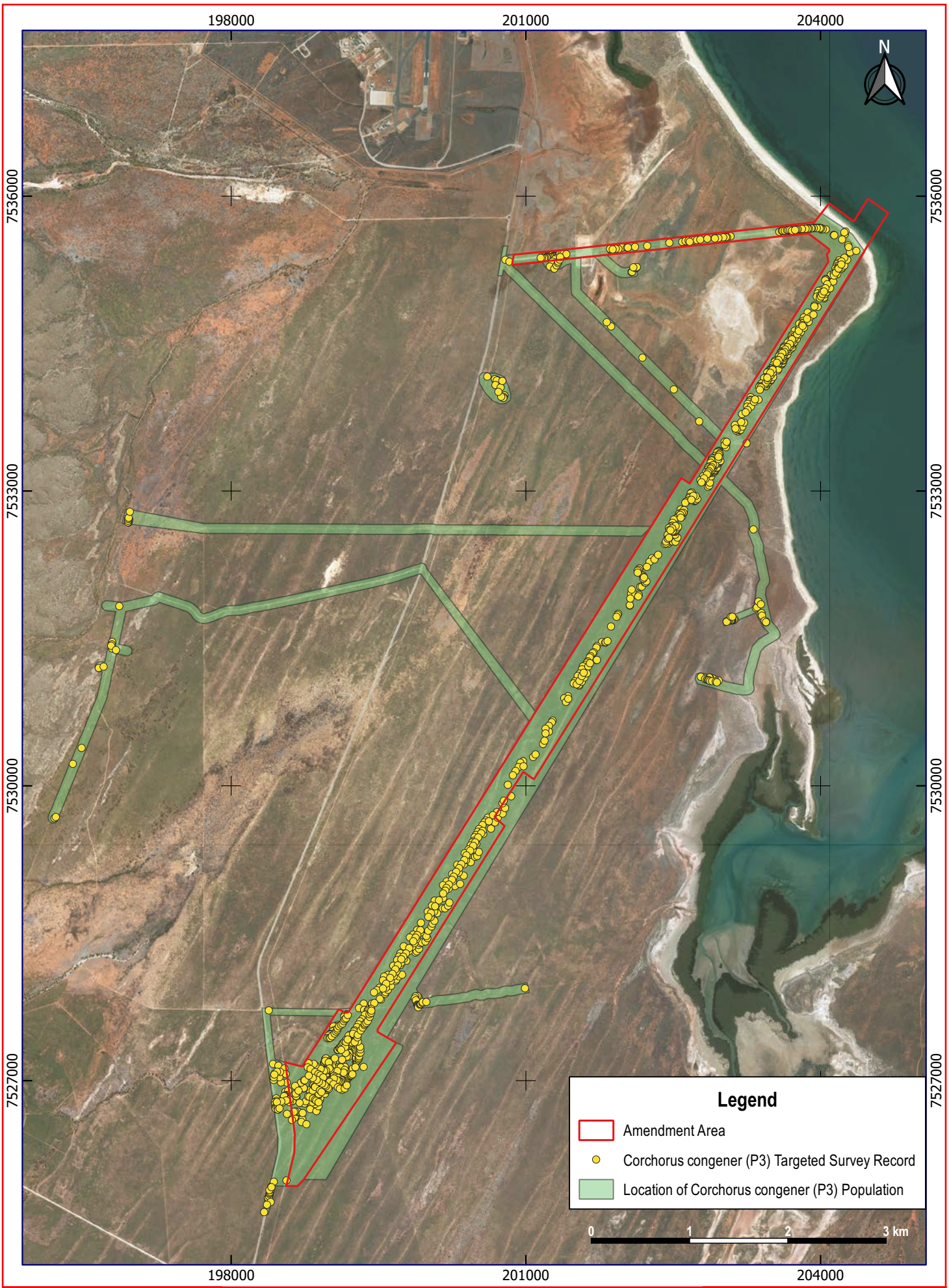

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Figure 5-16: Priority Flora Records in Relation to the Amendment Area

Shire of Exmouth

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5.4.5.2 Indirect impacts to flora and vegetation from dust during construction

Accumulation of dust particulates on leaf surfaces can potentially occur as a result of exposure to dust, resulting in a reduced ability for plants to photosynthesise and transpire, potentially causing a decline in health and eventual plant death. Dust is likely to be generated as a result of clearing ahead of infrastructure construction.

Impacts from dust generation are likely to be limited to within 50 m of the generation point and are likely to be short-term during the land clearing process. Potential short-term impacts during construction are considered unlikely to significantly affect vegetation condition or result in loss of vegetation. If loss of vegetation was to occur, given the vegetation communities are well represented locally and regionally, this is unlikely to result in an adverse impact on the biological diversity and ecological integrity of these communities.

There are no listed Threatened species or communities located within the amendment area or immediate surrounding area. The Priority species *C. congener (*Priority 3*)* is located throughout the amendment area (Attachment 2K), and is widespread throughout the Learmonth area. Short-term dust deposition on individual plants is considered unlikely to result in degradation of plant community health or result in loss of the species on a local or regional basis. It is noted that this species was frequently recorded adjacent to existing tracks and is therefore expected to be tolerant of dust associated with vehicle traffic (Attachment 2K). Appropriate mitigation measures to address potential impacts are presented in Table 5-21.

5.4.5.3 Indirect impacts to flora and vegetation from the introduction and spread of weeds

Of the eight weed species identified within the amendment area, Kapok bush (*Aerva javanica*), Buffel grass (*Cenchrus ciliaris*), and Mimosa bush (*Vachellia farnesiana*) are widespread through the region. Kapok bush and Buffel grass have been introduced widely within pastoral regions as a pasture grass from Shark Bay to the Kimberley.

Weeds have the potential to outcompete and displace native vegetation if introduced or conditions are altered to favour their growth. Additionally, weeds can displace palatable feed for stock, reducing carrying capacity of pastoral areas (DoEE 2018b).

Weeds may be spread and/or introduced by poor hygiene practices on vehicles and equipment, resulting in soil and weed vegetative material or seeds being transported around site, or into or offsite.

Given the existing presence of weeds across the area, and the plans to use locally-sourced construction equipment, it is unlikely that project activities will result in an introduction of new weed species. The spread or proliferation of weeds during construction will be managed through the management measures nominated in Table 5-21.

5.4.5.4 Indirect impacts to flora and vegetation from fragmentation of vegetation

The proposed development of infrastructure within the amendment area will disturb up to 176 ha, or 33%, of the total mapped native vegetation. No TECs or PECs were recorded within the amendment area or adjacent areas.

The potential for habitat fragmentation is most likely to occur where flora taxa or vegetation communities with limited populations or extents exist immediately adjacent to areas of disturbance. Due to the lack of TECs and PECs within the area, the widespread nature of

C. congener and the vegetation communities mapped and the generally linear, narrow footprint (which does not constitute an impediment to pollinators or gene flow), the potential for changes to genetic diversity, colonisation, or recruitment within or adjacent to the amendment area is considered low.

The Proposal Development Footprint (being assessed under Assessment number 2208) is narrow (ranging in width from approximately 3 m to 200 m), and the adjacent vegetation communities well represented regionally. The proposed clearing will not isolate any spatially restricted vegetation communities. It is considered unlikely that the proposed clearing will result in fragmentation of flora and vegetation communities.

5.4.5.5 Indirect impacts to flora and vegetation from changes in surface water flows and quality

Depending on the local topography, vegetation communities have adapted to site conditions that will allow for survival in intermittent flooding. Periods of sustained flooding will generally result in soil conditions becoming anaerobic, reducing the ability of vegetation to survive. The lack of soil oxygen will place vegetation under stress and a number of physiological and morphological responses will begin such as stomata closure, leaf curling, leaf dieback and crown loss. These survival mechanisms are critical to allow the plant to become tolerant to flood events.

Plant tolerance or adaptation to waterlogging generally correlates well with the degree of flooding in the natural habitat of any given species (Visser *et al.* 2000). Flood events in dryland systems are often unpredictable, infrequent and short lived (Ruprecht and Ivanescu 2000). Therefore dryland plant species typically exhibit moderate flooding tolerance with capacity to recover quickly once flooding has subsided (Argus *et al*. 2014). This capacity to adapt quickly to the post-flooding environment, for example through the re-establishment of an extensive root system, would be equally important in seedlings and saplings as surface substrates rapidly dry.

Given the high evapotranspiration rates characteristic of the region, it is not expected that flood inundation would remain over a long duration. The vegetation communities recorded within the survey area (Section 5.4.3.1) are typical coastal communities and are likely to have adapted over time to seasonal flood events.

Flood modelling (Attachment 2Q) assessed the flood extent for a:

- 10-year average recurrence interval (ARI) event.
- 50-year ARI event.
- 100-year ARI event.
- Probable Maximum Precipitation (PMP) event.

The results for a 100-year ARI event are shown in Figure 5-23. It is expected that vegetation within the amendment area could be impacted to some degree following a change to surface water flow patterns associated with development of the Proposal. It is predicted that a general increase in flood levels and velocities will occur on the western side of the Proposal Development Footprint, and a general decrease in flood levels on the eastern side of the Proposal Development Footprint will occur due to a proposed open drain to divert water (refer Section 5.7.5.1).

The potential impacts to each vegetation type were assessed based on the modelled changes to surface water flow patterns and depths (Attachment 2Q, Figure 5-23). The risk

of impact to each vegetation type, based on both the likelihood of each flood event and the consequence of the event, were the same for each flood event (Table 5-20).

Vegetation Community	Vegetation Characteristics	Risk of Impact	Estimated Recovery Period (years)
Acacia Shrubland	Predominantly mesophytic, or xerophytic meaning that they prefer moderate to dry conditions. *Acacias* located in the Pilbara are often located in extreme drying environments and are often short-lived perennials. Species like Mulga (*Acacia aneura*) have adapted to survive with minimal water over extended periods, but rely on flood events or surface sheet flow.	Moderate based on alteration or disturbance to 5-30% of a habitat, species or ecosystem	1-2
Melaleuca Shrubland	Predominantly helophytic to xerophytic species meaning that they can survive in both high and low water available environments. Drake *et al*. (2013) found that some Melaleuca species (*M. strobophylla*) can capitalise on inundation events suggesting a preference to excess water.	Moderate based on alteration or disturbance to 5-30% of a habitat, species or ecosystem	1-2
Stemodia Shrubland	Predominantly helophytic, or mesophytic, or xerophytic species meaning that they can adapt to survive to varying environments from high, medium, to low water availability respectively.	Moderate based on alteration or disturbance to 5-30% of a habitat, species or ecosystem	1-2
Tecticornia Shrubland	These species are often located near tidal landforms frequent to regular tidal/flooding event and survive in highly saline and waterlogged soil conditions	Minor based on alteration or disturbance to less than 5% of a habitat, species or ecosystem	<1
Cullen and Acacia Shrubland	Similar to Acacia shrubland as these species are also mesophytic or xerophytic.	Moderate based on alteration or disturbance to 5-30% of a habitat, species or ecosystem	1-2

Table 5-20: Potential Impacts to Vegetation Communities from Changes in Surface Water Flows

The potential indirect impacts to vegetation adjacent to the amendment area, within areas potentially impacted by changes in surface water flows, are expected to be minor (less than 5% of habitat impacted) to moderate (5-30% of habitat impacted) and recoverable in the short to medium-term (1-2 years) even following a PMP event. A surface water diversion (open drain) and a culvert will be installed to manage surface water flows adjacent to the Proposal Development Footprint (refer Section 5.7.5.1).

Given the vegetation within and adjacent to the amendment area is well represented locally and regionally, no significant impact on the diversity or ecological integrity of vegetation communities is expected at a local or regional scale as a result of minor changes to surface water flows as a result of the development of the Proposal.

5.4.5.6 Indirect impacts to flora and vegetation from changes in groundwater flows and quality

Within the central part of the amendment area, groundwater levels were recorded at 12-17 mbgl and groundwater was hypersaline (TDS > 46,000 mg/L).

Proposal-specific flora and vegetation studies did not identify groundwater dependent ecosystems (GDEs) within the amendment area.

The amendment area is not identified for groundwater abstraction under the Proposal currently under assessment by the EPA (Assessment number 2208). As such, the potential effects of groundwater abstraction have not been assessed within the amendment area.

The amendment area is identified for treated wastewater disposal, via infiltration. The wastewater treatment plant and disposal method would be subject to a future development application. The discharge of low volumes of highly treated wastewater within the amendment area is unlikely to adversely impact native vegetation.

5.4.6 Mitigation and Predicted Outcome

The proposed mitigation measures to address potential impacts to flora and vegetation as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-21.

The EPA objective '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained'* will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Ministerial approval for the proposed development would include conditions formalising the allowable impacts to flora and vegetation within and adjacent to the proposed infrastructure. The CEMP will include protocols and procedures for the monitoring and management of impacts to flora and vegetation during the construction of onshore infrastructure, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). The OEMP will include protocols and procedures for the monitoring and management of impacts to flora and vegetation during the operations phase of the Proposal, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). A Bushfire Management Plan will also be prepared. The Decommissioning and Closure Plan (DCP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include mitigation measures for potential impacts during decommissioning and closure, and protocols for monitoring following closure.	<u>Zoning</u> The amendment area covers the area proposed for development (the Development Envelope). Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and can only be developed/used in a manner consistent with the purpose of the reserve. <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67, model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(c) any approved State planning policy". "(q) the suitability of the land for the development taking into account the possible risk of flooding, tidal inundation, subsidence, landslip, bush fire, soil erosion, land degradation or any other risk". <u>Development Control</u> A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. <u>Environmental Conditions in LPS 4</u> There is the opportunity to insert management plans and other measures, as environmental conditions, by amending clause 4.7 of the LPS 4. Compliance with clause 4.7 could also be cross-referenced in Special Use No. 10 in Schedule 4 of the LPS 4.	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> The flora and vegetation within the amendment area are common and widespread, with all 10 vegetation communities well represented outside of the amendment area. Dust emissions during construction will be short-term in nature and the potential impact area will be localised (< 50 m from source). Increased presence of weeds, (species and abundance) may affect flora and vegetation. However these impacts would, at worst, result in

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
		localised and incidental effects on the health, abundance and structure of vegetation communities, all of which are well represented locally and in the region. 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 amendment area. 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.

Table 5-21: Proposed Mitigation Measures and Predicted Outcome for Flora and Vegetation

5.5 KEY ENVIRONMENTAL FACTOR 5 – SUBTERRANEAN FAUNA

5.5.1 EPA Objective

To protect subterranean fauna so that biological diversity and ecological integrity are maintained.

5.5.2 Policy and Guidance

A summary of the policy and guidance relevant to subterranean fauna, and how these have been considered, is presented in Table 5-22.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors.
Environmental Factor Guideline – Subterranean Fauna (EPA 2016l)	This guidance was consulted in the consideration of potential impacts on subterranean fauna and the assessment of the significance of the subterranean fauna values within and adjacent to the amendment area.
Technical Guidance – Subterranean fauna survey (EPA 2016m)	This guidance was consulted to determine the level of survey likely to be required.
Technical Guidance – Sampling methods for subterranean fauna (EPA 2016n)	This guidance was consulted to determine the level of survey likely to be required and the survey design.
A review of subterranean fauna assessment in Western Australia – Discussion paper (EPA 2012)	Referred to in the review of subterranean fauna values within and adjacent to the Proposal area and in the assessment of potential impacts.

Table 5-22: Policy and Guidance Relevant to Subterranean Fauna

5.5.3 Receiving Environment

A number of subterranean fauna studies have previously been undertaken within the region, as outlined in Table 5-23. Subterranean fauna are comprised of stygofauna (aquatic subterranean species) and troglofauna (air breathing subterranean species) which are known to be relatively diverse on a worldwide scale in Western Australia.

Additional site-specific studies, as listed in Table 5-23, were undertaken by various technical specialists, and are included in full within Attachment 2. They are also referred to, as appropriate, in the discussion on the assessment of potential impacts and proposed management measures.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
1988	Harvey, M.S.	A new troglobitic schizomid from Cape Range, Western Australia (Chelicerata: schizomida).
1993	Deeleman-Reinhold C.J.	*Trichocyclus septentrionalis* a new species of cave dwelling pholcid spider from north-western Australia (Araneae: Pholcidae).
1993	Humphreys and Shear	Troglobitic millipedes (Diplopoda: Paradoxosomatidae) from semi-arid Cape

Survey Date	Researcher/Consultant	Study Description/Title
		Range, Western Australia: systematics and biology.
1994	Humphreys	The subterranean fauna of the Cape Range coastal plain, north-western Australia.
1995	Humphreys and Feinberg	Food of the blind cave fishes of north-western Australia.
1996	Shear and Humphreys	A new Stygiochiropus from a North West Cape (Western Australia) coastal plain cave (Diplopoda: Polydesmida: Paradoxosomatidae).
1999	Humphreys	Relict stygofaunas living in sea salt, karst and calcrete habitats in arid north-western Australia contain many ancient lineages. In: The other 99%. The conservation and biodiversity of invertebrates.
2000	Humphreys	Chapter 30. The hypogean fauna of the Cape Range peninsula and Barrow Island, North-western Australia. In Ecosystems of the world. Subterranean ecosystems.
2001	Gray and Thompson	New lycosoid spiders from cave and surface habitats in southern Australia and Cape Range peninsula (Araneae: Lycosoidea).
2004	Humphreys	Cape Range, Australia: Biospeleology.
2008	Page *et al*.	Shrimps down under: Evolutionary relationships of subterranean crustaceans from Western Australia (Decapoda: Atyidae: Stygiocaris).
2018	Moore *et al*.	New populations of the rare subterranean blind cave eel *Ophisternon candidum* (Synbranchidae) reveal recent historical connections throughout north-western Australia
Site-specific Studies		
2017	Invertebrate Solutions	Desktop assessment of subterranean fauna for the Learmonth Bundle Project, Cape Range, Western Australia.
2017	Bennelongia	Review of subterranean fauna at Learmonth Bundle Project.
2019	Bennelongia	Subsea 7 Pipeline Fabrication Facility Stygofauna Survey

Table 5-23: Overview of Local and Regional Subterranean Fauna Studies

The Cape Range coastline, specifically the Western Cape, is a hotspot and key habitat for subterranean fauna due to the extensive limestone caves and karstic geologies found. A diverse relictual rainforest fauna of over 55 species of subterranean fauna have been documented and recorded (Humphreys 2000, 2004, 2008).

Many of the subterranean species associated with Cape Range karstic habitat (aquatic, troglobitic) are protected under legislation. Two of Australia's four stygobitic vertebrate species, the stygofaunal fish blind gudgeon *Milyeringa veritas* and the blind cave eel *Ophisternon candidum*), are listed as vulnerable under the EPBC Act, and the blind shrimp (*Stygiocaris stylifera*) is listed as a Priority 4 species by the DBCA (Bennelongia 2017).

Two desktop reviews were completed to assess the likelihood of subterranean fauna within the Development Envelope, prior to the inclusion of the borefield within the Development

Envelope (Invertebrate Solutions 2017, Bennelongia 2017). The reviews identified that the presence of troglofauna was unlikely (Attachment 2L, Attachment 2M) and it was determined unlikely that the subterranean fauna ecological communities recognised as TECs, such as the Bundera Cenote Anchialine community on Cape Range or Cameron's Cave near the townsite of Exmouth, occur in proximity to the Proposal area (Attachment 2M). In general, troglofauna are considered to be most abundant in karstic and fractured rock habitats. Some potential troglofauna habitat, in the form of small patches of nodular calcrete, has more recently been observed adjacent to the site of the proposed fabrication facility at the western end of the main portion of the Development Envelope, but the presence of troglofauna is unlikely (Attachment 2N). More favourable habitat occurs in the borefield, where the depth to groundwater is 20 to 30 m and there is some karstic habitat present (Attachment 2N). Sandplain is considered to have low prospectivity for troglofauna due to the small pore spaces, though troglofaunal could occur in the deeper substrates of Exmouth sandstone and Bundera calcarenite, if suitable (Attachment 2N). The occurrence of troglofauna is highly unlikely in the supratidal flats near the coast because the silt/clay substrate does not have large enough pore spaces and the depth to groundwater is only a few metres (Attachment 2N). On the basis of the information above, it was considered unlikely that a significant troglofauna community occurs within the main Development Envelope but could occur at the borefield (Attachment 2N).

Due to the presence of the Cape Range Subterranean Waterways (WA006), listed in the Directory of Important Wetlands in Australia', within and adjacent to the amendment area, surveys to target stygofauna were undertaken to determine the presence of stygofauna habitat and species, including listed species (Attachment 2N). Twenty bores were sampled (Figure 5-17), with each bore sampled three times (in October 2018, January 2019 and April 2019) (Attachment 2N).

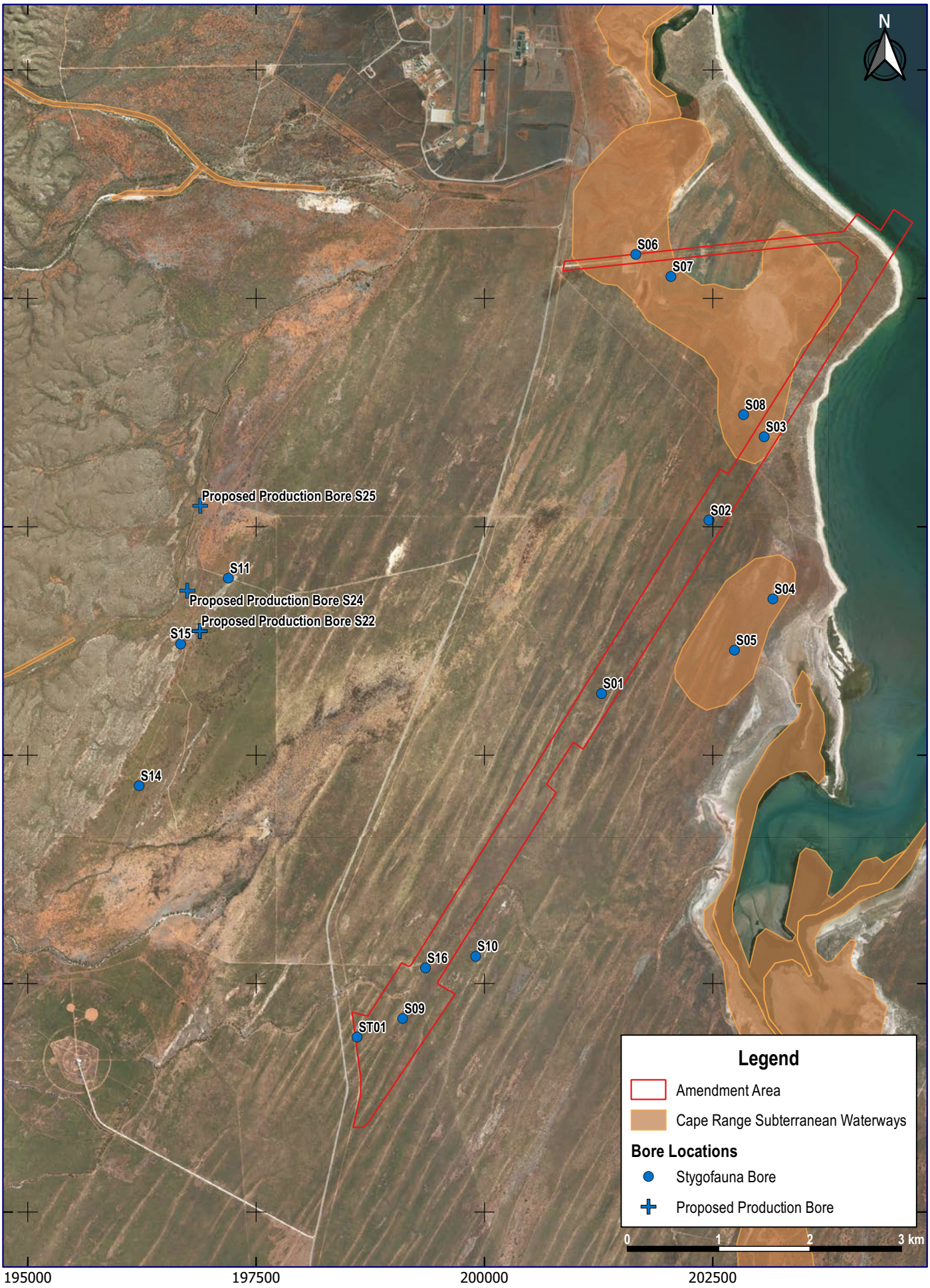

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Figure 5-17: Location of Stygofauna Sampling Bores Within and Adjacent to Amendment Area

Shire of Exmouth

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Eight species were collected from within or adjacent to the main part of the amendment area, east of the Minilya-Exmouth Road. Six of these species are known only from the amendment area and surrounds (Attachment 2N). The remaining two species were the copepod *Stygoridgwayia trispinosa*, which is found widely in the Pilbara (Tang *et al*. 2008), and the copepod *Phyllopodopsyllus wellsi*, which occurs elsewhere on the Cape Range Peninsula and on Barrow Island. Stygofauna were collected from the coastal bores but not from any of the bores in the sand plain towards the western (inland) end of the amendment area (Attachment 2N).

5.5.4 Potential Impacts

The future development of infrastructure within the amendment area has potential to directly and indirectly impact subterranean fauna. Table 5-24 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Construction/Operations	Mortality and loss of habitat from excavation and physical presence of infrastructure
Operations	Impacts to subterranean fauna from abstraction and/or reinjection of groundwater
	Impacts to subterranean fauna from changes to hydrological regimes and water quality
	Impacts to subterranean fauna from groundwater contamination

Table 5-24: Potential Impacts to Subterranean Fauna

5.5.5 Assessment of Impacts

5.5.5.1 Mortality and loss of habitat from excavation and physical presence of infrastructure

No direct loss of individuals or habitat will occur as a result of the construction of onshore infrastructure as the proposed excavations are shallow (up to 1 m), so will not impact stygofauna habitat, and will mainly occur in areas unlikely to support stygofauna (Figure 5-18). No troglofauna habitat was recorded within the amendment area (Attachment 2N).

Given the lack of stygofauna recorded towards the western (inland) end of the amendment area (Figure 5-18), and the proposed measures to maintain pre-development surface water flows as much as possible, the risk of impact to stygofauna from the physical presence of infrastructure, that could lead to altered surface water infiltration, is considered negligible.

5.5.5.2 Impacts to subterranean fauna from abstraction and/or reinjection of groundwater

Stygofauna were not collected from the bores in the sand plain towards the western (inland) end of the amendment area ((Figure 5-18, Attachment 2N).

The current 'Rural' zone classification is compatible with the use and development of land for a borefield. State Planning Policy 2.5 Rural Planning recognises that rural land is used for a wide variety of purposes including "water supply". Bores are commonly used in pastoral areas for providing livestock with access to water. Borefields are already existing in the Shire of Exmouth on Rural zoned land.

Groundwater abstraction within or adjacent to the amendment area is not proposed, with the proposed borefield for the Proposal located to the west of the Minilya-Exmouth Road.

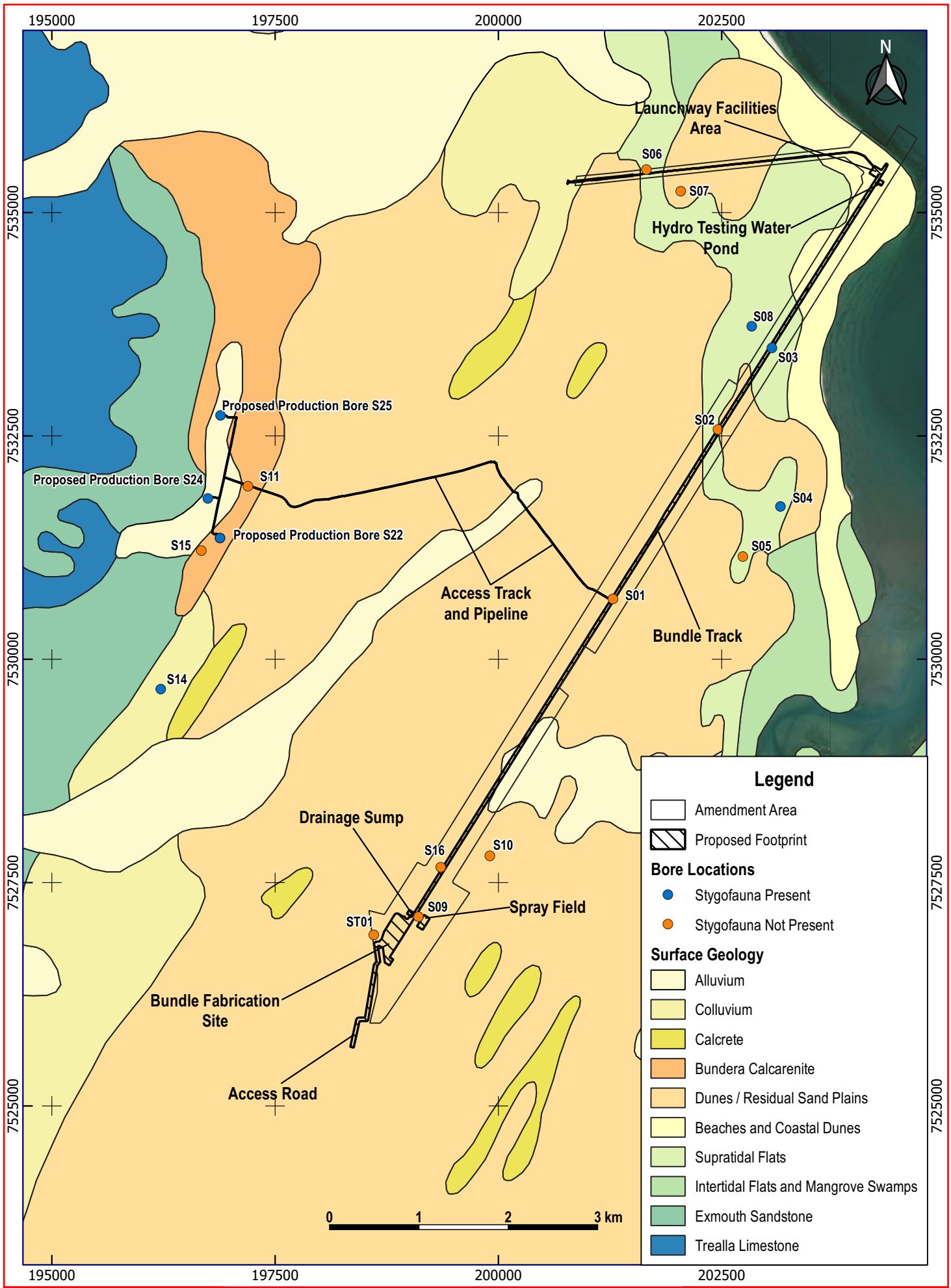
The reinjection of treated wastewater within or adjacent to the amendment area is not proposed.

5.5.5.3 Impacts to subterranean fauna from changes to hydrological regimes and water quality

The discharge of treated wastewater within the amendment area is part of the proposed future development. Given the minor volumes of treated wastewater proposed to be discharged, the low nutrient concentrations, and the large distance between the amendment area and the habitats found to support stygofauna (6-7 km), an impact to stygofauna from altered groundwater flows or quality is considered unlikely, even in the event of a significant wastewater plume (which is not expected given the very low volumes of wastewater).

5.5.5.4 Impacts to subterranean fauna from groundwater contamination

An impact to subterranean fauna could potentially occur as a result of a leak or spill of a chemical. The risk of groundwater contamination due to leak or spill of chemicals is considered low given the depth to groundwater and the adoption of robust chemical storage and handling procedures. Given the lack of stygofauna habitat towards the western (inland) end of the amendment area, the risk of an impact to subterranean fauna from a chemical leak or spill is considered negligible.



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Aerial Photo: ESRI Satellite
Original Size: A4
Grid: GDA94 / MGA zone 50

Figure 5-18: Location of Stygofauna Records Within and Adjacent to Amendment Area

Shire of Exmouth

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5.5.6 Mitigation and Predicted Outcome

The proposed mitigation measures to address potential impacts to subterranean fauna as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-25.

The EPA objective '*to protect subterranean fauna so that biological diversity and ecological integrity are maintained*' will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
The OEMP will include protocols and procedures for the monitoring of groundwater quality and quantity (levels) associated with the proposed groundwater bastraction (outside of the amendment area). The OEMP will also address the storage and handling of chemicals. The groundwater abstraction licence will have conditions relating to the monitoring of groundwater and maximum abstraction rates/volumes. Chemical storage and handling is controlled under various legislation including: • Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids. • Australian/New Zealand Standard 1596:2014 The storage and handling of LP Gas. • Australian Standard 4332-2004 The storage and handling of gases in cylinders. • Dangerous Goods Safety (Storage and Handlinbg of Non-explosives) Regulations 2007.	Development Control A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application.	Related to Amendment The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. Related to the Proposal Subterranean fauna habitat was not recorded in proximity to the fabrication shed, sprayfield or the majority of the Bundle tracks. No impact expected. The EPA objective for Subterranean Fauna will be met.

Table 5-25: Proposed Mitigation Measures and Predicted Outcome for Subterranean Fauna

5.6 KEY ENVIRONMENTAL FACTOR 6 – TERRESTRIAL FAUNA

5.6.1 EPA Objective

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

5.6.2 Policy and Guidance

A summary of the policy and guidance relevant to terrestrial fauna, and how these have been considered, is presented in Table 5-26.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors
Environmental Factor Guideline – Terrestrial Fauna (EPA 2016o)	Referred to in the assessment of potential impacts as a result of the Proposal
Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016p)	Referred to in the survey design which included a desktop study and reconnaissance survey. Based on the habitat identified and likelihood of occurrence for conservation significant species, it was determined that a targeted or Level 2 survey was not required.
Technical Guidance – Terrestrial fauna surveys (EPA 2016q)	Referred to in the survey design
Technical Guidance – Sampling of short range endemic invertebrate fauna (EPA 2016r)	Referred to in the assessment of potential impacts as a result of the Proposal
	Referred to in the survey design
Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011a)	
Survey Guidelines for Australia's Threatened Reptiles (DSEWPaC 2011b)	

Table 5-26: Policy and Guidance Relevant to Terrestrial Fauna

5.6.3 Receiving Environment

A limited number of terrestrial fauna studies have previously been undertaken within the region.

Two site-specific field studies, and one desktop assessment, have been undertaken (Table 5-27), with the reports included in Attachment 2. Each survey was undertaken in accordance with the relevant policy and guidance (Table 5-26).

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
2015	360 Environmental	Level 1 Fauna Assessment on Truscott Crescent, Exmouth.
Site-specific Studies		
2017	360 Environmental	Learmonth Level 1 Fauna Survey
2017	Invertebrate Solutions	Desktop Assessment of Short Range Endemic Invertebrates
2018	360 Environmental	Learmonth Level 1 Fauna Survey – amendment area

Table 5-27: Overview of Local and Regional Terrestrial Fauna Studies

5.6.3.1 Fauna Habitats

Four broad fauna habitats (including 'Beach' habitat) were identified within the amendment area (360 Environmental 2018b, Attachment 2O) with all considered widespread and common in the Exmouth region (Table 5-28).

5.6.3.2 Fauna Species

Project specific fauna studies identified 40 species from 29 families, comprising five reptile species, 29 bird species and six mammal species including the European rabbit (Attachment 2O). Out of the 40 species of fauna recorded, six significant species were recorded in the survey area:

- Osprey (*Pandion cristatus*)
- Lesser sand plover (*Charadrius mongolus*).
- Caspian tern (*Hydroprogne caspia*).
- Lesser crested tern (*Thalasseus bengalensis*).
- Crested tern (*Thalasseus bergii*).
- Rainbow bee-eater (*Merops ornatus*).

The migratory shorebirds recorded within the survey area (including the Lesser sand plover) are discussed in Section 5.6.3.4.

Fauna Habitat	Description	Survey Area (ha)
HG	*Triodia* hummocks made up the majority of the habitat with patches of scattered *Acacia* species (*A. gregorii*, *A.bivenosa*, *A. coriacea* and *A. tetragonophylla*) characterised by areas of dense lower strata and grasses provide habitat and cover for small reptile, bird and mammal species. Some woody debris and leaf litter is present providing microhabitat for some common reptile bird and mammal species.	512.8
DL	Minor Drainage Line characterised by rocky outcrops, woody debris and leaf litter within this habitat provide important features of microhabitats for reptile, bird, and mammal species. Birds may also roost or nest in scattered trees.	4.4
TiFp	Tecticornia low shrubland (*Tecticornia* and *Frankenia*). Characterised by low shrubland (*Tecticornia* and *Frankenia*) on saline flats and lacks an overstorey and midstorey. This habitat provides limited foraging opportunities for small bird species.	13.6
Beach	Beach characterised by a sandy/shelly shoreline. Shorebirds (i.e. waders) utilise this habitat for roosting and/or foraging	7.1
CD	Cleared/Track	8.5
	Total Area	**546.4**

Table 5-28: Extent of Fauna Habitats within the Amendment area

5.6.3.3 Short Range Endemics

A desktop assessment of Short Range Endemic (SRE) species was undertaken by Invertebrate Solutions (2017) and is provided as Attachment 2P. The assessment identified that nine confirmed SRE species of land snails occur within the region. The majority of the species are restricted to the central Cape Range Peninsula and are not likely to occur within the amendment area (Invertebrate Solutions 2017).

Based on habitat preferences, there is potential for two species of land snail, *Plectorhagaha* sp. 1 and *Quistrachia* sp. 1 to occur within the coastal plain area of the amendment area. However, given the absence of limestone outcropping within the amendment area, the likelihood of these species being present was considered low (Attachment 2P).

5.6.3.4 Migratory Birds

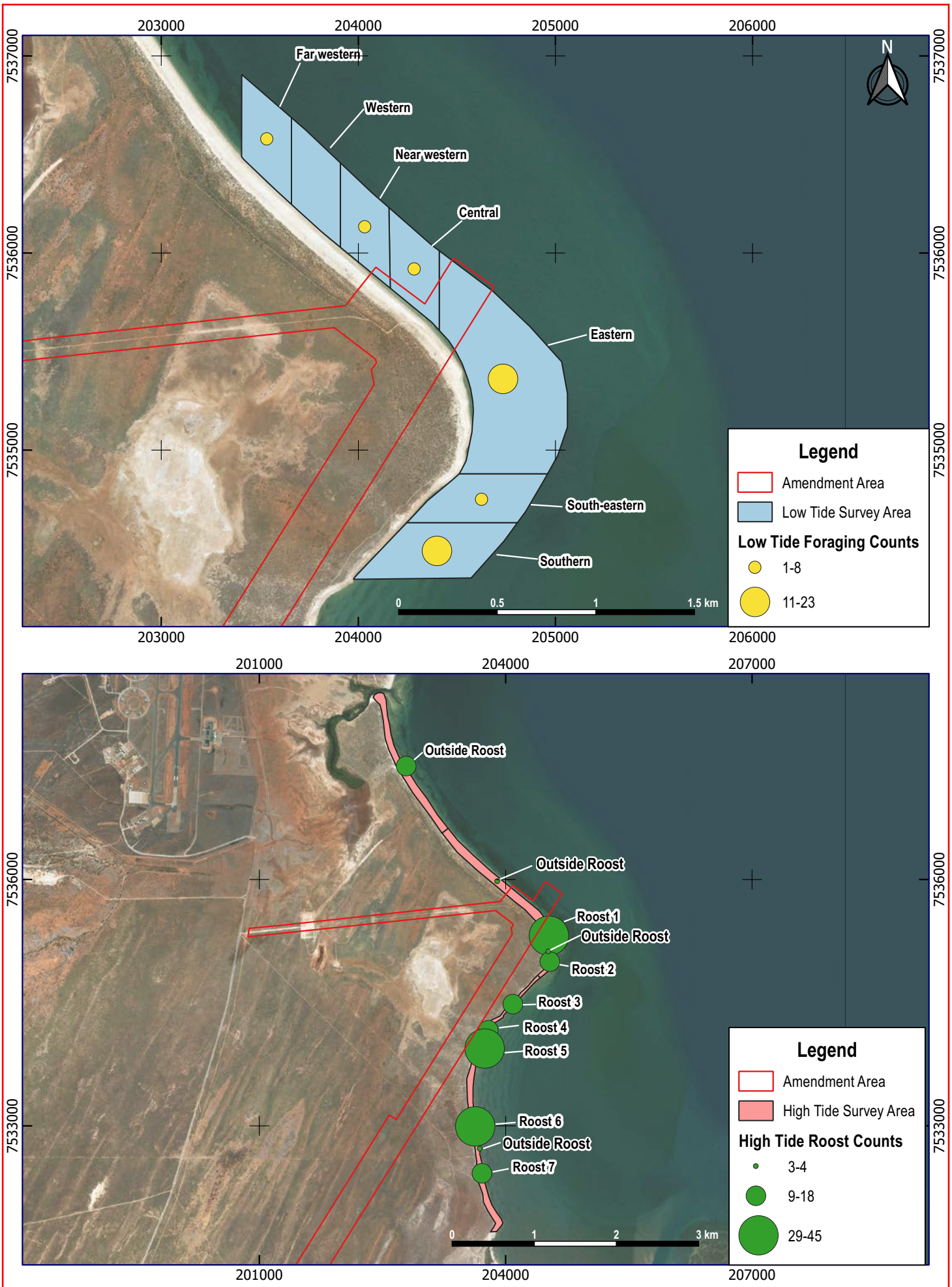
Migratory shorebirds (included under marine fauna due to their use of and reliance on intertidal and supratidal habitats) are the 37 species listed in EPBC Act policy statement 3.21 (DoEE 2017a). These species are listed under the EPBC Act and regularly visit Australia on their migration. The migratory shorebirds that visit Australia are from the East Asian–Australasian (EAA) flyway. The EAA flyway, which stretches from Siberia and Alaska to Australia and New Zealand, is a geographic region supporting populations of migratory waders during annual migrations (Bamford *et al*. 2008, DEWHA 2008). It is one of eight major flyways recognised around the world and is used by about 8 million waders of 54 different species (Bamford *et al*. 2008). Sites considered internationally important to migratory waders are those that regularly support 1% or more of the flyway population of a species or that are known to regularly support more than 20,000 waders in total (Ramsar Convention 2000).

Migratory birds, including waders, undertake annual migrations of thousands of kilometres between their breeding areas in the Arctic and their non-breeding areas in Australasia, Africa and South America (Bamford *et al*. 2008). Southward migration to non-breeding grounds in the southern hemisphere typically occurs from September to November. Waders spend summer in the non-breeding habitats (December to February), feeding intensively on invertebrates to build up stores of fat and protein in preparation for migration back to the Arctic (Bamford *et al*. 2008, Priest *et al*. 2002). Northward migration to the Arctic breeding grounds takes place between March and April, and waders capitalise on the abundant food supply during the Arctic summer (Bamford *et al*. 2008).

During a survey of migratory shorebirds within the Shorebird 2020 'Bay of Rest North' survey area in October 2018, during the southward migration, 345 birds were recorded roosting at high tide, with 179 being migratory shorebirds, the most common being Red-capped Plover (105), Greater Sand Plover (75) and Grey-tailed Tattler (31) (Western Wildlife 2019, Attachment 2J). No migratory shorebird recorded approached the 1% population criterion, 0.25% staging criterion or 0.1% national significance criterion for their species. A total of 76 birds were recorded at low tide of which 47 were migratory species (Attachment 2J). No migratory birds were recorded roosting or foraging within the amendment area (Figure 5-19). A high tide roost of 29 migratory shorebirds, including Greater Sand Plover (12) and Grey-tailed Tattler (6), was recorded approximately 150 m to the south east of the amendment area. A total of 23 migratory shorebirds, including Grey-tailed Tattler (11) and Greater Sand Plover (8), were recorded foraging at low tide approximately 300 m to the south east of the amendment area.

During a repeat survey in January 2019, during the non-breeding season, 439 birds were recorded roosting at high tide, with 155 being migratory shorebirds, the most common being Red-capped Plover (121), Greater Sand Plover (67) and Grey-tailed Tattler (27) (Western Wildlife 2019, Attachment 2J). No migratory shorebird recorded approached the 1% population criterion, 0.25% staging criterion or 0.1% national significance criterion for their species. A total of 153 birds were recorded at low tide of which 78 were migratory species (Attachment 2J). No migratory birds were recorded foraging within the amendment area (Figure 5-20). Five migratory shorebirds, consisting of Bar-tailed Godwit (4) and Oriental Plover (1), were recorded roosting at high tide within the amendment area. A high tide roost of 31 migratory shorebirds, including Bar-tailed Godwit (11), Greater Sand Plover (6) and Red-necked Stint (6), was recorded approximately 150 m to the south east of the amendment area. A total of 52 migratory shorebirds, including Ruddy Turnstone (16), Greater Sand Plover (8), Grey-tailed Tattler (8) and Sanderling (8), were recorded foraging at low tide approximately 250 m to the south east of the amendment area.

In these surveys, no counts of any migratory species exceeded the internationally or nationally significant criteria of 1% or 0.1% of the flyway population, respectively. Total counts of migratory shorebirds were well below the internationally significant threshold of 20,000 birds and the nationally significant threshold of 2,000 birds. No more than 13 migratory shorebird species were recorded, less than the > 15 species that indicates a nationally important site. The habitats within and adjacent to the amendment area clearly support small numbers of shorebirds. However, the habitats may be less suitable for shorebirds compared with other parts of the Exmouth Gulf, that have wider and/or more sheltered beaches with islets or sandbars for roosting and muddier substrates for birds foraging at low tide (Attachment 2J).



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Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

Figure 5-19: Shorebird Species Counts Within the 'Bay of Rest North' Survey Area (October 2018) (from Western Wildlife 2019)

Shire of Exmouth

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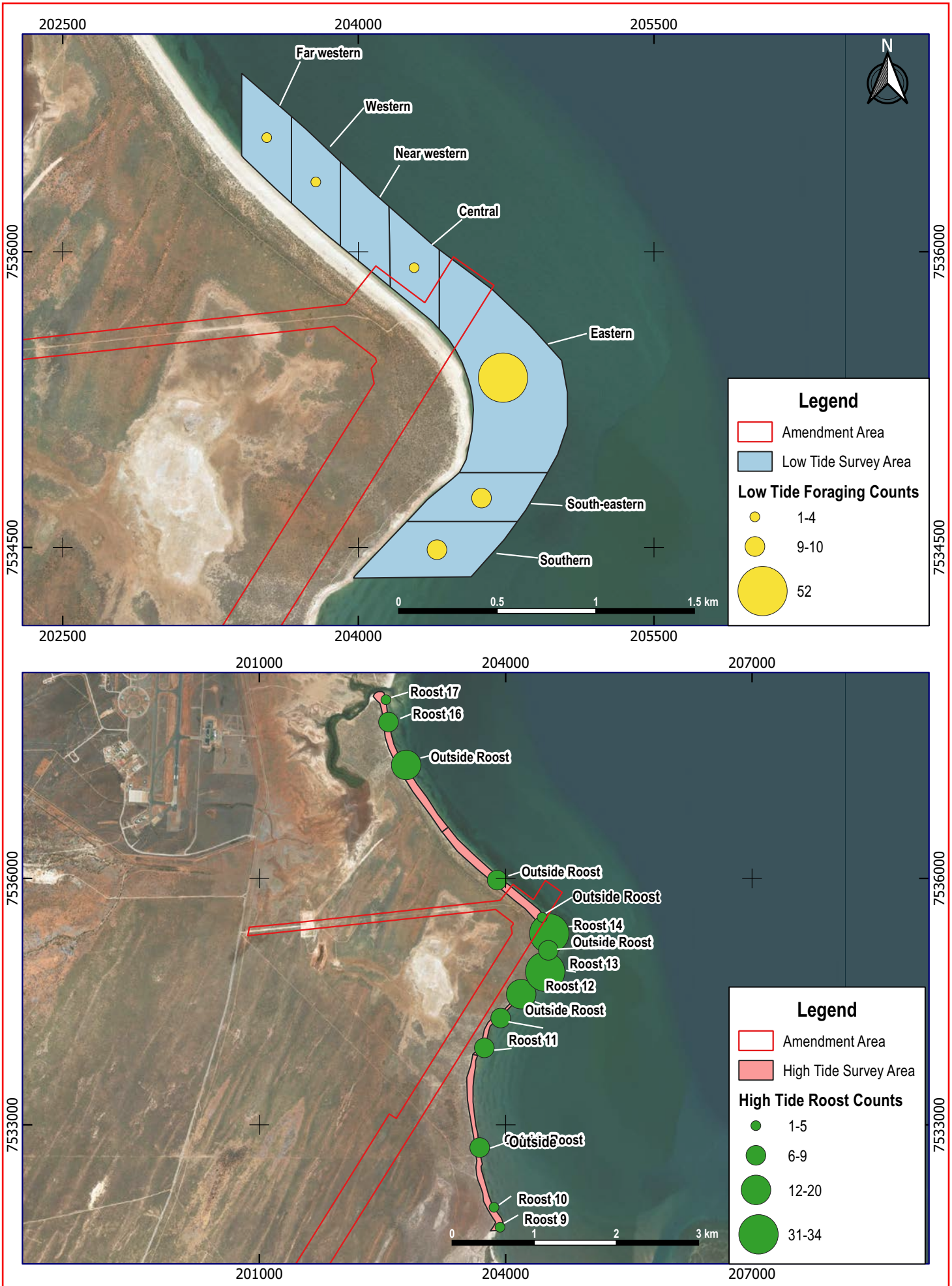

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Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

Figure 5-20: Shorebird Species Counts Within the 'Bay of Rest North' Survey Area (January 2019) (from Western Wildlife 2019)

Shire of Exmouth

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5.6.4 Potential Impacts

The future development of infrastructure within the amendment area has potential to directly and indirectly impact terrestrial fauna. Table 5-29 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Construction	Loss of up to 176 ha of fauna habitat
Operations	Direct loss of terrestrial fauna from vehicle movements and strikes
	Indirect impacts to fauna habitat as a result of barrier effects of the physical presence of infrastructure and fragmentation of habitat and populations
	Indirect impacts to fauna habitat as a result of degradation of habitat from introduction and increased spread of weeds/dust
	Indirect impacts to fauna habitat as a result of alteration of fire regimes
	Indirect impacts to fauna habitat as a result of alteration of habitat as a result of changes to coastal processes or hydrodynamic/hydrological regimes
	Indirect impacts to fauna habitat as a result of introduction of feral animals resulting in increased predation and competition

Table 5-29: Potential Impacts to Terrestrial Fauna

5.6.5 Assessment of Impacts

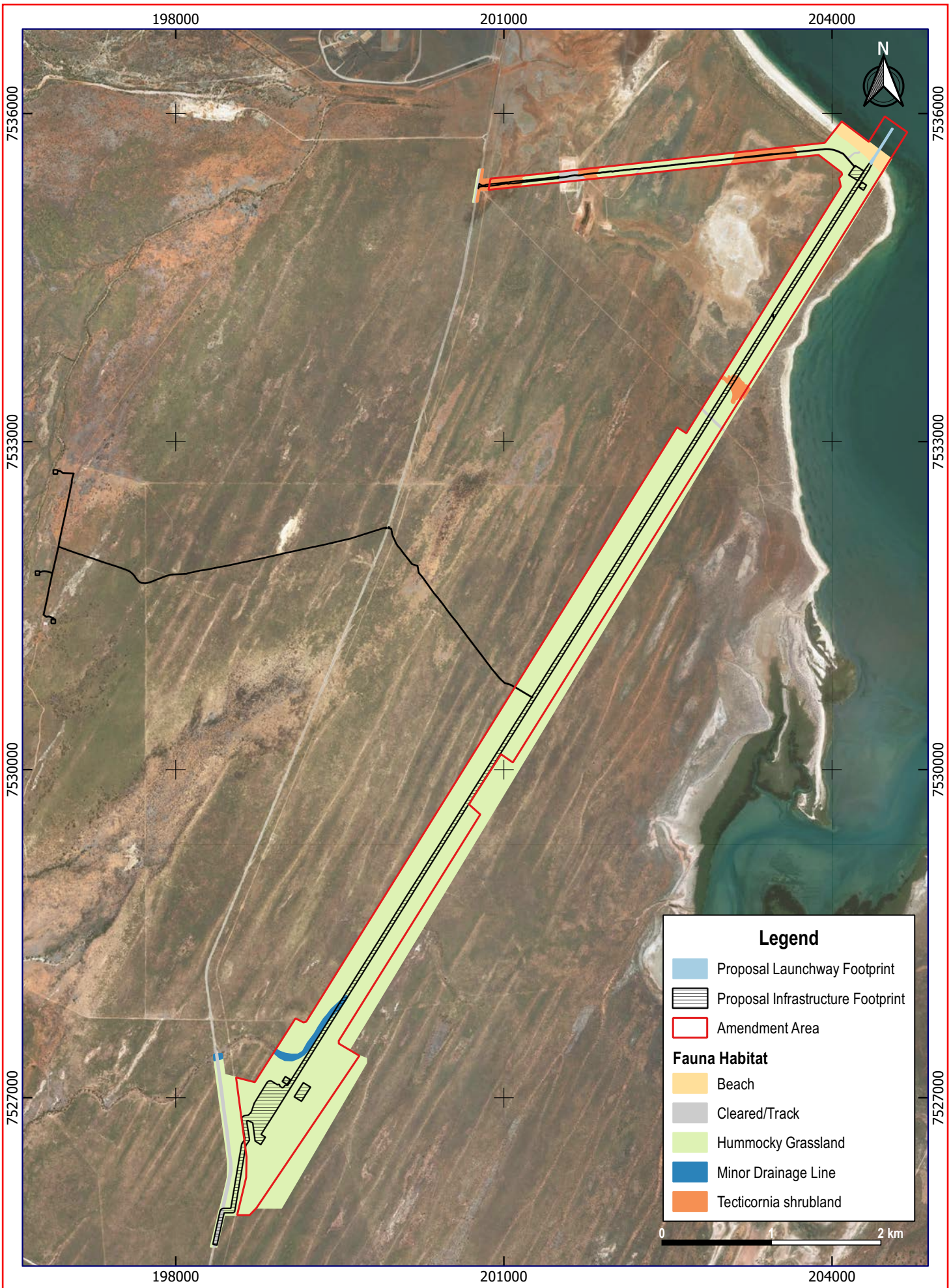
5.6.5.1 Loss of up to 176 ha of fauna habitat

Up to 176 ha of native vegetation will be cleared within the amendment area (and within the adjacent road reserve for the Minilya-Exmouth Road) for the development of infrastructure associated with the Proposal (Figure 5-21).

Triodia Hummock Grassland (HG) is the most widespread fauna habitat with 160.1 ha (31%) of the mapped habitat to be impacted. The highest percentage impacts are to CD (Cleared/Track) (58%) and TiFp (Tecticornia low shrubland) (56%). The vegetation associated with the HG and TiFp habitats is considered to be widespread and representative of the Learmonth area (Attachment 2K and Attachment 2O).

All significant fauna identified were migratory/marine birds including the Lesser sand plover, Caspian tern, Lesser crested tern and Crested tern. Potential impacts to coastal wader habitat (Fauna Habitat – Beach) are considered very limited, particularly at a regional scale. Rainbow bee-eaters were also recorded and are a highly common and widespread species in Australia, with a distribution that covers the majority of Australia (Barrett *et al*. 2003 in 360 Environmental 2018b).

A significant impact on the biological diversity and ecological integrity of terrestrial fauna, as a result of the proposed clearing, is not expected.



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Aerial Photo: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

Figure 5-21: Potential Loss of Fauna Habitat from the Proposed Infrastructure Footprint

Shire of Exmouth

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5.6.5.2 Direct loss of terrestrial fauna from vehicle movements and strikes

Injury or death of fauna from vehicle strike during construction is most likely to occur from heavy vehicle usage within the infrastructure footprint during the clearing phase. Vehicles undertaking land clearing will be slow moving and operating only during daylight hours to reduce the likelihood of fauna strike.

Due to the relatively short duration of the clearing phase (2 months) and the proposed management measures (Table 5-30), a significant impact on the biological diversity and ecological integrity of terrestrial fauna during construction of infrastructure is not expected.

5.6.5.3 Indirect impacts to fauna habitat as a result of barrier effects of the physical presence of infrastructure and fragmentation of habitat and populations

The majority of the proposed infrastructure (access roads, Bundle tracks, laydown areas) will not represent a significant barrier to the movement of fauna. The site will be surrounded by stock fencing (minimum requirement as advised by the Department of Planning, Lands and Heritage). The boundary fencing will extend from the fabrication shed seaward to the top of the beach. The fence will inhibit the movement of stock between the areas to the north and south of the site, but is not expected to significantly impede the movement of native fauna across the amendment area. Larger fauna such as the Western grey kangaroo or Black-footed rock-wallaby, which occur across the wider region, are likely to be able to jump a stock fence, or could pass the site along the beach or adjacent to the Minilya-Exmouth Road, while smaller fauna will be able to pass through or under the fencing.

Fragmentation of fauna habitat due to loss of vegetation reduces the ability of fauna to move freely to access dispersed or temporary resources and potentially reduces gene flow. Habitat fragmentation potentially exacerbates other threats, like predation by feral species, by providing access into habitats that were previously dense and difficult to traverse. 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. SREs, particularly vulnerable to habitat loss and fragmentation, were considered unlikely to occur in the amendment area (Section 5.6.3.3).

Future development in the amendment area is anticipated to result in disturbance to 176 ha (33%) of the total mapped fauna habitat (Attachment 2O). Current land use (grazing) and access tracks are likely to have resulted in a low level of habitat fragmentation in the region.

Given the existing access tracks through the area, and the absence of poorly represented habitat types supporting a population of breeding fauna species, habitat fragmentation is not expected to impact the overall health and viability of fauna populations within the area.

5.6.5.4 Indirect impacts to fauna habitat as a result of degradation of habitat from introduction and increased spread of weeds/dust

<u>Weeds</u>

Of the eight weed species identified within the amendment area, Kapok bush (*Aerva javanica*), Buffel grass (*Cenchrus ciliaris*), and Mimosa bush (*Vachellia farnesiana*) are widespread through the region. Kapok bush and Buffel grass have been introduced widely within pastoral regions as a pasture grass from Shark Bay to the Kimberley.

Weeds may be spread and/or introduced by poor hygiene practices on vehicles and equipment, resulting in soil and weed vegetative material or seeds being transported around site, or into or offsite. Additionally, weed growth may be encouraged by watering and nutrient loading from the irrigation of treated wastewater.

Given the existing presence of weeds across the area, and the plans to use locally-sourced construction equipment, it is unlikely that activities will result in an introduction of new weed species. The spread or proliferation of existing weeds will be managed through the management measures nominated in Table 5-30.

Dust

As outlined in Section 5.4.5.2 the potential accumulation of dust particulates on vegetation can potentially occur as a result of exposure to dust, resulting in a reduced ability for plants to photosynthesise and transpire, potentially causing a decline in health and eventual plant death which may negatively impact availability of fauna habitat.

Impacts from dust generation are likely to be limited to within 50 m of the generation point and are likely to be short-term during the land clearing process. Potential short-term impacts during construction are considered unlikely to significantly affect surrounding fauna habitat and result in loss of habitat. The mapped fauna habitats are well represented by local and regional vegetation communities and any potential impact is not likely to have an adverse impact on the biological diversity or ecological integrity of faunal assemblages. Dust suppression procedures will apply (mitigation measures are outlined in Table 5-30).

5.6.5.5 Indirect impacts to fauna habitat as a result of alteration of fire regimes

The region has a hot semi-arid climate with hot summers and mild winters (Section 2.5.1) and is subject to frequent natural fires, often preceded by several seasons of above average rainfall (DEC 2010b). Controlled burning is conducted as part of pastoral activities as part of regional fire management programs.

Due to the increased presence of people and machinery in the area following development of the Proposal, there is an increased risk of accidental fires, which could affect fauna habitat on a local and regional scale.

A Bushfire Attack Level (BAL) assessment will be provided as part of the development application and approval process. This assessment will identify the appropriate BAL rating to be applied to the development to ensure that the risks associated with fire are appropriately managed. Appropriate fire breaks will be installed, as required, around Proposal infrastructure to manage the risk to people and infrastructure. Firefighting equipment will be maintained within light vehicles, earth moving equipment and buildings. Management procedures including hot work permits will be applied to minimise the risk of accidental fire. It is considered unlikely that an accidental fire will be generated by future use and development within the amendment area. In addition, a Bushfire Management Plan will be in place.

In the event of fire, the loss or degradation of fauna habitat from fire is likely to be localised and short-term in nature and would not be anticipated to adversely impact the environment at a regional scale given the open structure of the vegetation and locally and regionally common nature of the fauna habitats within the amendment area (Section 5.5.3).

5.6.5.6 Indirect impacts to fauna habitat as a result of alteration of habitat as a result of changes to coastal processes or hydrodynamic/hydrological regimes

Hydrodynamic regime

Loss of coastal habitat, such as roosting or foraging habitat for migratory birds, could potentially occur as a result of changes to the hydrodynamic regime due to the future development and associated infrastructure, leading to altered erosion or accretion patterns.

The shoreline at Heron Point adjacent to the amendment area was not found to represent key foraging or roosting habitat for migratory birds (refer Section 5.6.3.4 and Attachment 2J). Significant changes to the beach profile due to the future development and associated infrastructure are not expected, with potential changes limited to potential sand accretion to the north of the launchway and erosion of small perched beaches to the south (Figure 5-11, Attachment 2D). None of the areas potentially affected by sand accretion or erosion overlap with areas recorded as migratory bird foraging or roosting habitat (Attachment 2D, Attachment 2J).

No impacts to other fauna habitat are anticipated due to changes to coastal processes or hydrodynamic regimes.

Hydrological regime

Proposal infrastructure and associated surface water drainage features have the potential to result in localised changes surface water flows within and adjacent to the amendment area.

The region is often subjected to seasonal flooding from cyclones or heavy rainfall events between January and March. Depending on the local topography, vegetation communities have adapted to site conditions that will allow for survival through intermittent flooding. Based on modelling (Attachment 2Q), it is likely that some areas would be susceptible to flooding impacts as a result of changes to surface water flows associated with development of the Proposal, but the associated vegetation would be expected to recover, if an impact does occur, within 1-2 years (refer Section 5.4.5.5). Thus a long-term loss of fauna habitat, or change in the biological diversity and ecological integrity of fauna habitat, is not expected.

Proposed management measures applicable to protection of fauna habitat and species are provided in Table 5-30.

5.6.5.7 Indirect impacts to fauna habitat as a result of introduction of feral animals resulting in increased predation and competition

Establishment of infrastructure could result in an increase in abundance of feral animals within or adjacent to the amendment area. This can result not only in an increase in predation of native fauna, but also result in an increase in competition for food resources.

Appropriate site management, such as controlling and removing food waste, and securing access to potable/non-potable water, can effectively mitigate the risk.

It is not considered likely that development will result in introduction of new feral animal species to the area or an increase in abundance of feral animals. It is anticipated that appropriate operational management controls as part of a future development would be effective and will prevent an increase in the abundance of feral animals within the amendment area (Table 5-30).

5.6.6 Mitigation, Monitoring, and Predicted Outcome

The proposed mitigation measures to address potential impacts to terrestrial fauna as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-30.

The EPA objective '*to protect terrestrial fauna so that biological diversity and ecological integrity are maintained*' will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Ministerial approval for the proposed development would include conditions formalising the allowable impacts to fauna habitat within and adjacent to the proposed infrastructure footprint. The CEMP will include protocols and procedures for the monitoring and management of impacts to fauna and fauna habitat during the construction of onshore and coastal infrastructure, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). The OEMP will include protocols and procedures for the monitoring and management of impacts to fauna and fauna habitat during the operations phase of the Proposal, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). The OEMP will also address the management of waste and freshwater resources and site speed limits. A Bushfire Management Plan will also be prepared. The Decommissioning and Closure Plan (DCP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include mitigation measures for potential impacts during decommissioning and closure, and protocols for monitoring	<u>Zoning</u> The amendment area covers the area proposed for development. Development in the amendment area will be subject to development approval in accordance with LPS 4. Outside of the amendment area, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and can only be developed/used in a manner consistent with the purpose of the reserve. <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(o) the likely effect of the development on the natural environment or water resources and any means that are proposed to protect or to mitigate impacts on the natural environment or the water resource"; "(q) the suitability of the land for the development taking into account the possible risk of flooding, tidal inundation, subsidence, landslip, bush fire, soil erosion, land degradation or any other risk". <u>Development control</u> Special Use No. 10 is proposed to be inserted into Schedule 4 – Special Use Zones of LPS 4, and would include a number of conditions. One of the conditions permits rural style fencing, which could be used to prevent stock from accessing the development. Details of fencing would be submitted as part of a development application.	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> The fauna habitats identified within the amendment area are well represented locally and regionally. The six conservation significant fauna identified in the amendment area are marine and migratory bird species that use coastal habitat. Impacts on this habitat are low at a local and regional scale. Based on the above, the biological diversity and ecological integrity of terrestrial fauna will be maintained.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
following closure.		

Table 5-30: Proposed Mitigation Measures and Predicted Outcome for Terrestrial Fauna

5.7 KEY ENVIRONMENTAL FACTOR 7 – INLAND WATERS

5.7.1 EPA Objective

To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.

5.7.2 Policy and Guidance

A summary of the policy and guidance relevant to inland waters, and how these have been considered, is presented in Table 5-31.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors.
Environmental Factor Guideline – Hydrological Processes (EPA 2016s)	This guidance was consulted in the consideration of the environmental values dependent upon the current surface water and groundwater regimes and the potential impacts on hydrological processes.
Environmental Factor Guideline – Inland Waters (EPA 2018d)	Referred to in the determination of data requirements to support the development of the PER.
Identification and investigation of acid sulphate soils and acidic landscapes (DER 2015a)	Referred to in the assessment and identification of acid sulphate soils.
Treatment and management of soil and water in acid sulphate soil landscapes (DER 2015b)	Referred to in the treatment and management of identified acid sulphate soils as well as groundwater.

Table 5-31: Policy and Guidance Relevant to Inland Waters

5.7.3 Receiving Environment

A limited number of studies relating to Inland Waters have previously been undertaken within the region, as outlined in Table 5-32.

Additional site-specific studies, as listed in Table 5-32, were undertaken by various technical specialists, and are included in full within Attachment 2. They are also referred to, as appropriate, in the discussion on the assessment of potential impacts and proposed management measures.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
2007	SKM	Exmouth Floodplain Management Study
2014	Hyd2o	Exmouth Hydrological Study
Site-specific Studies		
2018	GHD	Bundle Fabrication Facility Surface and Groundwater Investigation

Table 5-32: Overview of Local and Regional Studies Relating to Inland Waters

5.7.3.1 Topography and Soils

The elevation of the amendment area ranges from about 25 m Australian Height Datum (mAHD) at the inland end to 0 mAHD at the coast and generally slopes down from the south west to the north east. Topographical data indicates the site drains internally, with a coastal dune preventing discharge to the ocean (GHD 2018b, Attachment 2Q).

The majority of the area is characterised by a series of parallel network dunes and residual sand plains made up of red brown to yellow quartz sand. The dunes are approximately 5 m in height and are stabilised by light vegetation comprising grasses and small shrubs. The dunes generally trend north north east to south south west (Attachment 2Q).

5.7.3.2 Acid Sulphate Soils

Acid Sulphate Soils (ASS) are naturally occurring soils, sediments and peats that contain iron sulphides that are generally found in a layer of waterlogged soil or sediment in low-lying land bordering the coast, or estuarine, saline or freshwater wetlands throughout Western Australia (DER 2015a).

ASS are benign in an anoxic state and do not pose a significant risk to human or environmental health. However, when these soils are disturbed or exposed to air, they can oxidise and produce sulfuric acid, iron precipitates and concentrations of heavy metals. Disturbing ASS has the potential to cause significant environmental and economic impacts (DER 2015a).

DWER maintain ASS risk maps (DWER 2016) for the State that show potential areas of ASS risk. Review of the risk maps in relation to the amendment area identified:

- Minor portions of the amendment area are mapped as Class 1 'High to Moderate' risk of ASS within 3 m of the natural soil surface.
- A minor portion of the amendment area along the coast is mapped as Class 2: 'Moderate to Low' risk of ASS within 3 m of natural soil surface with 'High to Moderate' risk of ASS beyond 3 m (DWER 2016). These areas correspond generally with supratidal mud flats.
- The surrounding landscape is mostly mapped as having no risk of ASS.

A targeted ASS investigation was undertaken to confirm the presence, or absence, of ASS within the amendment area. ASS risk mapping (DER 2014), and the proposed layout of infrastructure for the Proposal, was used as a guide to determine the ASS investigation sites.

Results from field tests (pH_F and pH_{FOX}) performed on all the soil samples obtained during the ASS investigation indicated that no samples were actual or potential ASS (MBS Environmental 2018b, Attachment 2T). Results from laboratory analysis of selected soil

samples indicated that net acidity was less than 0.005% (wet weight) and well below DER (2015a) criteria for ASS. In addition, the measured acid neutralising capacity (ANC) was found to be high and variable, ranging from 0.67 to 11% (wet weight), indicating capacity to neutralise any acidity.

5.7.3.3 Geology

The amendment area is located on the coastal plains within a minor syncline between Cape Range in the west and Rough Range in the south east. The amendment area site surface geology is typically residual sand plains forming longitudinal dunes, with intertidal flats (calcareous clay, silt and sand) and supratidal flats (calcareous clay, silt and sand with authigenic gypsum and salt) identified in the far north east of the amendment area along the coastal fringes (GSWA 1980).

The Cape Range foothills are located approximately 4 km west of the site and coincide with the proposed groundwater supply bores. Within this area, the surface geology is typically Exmouth Sandstone, and Bundera Calcarenite. Higher in the range, Trealla Limestone and Tulki Limestone are exposed (GSWA 1980).

5.7.3.4 Hydrogeology

Groundwater drilling has been completed at 20 locations to confirm a suitable groundwater supply for the Proposal (Attachment 2Q), and to support stygofauna investigations (Attachment 2N). A summary of the site geology and hydrogeological units is presented in Table 5-33.

Based on an interpretation of the surface geology, it is inferred that minor sandstone and calcarenite underlie the surface sands, with a succession of limestone beneath. Where saturated, the sandstone and limestone units are considered a regionally important aquifer and are currently utilised for Exmouth Town water supply, RAAF Base Learmonth water supply, together with various stock and domestic supply bores (Attachment 2Q).

Unit	Thickness (m)	Comment
Sand	0-3	Coastal dune sand. Present across the main amendment area at surface, thickest in the west, absent in the water supply area, and thin or absent in coastal flats. Generally not saturated.
Sandstone (Exmouth Sandstone)	5-20	An interbedded sequence of pale red to yellow sandstone, varying from well cemented to poorly cemented. Was found throughout the amendment area. In some areas, the sandstone was interbedded with more calcareous sediments. Some minor clay bands were also noted. The sandstone, where found in lower elevation areas, was found to be saturated and offered reasonable groundwater flow.
Calcarenite/ limestone (Bundera Calcarenite, and possibly Trealla Limestone in the west at depth).	> 40	An interbedded sequence of white to brown, well to poorly cemented calcarenite/limestone was found throughout the amendment area where drilling continued deep enough. Shell fragments and minor clays were noted, particularly in the western areas at depth. The calcarenite/limestone was found to be saturated and offered reasonable to good groundwater flow. *Note: The sandstone and calcarenite/limestone units are considered to represent a single connected aquifer, with no discernible separation between the two.*

Table 5-33: Summary of Lithologies Recorded during the Drilling Program (from GHD 2018b)

5.7.3.5 Groundwater

Groundwater within the limestone aquifer generally flows eastwards, from Cape Range (source of groundwater recharge) towards Exmouth Gulf where it discharges (DoW 2011).

Due to the highly permeable nature of the limestone aquifer, the saline interface is known to extend up to 5 km inland. The freshwater aquifer thickens to the west, with distance from the coast, and is known to be up to 150 m in depth, but the aquifer permeability may also decrease with aquifer thickness (Attachment 2Q).

The shallowest depth to groundwater is found in the low lying bores located closest to the coast (e.g. S04, S05, and S06 (Figure 5-17)) where groundwater occurs at a depth of less than 1.5 mbgl, equivalent to less than 0.5 mAHD. Towards the western (inland) end of the amendment area, groundwater is found to occur at a depth of between 12 and 17 mbgl depending on location.

5.7.3.6 Surface Water

The floodplain has very few defined flow paths based on aerial imagery and topographical data, making it difficult to determine exact catchment boundaries. These ephemeral watercourses are expected to flow only during, and for short period following, significant rainfall events. Catchment areas were delineated using CatchmentSim v3.5 software and are shown in Figure 5-22. Three catchments with associated areas were delineated as follows:

- Catchment A – 108.3 km^2.
- Catchment B – 36.9 km^2.
- Catchment C – 59.8 km^2.

5.7.4 Potential Impacts

Future development within the amendment area has potential to directly and indirectly impact inland waters. Table 5-34 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Operations	Impacts to natural surface water flows and contamination of surface water as a result of placement of infrastructure
	Alteration of surface water flows that may result in changes to natural erosion and deposition patterns which could increase the turbidity of surface water
	Impacts to surface and groundwater resources through disposal of brine and treated wastewater
	Impacts water quality through exposure or disturbance of acid sulphate soils
	Alteration of the hydrology of the area from groundwater abstraction and reinjection of treated wastewater
	Alteration of groundwater volumes and quality, due to groundwater abstraction; and reinjection of treated wastewater
	Impacts to any wetlands, groundwater dependent ecosystems, and subterranean fauna, as a result of groundwater drawdown and changes to groundwater quality

Table 5-34: Potential Impacts to Inland Waters from development of the Proposal

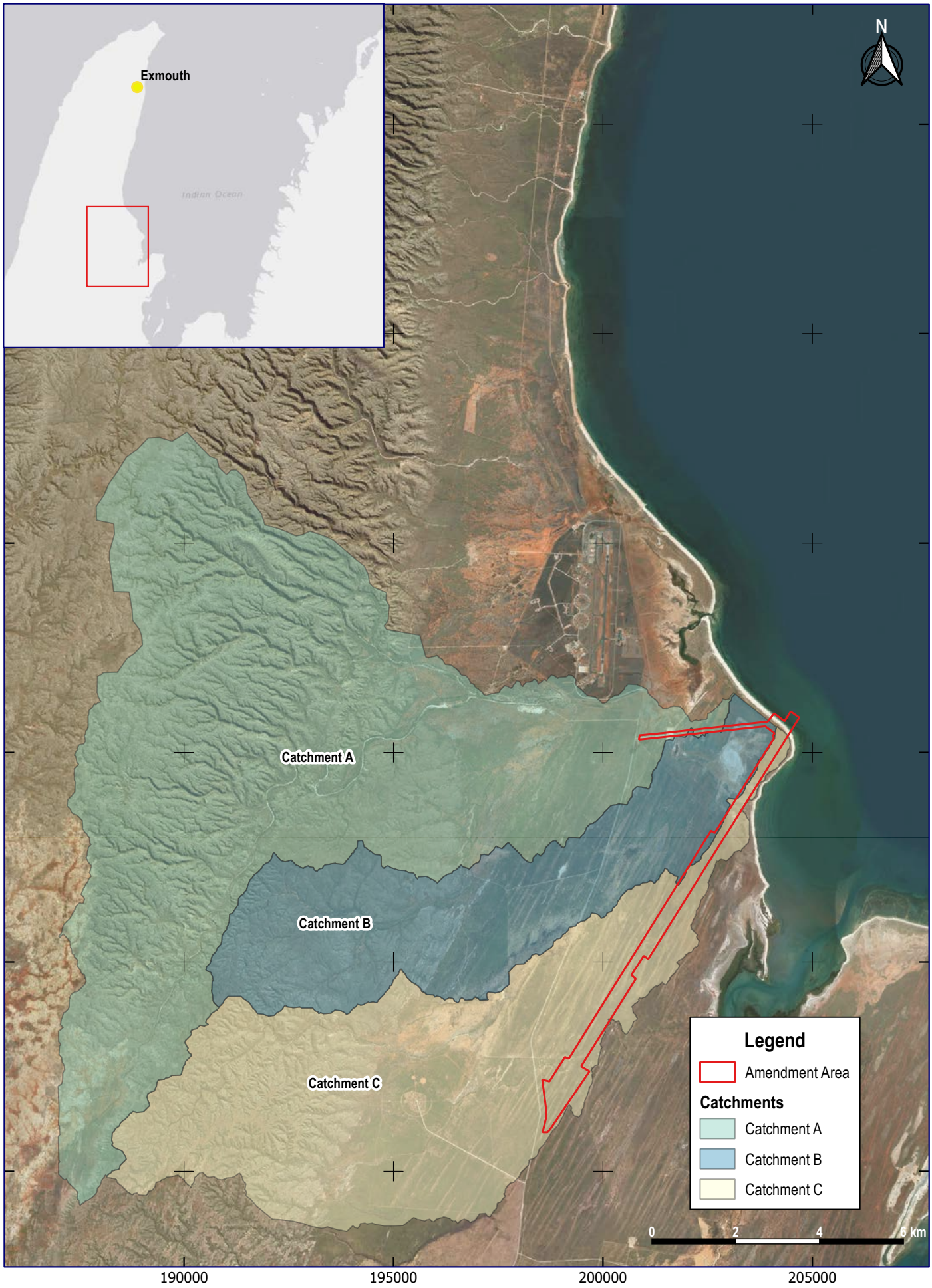

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Figure 5-22: Surface Water Catchment Areas in Relation to the Amendment area

Shire of Exmouth

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5.7.5 Assessment of Impacts

5.7.5.1 Impacts to natural surface water flows and contamination of surface water as a result of placement of infrastructure

The assessment of impacts has been completed in the context of the Proposal.

Current (baseline) and post-development surface water flow patterns were modelled using a rain-on-grid 2D approach (Attachment 2Q). Modelling scenarios included:

- 10-year average recurrence interval (ARI) event, which was used to design the surface water infrastructure such as culverts, channels and floodways.
- 50-year ARI event to determine the potential risks of climate change and associated impacts to infrastructure.
- 100-year ARI event, which was used to design flood damage protection measures, to ensure damage to infrastructure and discharge of chemicals does not occur.
- Probable Maximum Precipitation (PMP) Design Flood, which was used to demonstrate how the Proposal could modify flood behaviour following a worst-case flood event.

The following surface water drainage management measures were included within the post-development modelling scenarios:

- A culvert beneath the proposed infrastructure associated with the Proposal (Figure 5-23) to allow surface water to flow north east to south west beneath the track, along the existing flow path.
- An open drain running to the north east, adjacent to the proposed infrastructure (Figure 5-23), to convey surface flows to a natural depression where ponding is expected to occur under baseline conditions (Attachment 2Q).

A comparison of the existing and future case modelling for a 100-year ARI event is presented in Figure 5-23. Note that within Figure 5-23 the change in water levels was determined using existing case and subtracting the future case, so areas of increased flood levels are represented by negative values while areas experiencing reduced flood levels are represented by positive values. Modelling showed that there is very little change to maximum water levels as:

- Water is allowed to pass under the proposed infrastructure through the culvert.
- The open drain conveys flows along the proposed infrastructure alignment, ending up in the same end location as current flows.

The following residual impacts were noted:

- A general decrease in peak flood levels on the eastern side of the Bundle track.
- An expected marginal increase in flooding in the natural depression caused by additional inflow from the open drain.

Other than these points, surface water flow patterns are expected to remain similar to baseline flow patterns, and changes to flow velocities are not expected to alter any natural scour or sediment deposition characteristics of the area (Attachment 2Q). Contamination of surface water due to the placement of infrastructure is not expected as no acid sulphate soils were recorded within the amendment area (refer Section 5.7.3.2) and the scour or sediment deposition characteristics of the area are not expected to change.

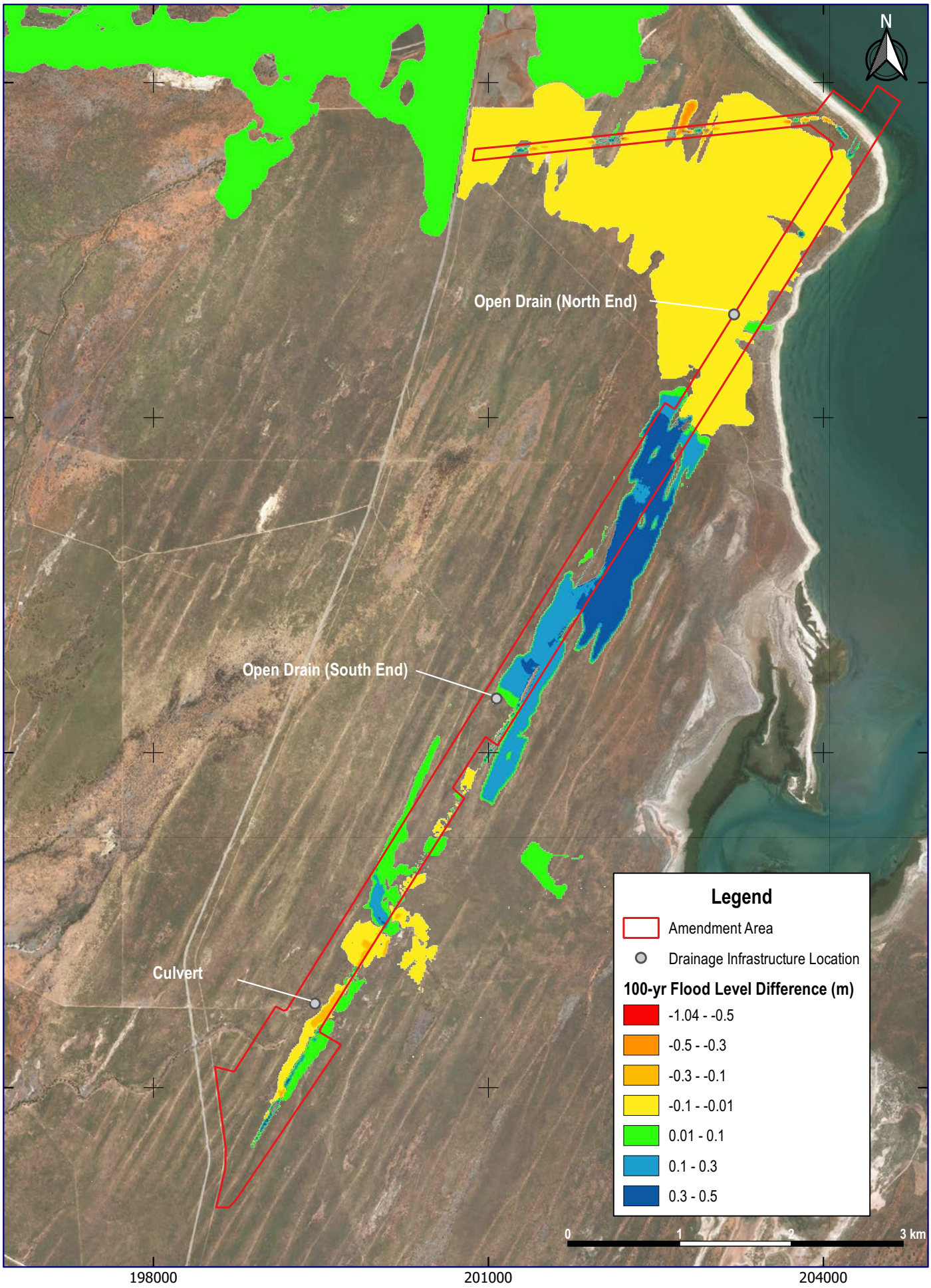

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Figure 5-23: Modelled Changes to Surface Water Flood Levels (100 year ARI event)

Shire of Exmouth

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5.7.5.2 Alteration of surface water flows that may result in changes to natural erosion and deposition patterns which could increase the turbidity of surface water

Changes to surface water flows are not expected to lead to changes in erosion and deposition pattrerns. Cut-off drains leading to sediment basins will control suspended sediment loads.

Significant impacts to surface water quality as a result of future development within the amendment area are not expected.

5.7.5.3 Impacts to surface and groundwater resources through disposal of brine and treated wastewater

All blackwater will be tankered to the Water Corporation's Exmouth Wastewater Treatment Plant (WWTP) for treatment. An estimated maximum greywater (wastewater from showers plus wash basins in ablution/shower block areas) 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 within the amendment area (Figure 2-1). It is estimated that the treated greywater total nitrogen (TN) and total phosphorus (TP) concentrations will be 4 mg/L and 2 mg/L (GHD 2018b). These nutrient concentrations are relatively low, being comparable with those in recycled water produced by a WWTP designed to achieve a high level of nutrient reduction.

Nutrients (nitrogen and phosphorus) in treated greywater will be managed by following guidelines provided by Department of Water (DoW) Water Quality Protection Note 22 (WQPN 22) 'Irrigation with nutrient-rich wastewater' (DoW 2008). The proposed land disposal area consists of a deep profile of calcareous soil, sediments and weathered limestone (typically 15 m to groundwater) with a very high phosphorus buffering capacity, as confirmed by a measured value of 100 units for the Phosphorus Buffering Index (PBI). These conditions indicate a nutrient risk rating of Category D (low) according to criteria presented in the WQPN 22.

Table 5-35 compares the estimated nitrogen and phosphorus loadings to the guidelines for Category D (from Table 2 of WQPN 22). The calculated loading were based on discharge of 6,560 L/day of treated greywater containing 4 mg/L and 2 mg/L of total nitrogen and phosphorus, respectively, to 1.5 ha of land (vegetated by native *Spinifex* and *Acacia* shrubs). Risks of nutrient enrichment of groundwater by leaching from the spray field are considered extremely low. Most of the applied wastewater (average application rate 0.44 mm/day) will be lost by evaporation and uptake by plants. The average annual nitrogen load (6.4 kg/ha/yr) is similar to plant uptake calculated for growth of 1,000 kg/ha of *Spinifex* (Grigg *et al*. 2008) or 2,000 kg/ha of *Acacia* (He 2012). The proposed phosphorus load (3.2 kg/ha/yr) is substantially less than plant uptake calculated for growth of 1,000 kg/ha of *Spinifex* (Grigg *et al*. 2008) or 2,000 kg/ha of *Acacia* (He 2012).

Parameter	Proposed Land Discharge	WQPN 22 Guideline (Category D)	Comments
Treated Water Application Rate	0.44 mm/day 160 mm/yr	50 mm/week (32 weeks/yr) 1,600 mm/yr	10% of maximum discharge rate
Inorganic N (maximum load)	6.4 kg/ha/yr (as total N)	480 kg/ha/yr	1.3% of maximum load
Inorganic N (maximum concentration)	4 kg/L (as total N)	30 mg/L	13% of maximum concentration
Reactive P (maximum load)	3.2 kg/ha/yr	120 mg/kg/yr	2.7% of maximum load
Reactive P (maximum concentration)	2 mg/L (as total P)	7.5 mg/L	27% of maximum concentration

Table 5-35: Comparison of Proposed Nutrient Loads and Concentrations to Guideline Values

Given the low nutrient loads, low wastewater volumes and lack of defined drainage channels within the vicinity of the proposed sprayfield, the risk of impact to surface water or groundwater quality is considered negligible.

The disposal of brine is not a component of the Proposal.

5.7.5.4 Impacts water quality through exposure or disturbance of acid sulphate soils

No acid sulphate soils were recorded within the amendment area (refer Section 5.7.3.2) and as such no impacts to water quality through exposure or disturbance of acid sulphate soils are expected.

5.7.5.5 Alteration of the hydrology of the area from groundwater abstraction and reinjection of treated wastewater

The current 'Rural' zone classification is compatible with the use and development of land for a borefield. State Planning Policy 2.5 Rural Planning recognises that rural land is used for a wide variety of purposes including "water supply". Bores are commonly used in pastoral areas for providing livestock with access to water. Borefields are already existing in the Shire of Exmouth on Rural zoned land.

Groundwater abstraction within or adjacent to the amendment area is not proposed, with the proposed borefield for the Proposal located to the west of the Minilya-Exmouth Road.

The reinjection of treated wastewater within or adjacent to the amendment area is not proposed.

5.7.5.6 Alteration of groundwater volumes and quality, due to groundwater abstraction and reinjection of treated wastewater

The current 'Rural' zone classification is compatible with the use and development of land for a borefield. State Planning Policy 2.5 Rural Planning recognises that rural land is used for a wide variety of purposes including "water supply". Bores are commonly used in pastoral areas for providing livestock with access to water. Borefields are already existing in the Shire of Exmouth on Rural zoned land.

Groundwater abstraction within or adjacent to the amendment area is not proposed, with the proposed borefield for the Proposal located to the west of the Minilya-Exmouth Road.

The reinjection of treated wastewater within or adjacent to the amendment area is not proposed.

5.7.5.7 Impacts to any wetlands, groundwater dependent ecosystems, and subterranean fauna, as a result of groundwater drawdown and changes to groundwater quality

No wetlands or groundwater dependent ecosystems occur within or adjacent to the amendment area. Stygofauna were not collected from the bores in the sand plain towards the western (inland) end of the amendment area (Figure 5-18, Attachment 2N).

The current 'Rural' zone classification is compatible with the use and development of land for a borefield. State Planning Policy 2.5 Rural Planning recognises that rural land is used for a wide variety of purposes including "water supply". Bores are commonly used in pastoral areas for providing livestock with access to water. Borefields are already existing in the Shire of Exmouth on Rural zoned land. Groundwater abstraction within or adjacent to the amendment area is not proposed, with the proposed borefield for the Proposal located to the west of the Minilya-Exmouth Road.

The reinjection of treated wastewater within or adjacent to the amendment area is not proposed. The surface disposal of small volumes of treated wastewater is not expected to lead to a change in groundwater quality.

5.7.6 Mitigation and Predicted Outcome

The proposed mitigation measures to address potential impacts to inland waters as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-36.

The EPA objective '*to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*' will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
Ministerial approval for the proposed development would include conditions limiting the extent of direct and indirect impacts to inland waters. The CEMP will include protocols and procedures for the management of impacts to surface water flows and quality during the construction of onshore infrastructure, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). The OEMP will include protocols and procedures for the management of impacts to surface water flows and quality during the operations phase of the Proposal, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). The OEMP will also address the storage and handling of chemicals and the management of waste and freshwater resources. Chemical storage and handling is controlled under various legislation including: • Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007. • Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids.	<u>Development Control</u> A development application would be required to address the 'Special Use No. 10' conditions. The Shire of Exmouth can impose conditions of approval on the development application. As part of a development application, details for potable and non-potable water supply, wastewater treatment, and stormwater management are to be addressed to the specification and satisfaction of the Shire of Exmouth. <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(o) the likely effect of the development on the natural environment or water resources and any means that are proposed to protect or to mitigate impacts on the natural environment or the water resource". Development would therefore have due regard to State Planning Policy 2.9 Water Resources (SPP 2.9), which enables the local government to require development applications to take account of the total water cycle management and water-sensitive design principles, and ensure that the development is consistent with current best management practices and best planning practices for the sustainable use of water resources, particularly stormwater.	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> After installation of surface water drainage measures, surface water flow patterns are expected to remain similar to baseline flow patterns. Given the absence of ASS, appropriate storage and handling of chemicals and the small wastewater discharge volumes, no changes to surface water quality are expected. Given the small wastewater discharge volumes, low nutrient concentrations and the depth to groundwater, no changes to groundwater quality are expected. The EPA objective for inland waters will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
• Australian/New Zealand Standard 1596:2014 The storage and handling of LP Gas. • Australian Standard 4332-2004 The storage and handling of gases in cylinders. The Decommissioning and Closure Plan (DCP), required to be prepared as part of the Public Environmental Review (PER) for the Proposal (under Assessment number 2208), will include mitigation measures for potential impacts during decommissioning and closure, and protocols for monitoring following closure.	State Planning Policy 2.9 Water Resources Under Section 2.1 of SPP 2.9, 'water resources' refers to "wetlands, waterways (rivers, streams and creeks), floodplains, foreshores, estuaries, groundwater aquifers and the wider marine environment". A general policy measure of SPP 2.9 is to aim to prevent or where appropriate mitigate against adverse effects on water quality and as a minimum, development should aim to maintain water quality and ensure water quantity is compatible with the receiving waters. SPP 2.9 can be implemented through the LPS 4 and day-to-day consideration of development proposals and applications, together with the actions and advice of agencies.	

Table 5-36: Proposed Mitigation Measures and Predicted Outcome for Inland Waters

5.8 KEY ENVIRONMENTAL FACTOR 8 – SOCIAL SURROUNDINGS

5.8.1 EPA Objective

To protect social surroundings from significant harm.

5.8.2 Policy and Guidance

A summary of the policy and guidance relevant to social surroundings, and how these have been considered, is presented in Table 5-37.

Policy/Guidance	Consideration for Proposal
Statement of Environmental Principles, Factors and Objectives (EPA 2016c, 2018c)	Referred to in the identification and assessment of Preliminary Key Environmental Factors.
Environmental Factor Guideline – Social Surroundings (EPA 2016t)	This guidance was consulted in the consideration of potential impacts from the Proposal to the social surroundings, as a result the mitigation hierarchy has been applied. The guidance states that '*for social surroundings to be considered in EIA, there must be a clear link between a Proposal or scheme's impact on the physical or biological surroundings and the subsequent impact on a person's aesthetic, cultural, economic or social surroundings'*. This chapter of the ER and the relevant supporting studies (Visual Impact Assessment and Social Impact Assessment) show the link between the Proposal and associated impacts.
Guidance for the Assessment of Environmental Factors – Assessment of Aboriginal Heritage (EPA 2004b)	Provides guidance on the process of Environmental impact assessment of Aboriginal Heritage. Referred to in the development of Aboriginal Heritage surveys and approvals. Section 5.8.3.3 provides a summary of the Heritage survey.
WA Aboriginal Heritage Act 1972 (AHA)	An act to make provision for the preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants.
Aboriginal Heritage Due Diligence Guidelines (DAA & DPC 2013)	All Aboriginal sites are protected by the AHA, the due diligence guidelines assist land users to be more aware of how their activities could impact Aboriginal sites. These guidelines were referred to in the determination of the work required to understand the potential impacts to Aboriginal heritage.

Policy/Guidance	Consideration for Proposal
Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design (Western Australian Planning Commission 2007)	Used in the development of the Landscape Visual Impact Assessment (LVIA) for the Proposal.
International Principles for Social Impact Assessment 2003 (Vanclay 2003) and Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects (Vanclay *et al.* 2015)	Used in the development of the Social Impact Assessment study to understand the social setting, potential impacts of the Proposal on the community and to describe potential mitigation measures.

Table 5-37: Policy and Guidance Relevant to Social Surroundings

5.8.3 Receiving Environment

A Social Impact Assessment (SIA) was undertaken to identify the key social risks, opportunities, and impacts that may occur as a result of the amendment and associated development of the Proposal (Attachment 2S). The SIA process involved three main steps:

- Social Scan – a high level review of the social characteristics, trends, and emerging issues within the potentially affected communities.
- Social Risk Rating– identification and ranking of the potential social risks and impacts on communities and the development of mitigation measures for each identified significant social risk or impact as well as opportunity realisation.
- Social Impact Assessment – assessment and discussion of the significance of potential social impacts (positive or negative) and recommended management measures.

The following sections describe the outcomes of the SIA.

5.8.3.1 Regional Surroundings

A limited number of publicly available social surroundings studies have been undertaken within the region, as outlined in Table 5-38.

Additional site-specific studies, as listed in Table 5-38, were undertaken by various technical specialists, and are included in full within Attachment 2.

Survey Date	Researcher/Consultant	Study Description/Title
Regional Studies		
1993	Martinick and Associates	Aboriginal site survey Learmonth area
2000	Morse, K. & Jackson, G.	An aboriginal archaeological assessment of Cape Seafarms' proposed prawn farm development, Heron Point, Cape Range Peninsula.
2008	Cooperative Research Centre for Sustainable Tourism.	Socio-economic impacts of sanctuary zone changes in Ningaloo Marine Park.
Site-specific Studies		
2018	SJC Heritage Consultant	Aboriginal Heritage Survey – Proposed Monitoring Bores
2019	360 Environmental	Landscape Visual Impact Assessment (Attachment 2R)
2019	360 Environmental	Social Impact Assessment (Attachment 2S)

Survey Date	Researcher/Consultant	Study Description/Title
2019	ACIL Allen Consulting	Economic Impact of Learmonth Fabrication Facility
2019	SJC Heritage Consultants Pty Ltd	Aboriginal Heritage Survey – Project Envelope

Table 5-38: Overview of Local and Regional Studies relating to Social Surroundings

The Gascoyne region covers an area of approximately 138,000 km^2 representing about 5.5% of the state 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 indigenous representation on a statewide basis (3.1%).

Most of the Gascoyne working population is employed in accommodation (primarily tourism-related), followed by supermarket and grocery stores, local government and hospitals (ABS 2016b). Other employing industries include tourism, fishing, mining, horticulture and pastoralism. Opportunities are being created for fly-in fly-out mining jobs from Carnarvon to the West Pilbara as well as indigenous and eco-tourism in inland and coastal areas of the Gascoyne (GDC 2019b). There is a labour shortage in the majority of the industries in the Gascoyne including seasonal workers for the horticultural, fishing and tourism industries and qualified tradespersons for small businesses (GDC 2019b).

The Gascoyne economy is supported by the tourism, mining, agriculture and construction industries; with tourism contributing the largest to the region's economy (DPIRD & GDC 2018). The Gascoyne Development Commission (GDC) aims to expand the tourism industry through investment in eco-tourism (flora and fauna, geology, fossils, artesian hot springs, bird watching), adventure tourism (scuba diving, surfing, hiking, four-wheel driving), cruise shipping, fishing and station stays.

Pastoralism is the predominant land use in the Gascoyne region, contributing to 2% of the State's gross total domestic product and 27% of the region's income (GDC 2019b). The Gascoyne's physical location gives it a comparative advantage – being adjacent to major mineral and energy regions, offshore oil and gas fields and associated investment pipelines as well as proximal to Asia. According to the GDC (2018), Exmouth has been an important hub for oil and gas production in the Carnarvon Basin, leading to migration-based population growth and rising incomes at a faster rate than the rest of the region. This has been realised as an investment opportunity for long-term development of mineral and energy resources in the Gascoyne. Key outcomes and priorities for the region identified by the GDC's *Gascoyne Regional Development Plan 2010-2020* include establishment of new industries and services, continued expansion of the tourism industry, a skilled Gascoyne community and a diversified and expanded mining industry (GDC 2010).

The large Gascoyne coastline attracts about 11% of the State's recreational fishers and supports three major fishing competitions including Gamex in Exmouth, Shark Bay Fishing Fiesta and Carnar-fin in Carnavon (GDC 2019b). Sport plays a significant part of the Gascoyne community with over 140 sporting clubs and recreational facilities in the region.

Motorsports such as the Gascoyne Dash desert enduro race and the Carnarvon Speedway Club attract many locals and visitors to racing events.

The Shire of Exmouth 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 population in Exmouth triples due to short-term or seasonal visitors (Shire of Exmouth 2018).

The highest employing industries in Exmouth are accommodation, light engineering and construction. Tourism has now become 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 – Exmouth 2030* was the need for greater full-time employment opportunities. Additionally, the community would like to see in the next ten years a stronger and more diverse local economy enabling year-long employment opportunities (Shire of Exmouth 2018). The Social Impact Assessment undertaken for the Proposal provides a more detailed social setting (Attachment 2S).

5.8.3.2 Natural and Historical Heritage

The Exmouth region's history is embedded in defence and pastoralism. Dutch sailors made the first recorded landing on the Ningaloo Coast in 1618 near the tip of the North West Cape. Since then, pearl farmers visited the region from Broome and a number of pastoralists operated sheep stations along the coastline.

In the early 1940s the United States (US) Navy established a submarine base under the code name Operation Potshot which soon became a refuelling facility for submarines. Operation Potshot included the establishment of a landing field on the western shore of Exmouth Gulf. In the 1950s, this became the RAAF Base Learmonth. The Potshot Monument has now been established as a historical attraction (Ningaloo Visitors Centre 2018a). In 1963, an agreement between the United States (US) and Australian government led to the establishment of the Harold E. Holt Very Low Frequency (VLF) communication station at the tip of the North West Cape. As a result, the town of Exmouth was established to support the operations of the facility. In 1992 the US and Australian defence force military presence was withdrawn. This triggered the development of Exmouth and Ningaloo Coast as an eco-tourism destination, with tourism still being the largest driver of the Shire's economy (Ningaloo Visitor Centre 2018a).

Other historical attractions within the Shire include the Solar Observatory, the Navy Pier, the Wreck of *SS Mildura* (a cattle ship from the Kimberley region wrecked during a cyclone in 1907), and the Vlamingh Head Lighthouse.

5.8.3.3 Aboriginal Heritage and Culture

In Australia the *Native Title Act 1993* and *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provide for the recognition and protection of native title rights of Aboriginal people who have maintained a traditional connection to their land and waterways since sovereignty. One registered Native Title claim exists across the Site: Gnulli WC1997/028 (DAA 2019). This Native Title claim covers approximately 82,708 km^2 of land and sea in the Yamatji Region.

The Gnulli Native Title Claim stretches from Wooramel River to North West Cape and Exmouth Gulf, and is comprised of three groups – the Ingaarda-Teddei, the Baiyungu and the Thalanyji peoples (SJC Consultants 2019). Anthropologists place the Ingaarda-Teddei, as occupying land south of the Gascoyne River and the Baiyungu and Thalanyji peoples living north of the Gascoyne. Several historical accounts (e.g. Steffano Manuscript) of the region provide an indication of the ways of life for the three indigenous inhabitant groups of the North West Cape (SJC Consultant 2019). Their staple diet being fish caught by the men, using nets (made from grass trees) or spears and sometimes using stone-walled tidal traps. Women foraged for various plant foods and seeds and were responsible for collecting water (carried in wooden bowls and large sea shells) and firewood. Their diets were supplemented by turtles (mainly eggs) and shellfish, and very occasionally dugong (SJC Consultant 2019). Anthropological accounts of the North West Cape peninsula told of 'coast-frequenting people', venturing out to sea on rafts of mangrove sticks and living amongst mangroves on the eastern shore of the Gulf (SJC Consultant 2019).

In Western Australia, the *Aboriginal Heritage Act 1972* (AHA) protects places and objects customarily used by, or traditional to, the original habitants of Australia. A register of such places and objects is maintained under the AHA however all sites are protected under the AHA whether they are registered or not.

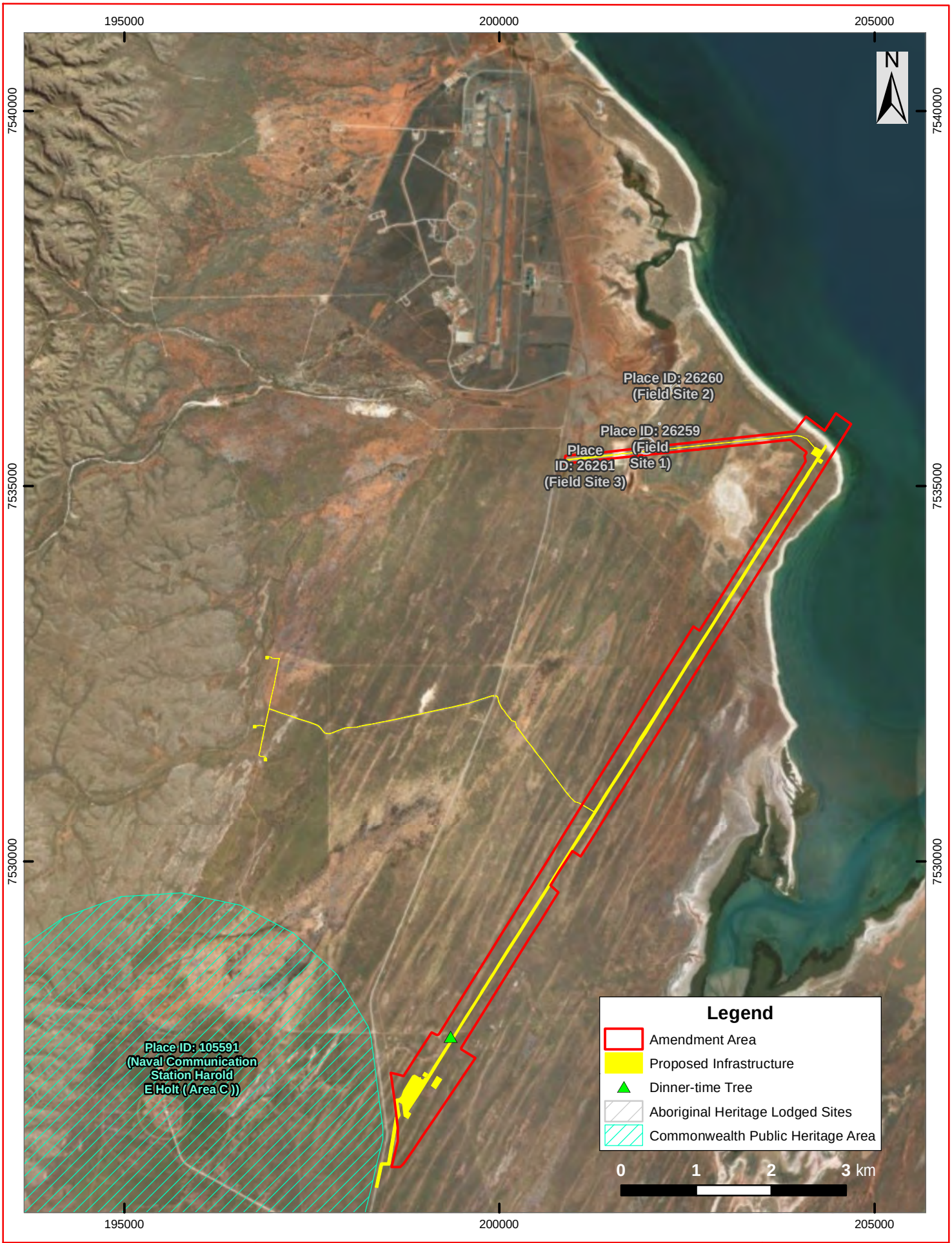
A desktop review of the DPLH Aboriginal Heritage Inquiry System (AHIS) identified no Registered Aboriginal sites and 4 lodged Aboriginal Sites partially within or adjacent to the amendment area (Table 5-41) (Figure 5-24) (DPLH 2019).

Site ID	Name	Status	Type	Distance from Amendment area
26259	Field Site 1	Lodged	Artefacts/Scatter, Shell	Partially within extent of the Site
26260	Field Site 2	Lodged	Artefacts/Scatter, Shell	687m
26268	CSF Isolated Find	Lodged	Other: 3 Isolated artefacts	280m
26261	Field Site 3	Lodged	Artefacts/Scatter, Shell	20m

Table 5-39: Registered Aboriginal Heritage Sites

The four sites are 'Other Heritage Places' that are recorded in the vicinity of Wapet Creek. These are listed as Lodged meaning they have been reported but their significance has not been assessed by the Aboriginal Cultural Materials Committee (SJC Consultants 2019). It is understood they were discovered as part of fieldwork for the Cape Seafarms project.

Department of Planning, Lands and Heritage (DPLH) records show two previous heritage surveys have been carried out in the vicinity of Heron Point; Martinick (1993) and Morse and Jackson (2000). The Martinick (1993) survey covered the proposed footprint for a pipeline fabrication project, located to the north and east of the amendment area. The Morse and Jackson (2000) survey examined the site of the Cape Seafarms Project between Wapet Creek and Point Heron.



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Original Size: A4
Aerial Photo: ESRI
Grid: GDA 94/ MGA Zone 50

Notes: Data sourced from Subsea 7 (2019), DPLH (2019)

Exmouth

Figure 5-24: Heritage

Subsea 7 has had ongoing engagement with the Yamatji Marlpa Aboriginal Corporation (YMAC), acting for the Gnulli Native Title Claim Group (Gnulli NTCG) throughout the development of the Proposal. On 12 December 2017 Subsea 7 obtained an Infrastructure Heritage Agreement with YMAC, acting for the Gnulli NTCG. In accordance with the agreement, two Aboriginal heritage surveys were undertaken for sites of archaeological and ethnographic significance, with representatives of the Gnulli NTCG. The first survey was undertaken in March 2018 for the proposed clearing (by Subsea 7) of tracks and drill pads for a proposed groundwater and stygofauna monitoring programme. No sites of archaeological significance were recorded by the heritage survey team (SJC Consultants 2019). The heritage survey team identified concerns regarding dust management during development within the amendment area and reiterated the importance of staged and minimal clearing (Steve Corsini pers comm. 2019).

The second Aboriginal heritage survey took place in early February 2019, surveying the amendment area. No archaeological or ethnographical sites, as defined under Section 5(a), (b) or (c) of the AHA, were recorded within the amendment area (SJC Consultants 2019).

The surveys undertaken on behalf of Subsea 7 identified one previously recorded archaeological site (Field Site 2). Another Morse site, Field Site 1, previously described as 'spread over 200 m north-south by 44 m east-west and containing marine shell, emu eggshell and stone artefacts' (Morse and Jackson 2000), appears to have been destroyed by earthwork activities associated with the abandoned fish farm (SJC Consultants 2019).

The amendment area is said to be important as a breeding and nesting area for Emus, and several varieties of edible plant foods occur in the region, though none were recorded during the heritage surveys (Steve Corsini pers comm. 2019).

The Heritage Survey team identified several matters for consideration during development within the amendment area (Steve Corsini pers comm. 2019):

- The possibility of artefacts to emerge in the more mobile soils once clearing works commence allowing wind to blow sand away.
- Maintaining public access to Heron Point.
- Maintaining public access to the Bay of Rest lagoon.
- Impacts to terrestrial wildlife, particularly Emus, due to habitat loss or restriction of movement due to fences.
- Potential impacts on marine life.

Additionally, a tree, now referred to as the 'Dinner Time Tree' within the amendment area, was identified by the group and it was requested that it not be disturbed (Figure 5-24).

5.8.3.4 Local Surroundings

The amendment area is located within Lots 233-235 and 1586 within the Shire of Exmouth Local Government Area and is approximately 35 km south of the Exmouth Townsite.

The amendment area is located on Crown Land and is subject to the 'Exmouth Gulf' Pastoral Lease, which has a term of 39 years, 3 months, 1 day that commenced on 1 July 2015. The Exmouth Gulf Pastoral Lease underlies Lots 233 and 1586.

There are no sensitive receptors in proximity to the amendment area. The Exmouth Gulf Station homestead is 5 km south east of the fabrication shed and the Minilya-Exmouth Road is approximately 500 m to the west. The community has reported that the Heron Point area

is used for recreational four-wheel driving, camping and fishing via various access tracks across the Exmouth Gulf Station. Heron Point and its immediate surrounds is not a gazetted or a Shire approved camping site.

5.8.3.5 Land and Recreation Uses and Amenity Values

The Exmouth region is located within the Western Australian Planning Commission's (WAPC) Gascoyne Planning Region and is subject to the strategic regional land-use plan – *The Ningaloo Coast Regional Strategy Carnarvon to Exmouth* (WAPC 2004) (Ningaloo Coast Regional Strategy).

Topography, Soil, and Vegetation

The amendment area is located in the Cape Range subregion of the Carnarvon Bioregion. The Cape Range forms part of the Exmouth peninsula with a rugged topography. The Range is bordered on the west site by the Indian Ocean and a narrow continental shelf that developed the Ningaloo fringing reef; the eastern side is the shallow Exmouth Gulf. The amendment area is relatively flat to gently sloping with the elevation ranging from approximately 25 m Australian Height Datum (AHD) inland to 0 m AHD to the coast, sloping from the south west to the north east (GHD 2017a). A drainage line runs through the south west of the amendment area.

The Carnarvon bioregion is composed of quaternary alluvial, aeolian, and marine sediments overlying Cretaceous strata. Cape Range forms the northern part of the Carnarvon Basin with rugged tertiary limestone ranges and extensive areas of red aeolian dunefield (CALM 2002). Vegetation comprises *Triodia* (spinifex) hummock grasslands with sparse Eucalyptus trees and shrubs; tidal mudflats in sheltered bays of Exmouth Gulf support extensive mangroves; beach dunes with Spinifex communities and an extensive mosaic of saline alluvial plains with samphire and saltbush low shrublands along the eastern side of the Gulf (DPaW 2002). The vegetation across the amendment area is typical of the Carnarvon bioregion and consists mostly *Acacia gregorii* low open shrubland over *Triodia epactia* closed grassland (Attachment 2K).

The amendment area comprises various pastoral access tracks and previously cleared areas in the northern sections as a result of the Cape Seafarms Project (refer Section 2.5.11).

Landforms

Landforms and landscape character units across the region were characterised and assessed (Attachment 2R). Unlike a Landscape Character Unit (LCU), a Land System is a classification system that excludes land uses and other human activities. The Land Systems that make up the majority of the region are the Range and Cardabia systems (DAFWA 2012), consisting of Hills/Ranges and Plains. Landforms in the region can be grouped by the following dominant landform types:

- Hills and Ranges (45.78%).
- Dunes (23.81%).
- Flats (13.62%).
- Plains (16.19%).
- Slopes and Plains (0.6%).

The amendment area is located in the Dune landform (Cardabia System) (Attachment 2K).

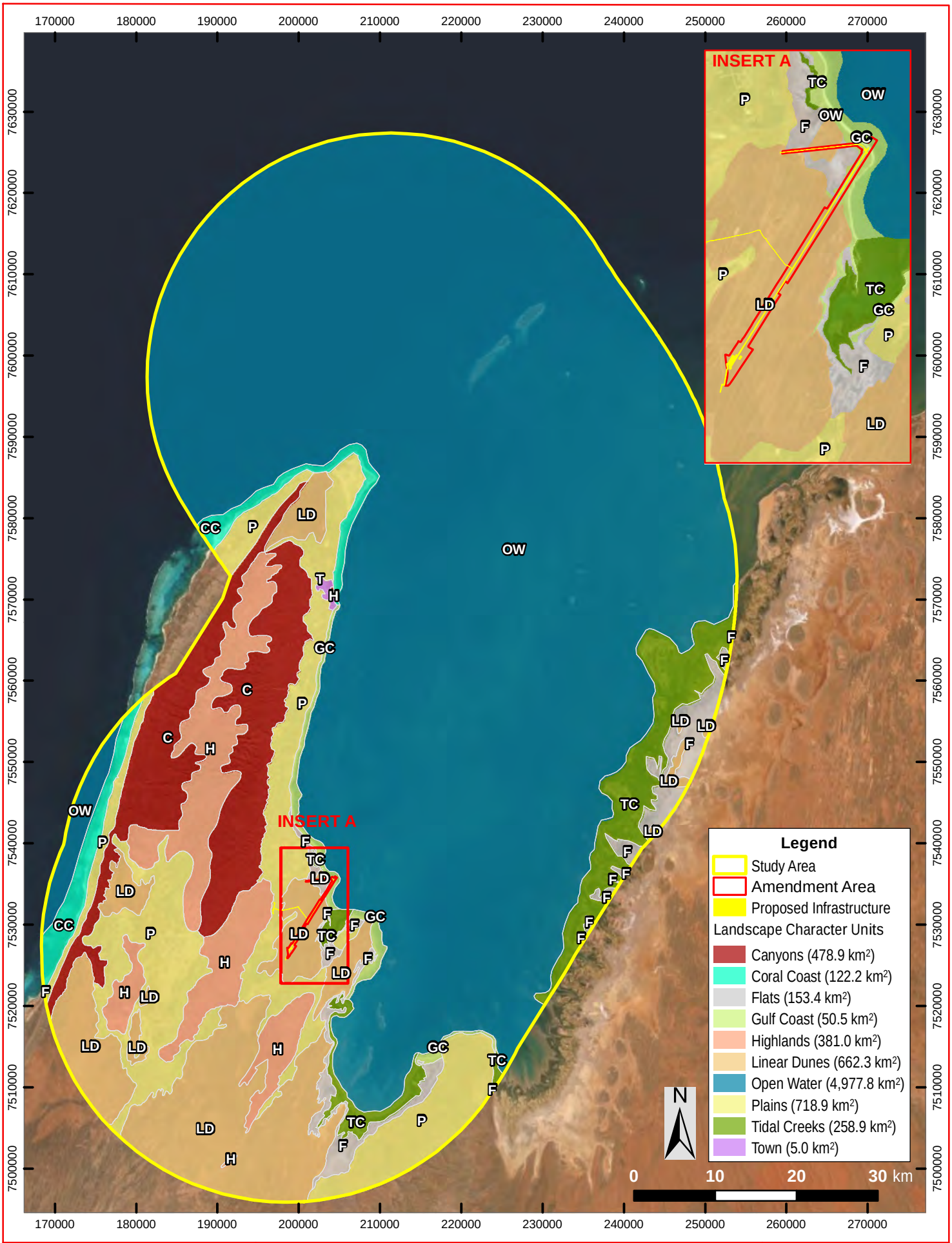
Landscape Character Units

Landscape Character is typically defined by the combination of physical/environmental elements and aesthetic elements and socio-cultural elements. While it is possible to define the former using data available on soil, geology, vegetation etc., the latter can only be defined through consultation and first-hand experience. Previous landscape and seascape assessments carried out in the area were also used to help define landscape character of coastal and marine areas (Heap *et al.* 2011).

The assessment of landscape character included visiting sites of valued places and sensitive receptors (identified using stakeholder engagement, guidance from the EPA, and Exmouth tourist information). A total of 10 Landscape Character Units (LCU) were identified:

- Canyon (16.9%).
- Coral Coast (4.3%).
- Flats (5.4%).
- Gulf Coast (1.8%).
- Highlands (13.5%).
- Linear Dune (23.4%).
- Plains (25.4%).
- Tidal Creek (9.1%).
- Town (0.2%).
- Open Water (beyond nearshore zone).

The distribution of these LCUs is illustrated in Figure 5-25. Detailed descriptions of each LCU can be found in the LVIA study report (Attachment 2R).



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Notes: Data sourced from Subsea 7 (2018)

Exmouth

Figure 5-25
Landscape Character Units

Scenic Quality Values

During the LCU assessment, a value of each landscape unit was allocated based on the rarity of the landscape and the combined environmental, social and cultural usage. The amendment area intersects four LCUs – Plains (low value), Linear Dunes (low value), Flats (moderate value) and Gulf Coast (high value). The majority of the amendment area is comprised of Linear Dunes, which is generally a low valued landscape and is not unique to the region (Attachment 2R).

The potential visual impact of development within the amendment area from surrounding vantage points was assessed. Charles Knife Canyon lookout provides a viewing point for visitors and tourists to experience landscape views of the Canyon LCU (high value). The assessment showed that the amendment area is not visible from this location. The Canyon LCU is in stark contrast to the Gulf Coast LCU which is described as low-lying, flat coastal scrubland, with soft dunes and clayey sandy beaches with muddy and or rocky reef and open water and cool colour palette (Attachment 2R). The Gulf Coast LCU has cultural values as a locally popular fishing and camping location and has a recreational land use. The Gulf Coast LCU is considered a high value landscape.

Amenity

No permanent sensitive receptors are located within 5 km of the onshore amendment area. The Exmouth Gulf Station Homestead is approximately 5 km to the south east. Community engagement has indicated that Heron Point is used for recreational camping, four-wheel driving and fishing, but it is not a gazetted camping area. Visitation to Heron Point is *ad hoc* and likely to be short-term.

Current Land Uses and Tenure

The LVIA study area represents a combination of various land tenures. Most of the tenure is overlapping and is predominantly:

- Pastoral Lease (11.77%).
- Mining Tenements (16.65%).
- Petroleum Titles (31.68%).
- Conservation Estate – DBCA (14.64%).

The current land use of the amendment area is pastoralism. Surrounding land uses other than pastoralism include:

- Airfields/Defence (0.034%).
- Built Areas (Exmouth Town) (0.05%).
- Communications (0.017%).
- Conservation (17.9%).
- Extractive Industries (0.004%).
- Industrial (0.006%).
- Other (large private complexes) (0.002%).
- Main Roads (0.030%).
- Petroleum (363 wells).
- Commercial Prawn Trawling (15%).

Pastoralism

The primary land use within and surrounding the amendment area is currently pastoral. Pastoralism is the primary land use in the Gascoyne region with the industry being founded on wool, but pastoralists have diversified their incomes through tourism, cattle, sheep, goats and horticulture (GDC 2010). The pastoral industry's production value in the Gascoyne was valued at $30 million in 2015 (GDC 2018).

Tourism

The Gascoyne region receives many visitors and tourism is the largest component of the industry. Tourism is Exmouth's major economic contributor with eco-tourism experiencing significant growth. Hospitality, accommodation and retail activity associated with tourism contribute significantly to the Shire's economy and job market. The seasonal nature of Exmouth's population fluctuates with the peak tourist seasons (peaking at 6000 people), with the town attracting a mix of intrastate, interstate and international visitors for holidays and recreational purposes (Shire of Exmouth 2016). The peak tourism season is March – October. Table 5-40 provides an estimate of the number of overnight visitors to the region (ABS 2016a).

Overnight Visitor Origins for the North West Region	Average Annual Visitors (2015/16/17)	Percentage of Total
Estimated Visitors		
Domestic Total	110,800	79
International Total	28,900	21
Total	**139,700**	**100**
Average Length of Stay (Estimated Nights)		
Domestic	7.9	-
International	5.0	-
Total	**7.3**	**-**

Table 5-40: Visitor Summary in the Shire of Exmouth (ABS 2016a)

Tourists and visitors are attracted to Exmouth region for the 'Ningaloo Experience', which is valued for its remote and self-sufficient recreational opportunities in undeveloped natural areas along the Ningaloo Coast and includes camping with minimal facilities (DBCA 2019). Other tourist attractions include swimming with Whale sharks and Humpback whales, scuba-diving, wildlife watching, boating, fishing, hiking, snorkelling, beach leisure, four-wheel driving, surfing, kayaking and sightseeing (Figure 5-26).

Whale sharks are one of the major attractions to Exmouth and the season runs from March to July each year. More recently, swimming with Humpback whales is an approved tourist attraction and has contributed to the extension of the tourist season and improved the viability of tour operator businesses (Tourism WA 2016). Some of the key diving locations within the Ningaloo Coast include the Exmouth Navy Pier, Muiron Islands, Lighthouse Bay sanctuary area, Bundegi Reef and locations along the Ningaloo Reef (Ningaloo Visitor Centre 2018b).

Recreational Use of the Amendment Area

The amendment area overlies Exmouth Gulf Station. Stakeholder engagement sessions revealed that the coastline of Heron Point is used for recreational camping and fishing. Though not a gazetted campsite, locals have been using this coastal area for recreational purposes. Boating, fishing, diving, whale-watching and snorkelling are popular recreational activities in Exmouth Gulf but are not understood to be focussed on areas off Heron Point.

The inland balance of the amendment area does not attract tourist or local visitation, as it is within the Exmouth Gulf Station pastoral lease area.

Defence

The defence industry plays an important role in Exmouth's economy with current facilities including the RAAF Base Learmonth, Learmonth Solar Observatory, Learmonth Air Weapons Range, and the deep-water Navy fuel wharf/pier. The Shire has lease arrangements with the Commonwealth through to 2033 for the civilian terminal at the RAAF Base Learmonth and the airport continues to be a significant economic driver for the tourism and business sectors, in addition to servicing the local community (Shire of Exmouth 2016).

The Shire has indicated its interest in the expansion of Defence operations in Exmouth as it would provide a critical mass of employment, population, and expenditure activity (Shire of Exmouth 2018).

Petroleum

Oil and gas production in the Shire is the largest mining activity in the region with the majority of oil production carried out on floating production storage and offloading (FPSO) facilities (Gascoyne Development Commission [GDC] 2010). Full-scale oil and gas production in Exmouth began in 2006 with Woodside's Enfield FPSO project. The majority of these activities are carried out in Commonwealth waters and therefore the share of economic benefits is not captured in the Gascoyne's economy (GDC 2018a, ACIL Allen 2019).

Exmouth plays an important 'supporting services' role for the oil and gas sector though current supply chain inputs to major projects is limited. An expansion of supply chain opportunities and capture of a greater share of expenditure in the local economy would drive economic growth in the region (GDC 2018a).

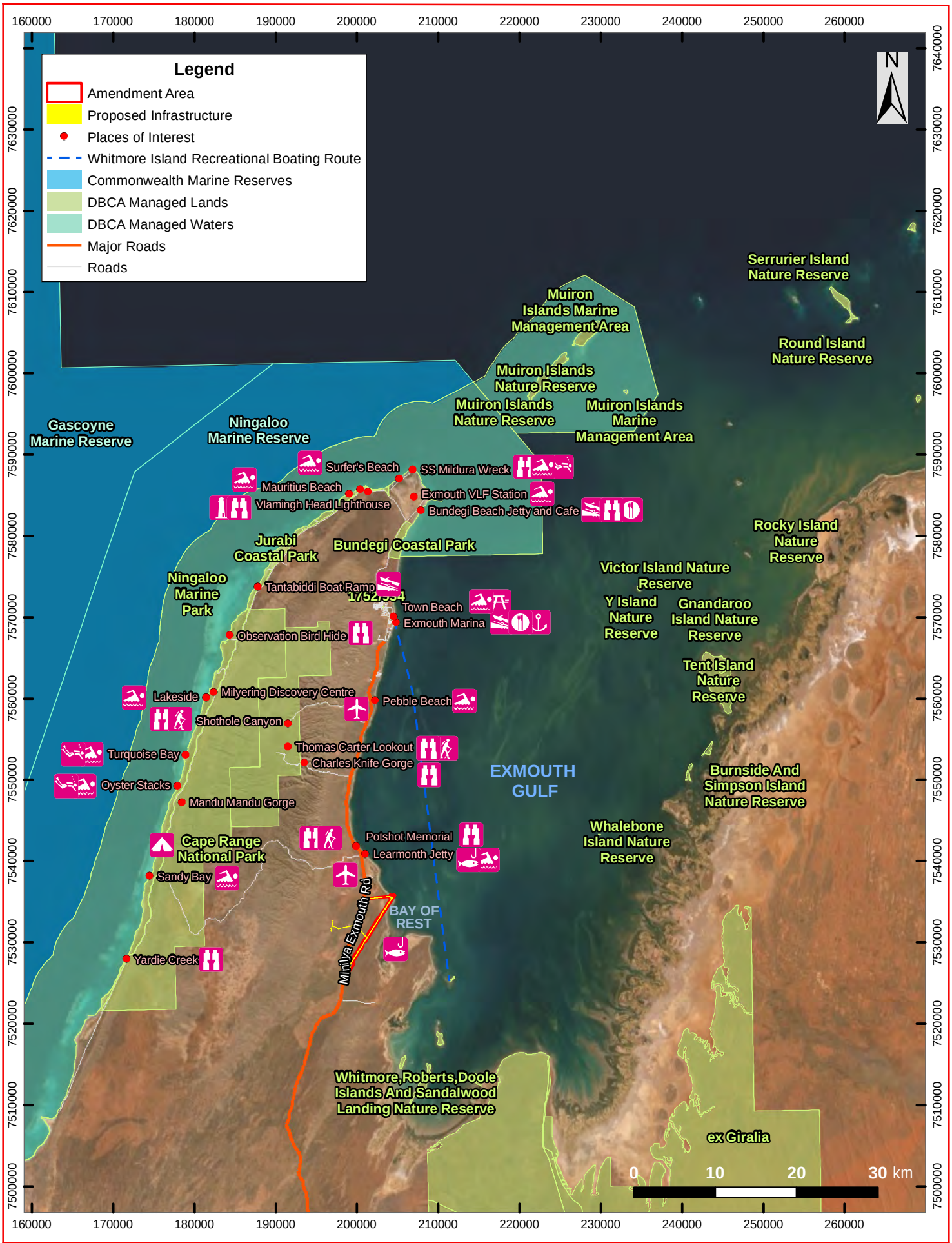
Conservation

Conservation is the largest land use in the Exmouth region and the conservation estate includes the Cape Range National Park, Ningaloo Marine Park, Jurabi Coastal Park, Bundegi Coastal Park, Muiron Islands Management Area/Nature Reserve and other DBCA managed areas, including the previous Giralia pastoral area. The amendment area does not intersect any of the conservation areas.

Future Land Uses of the Proposal Area

According to the Shire of Exmouth's *Local Planning Strategy 2012-2025* (LPS) a number of future land uses and zonings are being considered in the Exmouth area including residential, rural residential, industrial, tourism and restricted rural. Some of the future tourism zonings include short-stay tourism, tourism/residential, caravan and camping and wilderness camping investigation areas.

The amendment area is shown on the Strategy's spatial plans as a Rural area and partly within a Conservation and Landscape Protection area. The advertised LPS identified Lot 233 as an aquaculture site; however, the final version of the LPS removed the reference to the aquaculture site and replaced it as a Rural area (Shire of Exmouth 2019b). Therefore, a form of industrial activity (aquaculture) had previously been recognised and contemplated in the general location of the amendment area.



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Aerial Photo: ESRI
Grid: GDA 94/ MGA Zone 50

Notes: Data sourced from Subsea 7 (2018)

Exmouth

Figure 5-26
Recreational Values

5.8.3.6 Economic Surroundings

The Gascoyne region is located between two resource regions; the Pilbara and the Mid-West, and lies in close proximity to significant oil and gas exploration and extraction basins (SGS 2012). SGS (on behalf of the GDC) identified a number of opportunities for the Gascoyne to capitalise on, including both current and future developments (SGS 2012). Exmouth is the major settlement and the largest service centre between Carnarvon and Karratha. It is also the tourist gateway to the Ningaloo Marine Park, Ningaloo World Heritage and a number of national parks. Tourism has now become the largest industry and major economic contributor in the Shire, with eco-tourism expected to experience significant growth (Shire of Exmouth 2018). Hospitality, accommodation and retail also represent a considerable proportion of the Shire's economy and job market. Other key industries include fishing, pastoral activities, aquaculture, oil and gas, limestone mining, industrial activities, light engineering and government agency business.

The overall economic objective for the Shire of Exmouth is to '*diversify and grow our economy in a manner that provides year-round employment opportunities*' (Shire of Exmouth 2018). Community priorities and outcomes were identified to achieve this objective during stakeholder engagement sessions. Some of these included:

- Develop and encourage opportunities for business investment to develop a diverse economy.
- Create a strategic approach to economic development to attract investment and jobs in new and existing industries.
- Engage with local, state, national, and international stakeholders to build a stronger and sustainable tourism industry.
- Advocate and lobby for the provision of infrastructure that supports the local economy.

The GDC commissioned a report to identify economic development opportunities for the Gascoyne Region (SGS 2012). As a result, opportunities and priority projects were recommended in order to maximise economic and social benefits for Exmouth. These included the Exmouth Marina Expansion, marketing and promoting Exmouth as a logistics hub, development of the Exmouth Marine Supply Base, Fly In-Fly Out (FIFO) and Drive In–Drive Out (DIDO) initiatives (i.e. promoting Exmouth as a permanent residential base) and a number of Exmouth tourism initiatives (SGS 2012). Core values and considerations were also identified to guide future decision-making. Stakeholder engagement revealed that environmental protection and social advancement are equally as important as economic development and economic prosperity (SGS 2012). The Shire's Strategic Community Plan 2030 shows similar sentiments with the community wishing to build and diversify local businesses whilst ensuring the protection of the natural environment.

5.8.4 Potential Impacts

The future development within the amendment area has potential to directly and indirectly impact social surroundings. Table 5-41 summarises the potential impacts during each project phase.

Project Phase	Potential Impact
Construction/Operations	Disturbance to Aboriginal heritage places and/or cultural associations within the scheme amendment area
	Temporary and/or permanent constraint on access and traditional cultural activities
	Changes to the environment which may impact on Aboriginal heritage places
	Impacts to amenity values (e.g. aesthetics, access and/or active use of coastal areas) of the amendment area it supports
	Impacts to tourism activities in the scheme amendment area

Table 5-41: Potential Impacts to Social Surroundings

5.8.5 Assessment of Impacts

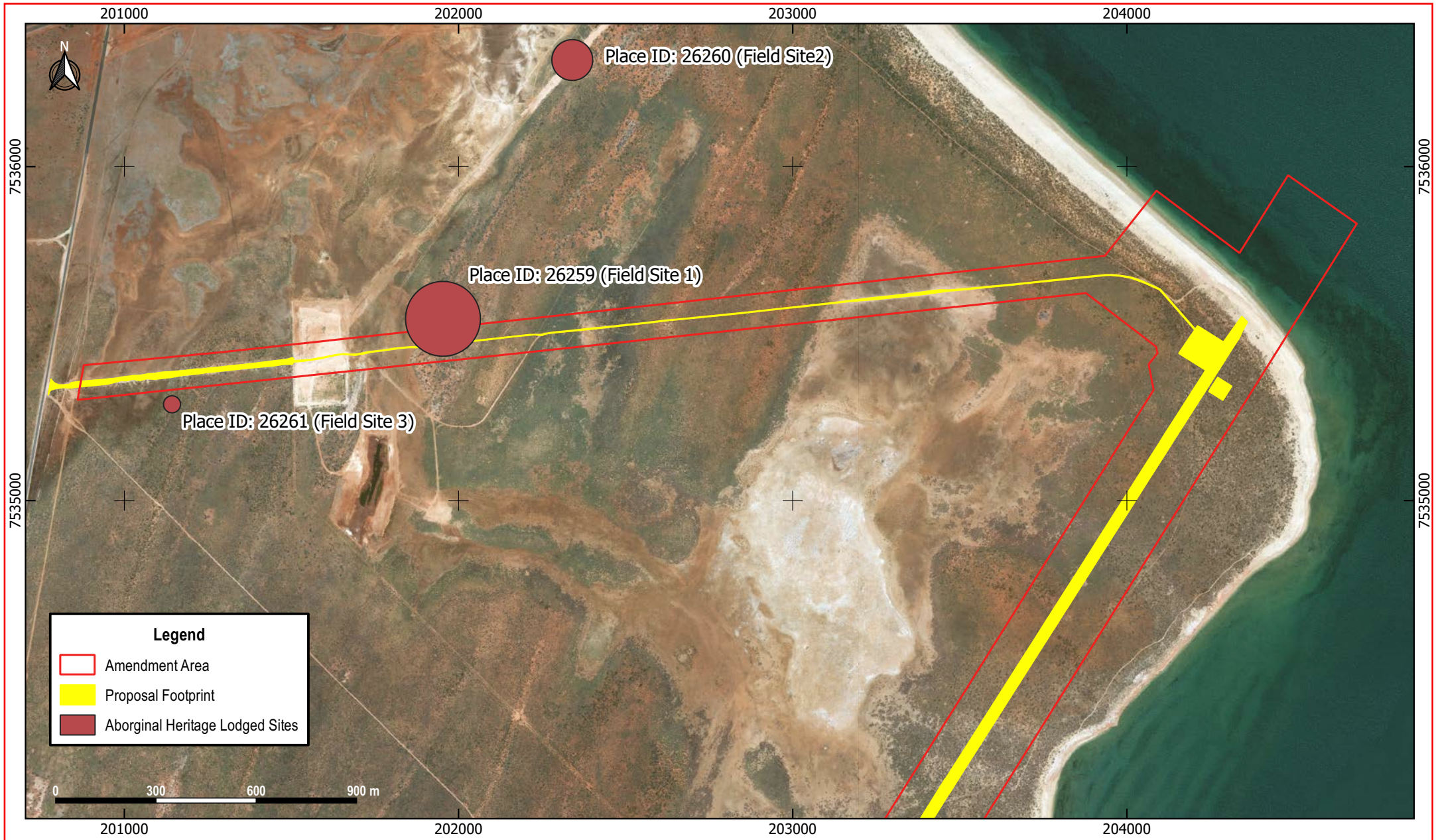
5.8.5.1 Disturbance to Aboriginal heritage places and/or cultural associations within the scheme amendment area

Four heritage sites have been recorded in the vicinity of Wapet Creek and adjacent to the amendment area (Figure 5-27). These are listed as 'Lodged' meaning they have been reported but their significance has not been assessed by the Aboriginal Cultural Materials Committee (SJC Consultants 2019). Heritage surveys across the amendment area, incorporating the advice and guidance of the Gnulli people, did not record any archaeological or ethnographic places (SJC Consultant 2019). Field Site 1, mapped as intersecting the amendment area and proposed northern access road alignment (Figure 5-27), appears to have been destroyed by earthworks associated with the abandoned fish farm (SJC Consultants 2019).

Therefore impacts to Aboriginal Heritage places or cultural associations are not expected. Notwithstanding, it is understood that all Aboriginal sites are protected by the AHA whether or not they have previously been identified or registered. A land user is obliged to comply with the provisions of the AHA, and Due Diligence Guidelines provide information on evaluation of a proposed activity and how it may affect Aboriginal heritage.

The heritage survey team identified the potential for artefacts to be present sub-surface, or to emerge in the more mobile soils following wind erosion of cleared or disturbed areas. The Gnulli considered the engagement of heritage monitors during ground disturbing works as an acceptable mitigation measure (Steve Corsini pers comm. 2019). The use of monitors during construction will be incorporated into a CEMP.

A tree, now identified as the 'Dinner Time Tree', was noted during the surveys and it was requested that it not be disturbed. The tree will be retained to ensure its value is maintained, noting that the tree itself is not a heritage site.



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Aerial Photo: ESRI
Grid: GDA 94/MGA Zone 50

Figure 5-27: Heritage Sites Adjacent to Northern Access Road

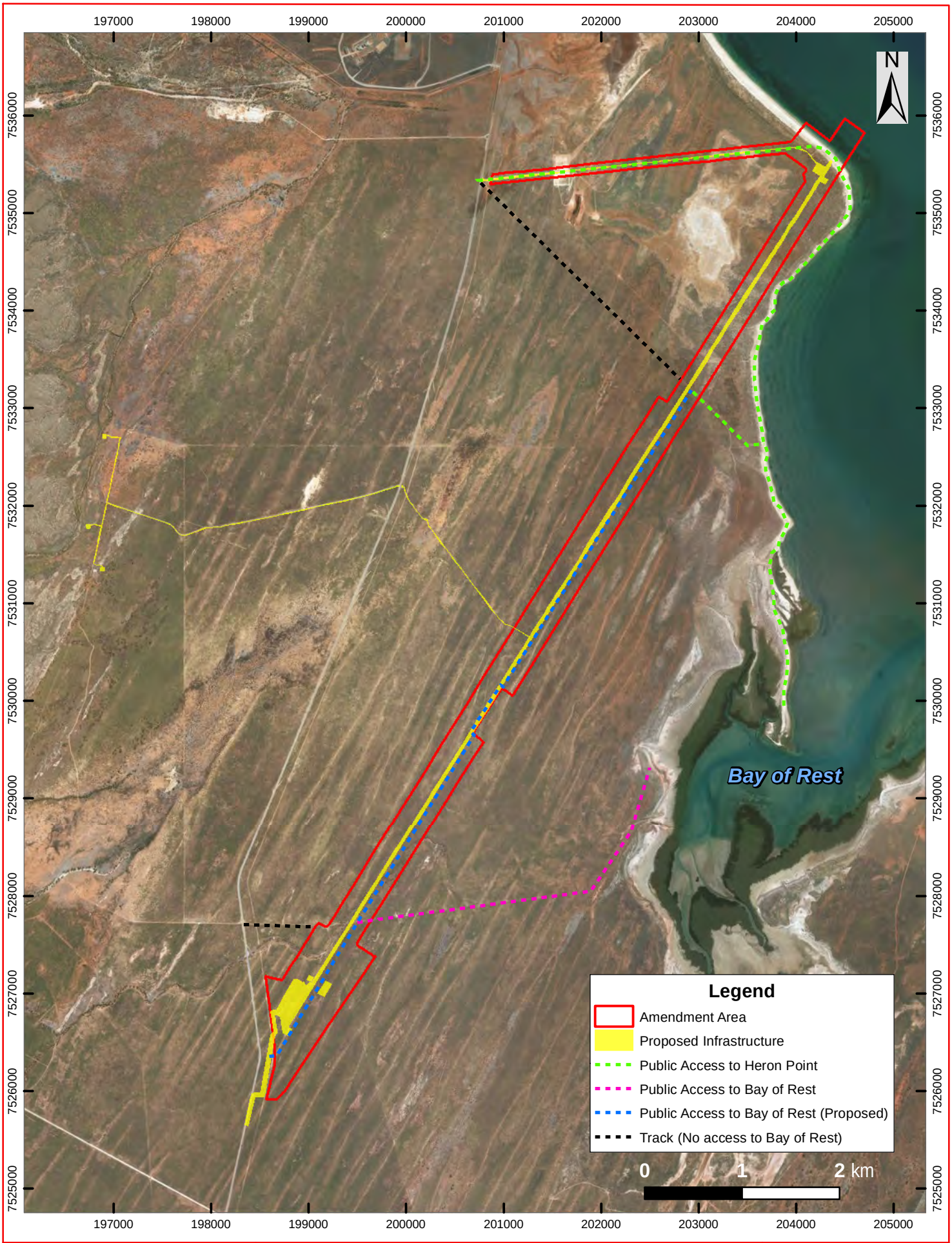
Shire of Exmouth
spirit for choice

W:\Subsea 7\GIS\Environment Review\Heritage.qgz 19/09/2019

5.8.5.2 Temporary and/or permanent constraint on access and traditional cultural activities

Subsea 7 has proposed that a launchway crossing will be incorporated into the Proposal design that allows off-road vehicles to continue along the beach to Heron Point and the Bay of Rest. Access along the beach will be temporarily (<3 months) impacted during launchway construction. To ensure that access to Heron Point and the Bay of Rest is maintained, Subsea 7 proposes to create a new access track that runs from the Minilya-Exmouth Road to the intersection of the existing track and the Bundle track, running parallel to the Bundle tracks (refer Figure 5-28). Consequently, significant impacts to the access of the area, and Heron Point and the Bay of Rest, are not expected.

Given that the site does not contain any culturally significant areas used for customary practices (Attachment 2T), impacts on traditional cultural activities are considered unlikely. Members of the Gnulli will be able to enter the site upon request to do so for a specified purpose. An Indigenous Land Use Agreement (ILUA) is currently under negotiation between the Gnulli and Subsea 7 and will be approved prior to the construction of the Proposal.



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Original Size: A4
Aerial Photo: ESRI
Grid: GDA 94/ MGA Zone 50

Notes: Data sourced from Subsea 7 (2019), 360 Environmental (2019)

Exmouth

Figure 5-28: Access to Heron Point (Post development)

5.8.5.3 Changes to the environment which may impact on Aboriginal heritage places

No sites of archaeological or cultural significant places were identified during the heritage survey (Attachment 2T). Surface water flow patterns are expected to remain similar to baseline flow patterns, and changes to flow velocities as a result of the Proposal are not expected to alter any natural scour or sediment deposition characteristics of the area (Section 5.7.5.1). No significant indirect impacts to coastal morphology as a result of altered wave climate, water flows and sediment movement following launchway construction, are expected (Section 5.2.6). Given all of the above, indirect impacts to Aboriginal places are considered unlikely.

5.8.5.4 Impacts to amenity values (e.g. aesthetics, access and/or active use of coastal areas) of the amendment area it supports

The following arrangements relate to the Proposal (currently under assessment by the EPA under Assessment number 2208).

Access

Access restrictions to the amendment area and surrounds have been examined in depth, with the following considerations:

- The beach in the area is often used by members of the public to drive to/from the Bay of Rest, or just generally to drive along this stretch of beach.
- Efforts to control access, such as fences, would impose a visual impact to the area that is not preferred by the public.

To maintain the current accessibility to this area of Heron Point, Subsea 7 proposes that no access restrictions to the launchway area will be in force for the large majority of the site operation. To provide for ongoing access to Heron Point and the Bay of Rest a launchway crossing has been incorporated into the launchway design that allows off-road vehicles to safely drive over the launchway. The crossing will be of a low profile design that is not prohibitive for any 4WD vehicle that is able to drive on the beach.

The launchway area will have an access restriction imposed during Bundle launch activities. This is expected to be for 1-2 days per launch, for an average of two launches per year (and not more than three). Notices regarding any upcoming launches will be well publicised and communicated to ensure that this closure is well understood. As an additional measure, signage will also be erected in the approaches to the beach crossing to ensure that the temporary closure is known.

During launch operations, access to the Bay of Rest will be maintained via an alternative access route. At present, there is direct access to the Bay of Rest from Minilya-Exmouth Road via an access track that extends across the proposed infrastructure alignment. To ensure continued access, Subsea 7 will create a new access track that runs from Minilya-Exmouth Road, to the intersection of the existing track and the Bundle tracks, running parallel to the Proposal site (refer Figure 5-28). This will ensure that access to the Bay of Rest is maintained at all times. A significant impact to long-term access to the area is not expected.

Noise and Dust Impacts

Noise will be generated during the construction phase of the Proposal by the various plant and vehicles operating. No loud noise sources, such as piling or blasting, are proposed.

Further, construction activities will occur during daylight hours (12 hour shifts), limiting the risk of impacts to social values.

Dust is likely to be generated during construction of the Proposal as a result of clearing for infrastructure. To limit the generation of dust, water carts will be used during construction.

Heron Point is not a gazetted camping site and there are no permanent sensitive receptors in close proximity to the amendment area. Recreational users of the area immediately adjacent to the amendment area may experience short-term (9-12 months) impacts to amenity due to intermittent noise and dust emissions during daylight hours during the construction phase.

Given the temporary and intermittent nature of potential dust and noise emissions, and the absence of nearby sensitive receptors, the potential impacts are not considered significant.

Lighting Impacts

The construction phase will require some artificial light sources appropriate to the task and compliant with occupational health and safety requirements. Construction activities will occur during daylight hours (12 hour shifts) limiting the risk of impacts to social values.

Operational phase lighting will be limited to the inshore (western) end of the amendment area, and will be the minimal needed to provide a safe working environment (noting that a daylight shift will be worked except in periods immediately preceding a Bundle launch when extended hours may be worked). Light spill will be minimised as much as possible.

Given the temporary and local nature of construction phase lighting, the minimal operations phase lighting and the absence of nearby sensitive receptors, the potential impacts are not considered significant.

5.8.5.5 Impacts to tourism activities in the amendment area

Recreational and Active Use

Activities undertaken in proximity to the amendment area include recreational camping, fishing and four-wheel driving, primarily at the coast. As discussed in the preceding sections, access to the beach will be maintained and impacts from dust, noise and lighting are not expected to significantly impact tourism activities.

Aesthetic Impacts

The results of the LVIA (photomontages and viewshed analysis) suggest that the Proposal's fabrication facility will be visible from along the Minilya-Exmouth Road and from offshore of Heron Point (Figure 5-29, Attachment 2R). The field assessment found that based on typical observer speeds, the facilities will likely be visible mostly off axis to the direction of travel. The zone of theoretical visibility (ZTV) for onshore components suggests that the facility could be visible from several other areas in the surrounding landscape. The field assessment did not find any high value receptor sites within these areas (Attachment 2R).

The Proposal's Bundle tracks are unlikely to be visible from much of the surrounding area due to the surrounding dunes and the limited alteration of the surrounding landforms (Attachment 2R).

The Proposal's launchway will be visible from adjacent beach areas, but is expected to blend in with the regional landscape in the same way as the current Learmonth Jetty which is a significantly higher structure (Attachment 2R).

VP01

VP04

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Original Size: A4
Aerial Photo Date: ESRI Satellite
Grid: GDA 94 / MGA Zone 50

Figure 5-29: Operations Phase Photomontages (Locations VP01 and VP04)

Shire of Exmouth

Charters/Tours

During stakeholder engagement, a local recreational fly fishing operator, Ningaloo Fly Fishing, has raised specific concerns regarding the Proposal. It is understood that primary concerns relate to reduced access to the Bay of Rest and impacts to visual amenity due to the presence of the launchway across the beach.

As noted above, access to the Bay of Rest will be maintained and the impacts to visual amenity are expected to be negligible. Access to the the southern and eastern parts of Exmouth Gulf will be maintained and a Notice to Mariners will be issued well in advance of offshore operations associated with the Proposal. Charter operators could readily plan activities to avoid offshore operations associated with the Proposal.

5.8.6 Mitigation and Predicted Outcome

The proposed mitigation measures to address potential impacts to social surroundings as a result of the amendment and associated infrastructure, the predicted outcome, and the planning mechanisms that are to be applied to ensure the impacts are managed to meet the EPA's objective are provided in Table 5-42.

The EPA objective '*to protect social surroundings from significant harm*' will be met.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
The CEMP will include protocols and procedures for the management of heritage values, including the provision of heritage monitors during initial clearing/excavation works. The CEMP would also address potential local impacts to amenity during the construction of infrastructure, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). The CEMP can refer to protocols that would be in place if Aboriginal heritage sites are discovered during construction. The 'Dinner Time Tree' will be included for protection. Monitors will be engaged during construction. The OEMP will include protocols and procedures for the management of impacts to local amenity during the operations phase of the Proposal, as outlined in the Public Environmental Review (PER) for the Proposal (under Assessment number 2208). A Bundle Launch Management Procedure will be prepared prior to the initial Bundle launch,	<u>Land Tenure</u> The coastline land tenure is Unallocated Crown land (UCL), and the Exmouth Gulf Station pastoral lease is Crown land. The UCL and the Crown land are not under the vested management, land ownership or control of Subsea 7 or the Shire of Exmouth. The DPLH may consider, if necessary, a document to formalise access arrangements, for example an easement in gross on Crown land under section 195 of the *Land Administration Act 1997*. This is a matter separate to the environmental review process. Land tenure matters have no bearing on the amendment. <u>Zoning</u> Under the LPS 1, Unallocated Crown land along the coastline is classified as 'Foreshore' reserve and could be developed/used in a manner consistent with the purpose of the reserve. The pastoral lease surrounding the amendment area is zoned as 'Rural', and could be developed/used in a manner consistent with the objectives and provisions of the zone. <u>Land Use Permissibility</u> The 'Special Use No. 10' zoning will facilitate the following land uses – marine support facility, pipeline fabrication facility, and telecommunications infrastructure. The Proposal currently under assessment by the EPA (Assessment number 2208) is for a pipeline fabrication facility. Subject to gazettal of Amendment 1, this land use would be a 'P' permitted use. A permitted use could proceed subject to development approval and subject to it complying with any relevant development standards and requirements of the LPS 4, and any relevant environmental conditions. The amendment proposes a definition for pipeline fabrication facility, as follows: *'pipeline fabrication facility means premises used for fabricating, testing and launching pipelines and includes: lay down and storage area(s); road access and parking area(s); workshops for*	<u>Related to Amendment</u> The amendment provides the ability for development, and in this case is interrelated to the Proposal (EPA Assessment number 2208). The rezoning would facilitate development, which would be assessed and determined under LPS 4. <u>Related to the Proposal</u> No sites or cultural places of significance were identified within the amendment area. 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.

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
detailing communications, exclusion zones and closure of the launchway crossing prior to and during the launch.	*fabrication facilities; facility offices and amenities; track(s), launchway(s) and coastal infrastructure used to convey pipelines to the coastline; and incidental uses and services thereto'.* <u>Model Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015</u> Consistent with clause 67 model provisions of the Planning and Development (Local Planning Schemes) Regulations 2015, in considering an application for development approval the local government is to have due regard to matters listed in that provision, including but not limited to: "(l) the effect of the proposal on the cultural heritage significance of the area in which the development is located"; "(q) the amenity of the locality including the following — (i) environmental impacts of the development; (ii) the character of the locality; (iii) social impacts of the development"; "(p) whether adequate provision has been made for the landscaping of the land to which the application relates and whether any trees or other vegetation on the land should be preserved"; "(s) the adequacy of — (i) the proposed means of access to and egress from the site; and (ii) arrangements for the loading, unloading, manoeuvring and parking of vehicles"; "(w) the history of the site where the development is to be located"; "(x) the impact of the development on the community as a whole notwithstanding the impact of the development on particular individuals". <u>Development control</u> Special Use No. 10 is proposed to be inserted into Schedule 4 – Special Use Zones of LPS 4, and would include a number of conditions. The conditions will include requirements for a Heritage Management Plan and the provision of ongoing public access to	

Proposed Mitigation Measures	Planning Mechanisms	Predicted Outcome
	Heron Point and the Bay of Rest from the Minilya-Exmouth Road.	

Table 5-42: Proposed Mitigation Measures and Predicted Outcome for Social Surroundings

6. HOLISTIC IMPACT ASSESSMENT

EPA (2018b) guidance suggests that the holistic impact assessment should provide a holistic assessment of the impacts of the proposal on the whole environment. The connections and interactions between the parts of the environment (environmental factors) and the predicted outcomes in relation to the environmental principles and the EPA's environmental objectives should be discussed.

A holistic impact assessment of the Proposal, focussing on the potential additive impacts on regional biodiversity, ecosystem integrity, and the social environment, is presented in the following sub sections.

6.1 BIODIVERSITY

6.1.1 Terrestrial

The proposed onshore clearing will result in a negligible reduction (on a spatial basis) of native vegetation that is common and widespread outside of the amendment area. The removal of individuals of the priority species *Corchorus congenor* (P3), which occurs widely across the Learmonth area, will not materially impact on the overall distribution or abundance of the species. No significant impacts to flora and vegetation are expected as a result of indirect impacts from the Proposal.

The vegetation within the amendment area is not considered high value fauna habitat. Indirect impacts to terrestrial fauna habitat associated with altered surface water flows or fire regimes are unlikely to result in a significant impact on terrestrial fauna. The increase in risk of vehicle strikes on terrestrial fauna represents an incremental increase to current risks. Discrete and cumulative impacts to terrestrial fauna associated with dust, weeds, or feral animals are not likely to be significant.

Stygofauna were not collected from any of the bores in the sand plain adjacent to the Proposal's nominated fabrication shed and sprayfield locations (Attachment 2N).

The construction of the Proposal has the potential to temporarily and locally displace migratory birds utilising the shoreline at Heron Point for foraging or roosting. No significant impact to migratory bird species is expected.

Overall, a significant impact to the biodiversity of the region is not expected.

6.1.2 Marine

Direct impacts to BCH are minor, being limited to within the launchway footprint.

Temporary, indirect impacts are predicted immediately adjacent (within 50 m) to the launchway during launchway construction. None of the BCH types likely to be impacted exhibit a limited distribution or unique community. The cumulative impacts are considered unlikely to compromise biodiversity at a local or regional scale.

Overall, a significant impact to the marine biodiversity of Exmouth Gulf is not expected.

6.2 ECOLOGICAL INTEGRITY (HEALTH AND PRODUCTIVITY)

6.2.1 Terrestrial

Direct impacts to native vegetation will be at a local scale and will not impact the ecological integrity of the Heron Point area or wider region. No significant impacts to flora and vegetation are expected as a result of indirect impacts from the Proposal.

Impacts to terrestrial fauna will be managed through the implementation of the nominated mitigation measures to maintain the abundance, health and productivity of terrestrial fauna in the Exmouth region.

No subterranean fauna were recorded adjacent to the Proposal's nominated fabrication shed and sprayfield locations (Attachment 2N). A significant impact to the health or productivity of subterranean fauna is not expcted.

Overall, a significant impact to the ecological integrity of the region is not expected.

6.2.2 Marine

Impacts to BCH will be at a local scale and will not impact the ecological integrity of Exmouth Gulf.

Overall, a significant impact to the ecological integrity of the region is not expected.

6.3 SOCIAL ENVIRONMENT

The EP Act defines social surroundings of people as their aesthetic, cultural, economic and social surroundings to the extent that those surroundings directly affect, or are affected by, their physical or biological surroundings.

6.3.1 Aesthetics

The natural beauty of the Exmouth region, including the Learmonth area is not expected to be significantly impacted. The landscape visual impact assessment (LVIA) predicted minor visual impacts from a comprehensive selection of vantage points around the Exmouth region. Against the backdrop of current terrestrial infrastructure (for example the RAAF Base Learmonth and airport) the proposed future development within the amendment area will not markedly change the aesthetic values of the region.

6.3.2 Culture

No significant sites of Aboriginal Heritage (archaeological or ethnographical) were recorded in the amendment area, which is not used for cultural or customary activities. Aboriginal Heritage values will not be significantly impacted or inhibited.

Access to Heron Point and Bay of Rest will be maintained and the public and tour operators will continue to be able to navigate Exmouth Gulf.

Overall, customs and social behaviour are not expected to be significantly impacted.

6.3.3 Economics

An Economic Impact Assessment was undertaken to model the economic contribution to the Proposal on the Gascoyne Region and to Western Australia (ACIL Allen 2019). To determine the economic contribution of the Proposal, the Proposal's economics (revenue, expenditure,

employment, wages and taxation payments) were modelled in relation to the State and regional (Gascoyne) economy. This was used to predict the economic contribution of the Proposal over the study period from 2017/18 to 2052/53.

The study concluded that the Proposal would make an important economic contribution to Western Australia and the Gascoyne Region. ACIL Allen estimated that the Proposal will directly contribute $742.2 million to the State's economy (in Gross Value Added terms) over the study period, averaging $20.6 million per annum. The level of activity is in turn expected to generate a further $880.7 million indirectly to the WA economy (an average of $24.5 million per annum), resulting in a total contribution of $1.62 billion over the study period at an average of $45.1 million per annum. When these values are compared to the Shires annual revenue for the 2017/2018 period (approximately $13 million) it is 60% higher and indicates a significant contribution to the regional economy.

Approximately 70% of the Proposal's economic contribution will be to the Gascoyne region, with the Proposal expected to contribute $1.14 billion to the Gascoyne economy over the study period at an average of $31.7 million per annum.

It was estimated that the Proposal would directly support an average of 40 full time equivalent (FTE) jobs per year over the study period, while a further 149 FTE positions per year on average would be indirectly created as a consequence of the Proposal. Overall, it was estimated that an average of 189 FTE employees would be supported by the Proposal each year over the study period.

Other economic impacts (contributions) as a result of the Proposal would include:

- Capitalising on an untapped natural advantage – the Proposal presents an opportunity for the Gascoyne region to take advantage of its location (i.e. proximity to oil and gas fields, suitable geography and topography).
- Capturing oil and gas sector activity – the Proposal presents an important opportunity to capture a share of the State's energy market that has previously eluded the Gascoyne region.
- Upskilling of workforce – Subsea 7 intends to establish a local workforce with no accommodation facilities on site, with workers accommodated in and sourced from Exmouth. An apprenticeship program is proposed in collaboration with the Central Regional TAFE in Exmouth. Recognised industry training opportunities will be offered to increase workforce capabilities and career progression.
- Employment – The Proposal also provides an opportunity to provide long-term, stable employment that usually fluctuates with high and low seasons of the tourism industry.

A significant impact to the social environment is not expected and any impacts will be managed through the implementation of a stakeholder engagement strategy. Overall a significant positive contribution to economic surroundings is expected due to the Proposal's estimated economic contributions and employment and industry opportunities.

7. GLOSSARY OF TERMS/ACRONYMS

7.1 ACRONYMS

4WD	four wheel drive
ABS	Australian Bureau of Statistics
AHA	Aboriginal Heritage Act 1972 (WA)
AHIS	Aboriginal Heritage Inquiry System
ANC	acid neutralising capacity
ARI	average recurrence interval
ASS	Acid Sulphate Soils
BAL	Bushfire Attack Level
BCH	Benthic Communities and Habitat
BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CE	Critically Endangered
DBCA	Department of Biodiversity, Conservation and Attractions
DCP	Decommissioning and Closure Plan
DIDO	drive in-drive out
DJTSI	Department of Jobs, Tourism, Science and Innovation
DoEE	Department of the Environment and Energy
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EAA	East Asian-Australasian flyway
EIA	Environmental Impact Assessment
EP Act	Environmental Protection Act 1986 (WA)
EPA	Environmental Protection Authority
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Cth)
EQO	Environmental Quality Objectives
EQP	Environmental Quality Plan
ER	Environmental Review for the Scheme Amendment No. 1 (Assessment Number: 2209)
ESA	Environmentally Sensitive Areas
ESD	Environmental Scoping Document
EV	Environmental Values
FIFO	fly in-fly out
FPSO	floating production storage and offloading
FTE	full time equivalent
GDC	Gascoyne Development Commission
GDEs	groundwater dependent ecosystems
ILUA	Indigenous Land Use Agreement
JDAP	Joint Development Assessment Panel
LAU	Local Assessment Unit
LCU	Landscape Character Unit
LEPs	Levels of Ecological Protection
LPS	Shire of Exmouth Local Planning Strategy
LPS 4	Shire of Exmouth Local Planning Scheme No. 4
LVIA	Landscape Visual Impact Assessment
MCMMP	Marine Construction Monitoring and Management Plan
NTCG	Native Title Claim Group
OEMP	Operational Environmental Management Plan
PBI	Phosphorous Buffering Index
PD Act	Planning and Development Act 2005 (WA)

PEC	Priority Ecological Community
PER	Public Environmental Review for the Proposal (Assessment Number: 2208)
PMP	probable maximum precipitation
RAAF	Royal Australian Air Force
SIA	Social Impact Assessment
sp./spp.	species: singular/plural
SPP	State Planning Policy
SRE	Short Range Endemic species
TEC	Threatened Ecological Community
TN	total nitrogen
TP	total phosphorus
UCL	Unallocated Crown Land
VLF	Very Low Frequency
WAPC	Western Australian Planning Commission
WoNS	Weeds of National Significance
WQPN	Water Quality Protection Note
YMAC	Yamatji Marlpa Aboriginal Corporation
ZoHI	Zone of High Impact
ZoI	Zone of Influence
ZoMI	Zone of Moderate Impact
ZTV	zone of theoretical visibility

7.2 MEASUREMENT TERMS

°C	degrees Celsius
ha	hectare
kL	kilolitre
km	kilometre
m	metre
mAHD	metres Australian Height Datum
mbgl	metres below ground level
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mm	millimetre
mol	mole, gram molecular weight
NTU	Nephelometric Turbidity Unit
pH_F	soil field pH
pH_{FOX}	soil field pH peroxide
PSU	Practical Salinity Unit
TDS	total dissolved solids
µm	micrometre

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